



Colorado Traffic Data Committee Survey Results Report

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1 INTRODUCTION

The Statewide Traffic Data Committee (Committee) conducted a survey of Colorado governmental agencies including Metropolitan Planning Organizations (MPO's), cities, counties, and other governmental agencies including Colorado Department of Transportation (CDOT), Federal Highways Administration (FHWA), Tolling Authority, and United States Air Force, for the purpose of gathering information related to traffic count data. Questions in the survey were designed to gather information related to traffic data collection, distribution, integration and data sharing activities of Colorado agencies.

There are a number of agencies throughout Colorado that could provide input to the Committee including 271 cities/towns, 64 counties, and a number of governmental agencies such as the MPO's, Transportation Planning Regions, the Local Technical Assistance Program (LTAP), and the Federal Highway Administration (FHWA). These agencies all have a vested interest in traffic data, traffic counting technology and traffic information (database) sources.

As of **December 30, 2008**, a total of 52 survey responses were received from participating Traffic Data Committee members. Duplicate agency responses were combined and some responses were eliminated resulting in **42** responses being analyzed in this report. The total number of participants includes **17%** of all the counties and **9%** of all the cities/towns in the State. It is worth noting the number of anticipated participants will continue to grow throughout the next several years as the Committee begins to expand communications and develop more on-line automated and integrated traffic database tools. In the meantime, the December, 2008 survey results will be used in evaluating existing gaps as well as overlapping activities in all of the various State traffic data programs. The Committee hopes that creating communication venues and technology tools will enable agencies to coordinate and streamline traffic data activities that will ultimately ensure a more integrated, comprehensive and complete statewide traffic data and transportation system. The Traffic Data Committee is committed to providing benefits to governmental agencies for participation. This report is one example of a benefit that provides the opportunity for agencies to save money by coordinating traffic data collection, potentially eliminating hundreds of duplicated efforts in collecting, processing, and disseminating traffic data throughout the State.

These survey results are only the beginning and provide the foundation for building communication and coordination tools such as having regular e-Newsletters, statewide Committee meetings, and the development of a statewide Traffic Data Web Portal for uploading, downloading, scheduling, and maintaining historical traffic data counts throughout the State. This report summarizes survey respondent's feedback and provides analysis of respondent's feedback as well as providing succinct conclusions of the results.

1.1 Individual Survey Results

For detailed survey information including the survey questions and for access to each individual agency survey response, the electronic links have been provided below. In addition, this report provides a copy of the survey questions in the Appendix.

Link to the survey:

http://www.surveymonkey.com/s.aspx?sm=Ua9QE2_2bEW3_2fMSWEYAQTCCw_3d_3d

Link to the survey results:

http://www.surveymonkey.com/sr.aspx?sm=qYTG8IHtRi5cr0pliTAEEnEPnwHpGG_2f2e9h_2b_2badtCGoc_3d

1.2 Colorado Committee Members Contact Information

As of **December 30, 2008**, the Statewide Traffic Data Committee received a total of **42** responses. These responses were provided from the on-line survey referenced in Section 1.1. The Committee contacted a number of agencies by e-mail and phone to request participation. The survey will continue to be on-line so as additional participants from throughout the State participate they can fill the survey as one of the first steps in being involved. As mentioned in the introduction, participation in the Committee provides participants with a quarterly e-Newsletter, opportunities to coordinate traffic data collection activities, access to information such as these survey results and information from FHWA.

The Committee was hoping to gain participation from 10% of all the cities and counties. Below are the number of participants and the percentages for all city, county and other agencies.

- 271 City agencies, **23** responded (**9%** participation)
- 64 County agencies, **11** responded (**17%** participation)
- 5 MPO's, **5** responded (**100%** participation)
- CDOT, RTD, E-470 Tolling Authority and the United States Air Force (USAF) also responded

Agencies that participated in the survey were required to input their contact information.

Table 1 shows the list of people who responded to the survey.

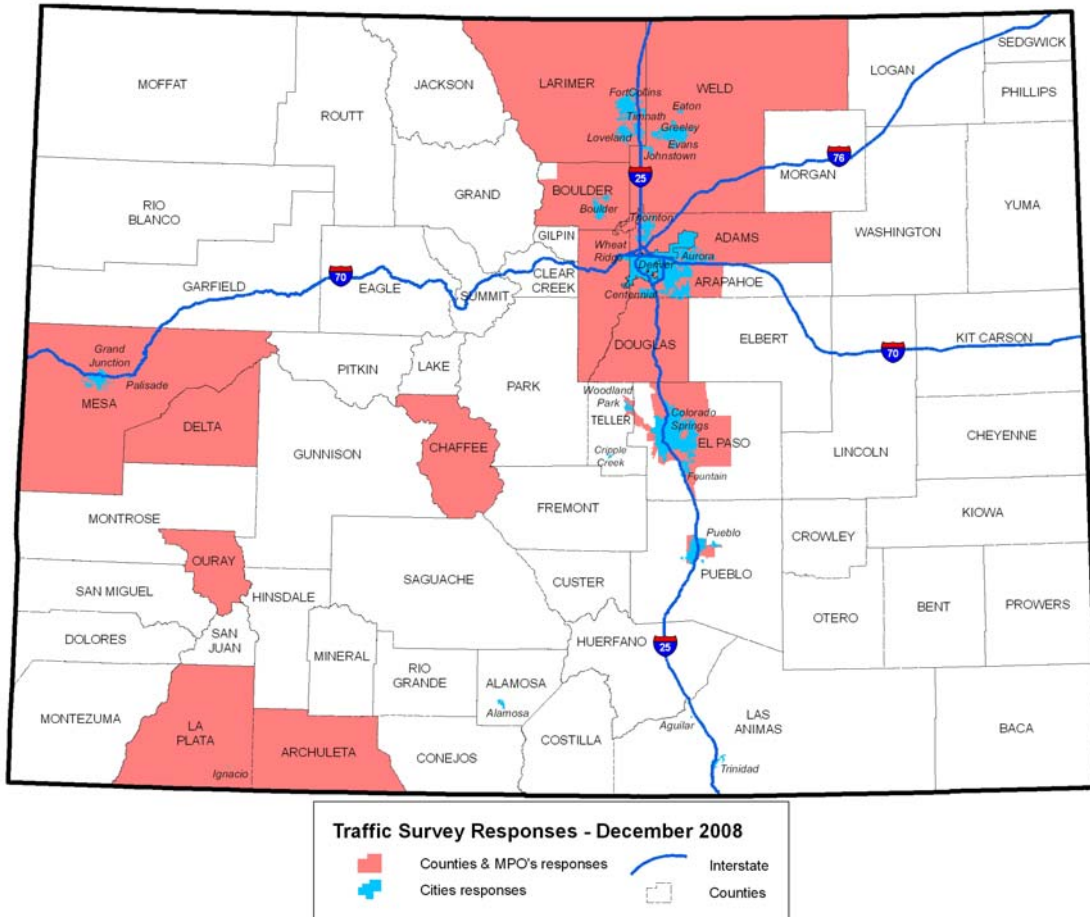
Table 1- Contact Information of Respondents

#	Agency	Name	Title	Email	Phone
1	Adams County	Phil Filler	Traffic Technician	pfiller@co.adams.co.us	303-853-7131
2	Aguilar	Ellen Larson	Mayor	aguilarmayor@aguilarwifi.net	719-859-0349
3	Alamosa	Jeanette Luttrell	Engineering Technician	jluttrell@cc.alamosa.co.us	719-587-2520
4	Archuleta County	Matt Katsos	Asset Technician	mkatsos@archuletacounty.org	970-264-5660
5	Aurora	Anna Bunce	Project Engineer-Traffic	abunce@auroragov.org	303-326-8227
6	Boulder County	Bill Cowern	Transportation Operations Engineer	Cowernb@bouldercolorado.gov	303-441-4054
7	CDOT	Elizabeth Stolz	Traffic Analysis Unit Manager	elizabeth.stolz@dot.state.co.us	303-757-9495
8	Centennial	Craig Faessler	City Traffic and Transportation Engineer	cfaessler@centennialcolorado.com	303-325-8035
9	Centennial	Travis Greiman	Civil Engineer	tgreiman@centennialcolorado.com	303-754-3458
10	Chaffee County	Kim Antonucci	Planner	kantonucci@chaffeecounty.org	719.530.5567
11	Colorado Springs	Justin H. Schaeffer	Senior Traffic Engineer	jschaeffer@springsgov.com	719-385-5438
12	Cripple Creek	Ray White	Director of Heritage Tourism	rwhite@cripple-creek.co.us	719-689-3315
13	Delta County	Bob Basher	Engineering Technician	bbasher@deltacounty.com	970-874-5914
14	Delta County	Bob Kalenak	County Engineer	bkalenak@deltacounty.com	970-874-2035
15	Denver	Mark Meulemans	Senior Engineering Associate	mark.meulemans@denvergov.org	720-913-0803
16	Denver Regional Council of Governments (MPO)	Lawrence Tilong	Transportation Planner	ltilong@drcog.org	303-480-6761
17	Douglas County	Mark Stacks	Traffic Engineer	mstacks@douglas.co.us	303-660-7490
18	E-470 Tolling Authority	Danna Smith	Accountant	dsmit@e-470.com	303-537-3790
19	Eaton	Donald Cadwallader	Assistant Town Manager	dcadwallader@eatonco.org	970-454-3338
20	Evans	Cameron Parrott	Sr. Civil Engineer	cparrott@ci.evans.co.us	970-475-1113
21	FHWA	Craig Larson	Transportation Planner	craig.larson@fhwa.dot.gov	720-963-3018
22	Fort Collins	Joe Olson	City Traffic Engineer	jolson@fcgov.com	970-224-6062
23	Fort Collins	Kathleen Bracke	Transportation Planning & Special Projects Director	kbracke@fcgov.com	970-224-6140
24	Fountain	Duane Greenwood	Public Works Director/City Engineer	dgreenwood@fountaincolorado.org	719-322-2036
25	Grand Junction	Jody Kliska	Transportation Engineer	jodyk@gjcity.org	970-244-1591

