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EVALUATION OF 2008 COLORADO CRASH DATA REPORTED TO MCMIS CRASH FILE

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16. Abstract

This report is part of a series evaluating the data reported to the Motor Carrier Management Information System (MCMIS) Crash File undertaken by the Center for National Truck and Bus Statistics at the University of Michigan Transportation Research Institute. The earlier studies showed that reporting to the MCMIS Crash File was incomplete. This report examines the factors that are associated with reporting rates for the State of Colorado.

MCMIS Crash File records were matched to the Colorado crash file to determine the nature and extent of underreporting. It was necessary to focus just on crashes involving a fatality, A-injury or B-injury, or in which a vehicle was towed due to disabling damage, because of problems identifying MCMIS reportable crashes in the Colorado crash file. It is estimated that Colorado reported 65.5 percent of this subset of reportable crash involvements in 2008.

Reporting rates were found primarily to be related to crash severity and the configuration of the vehicle. Almost 90 percent of fatal crash involvements were reported, 60.3 percent of A- or B-injury involvements, and only 67.8 percent of towed/disabled involvements. Trucks were reported at a somewhat higher rate than buses as a whole, 63.5 percent to 47.8 percent. Large trucks such as tractor-semitrailers were reported at a higher rate than smaller single unit trucks.

Missing data rates are low for most variables. Corresponding data elements in the MCMIS and Colorado crash files were reasonably consistent, though specific problems were noted with hazmat variables and the truck and trailer configuration.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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1. Introduction

The Motor Carrier Management Information System (MCMIS) Crash file was developed by the Federal Motor Carrier Safety Administration (FMCSA) to serve as a census file of trucks and buses involved in traffic crashes meeting a specified crash severity threshold. FMCSA maintains the MCMIS file to support its mission to reduce crashes, injuries, and fatalities involving large trucks and buses. Accurate and complete crash data are essential to assess the magnitude and characteristics of motor carrier crashes and to design effective safety measures to prevent such crashes. The data in the file are extracted by the States from their own crash records, and uploaded through the SafetyNet system. The usefulness of the MCMIS Crash file thus depends upon individual states identifying and transmitting the correct records on the trucks and buses involved in traffic crashes that meet the crash file severity threshold.

The present report is part of a series of reports that evaluate the completeness and accuracy of the data in the MCMIS Crash file. Previous reports showed some underreporting which seemed to be related in large part to problems in interpreting and applying the reporting criteria within the states' respective crash reporting systems. The problems often were more severe in large jurisdictions and police departments. States also had issues specific to the nature of its own system. [See references 2 to 39.] The States are responsible for identifying and reporting qualifying crash involvements. Accordingly, improved completeness and accuracy ultimately depends upon the efficiency and effectiveness of individual state systems.

This report focuses on MCMIS Crash file reporting by Colorado in 2008. Colorado ranks about in the middle of the states in terms of the number of cases reported annually to the MCMIS Crash file. Between 2003 and 2007, Colorado has reported from 1,416 to 2,767 involvements annually to the MCMIS Crash file. Colorado is the 22nd largest state by population and in most years ranks about 26th among the states in the number of truck and bus fatal involvements annually. In recent years the number of fatal truck and bus involvements in Colorado has ranged from 72 in 2003, 82 in 2004, 74 in 2005, 87 in 2006, to 91 in 2007.

Police accident report (PAR) data recorded in Colorado's statewide files as of April, 2010, were used in this analysis. The 2008 PAR file contains the crash records for 192,529 vehicles.

The process of evaluating state reporting consists of the following steps:

1. The complete police accident report file (PAR file hereafter) from Colorado was obtained for the most recent year for which MCMIS Crash file data were available, which was 2008.

2. An algorithm was developed, using the data coded in the Colorado file, to identify all cases that qualified for reporting to the MCMIS Crash file.

3. All cases in the Colorado PAR file—those that qualified for reporting to the Crash file as well as those that did not—were matched to the cases actually reported to the MCMIS Crash file from Colorado.

4. Cases that should have been reported, but were not, were compared with those that were reported to identify the sources of underreporting.

5. Cases that did not qualify but which were reported were examined to identify the extent and nature of overreporting.

2. Data Preparation

The Colorado PAR file and MCMIS Crash file each required processing before the Colorado records in the MCMIS Crash file could be matched to the Colorado PAR file. In the case of the MCMIS Crash file, the major tasks were to extract records reported from Colorado and to eliminate duplicate records. The Colorado PAR file was reformatted to create a comprehensive vehicle-level file from accident, vehicle, and person data.

The following sections describe the methods used to prepare each file and some of the problems uncovered.

2.1 MCMIS Crash Data File

The 2008 MCMIS Crash file as of June 9, 2009, was used to identify records submitted from Colorado. For calendar year 2008 there were 2,054 cases reported to the file from Colorado. An analysis file was constructed using all variables in the MCMIS file. This analysis file was examined for duplicate records (more than one record submitted for the same vehicle in the same crash; i.e., the report number and sequence number were identical). Fourteen such duplicates were found. Examination of these potential duplicates showed that twelve pairs had different crash dates and times. The other two pairs had the same crash date, but occurred in different counties. All pairs had different driver names and dates of birth, as well as different vehicle identification numbers (VIN), and vehicle license plate numbers. Therefore, these 14 records were not considered duplicate cases.

In addition, records were reviewed to find cases with identical values on accident number, accident date/time, county, street, officer badge number, VIN, and driver license number, even though their vehicle sequence numbers were different. The purpose is to find and eliminate cases where more than one record was submitted for the same vehicle and driver within a given accident. This can happen as records are corrected. No such duplicates were found. The resulting MCMIS file contains 2,054 unique records.