#	Agency	Name	Title	Email	Phone
26	Grand Junction	Sandra Mallroy	Transportation Systems Analyst	sandym@gjcity.org	970-244-1567
27	Greeley	Ryan Boothe	Neighborhood Traffic Program Coordinator	ryan.boothe@greeleygov.com	970-350-9752
28	Ignacio	Balty Quintana	Town Manager	balty@townofignacio.com	970-563-9494
29	Jefferson County	Will Kerns	Transportation Planner	wkerns@jeffco.us	303-271-8497
30	Johnstown	John Franklin	Town Planner	jfranklin@townofjohnstown.com	970-587-4664
31	La Plata County	Jim Davis	Dir. of Public Works	davisja@co.laplata.co.us	970-382-6372
32	Larimer County	Bill Gleiforst	Traffic Operations Manager	bgleiforst@larimer.org	970-498-5707
33	Loveland	Derek Schuler	Civil Engineer	schuldd@ci.loveland.co.us	970-962-2647
34	Mesa County	James Nall	Traffic Engineer	James.Nall@mesacounty.us	970-254-4151
35	Mesa County	Ken Simms	Senior Transportation Planner	ken.simms@mesacounty.us	970-244-1830
36	North Front Range MPO	Arvilla Kirchhoff	North Front Range MPO Modeler	akirchhoff@nfrmpo.org	970-224-6147
37	Ouray County	Chris Miller	Road & bridge Superintendent Ouray County	cmiller@ouraycountyco.gov	970-626-5391
38	Palisade	Nathan Boddy	Town Planner	nboddy@townofpalisade.org	970-464-5602
39	Pikes Peak Area Council of Governments MPO (PPACG)	Craig Casper	Transportation Director	ccasper@ppacg.org	719-471-7080
40	Pikes Peak Area Council of Governments MPO (PPACG)	John Hanson	GIS Planner	jhanson@ppacg.org	719-471-7080 ext.104
41	Pueblo	Joy Morauski	Traffic Engineering Analyst	jmorauski@pueblo.us	719-553-2722
42	Pueblo Area Council of Governments MPO	Bill Moore	MPO Administrator	bmoore@pueblo.us	719-553-2945
43	RTD	Lee Cryer	Planning Project Manager	lee.cryer@rtd-fastracks.com	303-299-2410
44	Thornton	Darrell Alston	Project Manager - Traffic	darrell.alston@cityofthornton.net	720-977-6480
45	Timnath	Abra Geissler	Engineer	abra.geissler@ibassociatesllc.com	303-678-7168
46	Timnath	Marc Dolezal	Civil Engineer - Timnath, CO	marc.dolezal@ibassociatesllc.com	303-678-7168
47	Trinidad	Brad Mincic	Engineering Tech.	bmincic@historicttrinidad.com	719-846-9843 x134
48	USAF	Ralph A Mitchell Jr	Community Planner	ralph.mitchell@schriever.af.mil	719-567-2075
49	Weld County	Wayne Howard	County Engineer	whoward@co.weld.co.us	970-304-6496
50	Wheat Ridge	Kelly Rosson	Engineering Technician	KROSSON@CI.WHEARIDGE.CO.US	303-235-2866
51	Woodland Park	William Alspach	Director of Public Works/City Engineer	walspach@city-woodlandpark.org	719-687-5213

Figure 1 below is a map showing the participation coverage of Committee members. The Committee is still in the development stages and will require additional meetings and coordination efforts to advertise the Committee's efforts and opportunities for participation. The goal of the Committee is to encourage statewide participation of multiple government agencies. The Committee anticipates hosting a statewide meeting in March, 2009 to discuss additional coordination efforts including the development of a statewide traffic data software application and traffic data training program.

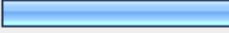
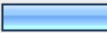





Figure 1 - Map of Traffic Survey Responses



1.3 Committee Member Roles

A number of Committee members responded to the survey question related to their individual roles and responsibilities within their respective organizations. Figure 2 below shows the percentage of responses for each survey category.

Figure 2 - Traffic Data Roles

3. What is your main interest(s) or role(s) with traffic data? (select all that apply)			Response Percent	Response Count
Data User (environmental modeling, transportation modeling)			68.3%	28
Data Supplier			31.7%	13
Data Coordinator (State agency, etc.)			19.5%	8
Data Collector			43.9%	18
Data Manager			41.5%	17
 Other (please specify)			7.3%	3
			<i>answered question</i>	41
			<i>skipped question</i>	1



OBSERVATION #1 – Data Standardization and Storage: According to the responses above, most of the Agency Committee members are traffic data users and traffic data collectors. This finding indicates a need for sharing and integrating traffic data across multiple governmental agencies.

OBSERVATION #2 – Data Scheduling: The necessity for developing a statewide traffic data scheduling tool that can serve the multiple overlapping data user, supplier, and collection needs is evident and therefore the results of this question indicate a need to coordinate traffic data scheduling efforts across multiple agencies throughout Colorado.

1.3.1 Committee Member Traffic Data Work Activities

In the survey, there were a number of questions that allowed participants to answer with open ended text responses. The specific question asked in the survey was, “Describe the Main Function of Traffic work you perform.” This question provides an overview of what Traffic Data Contacts throughout Colorado are responsible for and results can be seen in the table below.

Table 2 - Traffic Data Functions

#	Entity	Describe the Main Function of Traffic work you perform
1	Aguilar	None presently
2	Alamosa	Speed checks.
3	Aurora	Traffic signal timing & operations, ITS.
4	Boulder	Traffic operations, including signing, marking, operational studies, data collection and management, work zone traffic control and traffic calming.
5	CDOT	Collect Traffic Count and Vehicle Classification data for federal reporting, engineering, and other customers of the CDOT Traffic Database.
6	Colorado Springs	Traffic Operations, Senior Area Traffic Engineer for the north half of the city.
7	Delta County	Collect, analyze, and provide traffic count and analysis.
8	Denver	Collect traffic counts using road tubes, video detection, and electronic road surface counters. Process raw count data into usable reports, as well as manage Denver traffic count data.
9	Denver Regional Council Of Governments	Collects traffic counts from other government agencies and private contractors. Perform quality control and add acceptable counts to DRCOG traffic count database for planning/modeling use.
10	Douglas County	Collect data relating to traffic counts and accidents.
11	E-470 Toll Authority	Track traffic by plaza location to compare against traffic forecast.
12	Eaton	Maintenance of existing roadway.
13	Evans	Traffic Counts, Sign Requests, Manage contractors who work on signals.
14	Fort Collins	City Traffic Engineer. Oversee Signing, Marking, Traffic Signals, Traffic Data Collection, Neighborhood Traffic, etc.
15	Fort Collins	Performs travel demand modeling.
16	Fountain	Most traffic data in the City of Fountain is collected by Traffic Engineering Consultants working for developers or under separate contract with the City. Currently use some tube counters and conduct some counts on an as needed basis. Due to budget constraints, the City performs very few if any counts each year.
17	Grand Junction	Investigate citizen requests for signs, signals and markings. Issue work orders for traffic related requests. Markings layout. Handle all school related traffic issues. Handle street light requests within the City. Maintain ADT information on City streets.
18	Greeley	Traffic Engineering Studies and neighborhood traffic safety.
19	Jefferson County	Compiling and maintaining the Jefferson County Crash and Count GIS.
20	Johnstown	Coordinate consultant work, represent the Town in regional transportation matters.
21	Larimer County	Manage and supervise all Traffic Data collection, Traffic Count and Traffic Accident Data input to and reports from databases. Perform and supervise traffic studies. Oversee installation and maintenance of all traffic control devices, signs, signals, pavement markings etc. Supervise maintenance of GIS inventory database for traffic and roadway assets.
22	Loveland	Manage programs: Traffic Counts, Traffic Calming, and School Safety. Design Traffic Signal Projects.
23	North Front Range MPO	Traffic volumes are collected to calibrate our travel model.
24	Ouray County	Road maintenance, hard surface and gravel.
25	Pikes Peak Area Council of Governments	GIS and Traffic Counts.

#	Entity	Describe the Main Function of Traffic work you perform
26	Pikes Peak Area Council of Governments	Regional travel forecasting.
27	Pueblo	Data collection of traffic volume and management, Turning movement counts, signal/ stop sign warrant studies. Sign and pavement marking management and traffic regulations.
28	Pueblo Area Council Of Government (PACOG)	The PACOG MPO contracts with the City of Pueblo Traffic Engineering Division for traffic counting services. The City maintains and uses electronic counters purchased through the MPO and, in some years, contracts with a private firm to do counts at 60-100 locations (depending on counting budget). Processing of the raw count data is done, in part, by a part-time Traffic Analyst whose personnel costs are paid through the Unified Planning Work Program budget. The traffic count data is used during updates to the Long Range Transportation Plan and for special sub-regional studies and more detailed plans. The MPO also serves as a data coordination center maintaining and updating traffic counts from the County and CDOT with the data obtained by the City. These cooperative arrangements work very well for the MPO and Transportation Planning Region areas.
29	RTD	Travel modeling.
30	Thornton	Address citizen issues, signal timing, data collection, perform traffic studies, analyze traffic data, plan review, coordination with other staff and other agencies.
31	Timnath	Planning and Review.
32	Trinidad	Engineering Projects and speed studies.
33	US Air Force	Plan, design, and construct roadways and parking lots for the air base.
34	Weld County	Traffic Engineering.
35	Wheat Ridge	Traffic Counts.



OBSERVATION #3 – Data Storage and Standardization: Survey results showed that survey respondents are responsible for a number of different traffic data functions that require an accurate and complete traffic dataset. Although the data functions are varied, the traffic data required to perform these functions are the same. Therefore a need to standardize traffic data is critical for data sharing across governmental agencies.

OBSERVATION #4 – Data Distribution: In general, traffic data contacts are responsible for providing customer service by answering questions about traffic volume and classification data, maintaining current/historical and accurate traffic database information, and coordinating traffic data collection schedules with other agencies and internal staff.

2 AGENCY DETAILS

This section of the survey report provides summary, analyses, and conclusions ascertained from the agency detail survey questions that are directly related to the need for developing Committee communication and technology tools. For example, survey questions were tallied to provide a snapshot of the total responses provided and in some cases, the results were tallied and categorized according to the question.

2.1 Agency Size

In an effort to categorize each agency as a large, medium, or small traffic data entity, the survey requested that respondents provide details about the agency. The survey respondents were asked to provide the total population numbers within their jurisdiction. Not all respondents answered this question and therefore not all participating agencies are categorized. Only 35 agencies are categorized below and most agencies have between 1 and 5 employees working on their traffic data programs. Survey results were categorized into the following: Large agencies have a total population of 50,000 or more, Medium agencies have a total population between 10,000 and 50,000, Small agencies have a population of less than 10,000.

Survey results showed: **11** Small agencies, **6** Medium agencies, **16** Large agencies.

The figures below show the responses by agency. The population totals were based on the 2000 Census and Survey responses.

Table 3 - Small Agencies

Name	Population
Aguilar	593
Alamosa	9,000
Eaton	4,500
Ignacio	742
Johnstown	9,000
Palisade	3,600
Ridgway	4,500
Schriever AFB	6,000
Timnath	400
Trinidad	10,000
Woodland Park	8,500

Table 4 - Medium Agencies

Name	Population
Delta	30,000
Evans	20,000
Fountain	23,000
Pagosa Springs	11,700
Salida	15,000
Wheat Ridge	32,000

Table 5 - Large Agencies

Name	Population
Aurora	300,000
Boulder	100,000
Centennial	105,000
Colorado Springs	550,000
Denver	544,759
DRCOG	2,600,000
Fort Collins	130,000
Grand Junction	55,000
Greeley	95,000
La Plata County	50,000
Larimer County	250,000
Loveland	65,000
NFRMPO	435,700
PACOG	155,000
Pueblo	102,000
Thornton	118,000



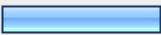

OBSERVATION #5 – Data Scheduling, Storage, and Standardization: This result generally indicates that all different sized agencies have a need to collect, analyze and provide traffic data. Therefore, as the Committee continues to grow and develop communication and on-line tools, large, medium and small agency needs will need to be considered.

2.2 Traffic Data Field Collection

One of the major reasons for the development of a Statewide Traffic Data Committee is to coordinate data collection activities that will ultimately lead to reducing data collection costs. These reductions can come through the elimination of duplicate traffic count collections at the same locations by multiple agencies within the same year.

The survey requested participants to select yes or no to the question “Does your agency collect traffic data in the field?”.

Figure 3 - Field Data Collection

11. Does your agency collect traffic data in the field?			
		Response Percent	Response Count
Yes		78.0%	32
No		22.0%	9
		<i>answered question</i>	41
		<i>skipped question</i>	1







OBSERVATION #6 – Field Data Collection Standardization: As seen in Figure 3 above, 78% of the respondents perform traffic data collection activities. Since there is a need to share data, these results indicate a need to standardize field data collection procedures. This includes the need to create a statewide field data collection training program and implementing statewide standard methods for traffic data collection and quality control procedures.