2.2 Colorado Police Accident Report File

The Colorado PAR data for 2008 obtained from the state was dated April, 2010. The data were stored as text files on a website that permitted downloading the data. Accident, Vehicle, and Person information from the EARS_2447 application were downloaded. The combined files contained records for 103,825 traffic crashes involving 192,529 units. Data for the PAR file are

reported on the State of Colorado Traffic Accident Report (DR 2447, revision 2/1/06) by police officers.

As with the MCMIS file, the PAR file was first examined for duplicate records (involvements where more than one record was submitted for the same vehicle in the same crash). A search for records with identical case numbers and vehicle numbers found no instances of duplicates. In addition, manual inspection of case numbers verified that they were recorded in a consistent format, so there was no reason to suspect duplicate records based on similar, but not identical, number formats (such as 1003702 and 1-03702, for example).

Just as in the preparation of the MCMIS Crash file, cases also were examined to determine if there were any records that contained identical case number, time, place, and vehicle/driver variables, regardless of vehicle number. Two different crash records should not be identical on all variables. Records were examined for duplicate occurrences based on the fields for case number, accident date and time, crash county, road, vehicle license plate number, and driver date of birth. Using this search method, two duplicate pairs were found. These records were in the same crash, but had different vehicle numbers. However, manual examination of the records showed that the records in each pair had the same vehicle identification number (VIN), model year, make and body style. A couple of vehicle variables differed, but since the primary variables identifying the vehicle were identical (e.g., the VIN), they were considered duplicate records. One member of one pair had many unrecorded values, so the additional record may have been added during an update. After deleting the duplicate records, the resulting PAR file has 192,527 unique cases.

3. Matching Process

The next step involved matching records from the Colorado PAR file to corresponding records from the MCMIS file. There were 2,054 Colorado records from the MCMIS file available for matching, and 192,527 records from the Colorado PAR file. All records from the Colorado PAR data file were used in the match, even those that did not meet the requirements for reporting to the MCMIS Crash file. Using all crash records in the match allowed the identification of cases reported to the MCMIS Crash file that did not meet the reporting criteria.

Matching records in the two files is accomplished by using combinations of variables common to the two files that have a high probability of uniquely identifying specific accidents and specific vehicles within the accidents.

In the Colorado data, Accident Row Id uniquely identifies a crash, but it did not appear to match Report Number in the MCMIS Crash file. Accident Row Id in the PAR file is an 8-digit character field, and in the MCMIS Crash file Report Number is stored as a 12-character alphanumeric value. The report number in the MCMIS Crash file is constructed as follows: The first two columns contain the state abbreviation (CO, in this case), followed by nine digits, and a tenth numeric or alpha value. Since the PAR Accident Row Id did not correspond to the MCMIS Report Number, these variables could not be used in the match.

Other data items that are useful in matching at the crash level include Crash Date, Crash Time (stored in military time as hour/minute), Crash County, Crash City, Crash Street, and Reporting Officer’s Identification number. The PAR file contained all of these variables. Upon closer

examination, Location and LocOther in the PAR file did not match the format of MCMIS Crash Street. In addition, City Name was unrecorded in 21.4 percent of PAR cases and in 53.8 percent of MCMIS cases. Officer badge number was unrecorded in 80.0 percent of PAR cases and in 0.1 percent of MCMIS cases.

Variables in the MCMIS file that distinguish one vehicle from another within a crash include vehicle license plate number, VIN, driver license number, driver date of birth, and driver name. Vehicle license number, VIN, and driver date of birth were present in the PAR file. Vehicle license number and VIN were each unrecorded in fewer than 6 percent of PAR cases, and in fewer than 1 percent of MCMIS cases. Driver date of birth was unrecorded in 11.4 percent of PAR cases and in 2.0 percent of MCMIS cases.

The match was performed in five steps, using different combinations of the available variables, but always including variables that could identify specific crashes and specific vehicles in those crashes. At each step, records in either file with duplicate values on all the match variables for the particular step were excluded, along with records with missing values for the match variables. Table 1 shows the variables used in each match step and the number of records matched at each step.

Table 1 Steps in MCMIS/Colorado PAR File Match, 2008

Step	Matching variables	Cases matched
Match 1	Crash date (month, day), crash time (hour, minute), county, city, VIN, and driver date of birth	580
Match 2	Crash date (month, day), crash time (hour, minute), county, VIN (6 digits), and driver date of birth	1,048
Match 3	Crash date, hour, county, and vehicle license plate number	197
Match 4	Crash date, and VIN (6 digits)	52
Match 5	Hand-matched using all available variables	44
Total cases matched		1,921

The first match included the variables crash date (month, day), crash time (hour, minute), county, city, vehicle identification number (VIN), and driver date of birth. The second match step dropped city, and used only the last six digits of the VIN. After some experimentation, the third match step included crash date, hour, county, and vehicle license plate number. The variables used in the fourth step in the computer-based match were crash date, and the last six digits of the VIN. Matches in the fourth step were also verified by a manual review of other variables common to the two files. At this point there were still 177 unmatched cases.

The fifth match was accomplished through a combination of computer matches to get a set of cases with some common elements, followed by hand matches to review a large number of different variables that might indicate that the right cases were found. The first set of potential matches reviewed consisted of records in both files that had the same crash date, county, and driver date of birth. The second used crash date, hour, county and a variable that captured the vehicle type. The vehicle type variable was created specifically for this purpose to aggregate vehicle types found in the PAR into categories similar to those in the MCMIS crash data. All

potentially matched cases in these two matches were hand-verified, and only the cases where there was high confidence that matching records were found were retained (16 cases).

For *each* of the remaining 161 unmatched cases, all PAR cases were listed that occurred in the same county on the same month and day, and a match was searched for in the MCMIS Crash file records. In addition, cases were searched for in the MCMIS data by vehicle license plate number only. In these instances the variables crash street and crash time were used to pinpoint the correct accident. This process produced an additional 28 matches. In total, the fifth matching step yielded an additional 44 matches.

To illustrate the nature of this effort to match cases, the following example is offered: The example case is a MCMIS record for a crash that occurred in Summit County, on January 2 at 3:09 pm. All crashes in the Colorado file that occurred on that date and county were identified in the Colorado file. There were 14 vehicles involved in crashes on that day. None matched on the time exactly, though there was one crash that occurred six minutes later. The location for that crash in the MCMIS file is I-70 at milepoint 206. The crash six minutes later in the Colorado PAR file was also on I-70, but at milepoint 212. None of the VINs in the Colorado record bear any resemblance to the VIN in the MCMIS record. The plate number in MCMIS bears no resemblance to any of the 14 plate numbers in the Colorado records. None of the drivers (there was missing data for three of the drivers) match the birth year or month of the record in MCMIS Crash file. The record in MCMIS is for a tractor-semitrailer. There was no crash in the Colorado file recorded as a tractor-semitrailer on that date and in that county. In light of these differences, it was not possible to match the MCMIS record to any of the records in the Colorado file.

This process was followed for each of the 161 unmatched cases in the MCMIS file.

In total, this process resulted in matching 93.5 percent of the 2,054 MCMIS records to the Colorado PAR file. One hundred thirty-three cases of the MCMIS records could not be matched. Some of these unmatched cases may be duplicate records in the MCMIS file, as a somewhat similar MCMIS record had already been matched to a PAR record with a different crash number. Other records could not be matched due to unrecorded values or different values in the critical match variables (county, crash date, vehicle license plate number, and VIN). Perhaps some of these records were added to the MCMIS file as a result of applying corrections to the original records.

The matches made were verified using other variables common to the MCMIS and PAR file as a final check to ensure each match was valid. The above procedure resulted in 1,921 matches, representing 93.5 percent of the 2,054 records reported to MCMIS.

Figure 1 shows the flow of cases from the two files (Colorado and MCMIS) through the matching process and then into the file used to evaluate crash reporting. Of the 1,921 matched cases, 1,113 apparently met the MCMIS reporting criteria (and thus are identified as "reportable"), as well as that could be determined using the data supplied. The method of identifying cases reportable to the MCMIS Crash file is discussed in the next section.

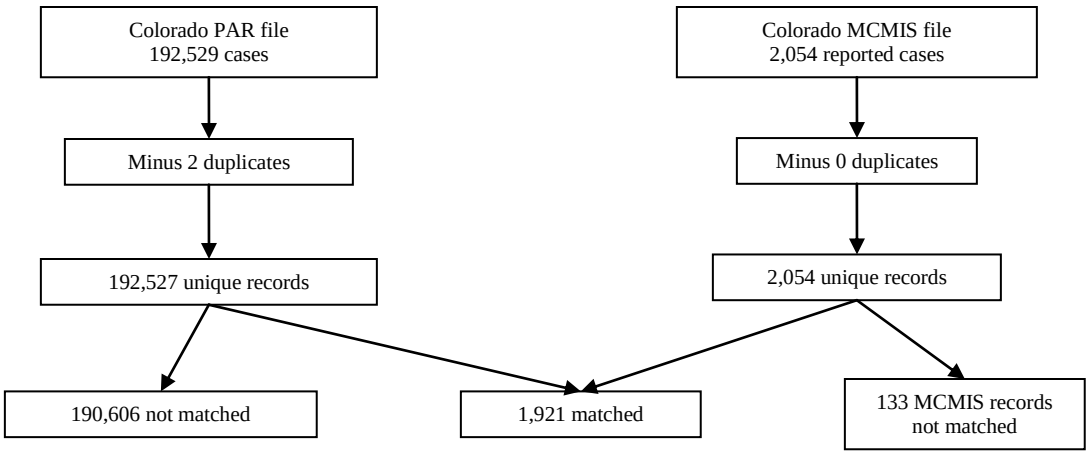

Figure 1 Case Flow in MCMIS/Colorado Crash File Match

4. Identifying Reportable Cases

To evaluate how complete reporting is to the MCMIS crash file, it is necessary as a first step to identify records that qualify for reporting, which involves identifing vehicles that meet the vehicle type reporting criteria, and crashes that meet the crash severity criteria. Records are selected as reportable using the information available in the computerized crash files supplied by the State of Colorado. Records that are reportable to the MCMIS Crash file meet criteria specified by the FMCSA. The reporting criteria cover the type of vehicle and the severity of the crash. These criteria are discussed in more detail below, but the point here is that records transmitted to the MCMIS Crash file must be selected from among all the records in the state's crash data, using the data that are available in the state's crash data.

The method developed to identify reportable records is intended to be independent of any prior selection by the state being evaluated. This approach is necessary to provide an independent check on the completeness of reporting. Accordingly, this process relies on the information recorded by the officers on the crash report for all crashes.

The MCMIS criteria for a reportable crash involving a qualifying vehicle are shown in Table 2. Reportable records must meet both the vehicle type and crash severity criteria. The method used for vehicle criteria and crash severity are each discussed in turn.