2.2.1 Agency Staff versus Contractor Field Data Collection

78% of the agencies that responded to the survey indicated that their agency collects traffic data in the field. The follow up question asked in the survey was designed to understand if agencies collect data with staff internally or if agencies hire consultants to collect traffic data. Below are the summarized results for the question, “Who collects traffic count data for your agency?”.

Figure 4 - Traffic Count Collection by Consultant vs. In House Staff

13. Who collects traffic count data for your agency?			
		Response Percent	Response Count
In house staff		53.1%	17
Contractor(s)/Consultant(s)*		15.6%	5
Both in house staff and Contractor(s)/Consultant(s) *		31.3%	10
* Please list Contractor/Consultant names			13
		answered question	32
		skipped question	10



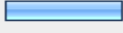
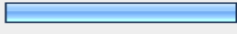

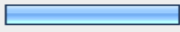
OBSERVATION #7 – Field Data Collection Standardization and Data Storage and Standardization: Over 50% of the agencies that collect traffic data do so with in-house staff. This result indicates a need for providing traffic data collection standardization and training. Developing statewide field data collection standards and training for agency contractors and staff will help to ensure interoperability and integration of traffic data through collection, processing, and overall traffic data standardization.

2.2.2 Agency Field Data Collection Details

In an effort to understand the details of statewide traffic data collection activities and how the activities are managed from one agency to another, additional survey questions were developed.

Of the 13 agencies that do not collect traffic data in the field, the survey asked where the agency acquires traffic count data. The detailed and summarized results to this question can be found in the Figure and Tables below.

Figure 5 - Traffic Count Data Acquired

12. Please describe how your agency acquires traffic count data since you do not collect traffic data in the field?					
			Response Percent	Response Count	
Purchase traffic data			0.0%	0	
Hire consultants/contractors to collect data			22.2%	2	
Get it from CDOT web site			44.4%	4	
 view	Other (please describe)			33.3%	3
<i>answered question</i>				9	
<i>skipped question</i>				33	

The results show that **22%** of the respondents hire consultants and over **44%** get their counts from CDOT. This is an opportunity for agencies to save money through coordinated data collection efforts including scheduling, acquiring, and electronically sharing traffic count data across multiple agencies. For every traffic count that is shared, the potential savings is anywhere from \$100 to \$400 per traffic count. If the Traffic Data Committee can provide shared communication and technology tools that keeps each agency from having to collect one traffic count per agency (42 Total) the potential savings is minimally \$4,200 dollars per year. The goal of the Committee is to engage agencies and have integrated data sharing, scheduling, and processing of traffic count data.

Survey respondents had the opportunity to list the name(s) of their agency contractor(s) in the open text format question “Please list Contractor/Consultant names.” The results from that question are summarized below.

Table 6 - Traffic Data Contractors

#	Entity:	List Contractor/Consultant names
1	Centennial	DMJM + Harris, Counter Measures and All Traffic Data, Lowest bidder
2	CDOT	TDS and other various consultants
3	Colorado Springs, DRCOG, Loveland, Thornton, Timnath	All Traffic Data
4	Denver	Varies per bid
5	Fountain	LSC
6	Pueblo	Lowest bidder

Survey respondents had the option to provide more details about how their respective agencies acquire traffic data and the results are summarized in the table below.

Table 7 - Traffic Data Acquisition

#	Entity	Describe how your agency acquires traffic count data since you do not collect traffic data in the field?
1	PACOG	The MPO budgets for traffic counting services from the City of Pueblo. Highway data is obtained from the CDOT website. Pueblo County provides its traffic counting data to the MPO/TPR. For special studies performed by consultants, the MPO/TPR often requires supplemental or more detailed traffic counts which are also used in the database.
2	Aguliar	Get it from CDOT web site.
3	Aurora	Sometimes hire, sometimes get it from CDOT or DRCOG, some small and very targeted field collection on an infrequent basis.
4	DRCOG	Get from CDOT and other agencies.
5	Lakewood	Get it from CDOT web site.
6	Salida	Get it from CDOT web site.
7	Woodland Park	Get it from CDOT web site.



OBSERVATION #8 – Data Distribution: One **third** of the **13** agencies that do not collect traffic data in the field rely on CDOT’s database. Another **third** of agencies hire consultants to collect data in the field. The results from this question show a strong dependency on other data sources such as CDOT or other agencies and therefore a need to electronically distribute and integrate data is paramount.

3 TRAFFIC COUNT PROGRAM DETAILS

Survey participants were asked to comment on a number of traffic count program business practices. For example, questions were asked that related to the number of traffic counts collected annually, what days of the week that counts are acquired in the field, and the interval(s) that traffic data is collected. Survey results are presented below.

The Figure below shows the number of traffic data collection sites found in multiple agencies throughout the State. This establishes the opportunity to share traffic data statewide which could save agencies time and money. There are over **4,900** short-duration count sites and **750** permanent traffic collection sites maintained by various agencies. This number partially covers the State as there are more agency counts collected than Committee members that responded to the survey. However, results show that agencies are collecting and maintaining traffic data collection equipment and data statewide.

Figure 6 - Statewide Traffic Count Sites

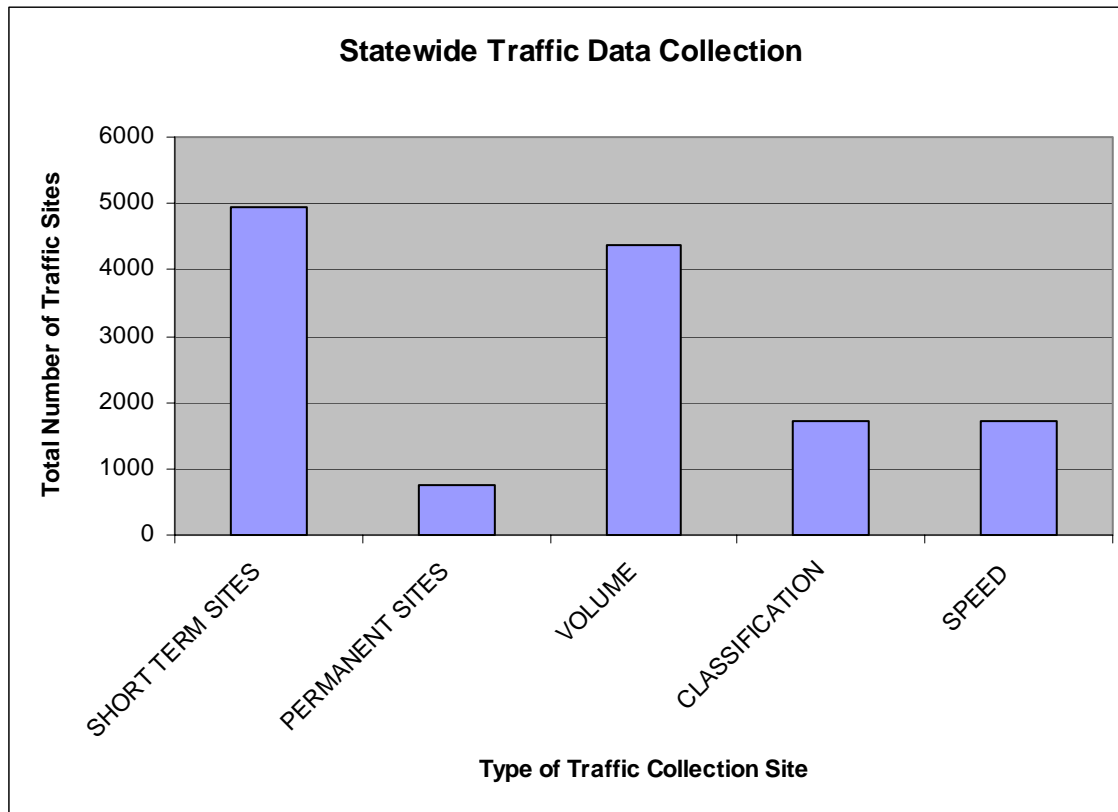
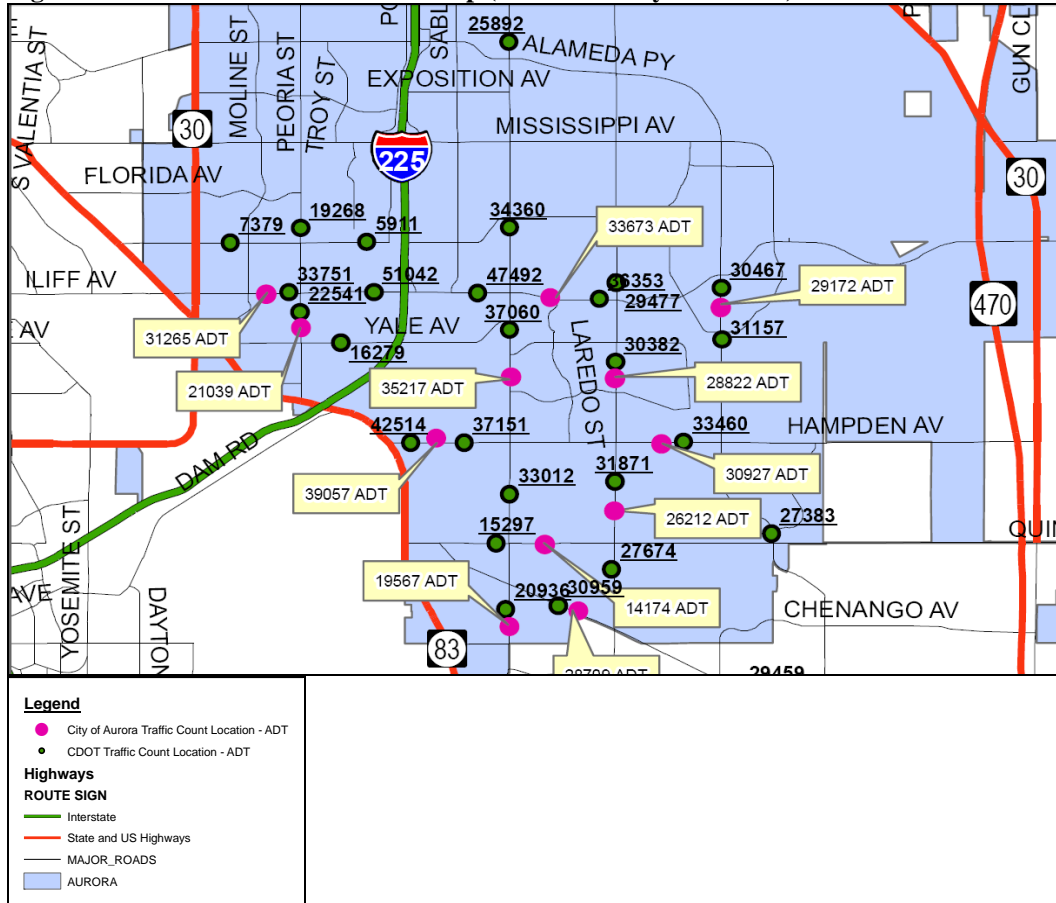


Table 8 - Statewide Traffic Count Sites

SHORT TERM SITES	4,940
PERMANENT SITES	750
VOLUME	4,370
CLASSIFICATION	1,710
SPEED	1,730

Not accounted for in the total number of traffic sites above, is that there are several geographic locations where there is a duplication of effort across agencies. The easiest way to determine the magnitude of this duplication of effort is to look at the results on a spatially representative traffic data map. The map below is an example and displays two datasets of where the CDOT collected data and where the city of Aurora collected data.

Figure 7 – Redundant Traffic Count Map (CDOT vs. City of Aurora)



OBSERVATION #9 – Data Scheduling, Data Storage and Standardization: It is clear that implementing technology, scheduling, and communication tools can provide benefits to all agencies by eliminating the duplication of effort illustrated by the above map.