Table 2 Vehicle and Crash Severity Threshold for MCMIS Crash File

Vehicle	Truck with GVWR over 10,000 or GCWR over 10,000, or Bus with seating for at least nine, including the driver, or Vehicle displaying a hazardous materials placard.
Accident	Fatality, or Injury transported to a medical facility for immediate medical attention, or Vehicle towed due to disabling damage.

4.1 Vehicle type

Colorado uses a supplemental form (FMC Overlay C) to collect much of the data uploaded to the MCMIS Crash file. The *Traffic Accident Reporting Manual* (page 51) instructs the officer to complete the truck and bus blocks on the DR2447 in cases meeting the following criteria:

- "Any vehicle with a GVWR or GCWR of 10,001 pounds or greater; or
- "Any vehicle in commerce and equipped to transport other motor vehicles by means of winches, cables, pulleys, or other equipment for towing, pulling, or lifting; or
- "A vehicle hauling hazardous materials requiring placarding; or
- "A bus, if it is designed to transport nine or more people, including the driver, and is used in the furtherance of a commercial enterprise. This definition includes all school buses."

The Colorado instruction manual states that if the vehicle is greater than 10,000 pounds, but not in "commerce," only certain blocks of Overlay C need to be completed by the officer. There is one example of a vehicle with a GVWR over 10,000 pounds but which would not, according to the manual, be reportable. In this example, the vehicle has a gross combination weight rating of 15,800 pounds and is transporting hay. It is not clear why the case would not be reportable, unless the vehicle was just transporting the hay from one side of the road to the other and the hay was for his own use. There is no exemption for reportable vehicles used in farming operations as such.

With the exception of the single example discussed in the previous paragraph, the instructions in the Manual capture the vehicle criteria for the MCMIS file very well.

The first step is to identify vehicles in the Colorado crash file that meet the MCMIS criteria. Vehicle type is captured in the Vehicle/Vehicle Combination field on the crash form that classifies vehicles among 18 distinct types. Codes 1 to 4 identify vehicles with a GVWR over 10,000 pounds and require use of Overlay C. Codes 5-15 are classified as vehicles with a GVWR of 10,000 pounds or less. The Colorado crash file also includes a body type variable, a text field in which the reporting officer records the vehicle type, and the VIN. There is a series of codes in Appendix G of the *Traffic Accident Reporting Manual* for different body styles. In most cases, officers use those codes, but in many others they use variants or simply write out the body type. The VIN can be used in many cases to definitively identify reportable vehicles or to identify vehicles that do not meet the reporting criteria.

Vehicle type, body type, and the VIN were all used to identify vehicles that meet the vehicle type qualifications of the MCMIS reporting criteria. In general, the vehicle type categorical variable and the body type field were used primarily to identify reportable vehicles. Where the two variables were consistent and seemed to identify a vehicle that met the reporting criteria, those vehicles were taken. The VIN was used to eliminate vehicles that are not reportable, such as motorhomes, or to identify reportable vehicles misclassified as light vehicles or where vehicle type was left blank on the DR2477.

The VINs were decoded by David Hetzel of NISR, Inc., using software that he has developed. Hetzel decoded 192,660 VINs that were recorded in the Colorado crash data. (VIN was unrecorded in 10,483 cases, 5.4 percent of all vehicles, including 133 unmatched MCMIS cases.) The VIN-decoding program classified vehicles as light vehicles (<10,000 GVWR), pickups with a GVWR over 10,000 pounds, medium and heavy trucks, several different bus types (cross-country, school, transit, etc.), and trailer. Table 3 shows the distribution of vehicle types identified by the VIN. The VIN decoding software is written for truck- and bus-related VINs, so passenger vehicles and other light vehicles that are not trucks are combined into a single category. Note that not all the vehicles identified by the software are necessarily reportable trucks or buses. For example, motorhomes, since they are designed for private use, do not qualify. Many medium/heavy pickups are used solely for personal transportation and not part of a business. But many of the categories, such as single unit trucks and truck tractors, identify vehicles that are virtually never used solely for personal transportation and thus always qualify.

Table 3 VIN-based Vehicle Type

VIN vehicle	N	Percent
Cross country / intercity bus	153	0.1
Large van	822	0.4
Med/heavy truck based motorhomes	16	0.0
Medium/heavy pickups (>10k lbs)	966	0.5
Other bus type	9	0.0
School bus	351	0.2
Single unit truck (10k-19.5k lbs)	1,641	0.9
Single unit truck (19.5k-26k lbs)	661	0.3
Single unit truck (>26k lbs)	1,224	0.6
Step van	65	0.0
Step van or walk in van	10	0.0
Trailer	161	0.1
Transit/commuter bus	738	0.4
Truck tractor (cab only with/without trailer(s))	3,234	1.7
Light vehicle, un-decodable, or missing	182,609	94.8
Total	192,660	100.0

The vehicle type variable was used to identify vehicles and combinations over 10,000 pounds, as well as buses. Cases where the VIN showed that the vehicle was a light vehicle or motorhome were excluded. If the VIN showed that the vehicle was a heavy pickup, carrier variables were consulted to see if there was any evidence that the vehicle was used for commercial purposes. Otherwise, medium/heavy (GVWR class 3) pickups were excluded. Any case where the VIN showed that the vehicle met the vehicle type reporting criteria was included, even if the vehicle

was classified by the reporting officer as a light vehicle in the vehicle type variable from the crash report. The full method of identifying reportable vehicles is documented in Appendix B.

Overall, this approach, while it maximizes the available information, is quite conservative. Many vehicles classified in the vehicle type variable as vehicles or combinations over 10,000 pounds were found to be light vehicles by VIN. And most of the medium/heavy pickups were not included because no evidence could be found of commercial use, though it is likely that many were in fact used for commercial purposes.

In addition to these vehicle types, any vehicle, regardless of size, displaying a hazardous materials placard also meets the MCMIS vehicle type definition. Colorado's Overlay C includes fields for Placard, Release, Class, 4-digit Material ID, and Hazmat Quantity. These variables were used to identify vehicles transporting hazmat.

In total, 8,387 vehicles were identified in the Colorado PAR data as eligible trucks, buses, and other vehicles transporting hazardous materials.

Table 4 shows the distribution by vehicle type of these vehicles. Medium or heavy trucks accounted for 77.2 percent of the vehicles, while 20.3 percent are buses. Another 2.5% were light vehicles with hazmat placards.

Table 4 Vehicles Meeting MCMIS Vehicle Criteria
Colorado PAR File, 2008

Vehicle type	N	%
Truck	6,395	76.2
Bus	1,773	21.1
Other, transporting hazmat	219	2.6
Total	8,387	100.0

4.2 Crash Severity

The next step is to identify crashes that meet the MCMIS crash severity criteria. With respect to crash severity, qualifying crashes include those involving a fatality, an injured person transported for immediate medical attention, or a vehicle towed from the scene due to disabling damage. The Colorado Injury file includes information about the injury severity for each injured person involved in the crash. Colorado classifies injury using the common KABCN scale, where injuries are classified as Fatal (K), Incapacitating (A), Non-incapacitating but evident (B), Complaint of injury (C), and No injury. Crashes with fatal injuries can be identified easily using this information.

The data do not include a variable to indicate whether an injured person was transported for immediate medical attention. This information is not captured directly on the DR 2447. Whether EMS was called is not captured unless there is a fatality in the crash, in which case the DR 2447A is completed to record the time EMS was notified, arrived on scene, and arrived at the hospital. But for non-fatal injuries, there is no information on the PAR or in the PAR crash data which gives an indication as to whether an injured person was transported for medical attention.

Since it is not known if an accident involved a transported injury, it is necessary to find a surrogate. In this analysis, A- and B-injury crashes were used as a surrogate for injured/transported. It should be acknowledged that Colorado does not agree with this approach. It was indicated to us that police officers are trained to code A-injuries for persons who are transported, regardless of the nature of the injuries. This would mean that the set of A-injuries–defined as incapacitating injuries in the Colorado *Investigating Officer's Traffic Accident Reporting Manual*–also completely identifies the set of injuries transported for treatment. That definition also includes the following sentence: "This also includes an injured party transported to a hospital because of the severity of the injuries." The question really is whether officers interpret that sentence as meaning that all injured persons transported for treatment are classified as A-injuries, and no other injuries, whether evident but not incapacitating (B-injuries) or a complaint of pain (C-injuries), are transported for treatment.

While we have the highest respect for the officers and crash reporting personnel of Colorado, our own analysis of available information leads us to a different judgment. It is possible to use the National Automotive Sample Survey General Estimates System (NASS GES or just GES) file for comparison. GES is a nationally-representative sample of police reported crashes. GES can be used to identify vehicles that meet the MCMIS vehicle type definition and crashes that meet the MCMIS crash type definition. Injuries in GES are also coded using the same KABCN as Colorado.

When the population of crash involvements that meet the MCMIS reporting criteria is isolated in GES, the distribution of the most severe injury in the crash is very similar to the same distribution in the Colorado crash data. Table 5 shows that the percentage of fatal, A-, B-, and C-injury involvements in Colorado is very close to that found in the GES crash data, which represents the national experience. The percentage of A-injury involvements is somewhat lower in Colorado than in GES (2.4 percent compared with 3.3 percent in GES), but overall, the results are very similar. The right-hand column in the table also shows the consequence in the GES data if all injuries that were transported for treatment were coded as A-injuries. In that case, the percentage of A-injuries would increase from 3.3 percent of the involvements to 12.7 percent, while the percent of B-injuries would decrease from 6.2 percent to 2.0 percent, while C-injury involvements would go down from 9.8 percent to 5.0 percent. Note that this distribution is significantly different from that observed in Colorado, and that it reverses the expectation that there would be more of the lower severity injuries than of the higher severity injuries–i.e., more C-injuries than B-injuries and more B-injuries than A-injuries. The expected order is observed in both the Colorado crash data and the unadjusted GES data.

Table 5 Comparison of Injury Distributions

Maximum injury in crash	Colorado Crash Data	GES Crash Data	
		As coded	All transported injuries counted as A-injury
Fatal	0.6	0.7	0.7
A-injury	2.4	3.3	12.7
B-injury	5.9	6.2	2.0
C-injury	8.9	9.8	5.0
No injury	81.7	79.5	79.5
Unknown	0.5	0.5	0.1
Total	100.0	100.0	100.0

Accordingly, our judgment is that it is not appropriate to use A-injuries as accounting for all injuries transported for immediate medical attention. While using A- and B-injuries does not give a complete identification of all crashes that meet the MCMIS crash severity criteria, it does identify a subset of cases that are highly likely to meet the criteria. As such, this is the best available surrogate, based on analysis of the GES file.