3.1 Annual Short-Duration Traffic Count Programs

The definition of a short-duration count is a traffic count that is acquired within 24 or 48 consecutive hours. Typically traffic data is acquired by installing road tubes, across the roadway to acquire specifically configured 15 minute, 60 minute (hourly), or daily total traffic data. Other methods used for acquiring short-duration count data can include using the Quixote puck in the center of a lane and manually counting traffic from the side of the roadway.

Below is a Table showing the agencies that collect traffic data by the total number of traffic data sites collected annually. For survey respondents that collect more than 500 short-duration counts annually, the result is shown as 500. For example, CDOT collects approximately 2,500 short-duration counts per year but is shown on the Table below at 500 counts per year. If the Maximum Short-Term Sites field is blank, the survey respondent did not answer the question

Table 9 - Annual Short-Duration Counts Collected by Agency

#	Entity	Number of Annual Short-Term Sites
1	Adams County	340
2	City of Boulder	50
3	Castle Rock	130
4	CDOT	500
5	Centennial	140
6	Colorado Springs	160
7	Commerce City	300
8	Delta County	500
9	Denver	300
10	DRCOG	300
11	Durango	400
12	Evans	20
13	Fort Collins	70
14	Fountain	10
15	Grand Junction	300
16	Greeley	100
17	Jefferson County	130
18	La Plata County	400
19	Loveland	110
20	Mesa County	30
21	NFRMPO	10
22	Pagosa Springs	20
23	PPACOG	20
24	City of Pueblo	100
25	Ridgway	10
26	Schriever AFB	10
27	Thornton	220
28	Timnath	10
29	Trinidad	20
30	Weld County	500
31	Wheat Ridge	20
	TOTALS	5,230



OBSERVATION #10 – Data Scheduling, Data Storage and Standardization: There are **3** agencies collecting over 500 short-duration counts annually. Another **13** agencies are collecting over 100 short-duration counts per year. This indicates a need to coordinate traffic data collection schedules, storage of data, and standardize the method for field data collection across agencies.

3.2 Number of Continuous Automatic Traffic Recorder (ATR) Stations

In an effort to understand the amount of traffic data collected in the various city, county, and other governmental agencies throughout the State, it was important to ask about the total number of continuous traffic count stations configured to collect data daily (24hours per day 7 days per week) by each agency. A continuous count station can include installing loops, piezos, radar, autoscope, and other continuous traffic count equipment.

Below is a Table showing how many continuous count stations are located throughout the State by each agency.

Table 10 - Continuous Count Stations by Agency

#	Entity	Number of Permanent Sites
1	Aurora	30
2	City of Boulder	10
3	Castle Rock	10
4	CDOT	110
5	Denver	150
6	Fort Collins	20
7	Grand Junction	60
8	Jefferson County	290
9	Loveland	10
10	PPACOG	10
11	Timnath	50
	TOTALS	750



OBSERVATION #11 – Data Scheduling, Data Storage and Standardization: There are **11** agencies collecting continuous count traffic data annually. Of the **11** agencies, a total of **5** agencies are collecting data from over 50 continuous count traffic stations per year. This indicates a need to coordinate traffic data collection schedules, storage of data, and standardize the method for field data collection across agencies.

3.3 Number of Vehicle Classification Stations

In an effort to understand the type of traffic data collected in the various city, county, and other governmental agencies, it was important to ask about the number of vehicle classification count stations by each agency. A vehicle classification station is a site that provides data by organizing data into different classification bins such as a motorcycle bin, car bin, and truck bin. Below is a Table showing how many classification stations are located throughout the State by each agency.

Table 11 - Vehicle Classification Sites by Agency

#	Entity	Number of Classification Sites
1	Adams County	20
2	Aurora	30
3	CDOT	500
4	Colorado Springs	100
5	Commerce City	20
6	Delta County	500
7	Grand Junction	20
8	Greeley	40
9	Loveland	20
10	Mesa County	30
11	NFRMPO	10
12	PPACOG	20
13	Schriever AFB	10
14	Thornton	220
15	Timnath	50
16	Trinidad	10
17	Weld County	400
TOTALS		2,000



OBSERVATION #12 – Data Scheduling, Data Storage and Standardization: There are **3** agencies collecting over 500 classification counts annually. Another **4** agencies are collecting over 100 classification counts per year. This indicates a need to coordinate traffic data collection schedules, storage of data, and standardize the method for field data collection across agencies.

3.4 Number of Speed Data Collection Stations

In an effort to understand the amount of speed data collected in the various city, county, and other governmental agencies, it was important to ask about the total number of speed data collection stations by each agency. Below is a Table showing how many speed stations are located throughout the State by agency.

Table 12 - Speed Sites by Agency

#	Entity	Number of Speed Collection Sites
1	Adams County	20
2	Alamosa	10
3	City of Boulder	20
4	Castle Rock	10
5	CDOT	110
6	Centennial	50
7	Colorado Springs	200
8	Commerce City	30
9	Delta County	500
10	Fountain	10
11	Grand Junction	20
12	Greeley	60
13	Jefferson County	290
14	Loveland	20
15	Mesa County	30
16	Pagosa Springs	10
17	City of Pueblo	100
18	Ridgway	10
19	Thornton	220
20	Trinidad	10
21	Weld County	400
22	Wheat Ridge	20
	TOTALS	1,730



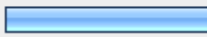
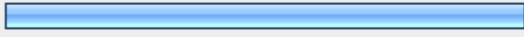
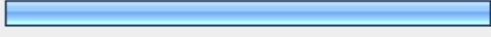
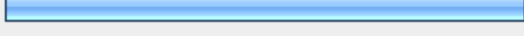
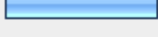
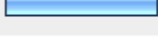
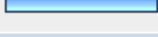
OBSERVATION #13 – Data Scheduling, Data Storage and Standardization: There is **1** agency collecting over 500 speed counts annually. Another **6** agencies are collecting over 100 speed counts per year. This indicates a need to coordinate traffic data collection schedules, storage of data, and standardize method for field data collection across agencies.

3.5 Short-duration Traffic Data Collection Days of the Week

There are a number of days during the week in which short-duration traffic data can be collected. It is critical to know what day of the week the traffic count was collected on for traffic data summarization and annual calculation purposes. For example, there are traffic data adjustments that can be made to create an annualized traffic data number that represents an Annual Average Daily Traffic (AADT) volume number. Traffic data adjustment factors are calculated specifically for the day of the week that data was collected.

Below are the results from the question that was asked in the survey, “What days of the week do you collect short-term traffic counts?”

Figure 8 - Data Collection by Day of the Week

28. What days of the week do you collect short-term traffic counts? (select all that apply)			
		Response Percent	Response Count
Monday		38.7%	12
Tuesday		100.0%	31
Wednesday		93.5%	29
Thursday		100.0%	31
Friday		29.0%	9
Saturday		29.0%	9
Sunday		29.0%	9
		<i>answered question</i>	31
		<i>skipped question</i>	11



OBSERVATION #14 – Field Data Collection and Standardization: All agencies that collect data responded their agency collects data on Tuesdays and Thursdays. A large number of agencies collect data on Wednesdays. Only a few agencies collect data on Monday, Friday, Saturday, or Sundays. When considering using and integrating data from various agencies to calculate traffic statistics, the days of the week will need to be considered. Standardization of creating factors will be necessary when calculating AADT’s.

3.6 Traffic Data Collection Intervals

Traffic data can be collected at different intervals such as every 15 or 30 minutes and hourly. It is important to understand what the current intervals are so that data formatting consideration can be made to accommodate all agencies. Below are the results of the question, “What time period does your agency collect traffic data?”

Figure 9 - Data Collection Intervals

29. Select the appropriate answer.					
Short-Duration time interval					
	N/A	15 minute	30 minute	60 minute	Response Count
What time interval increment does your agency collect traffic data?	22.6% (7)	48.4% (15)	0.0% (0)	29.0% (9)	31
Permanent time interval					
	N/A	15 minute	30 minute	60 minute	Response Count
What time interval increment does your agency collect traffic data?	50.0% (9)	27.8% (5)	0.0% (0)	22.2% (4)	18




OBSERVATION #15 – Field Data Collection and Standardization: A majority of agencies collect data at 15 minute and or 60 minute intervals and there are no agencies collecting data at 30 minute intervals. Therefore, there needs to be electronic filtering and summarization tools that provide and display, store, and analyze data at two increments; 15 minute and hourly.

3.7 Short-duration Traffic Data Collection Season

There are several months of the year in which short-duration traffic data can be collected. It is critical to know what months of the year traffic count data is collected during the year for traffic data summarization and annual calculation purposes. For example, there are seasonal traffic data adjustments that can be made to create an annualized traffic data number that represents an Annual Average Daily Traffic (AADT) volume number. Traffic data adjustment factors are calculated specifically for the month of the year that the data was collected..

Below are the results from the question that was asked in the survey, “What months of the year do you collect short-term traffic counts?”

Figure 10 - Collection Months

When do you count?				
	Year round	Summer months (May - August)	Other	Response Count
What time interval increment does your agency collect traffic data?	38.7% (12)	29.0% (9)	32.3% (10)	31
Please specify if your response to "When do you count?" is 'other'.	 view			13
<i>answered question</i>				31
<i>skipped question</i>				11

In addition to selecting year round, summer months and other, survey participants had the option to type in a description. Below is a Table showing those responses.

Table 13 - Data Collection Season

#	Entity	Response
1	Centennial	September/October
2	E-470 Toll Authority	Collect traffic data 24/7
3	Fountain	Times vary except try to take counts while public schools are in session
4	Greeley	Spring and Fall during school
5	Jefferson County	Only when no snow is on the ground
6	Loveland	Mostly summer, some fall and spring
7	NFRMPO	During the school year
8	RTD	Spring/Fall
9	Schriever AFB	Depends on contract period
10	Timnath	Collect once a year in October
11	Wheat Ridge	Weather pending



OBSERVATION #16 – Field Data Collection and Standardization: Agencies responded with a number of different seasonal count program intervals including year round, summer months, and once a year. When considering using the data from various agencies to calculate traffic statistics, the month of the year will need to be considered.




4 HARDWARE AND SOFTWARE

Attempting to integrate a number of agencies traffic data requires an understanding of software and hardware technologies utilized in the field. Several survey questions asked about hardware and software used for traffic data collection and the results can be found below.

4.1 Automated Polling Technologies

Automated polling technologies include the ability to call a traffic count station from a remote location to download the data. The question “Do you have automated polling for your ATR stations?” was asked and the results can be found below.

Figure 11 - Automated Polling

30. Do you have automated polling ^a for your ATR stations?				
			Response Percent	Response Count
Yes			15.6%	5
No			78.1%	25
Don't know			6.3%	2
			<i>answered question</i>	32
			<i>skipped question</i>	10






OBSERVATION #17 – Field Data Collection and Standardization: Only 5 agencies have automated polling software and hardware technologies in place. There is a need to standardize the way data is exported from these systems if a statewide traffic data is to be integrated.

4.2 Non-Intrusive Data Collection Technologies

One of the major costs in collecting continuous traffic counting data is in tearing up the pavement to install the hardware. There are a number of other methods for collecting traffic data that are non-intrusive. The question was asked, “Does your agency use non-intrusive traffic counting equipment?” The response results are shown below.

Figure 12 - Non-Intrusive Equipment

32. Does your agency use non-intrusive traffic counting equipment? Non-intrusive means one did not have to install anything into or on top of the pavement, for example RADAR, or a manual count.			Response Percent	Response Count
No			68.8%	22
 Yes (please specify type of technology utilized)			31.3%	10
			answered question	32
			skipped question	10

If a respondent indicated their agency uses non-intrusive traffic counting equipment, survey respondents were asked to elaborate on the types of non-intrusive equipment utilized. Below are the responses.