In order to estimate the consequences of this approach, we examined five years of crash data reported in GES. Table 6 shows the percentage of crash involvements in each crash severity threshold by the MCMIS crash severity reporting categories. All fatal involvements are reportable, of course, so the table shows that 100 percent of the cases where the most severe injury was a fatality meet the MCMIS fatal reporting threshold. More interesting are the proportions for the non-fatal injuries. Note that 96.0 percent of the cases in which the maximum injury severity was an incapacitating injury (A-injury) were in the injury/transported group and an additional 2.0 percent met the tow/disabled criteria. So, overall, an estimated 98.0 percent of truck and bus involvements in which the most severe injury was an A injury met at least one of the MCMIS crash severity reporting criteria. For non-incapacitating (B) injuries, 92.3 percent (70.3 + 22.0) are reportable. A majority of involvements are reportable even where the most severe injury is a possible (C) injury, with 71.9 percent meeting either the injury/transported or tow/disabled criteria. Note, however, that less than half of C-injured persons were transported for treatment. Where no injury occurred, only 18.3 percent were reportable, almost all because of the tow/disabled requirement.

Table 6 Percentage of Involvements that Meet the MCMIS Reporting Threshold by Most Severe Injury in Crash, GES 2004-2008

Maximum injury severity in crash	MCMIS Reporting Threshold				Not report-able	Total
	Fatal	Injury/ transported	Tow/ disabled	Total reportable		
Fatal (K)	100.0	0.0	0.0	100.0	0.0	100.0
Incapacitating (A)	0.0	96.0	2.0	98.0	2.0	100.0
Nonincapacitating (B)	0.0	70.3	22.0	92.3	7.8	100.0
Possible (C)	0.0	48.6	23.3	71.9	28.1	100.0
No injury	0.0	0.0	18.3	18.3	81.7	100.0

Based on Table 6, it was determined that crashes in which the most severe injury was either a fatality, an incapacitating injury, or a non-incapacitating but evident injury—K, A, or B

injuries—identify a subset of crashes that have a high probability of meeting the MCMIS Crash severity criteria. About 95 percent of these crash involvements meet the MCMIS injured/transported threshold. Thus, the K, A, or B involvements can be reasonably identified as reportable, even without the direct information on whether an injured person was transported for treatment.

The other reporting criteria related to crash severity is whether any vehicle in the crash was towed due to disabling damage. The Colorado PAR file includes the information needed to identify such crashes. The crash form contains a check box for Towed Due to Damage. Officers are instructed to check this box if the vehicle was towed because of damage sustained in the accident. There is also a space to enter the name of the tow company. If what appears to be the name of a towing company is entered there, it is interpreted as meaning that the vehicle was towed.

The Colorado crash file also includes information on crash-induced damage to vehicles in a 40-character Damage Severity variable. The reporting officer indicates the level of damage to each of 40 different areas of vehicle combination, using diagrams on the crash form. This information is captured in the Damage Severity variable. The first twenty digits refer to the power unit, and the last twenty to a trailer, if present. The values are: 1=Slight damage (scratches, minor dents, and cracked windows), 2=Moderate damage (moderate dents, windows out, etc.), and 3=Severe damage (major body/mechanical damage). For this analysis a new variable was created to identify the most severe damage recorded for any part of the vehicle or trailer.

Using the available tow and damage information, a vehicle was considered tow/disabled if Towed Due to Damage was marked, or if Damage Severity was severe and the name of a towing company was entered on the police report. For the latter criteria, all the strings entered in the space for the name of the towing company were reviewed, and only cases with what appeared to be a real towing company were included. Cases with values such as “Fled the scene”, “NOT TOWED”, and “No Damage-Driven” were excluded.

Implementing the eligible vehicle and crash severity filters identified a total of 1,744 cases in the Colorado crash data in 2008. There were 1,744 qualifying vehicles—either a truck or bus or hazardous placarded vehicle—involved in a crash that included either a fatality, an A- or B-injury, or a vehicle towed due to disabling damage. As noted above, based on the GES analysis, this number very likely underestimates the true number of reportable records, because a large number of involvements in C-injury crashes where the injured person was transported are not taken. In fact, based on the GES analysis, the filter here identifies about 86 percent of the true number of reportable records. It should also be noted that the number of involvements probably includes a small number of records that are not reportable because there are some crashes with A- or B-injuries in which no one is transported for immediate medical attention. Based on the GES analysis, it is estimated that about 2.0 percent of the records that meet the filter are not truly reportable.

Thus, the filter used here identifies about 86 percent of reportable records and about 98 percent of the records so identified meet the reporting threshold. This set of records is an adequate work-around for the limitations of the crash data. Although the set of reportable records cannot be identified precisely, a substantial subset can be identified with an estimated 98 percent accuracy. Evaluation of the completeness of reporting of this subset can provide useful insights into overall

reporting by the State. However, it should also be noted at the same time that the ability to identify overreporting—that is, reporting of records that do not meet the criteria—is severely limited. For the reported cases that do not include an A- or B-injury, the possibility cannot be excluded that C-injury cases were transported for medical attention. It is also the case that tow information is not collected from crash reports that are submitted in hard copy.[1] This means that some or all of the records that appear to not meet the reporting criteria, based on the coding in the Colorado crash file, may in fact qualify. Therefore, the analysis in this report is restricted to a subset of records that can be identified as reportable to the MCMIS crash file.

As Figure 1 above (page 6) shows, there were 2,054 records reported to the MCMIS Crash file by Colorado in 2008. Of these, 1,921 were matched to the Colorado PAR file. Within the Colorado crash file, 1,744 were identified as a subset of crashes that were reportable. These 1,744 is not the full set of cases that were reportable, because of the limitations discussed above, but they constitute a set of cases that are 95 percent likely to be reportable. Of these 1,744 reportable records, 1,143 were actually reported, for an overall reporting rate of 65.5 percent. The next section will identify those factors in the data that are associated with rates of reporting.