Table 14 - Non-intrusive Equipment

#	Entity	Response
1	Adams County	Radar, Jarmar TMC boards
2	CDOT	Radar
3	Denver	Autoscope video detection, manual counts
4	Douglas County	Will be using RTMS in the near future
5	Fort Collins	Video Detection
6	Fountain	In house counts are usually performed using the Police Radar Trailer or tube counters
7	Greeley	SpeedSpy data collectors, and Jamar Turn Movement Counters
8	Loveland	Traficon cameras and video detection software
9	Thornton	Manual count. Counts from video detection at intersections are also used whenever possible
10	Weld County	Manual as needed



OBSERVATION #18 – Field Data Collection and Standardization: Some agencies use non-intrusive traffic data collection technologies and a number of different non-intrusive hardware and software technologies are used. There is a need to standardize the way data is exported from these systems if a statewide traffic data is to be integrated.

4.3 Field Equipment

There are a number of types of field data collection equipment utilized for collecting traffic data. It is important to understand the capabilities of how these technologies store electronic data for data integration purposes. Below is a list of the different equipment used by different agencies.

Figure 13 - Traffic Collection Equipment

33. What type of traffic collection equipment do you (or your contractors) currently use for collecting permanent or short duration counters? (select all that apply)			
		Response Percent	Response Count
I don't know		21.9%	7
Autoscope		9.4%	3
Diamond		6.3%	2
EMC		3.1%	1
IRD		0.0%	0
Jamar		53.1%	17
Metro Count		3.1%	1
Metter-Toledo		0.0%	0
Mitron		0.0%	0
Nu Metrics		28.1%	9
PAT		0.0%	0
Peek		18.8%	6
Time Mark		9.4%	3
Wavetronic		0.0%	0
view	Other (please specify)	15.6%	5
		answered question	32
		skipped question	10

In additions to the types of equipment used, the following table shows equipment used by entity.

Table 15 - Traffic Data Collection Equipment by Vendor

#	Entity	Equipment Used
1	Fort Collins, Denver	Autoscope
2	Alamosa, CDOT	Diamond
3	CDOT	ECM
4	Golden, Loveland, NFRMPO, Trinidad, City of Pueblo, Delta County, Grand Junction, Colorado Springs, Fountain, Fort Collins, Thornton, Castle Rock, Commerce City, Greeley, Denver	Jamar
5	Delta County	Metro Count
6	City of Pueblo, Colorado Springs, Fort Collins, Thornton, Evans, Greeley, Denver Wheat Ridge	Nu Metrics
7	Grand Junction, Castle Rock, Commerce City, Wheat Ridge	Peek
8	Colorado Springs, Greeley	Time Mark



OBSERVATION #19 – Data Storage and Standardization: There are many types of field equipment used in Colorado for collecting traffic data. Along with these different types of field equipment technologies, there are different vendor-specific software platforms. Therefore, it is important to build software integrated tools to accommodate the different hardware and software platforms so that traffic data can be stored, processed, and shared within the statewide traffic data warehouse.

4.4 Traffic Data Software

There are many types of traffic data software utilized for collecting, processing, and analyzing traffic data. It is important to understand the capabilities of how these technologies store electronic data for data integration purposes. Below is a list of the different traffic data software technologies used by agencies.

Figure 14 - Traffic Data Software

34. Does your agency have any software programs to manage, process, receive, or work with traffic count data?			Response Percent	Response Count
No			43.8%	14
Yes (please describe)			56.3%	18
			<i>answered question</i>	32
			<i>skipped question</i>	10

The following table lists the descriptions that were provided for those agencies that answered yes to the above question.

Table 16 - Traffic Data Software Used

#	Entity	Description of Traffic Data Software
1	Adams County	Jamar and Peek software
2	Alamosa	Centurion
3	Archuleta County	TOPS (Traffic Operations & Planning Software)
4	CDOT	Currently implementing TRADAS
5	Centennial	MS Access
6	City of Pueblo	Only the software used with the collection equipment
7	Colorado Springs	Jamar, Nu Metrics and Time Mark software
8	Delta County	MetroCount Traffic Executive
9	Denver	Jamar and Nu-Metrics
10	Fort Collins	Jamar Software, Transcad model
11	Grand Junction	Peek's TOPS software, Mesa County's TRAX, GBA Asset Mgt. program to post data to GIS, Jamar
12	Greeley	Jamar(Traxpro) Timemark (TMWin)
13	Jefferson County	Jamar TrafficPro
14	Larimer County	TRADAS - All data is input into the TRADAS (Roadrunner database), data is "published" from TRADAS into EXOR - A GIS Asset Inventory database
15	Loveland	Jamar and Traficon software
16	Trinidad	Jamar Program
17	Weld	Excel software is used
18	Wheat Ridge	TOPS And Highway Data Management

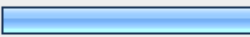



OBSERVATION #20 – Data Usage: A total of **44%** of the respondents indicated their agency does not have access to software programs to manage, process, receive, or work with traffic count data. In addition, this result shows that there are all sorts of different software packages used that make integrating all these datasets difficult.

4.5 GIS Usage in Traffic Data Programs

Since all traffic data is location based, it is necessary to understand whether agencies are currently using Geographic Information System (GIS) technologies to review, analyze, and publish data. The first question asked of survey participants was, “Does your agency use GIS?” Results from this question are summarized below.

Figure 15 - GIS Usage


16. Does your agency use GIS (Geographic Information Systems)?			
		Response Percent	Response Count
Yes		96.9%	31
No		3.1%	1
		<i>answered question</i>	32
		<i>skipped question</i>	10



OBSERVATION #21 – Data Usage: An overwhelming 97% of respondents (31 agencies) indicated their agency uses GIS technology. This result indicates an opportunity to leverage already existing technology and that providing some sort of geographical representation of traffic counts would be beneficial.

In addition to using GIS technologies within an agency, it is also important to understand what agencies are using GIS for to accomplish in their traffic data programs. Therefore, the follow up GIS question was asked, “*Is GIS used for Traffic Data Display, processing and/or publishing.*” The following Figure summarizes how agencies are using GIS.

Figure 16 - GIS Functions

17. Is GIS used for ...					
	Yes	No	Don't know	N/A	Response Count
Display of Traffic Data (Stations, Volume, etc.):	66.7% (20)	26.7% (8)	6.7% (2)	0.0% (0)	30
Processing of Traffic Data:	17.9% (5)	75.0% (21)	7.1% (2)	0.0% (0)	28
Publishing of Traffic Data:	37.9% (11)	48.3% (14)	13.8% (4)	0.0% (0)	29
Other (please describe) 					4
answered question					30
skipped question					12



OBSERVATION #22 – GIS Data Usage: There are **20** agencies using GIS technologies to display traffic data, **5** agencies using GIS to process traffic data and **11** agencies using GIS to publish traffic data. These results indicate a need to consider GIS technologies in the development of a statewide web-based traffic data application for display and publishing of traffic data but that processing of data could be left to the individual agency.

Additional detailed GIS follow up survey questions allowed agencies to add a description in the “other” column. Each agencies response can be seen in the Table below.

Table 17 - GIS Data Usage

#	Entity	Display of Traffic Data (Stations, Volume, etc.)	Processing of Traffic Data	Publishing of Traffic Data	Other
1	Alamosa	No	No	No	Will have GIS soon.
2	Boulder County	Yes	No	Don't know	
3	Castle Rock	No	No	No	
4	CDOT	Yes	No	No	
5	Centennial	Yes	No	No	
6	City of Pueblo	No	No	Yes	
7	Colorado Springs	Yes	Yes	Yes	
8	Commerce City	Yes	No	No	
9	Delta County	Yes	No	Yes	
10	Delta County	Don't know	Don't know	Yes	Published on Delta County web site under Engineering related documents.
11	Denver	No	No	No	
12	DRCOG	Yes	No	No	
13	Evans	Yes	No	Yes	
14	Fort Collins	Yes		Yes	
15	Fountain	No	No	No	City GIS System is currently set up primarily for use by Fountain Water & Electric Utility Department. Other Departments utilize the system primarily for maps and display exhibits on a limited basis.
16	Golden	Yes	Yes	Yes	
17	Grand Junction	Yes	Yes	Don't know	
18	Greeley	Yes	Yes	Yes	
19	Loveland	Yes	No	No	
20	NFRMPO	Yes	Yes	Yes	
21	Ridgway				Just got online with GIS. Will be using it for all the reasons listed above.
22	Schriever AFB	No	No	No	
23	Thornton	Yes	No	Yes	
24	Timnath	No	No	No	Just started using GIS so we will be converting our traffic data into GIS format in the near future.
25	Trinidad	Don't know	Don't know	Don't know	
26	Wheat Ridge	No	No	No	

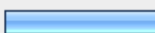
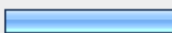



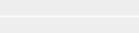




5 TRAFFIC DATA USAGE AND FORMATS

One of the major challenges in sharing traffic data from multiple data sources is working with data that is in different formats. The survey required respondents to choose the different data formats in which each agency currently stores traffic data.

5.1 Traffic Data - Contractor Formats

In Figure 17, results of the question “How does your agency receive data from contractors?” are summarized below.

Figure 17 - Data Formats

14. How does your agency receive data from contractors? (List all that apply)			
		Response Percent	Response Count
N/A		35.7%	10
Hard copy paper report		39.3%	11
Flat electronic text file		7.1%	2
Card File (format counter equipment requires)		7.1%	2
PDF		42.9%	12
MS Excel Spreadsheet		32.1%	9
MS Access database		10.7%	3
DBase (.dbf)		7.1%	2
GIS file (such as ESRI shapefile or other GIS format)		14.3%	4
Comment (optional)  view			1
answered question			28
skipped question			14



OBSERVATION #23 – Data Storage Standardization: The results of this question indicate most traffic counts are either in hard copy format, PDF, or an MS Excel Spreadsheet. It also indicates that traffic count personnel has very limited database skills and do not take the huge advantage of storing and analyzing traffic data in a relational database management system. These results indicate a strong need for data storage standardization that includes traffic data field description standardization such as location, the standardization of methods for storing traffic data, and the development of a training program and documentation for a statewide standardization guidance document.



OBSERVATION #24 – Data Storage Standardization: Across governmental agencies, there are a number of formats for storing traffic data. Over **40%** of respondents acquire and store traffic data in a hard copy format. This result indicates a need for a statewide electronic web-based tool that can allow agencies to upload, input, retrieve and store historical traffic count data. Of the agencies that do store traffic count data electronically, there are a number of formats such as a PDF, MS Excel, MS Access, and ESRI that are used. This indicates a need for an electronic tool that can standardize traffic data for the purpose of sharing information with other agencies and the public.

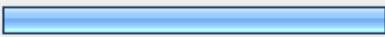







OBSERVATION #25 – Data Storage Standardization: Results show a number of different formats are used including hard copy paper formats, electronic spreadsheets, and different databases. In response to this challenge, the Traffic Data Committee will develop a Traffic Data Sub-Committee. The Sub-Committee will work together to come up with a standard traffic data specification that includes the preferred traffic data format for all traffic data users. This traffic data standard will provide an opportunity for all agencies to take advantage of a developing a new web-based traffic data processing application that is currently being discussed statewide.