5. Factors Associated with Reporting

The process described in section 4 identified 1,744 records in the 2008 Colorado crash file as meeting a subset of the MCMIS Crash file reporting criteria. This section provides a discussion of factors that apparently affected the successful identification and reporting of records to the MCMIS Crash file. As described above, the reportable records evaluated here are a subset of the full set of reportable records. Due to data limitations, that full set cannot be identified, but a subset of reportable records was identified, and the reporting of those records will be evaluated in this section.

5.1 Overreporting

It is not possible to determine whether there was any overreporting of cases to the 2008 MCMIS Crash file. Because injuries transported for medical attention cannot be identified in the Colorado crash file, it cannot be determined for any particular case that it was not reportable, because it may have included a transportable injury. Thus, there will be no evaluation of overreporting.

5.2 Reporting Criteria

This section presents the results of examining reporting rates by the factors—crash severity and vehicle type—that are used to determine if a specific crash involvement is reportable. This analysis is intended to help identify characteristics of the vehicle or crash that are more likely to trigger the process that results in a reported case. The case reporting evaluated here is just for the subset of MCMIS reportable cases. This subset is likely about 85 percent of the full number, but the fact that this evaluation only covers certain reportable cases should be kept in mind.

Table 7 shows reporting rates, the number of unreported cases, and the proportion of unreported cases for each level of the MCMIS crash severity criteria. Traffic crashes that resulted in a fatality or serious injury were reported at the highest rate. Almost 90 percent of fatal involve-

[1] Personal communication with the responsible parties in Colorado.

ments were reported, though note that there were only 57 in the Colorado data for 2008. The reporting rate was significantly lower for the 696 A or B-injury involvements that were reportable. Only 60.3 percent of these were reported. The rate is somewhat higher for the involvements that only met the towed/disabled criterion, with a 67.8 percent reporting rate. All of these differences are statistically significant. The very high rate of reporting for fatal crashes may indicate that fatal crashes are scrutinized more closely and are therefore more likely to be recognized as meeting the reporting criteria. The lower rate for towed/disabled, along with the large number of such cases, means that over half of the unreported cases fall into this least severe crash group.

Table 7 Reporting Rate by MCMIS Crash Severity, Colorado 2008

Crash severity	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Fatal	57	89.5	6	1.0
A/B injury	696	60.3	276	45.9
Towed/disabled	991	67.8	319	53.1
Total	1,744	65.5	601	100.0

The second component of the MCMIS Crash file criteria is the vehicle type. As described above, trucks, buses, and other vehicles transporting sufficient amounts of hazmat to require a placard all meet the reporting requirements. Table 8 shows the rates for the different general types of vehicles. The reporting rate for trucks was 68.3 percent and for buses, 49.0 percent, so trucks in reportable crashes are recognized at somewhat higher rate than buses,. The difference between trucks and buses is statistically significant and similar to what has been observed in other states. Note that the reporting rate for light vehicles transporting hazmat is similar to the rate for buses.

Table 8 Reporting Rate by MCMIS Vehicle Class, Colorado 2008

MCMIS vehicle class	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Truck	1,473	68.3	467	77.7
Bus	153	49.0	78	13.0
Light vehicle w/hazmat	118	52.5	56	9.3
Total	1,744	65.5	601	100.0

Table 9 provides more detail about the effect of vehicle type on reporting rates, showing rates by the type of vehicle as indicated by the VIN. Trucks are classified by their GVWR and by whether they are straight trucks or tractors. Note that, among the trucks, the highest reporting rates are for the biggest vehicles. Truck tractors were reported at a 79.8 percent rate, compared to the overall rate of 65.5 percent. There is a consistent trend to higher reporting rates as the GVWR of single unit trucks (SUT) increases. Medium SUTs are reported at only a 24.1 percent rate, while 53.6 percent of those with GVWR's between 19,500 and 26,000 pounds were reported, and 65.2 percent of SUTs with a GVWR over 26,000 pounds. It is important also to note that most of the unreported vehicles are large trucks. There were 193 truck tractor involvements that were not reported, 78 SUTs with a GVWR over 26,000, 45 SUTs with a GVWR between 19.5K and 26K,

and 145 SUTs with a GVWR between 10K and 19.5K. While reporting rates were lower for smaller vehicles, most of the unreported cases are for large trucks.

Table 9 Reporting Rate by Vehicle Type Determined by VIN, Colorado 2008

VIN vehicle type	Reportable cases	Reporting rate	Unreported	% of total unreported
Large van	24	33.3	16	2.7
Step van	5	60.0	2	0.3
School bus	37	48.6	19	3.2
Cross country/intercity bus	12	75.0	3	0.5
Transit/commuter bus	58	65.5	20	3.3
Other bus type	1	0.0	1	0.2
Medium/heavy pickup truck (>10K lbs)	11	81.8	2	0.3
Single unit truck (10K-19.5K lbs)	191	24.1	145	24.1
Single unit truck (19.5K-26K lbs)	97	53.6	45	7.5
Single unit truck (>26K lbs)	224	65.2	78	13.0
Truck tractor with or without trailer(s)	954	79.8	193	32.1
Trailer	3	100.0	0	0.0
Unknown	127	39.4	77	12.8
Total	1,744	65.5	601	100.0

There is some variation in reporting across the different types of buses, but the variation does not appear to be related clearly to size. About 65.5 percent of transit buses were reported, which typically are large with seating for many passengers, while only 48.6 percent of schools buses were. It is possible that there are operational differences that account for these differences, though the instructions with respect to vehicle types on Overlay A are clear.

Reporting rates by the cross-classification of vehicle type and crash severity show the separate effects of vehicle type and severity. (See Table 10.) However, the pattern of reporting by crash severity is close to the same for both trucks and buses. Rates are highest for fatal involvements, and drop steeply for both trucks and buses, though the decline is to even lower rates for buses than trucks. The differences are statistically significant. Much of the underreporting problem is related to overlooking nonfatal crashes, whether they are an A- or B-injury crash or just towed/disabled.