5.2 Traffic Count Location Description Formats

Traffic count location descriptions are the most important data field when trying to understand where a traffic data was collected in the field. Location descriptions can be documented in a textual or graphical format (on a map) that provides an exact location of where the traffic data element applies. Survey respondents were asked to provide an answer to how their specific agency stores traffic count location descriptions. Below are the results to the question, “What naming convention is used to describe where a traffic count site is located?”

Figure 18 - Traffic Location Description Format

18. What naming convention is used to describe where a traffic count site is located? (Following are some samples all describing the same CDOT headquarters entrance)			Response Percent	Response Count
English description (On Arkansas Ave 625 ft EO Colorado)		80.0%	24	
Physical Address (4201 E Arkansas Ave., Denver, CO)		13.3%	4	
UTM coordinate (505,281 4,393,479 Meters)		3.3%	1	
Geographic Coordinate (104°56'18.278"W 39°41'28.087"N)		16.7%	5	
 Other (please specify)		23.3%	7	
			answered question	30
			skipped question	12



OBSERVATION #26 – Data Scheduling and Data Storage and Standardization:

Although it seems most agencies use the standard English description for naming a traffic data collection location, there is not a statewide data standard for describing or naming traffic count locations and very few agencies use a map to provide graphical location descriptions. This makes it a challenge to integrate data when there is not a standardized location description. Therefore, an electronic tool that provides for different formats in describing a location needs to be developed that includes a graphical display or map of the traffic data element location. The purpose of this tool is to allow agencies to maintain their current naming conventions but associating the naming convention with a statewide traffic database location that is standardized throughout the State. Once this tool is available, agencies can begin to view, schedule, locate, and share traffic data across jurisdictional boundaries regardless of agency or data sources.

Below is a Table showing all the individual responses to the question “*What naming convention is used to describe where a traffic count site is located?*” We should list the entities in alphabetical order

Table 18 - Location Description Formats

What naming convention is used to describe where a traffic count site is located? (Following are some samples all describing the same CDOT headquarters entrance)						
#	Entity	English description (On Arkansas Ave 625 ft EO Colorado)	Physical Address (4201 E Arkansas Ave., Denver, CO)	UTM (505,281 4,393,479 Meters)	Geographic (104°56'18.27 8"W 39°41'28.087" N)	Other (please specify)
1	Golden	X				Need to move to a Geographic Coordinate but none exists on the crash reports
2	Timnath	X				
3	Loveland	X				AutoCAD Map of City showing spot locations
4	Larimer County					County station number, Road number and mile point on county road system
5	Trinidad					Pick my own name
6	City of Pueblo	X				
7	Delta County	X				
8	Grand Junction	X				
9	Ridgway	X	X			
10	Schriever AFB	X			X	
11	Colorado Springs	X	X		X	
12	Fountain	X	X			
13	Boulder County					Intersection (Broadway and Lee Hill) or street and direction away from other street (Broadway south of US-36)
14	NFRMPO	X				
15	Thornton	X				Example - Colorado Boulevard - 100th Avenue to 104th Avenue
16	Fort Collins		X			
17	Evans	X				
18	Timnath					
19	Eaton					
20	NFRMPO	X				
21	Castle Rock	X				
22	CDOT	X				
23	Commerce City	X				
24	Greeley	X			X	Cross roads of major intersections
25	Centennial	X	X			
26	Denver	X				
27	DRCOG	X				
28	Wheat Ridge	X	X			



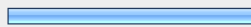

OBSERVATION #27 – Traffic Count Location Description: It is evident from these responses that most agencies are describing traffic count locations by an English description. This naming convention may make sense to the field personnel familiar with their jurisdiction but impossible to easily locate when provided to other agencies or customers of the data. It would be well worth the time for agencies to simply calculate a geographic coordinate by using a simple tool in a familiar web product (i.e. Google Maps or Yahoo Maps) and have this coordinate stored with the traffic count location description. In addition, with the decrease in cost of GPS equipment, agencies should be required to supply a geographic coordinate of actual field locations that are not ambiguous.

5.3 Electronic Data Access

Another major challenge in managing traffic data is providing traffic data to customers upon request. This challenge is clearly illustrated by the survey results found below. Questions in the survey were designed to capture information about how agencies share data and fulfill customer requests for traffic data.

The following Figure shows the summarized results of the question, “Can others access your agencies data electronically?”

Figure 19 - Electronic Data Access

19. Can others access your agencies data electronically?			Response Percent	Response Count
Yes			34.4%	11
No			65.6%	21
			<i>answered question</i>	32
			<i>skipped question</i>	10


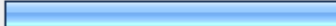






OBSERVATION #28 – Data Distribution: Electronic access to traffic data is provided by **34%** of the agencies that responded to the survey. It should be mentioned that only 32 of the 45 respondents answered this question which indicates a challenge in responding to customer requests for traffic data. About **65%** of the respondents indicated their agency does not provide traffic data access electronically indicating a need for a data distribution method for sharing and storing data.

5.4 Agency Methods of Sharing Data

Several agencies publish their traffic data. The following Figure describes how they publish their data.

Figure 20 - Data Publishing Methods

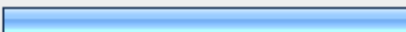

21. What methods are used for publishing/sharing your agencies data? (select all that apply)			Response Percent	Response Count
Website with traffic data is downloaded on demand			84.6%	11
Phone call/e-mail requests are handled as received and traffic data is distributed by request			69.2%	9
Access to server with data given to "special users"			7.7%	1
Copies made of hard copy of traffic count information			46.2%	6
 Other (please describe)			23.1%	3
			<i>answered question</i>	13
			<i>skipped question</i>	29



OBSERVATION # 29 – Data Distribution: A total of **11** survey respondents indicated their traffic data is available on demand and on-line. Other agencies responded their agency provides data to requestors that ask for data by phone or e-mail. Only **one** agency provides access to a server with traffic data and a number of agencies provide only hard copies of traffic data to customers. The results of this question indicate a need for a statewide on-line electronic storage and historical traffic data warehouse and application system. Since there are not that many agencies providing electronic downloading of data, building a statewide web application that allows customers to download and retrieve historical traffic data would benefit a number of agencies.

Additional questions were asked of respondents related to how agencies share data on a website. The following Figure shows a summary of the number of respondents that indicated their agency shares data on a website.

Figure 21 – Website Data Sharing

22. Does your agency share data on a website?			
		Response Percent	Response Count
Yes		84.6%	11
No		15.4%	2
		<i>answered question</i>	13
		<i>skipped question</i>	29



OBSERVATION #30 – Data Distribution: **11** survey respondents indicated their traffic data is available on demand and on-line, about **85%** of agencies who answered this question post traffic count data on a website. The other agencies do not share traffic data electronically on a website. The only way customers can access this data is contacting the traffic data agency staff directly. The results of this question indicate a need to develop data distribution tools.

Additional follow up questions were asked about how agencies store data for displaying on the internet. The summarized results are indicated below.

Figure 22 - Web Software

24. What Web and database software does your agency use to manage the web traffic data application? (select all that apply)				
			Response Percent	Response Count
Basic HTML editor			0.0%	0
Cold Fusion	<input checked="" type="checkbox"/>		33.3%	1
Front Page			0.0%	0
JavaScript			0.0%	0
Java	<input checked="" type="checkbox"/>		33.3%	1
ArcServer			0.0%	0
Arclnfo	<input checked="" type="checkbox"/>		33.3%	1
ArcIMS			0.0%	0
Spreadsheet (Excel, Lotus 123, etc)			0.0%	0
MS Access	<input checked="" type="checkbox"/>		33.3%	1
MySQL			0.0%	0
Native GIS (shapefile, feature class, etc)			0.0%	0
Oracle	<input checked="" type="checkbox"/>		33.3%	1
SQL Server			0.0%	0
SYBASE			0.0%	0
 Other (please specify)	<input checked="" type="checkbox"/>		33.3%	1
<i>answered question</i>				3
<i>skipped question</i>				39




OBSERVATION #31 – Data Distribution and Data Storage and Standardization:

The results above show very few responses and of the respondents that answered this question, indicate that there are a number of different web and database platforms used. Therefore, a need to build a master statewide traffic data warehouse is necessary. The statewide data warehouse should allow for different backend database applications by developing integration tools that can accommodate multiple agencies and multiple database and web application backend applications.

5.5 Quality Assurance

Traffic data collection, pre-processing, post-processing, and dissemination requires a significant amount of quality control and quality assurance (QA/QC) practices to ensure the most accurate and highest quality possible. Since there are 271 Cities/Towns and 64 Counties throughout Colorado, there are a number of different QA/QC procedures currently in place. However, all traffic data should be checked for formatting, trending, data abnormalities, and consecutive zeros. These are standardized checks that can be performed within any agency given the right tools. The survey asked respondents to provide responses to the following question, “Does your agency have a formal inspection program to check internal and/or contractor work for the following items: Field Setup, Data Format, Traffic Data Trends, Data Abnormalities, and Zero’s or no Data?” See responses below.

Figure 23 – Traffic Count Data Quality Assurance

26. Does your agency have a formal inspection program to check internal and/or contractor work for the following items?					
	Yes	No	Don't know	N/A	Response Count
Audit traffic counter setup in field occasionally: (correct field location, proper installation, etc)	37.5% (12)	50.0% (16)	9.4% (3)	3.1% (1)	32
Check data format: (file naming convention, table schema, etc)	31.3% (10)	56.3% (18)	9.4% (3)	3.1% (1)	32
Check traffic data for trends: (compare results to ATR, compare against historic data, etc)	56.3% (18)	37.5% (12)	3.1% (1)	3.1% (1)	32
Check for data abnormalities: (very high or low counts)	56.3% (18)	37.5% (12)	3.1% (1)	3.1% (1)	32
Check for zero's or no data:	46.9% (15)	43.8% (14)	6.3% (2)	3.1% (1)	32
Please describe your informal inspection program if you have no formal inspection program. 					5
answered question					32
skipped question					10



OBSERVATION #32 – Data Storage and Standardization: There are a number of agencies that skipped this question indicating their agency might not have a formal traffic data QA/QC inspection program. Other agencies indicated there are a number of quality checks that are not currently performed on their traffic data. This indicates a need for a statewide traffic data training program as well as the need for some automated tools that can perform QA/QC checks such as checking data for zeros or no data. These responses also indicate a need for a statewide historical traffic database and automated traffic trending tools.

5.6 Traffic Data Usage

Understanding how agencies use data as a traffic data analysis tool is critically important when trying to integrate multiple agency data. This section of the report provides information about different data analyses practices related to traffic data throughout the State.

Once data is collected, it is important to understand what activities are performed with data prior to publishing or using the data for the intended purposes. Therefore, the survey requested that participants respond with the types of activities performed after traffic data is collected. Figure 24 below shows the summarized responses of how traffic data is prepared for publication.

Figure 24 - Traffic Data Preparation and Sharing

15. With regard to traffic data, does your agency...					
	Yes	No	Don't know	N/A	Response Count
*Process data:	71.9% (23)	25.0% (8)	3.1% (1)	0.0% (0)	32
**Perform analysis:	83.9% (26)	9.7% (3)	6.5% (2)	0.0% (0)	31
Share data with internal users:	96.9% (31)	0.0% (0)	0.0% (0)	3.1% (1)	32
Share data with external users:	90.0% (27)	3.3% (1)	3.3% (1)	3.3% (1)	30
	<i>answered question</i>				32
	<i>skipped question</i>				10



OBSERVATION #33 – Data Usage: The survey responses show that over 70% of respondents that collect data actually process the data. This means that an agency data that comes in from the field is further reviewed or edited, analyzed, and shared with internal and/or external data users. This indicates a need to develop a documented statewide traffic data standard for collection, processing, and analysis.

Of the agencies that responded to the data preparation and sharing question, the details by agency are listed in the table below.

Table 19 - Traffic Data Usage

#	Entity	Process data	Perform analysis	Share data with internal users	Share data with external users
1	Alamosa	Yes	Don't know	Yes	Don't know
2	Aurora	Yes	Yes	Yes	Yes
3	Boulder County	No	Yes	Yes	No
4	Castle Rock	Yes	Yes	Yes	Yes
5	CDOT	Yes	Yes	Yes	Yes
6	Centennial	Yes	No	Yes	N/A
7	City of Pueblo	Yes	Yes	Yes	
8	Colorado Springs	Yes	Yes	Yes	Yes
9	Delta County	Yes	Yes	Yes	Yes
10	Denver	Yes	Yes	Yes	Yes
11	DRCOG	Yes	Yes	Yes	Yes
12	Evans	Yes	Yes	Yes	Yes
13	Fort Collins	No	Yes	Yes	Yes
14	Fountain	Yes	Yes	Yes	Yes
15	Golden	Yes	Yes	Yes	Yes
16	Grand Junction	Yes	Yes	Yes	Yes
17	Greeley	Yes	Yes	Yes	Yes
18	Larimer County	Yes	Yes	Yes	Yes
19	Loveland	No	Yes	Yes	Yes
20	NFRMPO	Yes	Yes	Yes	Yes
21	Ridgway	Yes	Yes	Yes	N/A
22	Schriever AFB	Yes	Yes	N/A	Yes
23	Thornton	No	Yes	Yes	Yes
24	Timnath	Don't know	Yes	Yes	Yes
25	Trinidad	Yes	Yes	Yes	Yes
26	Wheat Ridge	Yes	Don't know	Yes	Yes



OBSERVATION #34 – Data Distribution and Data Usage: There are **22** agencies that process data, **26** agencies that perform data analysis, **30** agencies that share data internally, and **34** agencies that share data externally. This result indicates a need for developing a method for sharing and shoring data electronically on-line. This result also indicates a need for traffic data usage tools such as automated traffic data tools for processing, analysis, and data dissemination.

5.7 AADT

The purpose of collecting traffic data throughout the calendar year is to gather data from a representative data sampling of traffic locations that represent the total number of vehicles at any given time of the calendar year. An Average Annual Daily Traffic (AADT) number annualizes a one-time 24 or 48 hour traffic count or ATR data to represent the total traffic volume at any given time of the year for a specific traffic segment (length of roadway). There are a number of factors applied to a raw (unadjusted/unfactored) traffic data count that annualizes a raw traffic volume count. Some of these factors are described below. The CDOT calculates AADT's for all segments of State Highways once a year using continuous count, short-duration, and vehicle classification traffic count data from January 1 to December 31 of the calendar year.

5.8 Factoring of Traffic Data

When analyzing traffic data, there are several important characteristics about the data that are necessary to understand. One of the critical characteristics is whether it is a raw (unadjusted/unfactored) or adjusted/factored number. If the traffic data element is adjusted, it is important to understand what types of adjustments are made to the data. One adjustment is applying a factor such as day of the week factor to the raw traffic data count.

The survey requested that respondents reply to the question, “Does your agency factor traffic count data?” Results can be seen below.

Figure 25 - Traffic Data Factors

31. Does your agency apply 'factors' to your traffic count data? The term 'factor' refers to a correction number to raise or lower counts based on some reason (i.e. seasonal factors, truck axle correction factors, known site issues, etc).			Response Percent	Response Count
Don't know			9.4%	3
No			71.9%	23
Yes (please specify when factors are applied)			18.8%	6
			<i>answered question</i>	32
			<i>skipped question</i>	10



OBSERVATION #35 – Data Usage: Around **19%** of the respondents indicated their agency factors traffic count data. It is important to understand the different data uses for these factored counts when sharing data. Therefore, a need to standardize the data factoring methods for the statewide traffic data warehouse is critical.

Respondents had a chance to provide additional information about the software programs utilized in an open text field. Below are the results from the agencies that use software programs to manage, process, receive or work with data.

6 STATEWIDE TRAFFIC DATA COMMITTEE

There has been an overwhelmingly positive response to creating a formalized Traffic Data Committee in Colorado. The purpose of this survey was to assess City, County, and other agencies interest in becoming a stakeholder (participant) in the advancement of traffic data sharing, coordination, and storage across multiple agencies.

6.1 Agency Data Sharing

Agencies had an opportunity to provide comments about other agencies data in which they prefer to have access. Below are the results.

Table 20 - Data Sharing Interests

#	Entity	What other agencies would you like to get data from?
1	Aurora	CDOT, DRCOG, Arapahoe County, Centennial, Denver, possibly Douglas County depending on location.
2	Boulder County	Boulder County, CDOT and any other agencies or firms that collect data in and around the City of Boulder.
3	CDOT	All agencies, Cities, and Counties.
4	Centennial	Surrounding municipalities: Aurora, Greenwood Village, Littleton, CDOT, etc.
5	City of Pueblo	Any agency that is collecting data. Pueblo and Colorado Springs.
6	Colorado Springs	Locally, already cover and have a working relationship with all entities within our area of interest. City has already established standardization for our own in-house use. Private Developers.
7	Delta	Mesa County, Montrose County, Gunnison County, and CDOT.
8	Evans	CDOT and Greeley.
9	Fountain	CDOT & El Paso County.
10	Grand Junction	Mesa County and CDOT.
11	Greeley	CDOT, & Weld County.
12	Johnstown	CDOT and NFRMPO.
13	Loveland	State and surrounding jurisdictions to Loveland.
14	NFRMPO	Colorado Dept of Transportation. Cities and Towns within Larimer County and adjacent counties.
15	PACOG	As our planning funding sources decline, additional CDOT data collection would be very welcome and useful. Locally, we've been in fairly good shape because all the agencies cooperate and coordinate the use of counting resources. Access to more of CDOT's "specialized" (i.e. classification, intersection studies, etc.) data would also be useful if we are no longer able to collect it ourselves.
16	Palisade	Mesa County.
17	Ridgway	CDOT, Montrose County, San Miguel County, and San Juan County.
18	Thornton	Northglenn, Westminster, Broomfield, Commerce City, Brighton, and Adams County.
19	Wheat Ridge	CDOT.



OBSERVATION #36 – Data Sharing and Usage: All of the agencies listed in the Table above would like to have access to other agencies traffic data. Most of the agencies indicated a need to access CDOT's traffic data. These results indicate a need for data sharing and data usage tools. Some agencies (Colorado Springs) already have set up data sharing standards. The Committee should look at these other data sharing standards and evaluate the feasibility of implementing them as a statewide effort.

6.2 Traffic Data Committee Interests

Below is a Figure showing the ranking of how interested agencies are in sharing data, participating in the Committee, volunteering, and helping to establish traffic data policies throughout the State.

Figure 26 - Agency Interests

35. Rank your agencies interest in the following ...						
	Not interested	Low	Medium	High	Rating Average	Response Count
Sharing data with the public:	0.0% (0)	12.2% (5)	34.1% (14)	53.7% (22)	2.41	41
Sharing data with other agencies:	0.0% (0)	9.8% (4)	29.3% (12)	61.0% (25)	2.51	41
Uploading data to a web portal for statewide distribution:	5.1% (2)	33.3% (13)	28.2% (11)	33.3% (13)	1.90	39
Committee volunteer:	28.9% (11)	31.6% (12)	18.4% (7)	21.1% (8)	1.32	38
Data standard development committee:	28.2% (11)	28.2% (11)	25.6% (10)	17.9% (7)	1.33	39
Policy committee:	30.8% (12)	28.2% (11)	20.5% (8)	20.5% (8)	1.31	39
Receive an e-Newsletter:	0.0% (0)	12.5% (5)	32.5% (13)	55.0% (22)	2.43	40
What other agencies would you like to get data from? (please specify) <input type="button" value="view"/>						19
<i>answered question</i>						41
<i>skipped question</i>						1



OBSERVATION #37 – Data Distribution, Data Scheduling, Data Usage: Over **50%** of the respondents indicated their agency is interested in sharing data with the public, sharing data with other agencies, and receiving the Traffic Data Committee e-Newsletter. These results indicate a need to develop data scheduling, distribution, and usage tools that all agencies can access electronically.

7 FEEDBACK AND CONCLUSIONS

There are many conclusions and a number of feedback comments that have contributed to this report. Below are only some of the highlighted comments and conclusions received.

7.1 Survey Feedback

Each Survey Participant had the opportunity to provide an open text feedback comment. Some agencies commented they are in full support of the Traffic Data Committee's efforts. Other feedback will continue to make the Traffic Data Committee more formalized and organized as time passes. If you have a comment about this report or the Committee's activities, please contact Elizabeth Stolz at Elizabeth.stolz@dot.state.co.us or by phone at 303-757-9495.

7.2 Conclusions

The number one reason to continue developing the Committee and gain participation from as many Colorado agencies as possible is to save the tax payers of Colorado money. Developing communication and technology tools will minimize the number of duplicated traffic data collection efforts across the State. Sharing information such as when and where agencies plan to schedule traffic counts will allow agencies to realize savings including the time and cost of collecting traffic data.

Integrating traffic data sources from multiple agencies has already begun. Preliminary results as of December, 2008 show great promise for achieving cost and time savings. CDOT gathered data from 10 different agencies that included over **400** traffic counts. Cost savings for CDOT only from these shared traffic counts would include **400** traffic counts multiplied by **\$100** per count for a total potential savings of **\$40,000**. Although these traffic counts were in different formats, CDOT was able to work with the local agencies to integrate the data with the main CDOT traffic database. Data integration business processes will need continued work to create efficiencies but these results show a step in the right direction.

In addition to cost saving, time spent managing field data collection can be shifted to developing technology tools that will benefit all agencies in Colorado.

Below is a proposed plan to developing technology tools that will allow agencies to access the same technology tools and distribute the data integration workload to each individual agency. By allowing each agency to access, upload, and download data, the entire quality of the Traffic Data Warehouse will increase.

7.2.1 Proposed Data Access Web Modules

The Traffic Data Committee is interested in building a data access web application that provides a geographic component. The Committee anticipates developing the following major modules. As responses to this survey are received and analyzed and as we meet with various agencies this list will be updated to reflect the traffic data user communities' requirements. A detailed functional requirement would be written that would contain as to what would be included in this application.

Table 21 - Traffic Data Warehouse Application Modules

Module Name	Module description	Priority
Geographic Traffic Data Access	<p>The user will be able to view posted traffic count locations and then interface to the detailed data. The data will consist of the following information at a minimum but more details can and will be added.</p> <ul style="list-style-type: none"> • Unique Traffic Count ID • Agency name and contact information containing owner information (i.e. CDOT – Elizabeth Stolz) • AADT (Average Annual Daily Traffic) and the year it represents (if applicable). • If an AADT can not be derived then the ADT (Average Daily Traffic) and the date(s) that data represents. • Link to the detailed monthly, weekly, daily and/or hourly counts • Link to a detailed map in any of the major internet mapping applications such as Google Maps, Yahoo Maps, Map Qwest, etc. <p><i>Note: These counts will only be posted if they have passed a quality assurance program.</i></p>	High
Traffic Count Scheduler	<ul style="list-style-type: none"> • User would enter a date range and proposed traffic counts would display along with the contact information of the agency proposing to perform the work. • Qualified participants can enter/batch upload in their proposed traffic location(s) and details (collection dates, count method, owner details etc) that would become available to others to view. Ideally as soon as they submit their information these proposed count locations would be seen by others. This function would only be available to qualified participants based on a user name and password. In addition, the owners of proposed data collection sites could modify or delete their data collection sites but not others based on their user name. 	High
Traffic Data Posting	Qualified users would be able to upload their traffic count data based on predefined rules and data formats. The data upload function would be based on a user name and password.	Medium
Traffic Data Database	All data would be stored in a relational database system. The data base would be designed in order to store the following data items: Qualified agency names, contact information, user name and passwords Historic Traffic count locations and raw data Proposed traffic count location details and dates	High
Traffic Data Access Web Service	All the application components would be built using a service oriented architecture that any agency would be able to consume into their own applications. This service would pass and receive http request and data using XML standards.	Medium

7.2.2 Traffic Data Warehouse Development Project

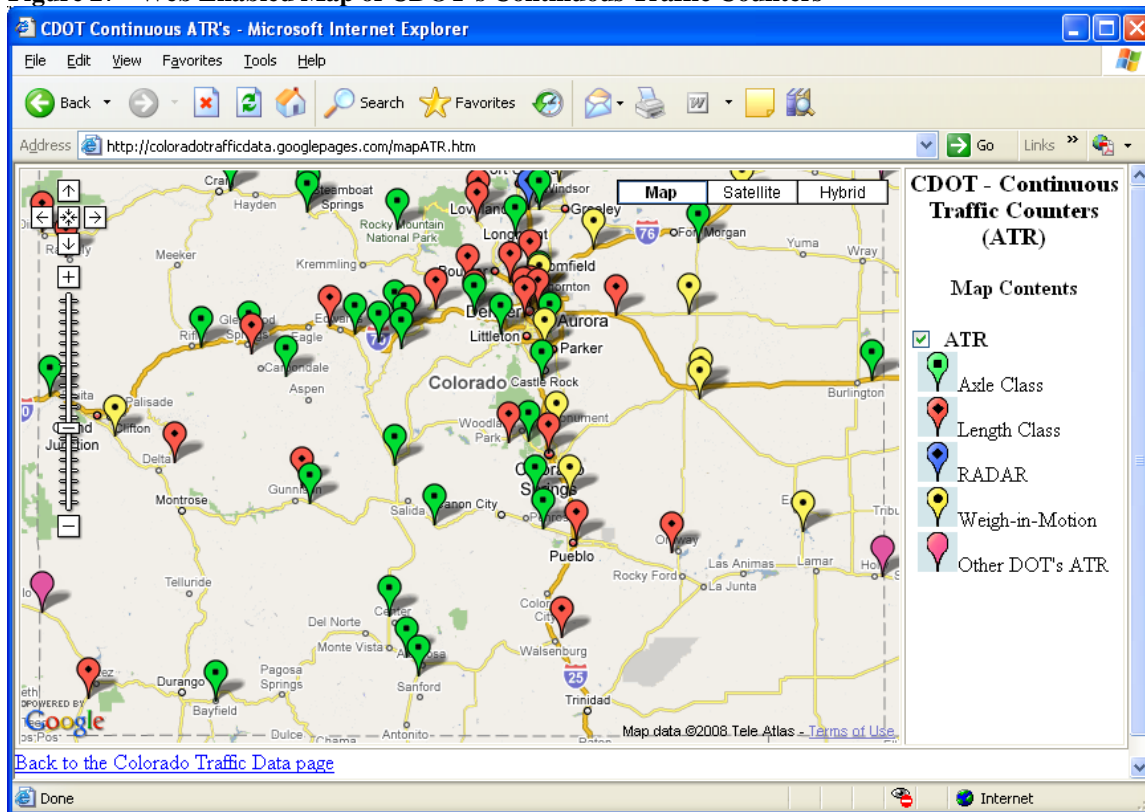
The development of a traffic data warehouse will require a phased approach to complete the project. For example, developing a traffic data warehouse could include all the modules described in Section 7.2.1 organized into phases. For planning purposes, the projected phases have been organized and described below.

7.2.2.1 Phase 1 - Data Scheduling Tools Development

Phase 1 of the Data Warehouse Development (DWD) project could include developing software tools that allow agencies to communicate across agency borders. A web application with tools for inputting the location and type of traffic data collection could then be used to display the locations. Immediately this web tool would provide agencies with a communication tool that can allow for continuous feedback and potentially eliminate duplication of efforts in collecting traffic data. Below is a prototype developed by CDOT that might serve as a sample display of how the data scheduling tools might provide information on the web.

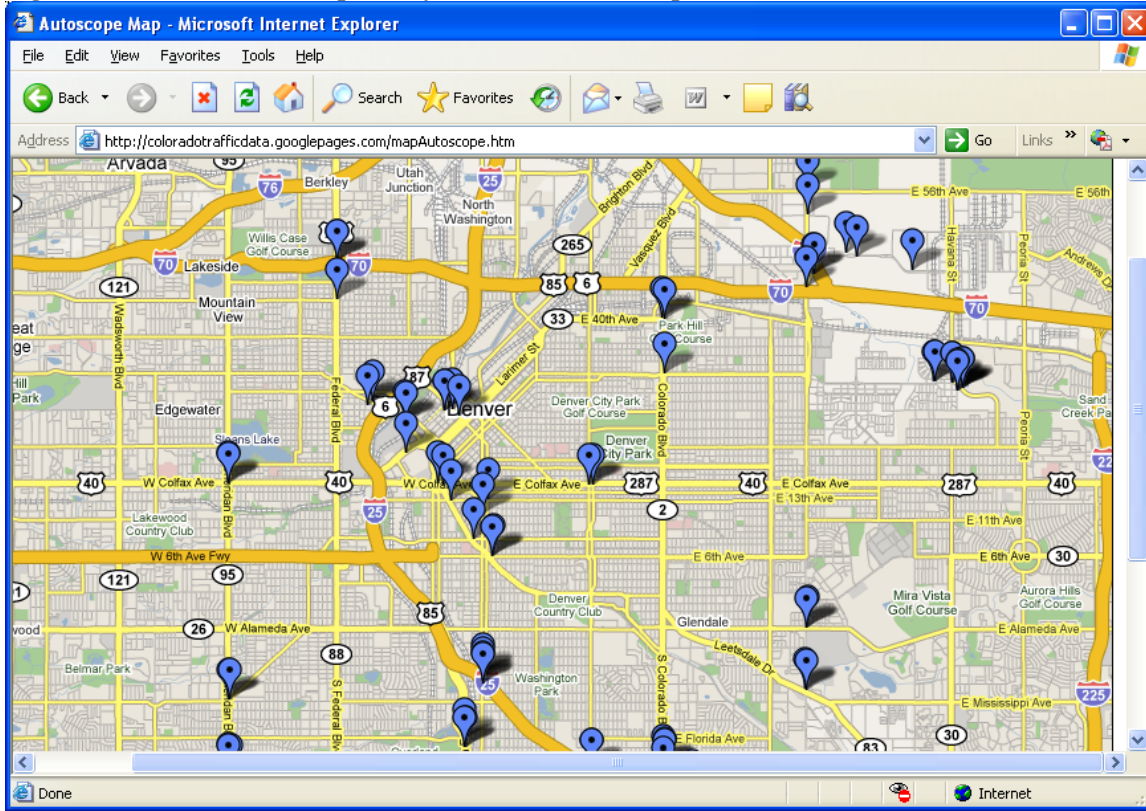
Below is a web enabled location map showing all of CDOT's ATR locations by type (axle class, length class, Radar, Weigh-in-motion).

Figure 27 - Web Enabled Map of CDOT's Continuous Traffic Counters



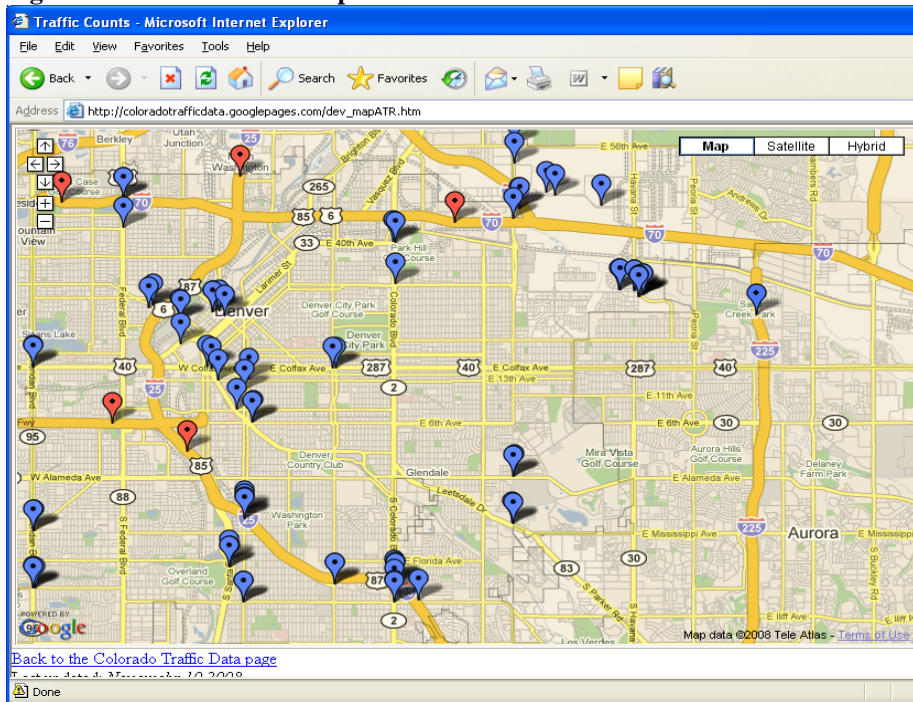
The scheduling tools might allow an agency to load traffic data into the application about all the details such as site location and schedule collection date (s). Below is a map showing the City of Denver Autoscope – continuous count traffic data collection locations.

Figure 28 - Web Enabled Map of City of Denver's Autoscope Counters



Finally, the scheduling tools could overlay both CDOT traffic data sites with the City of Denver sites to see if there are opportunities for sharing data. Below is a map showing the City of Denver sites in blue and CDOT sites in Red.

Figure 29 - Web Enabled Map CDOT vs. Denver's Countinous Counter Sites



Additional scope of work, functional details of the software, and requirements to fulfill all Traffic Data Committee participants' needs will be necessary. This could potentially be worked on by a subcommittee of the Traffic Data Committee called the Standards Committee.

7.2.2.2 Phase 2 - Electronic Data Storage and Standardization

Phase 2 might include an electronic data storage and standardization work within the Traffic Data Warehouse. This includes the way traffic data field location descriptions are stored, the format of all traffic data, and the quality control and quality assurance of data getting into the Traffic Data Warehouse. This Phase could include development of a training program that includes field data collection training and traffic software training program development and implementation. Other items that Phase 2 might include are the development of a statewide standardization document or reference document that provides guidelines for data collection, processing, and analysis of traffic data. This Phase could also include the development of electronic web-enabled uploading and downloading of traffic data with quality control and quality checking of agency data prior to loading and committing the data to the Traffic Data Warehouse.

7.2.2.3 Phase 3 - Field Data Collection Standardization

This Phase could include the development of a statewide traffic data field collection training program. There could be a field data collection manual developed in this Phase too.

7.2.2.4 Phase 4 - Data Usage

This Phase could include the development of electronic processing and analysis tools, training manuals, and other data usage training materials. This Phase could also include the development of GIS and spatially enabled traffic data tools such as a search enabling finding all the traffic data items on a given roadway.

7.2.2.5 Phase 5 - Data Distribution

Phase 5 could include the development of a public display of all traffic data in the warehouse and allow downloading of data sets by the area of interest. This could include documenting the methods for sharing and storing data, providing training, and documenting the details of a web enabled application for traffic data distribution.