Table 10 Reporting Rate by Vehicle Type and Crash Severity, Colorado

MCMIS Vehicle type	Crash severity			Total
	Fatal	A/B injury	Towed/ disabled	
Truck	96.0	63.5	69.7	68.3
Bus	100.0	47.8	51.4	49.0
Hazmat placard	33.3	50.0	54.9	52.5
Total	89.5	60.3	67.8	65.6

5.3 FMCI Overlay Data

Colorado collects some of the data required for the MCMIS crash file on the second page of the DR 2447 in the Federal Motor Carrier Information (FMCI) area. Officers, for certain vehicle types, as specified on Overlay A, are instructed that "FMC (Overlay C) [is] Required" for buses and vehicles or vehicle combinations over 10,000 pounds. The motor carrier data from this area can be used as an indicator of whether reporting officers recognized vehicles as meeting the vehicle type criteria. Since Colorado uses the FMCI area to collect crash data for the MCMIS file, rather than integrating all elements into the primary crash form, recognition by reporting officers may be a critical first step in the reporting process.

It appears that completing the FMCI increases the chance that a reportable case will be reported, but it is not a sufficient to insure reporting. The reporting rate for reportable records that had a FMCI area form with data ranged from 42.1 percent to 80.9 percent, depending on the number of items completed, with an overall rate of 76.0 percent if any item is completed and 19.9 percent if no items are completed.

Table 11 Reporting Rates by Items Recorded on Federal Motor Carrier Information Overlay C, Colorado 2008

CMV variables recorded	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
None recorded	326	19.9	261	43.4
1 recorded	47	80.9	9	1.5
2 recorded	141	79.4	29	4.8
3 recorded	19	42.1	11	1.8
4 recorded	138	68.1	44	7.3
5 recorded	1073	77.0	247	41.1
Total	1,744	65.5	601	100.0

Note that Table 11 implies that there were 65 cases (326 − 261 = 65) in which the reporting officer did not fill out any items from Overlay C, yet the record was properly reported to the crash file. And note also that there were 247 records for which five different items were completed by the reporting officer, and yet they were not reported. In fact, these 247 records account for over 40 percent of the unreported cases. Clearly there is some secondary processing that occurs in which cases are reviewed and a decision taken whether to report. This process picks up some cases that should be reported but which were missed by the reporting officer. But it also overlooks a number of records that should be reported, but which were not.

5.4 Registration state and area of operations

The registration state of the vehicle may be considered a surrogate (imperfect of course) for involvement in interstate commerce, to test if vehicles clearly involved in interstate commerce are more or less likely to be reported to the national crash file, maintained by regulator of trucks and buses involved in interstate commerce. Table 12 shows reporting rates by whether the vehicle was registered in the State of Colorado or somewhere else. Out-of-state registered vehicles are somewhat more likely to be identified as reportable and to be reported. Over 76

percent of out-of-state vehicles were reported, compared with about 60 percent of the reportable vehicles that were registered in state. Over 70 percent of the unreported records involved vehicles registered in Colorado.

Table 12 Reporting Rates by Vehicle Registration State, Colorado 2008

Vehicle registration state	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
In-state	1,060	59.2	432	71.9
Out-state	671	76.6	157	26.1
Unrecorded	13	7.7	12	2.0
Total	1,744	65.5	601	100.0

5.5 Reporting Agency

In addition to the reporting criteria, reporting rates may reflect differences in the type of enforcement agency that investigated the crash. The level and frequency of training or the intensity of supervision may vary, along with the focus of enforcement emphasis. Such differences can serve as a guide for directing resources to areas that would produce the greatest improvement. This section examines reporting rates by the type of reporting agency.

Reporting rates do not vary appreciably by the type of investigating agency, as reflected in Table 13. There are three primary types of investigating agencies identified in the Colorado crash file: State Patrol, Sheriff, and police departments. The Colorado State Patrol, however, was responsible for 1,443 out of the 1,744 crash involvements evaluated here. Crashes covered by the State Patrol were reported at a 67.3 percent rate, significantly higher than the 57.1 percent rate for police departments, and the 53.3 percent rate for Sheriffs (though only 15 reportable involvements were covered by Sheriffs). Differences in training and enforcement focus may account for the higher overall reporting rate of the State Patrol, in comparison with Sheriffs and police departments.

Table 13 Reporting Rate by Investigating Agency, Colorado 2008

Investigating agency	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Colorado State Patrol	1,443	67.3	472	78.5
Sheriff	15	53.3	7	1.2
Police Department	282	57.1	121	20.1
Other	4	75.0	1	0.2
Total	1,744	65.5	601	100.0

5.6 Fire Occurrence

FMCSA has a special interest in ensuring that reportable crash involvements in which a vehicle fire occurred are accurately reported. With respect to the occurrence of fire in reportable crash involvements, there were nine such cases, and eight were reported, for a reporting rate of 88.9

percent. All the fires occurred in truck crashes. There were no bus fires in reportable cases for 2008 in Colorado.

Table 14 Reporting of Crash Involvements with Fire Occurrence, Colorado 2008

Vehicle type	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Truck	9	88.9	1	100.0
Bus	0	n/a	0	n/a
Light vehicle w/hazmat	0	n/a	0	n/a
Total	9	88.9	1	100.0

5.7 Case Processing

The rate of case processing may also be related to reporting rates. However, in Colorado it does not appear that there are any significant delays or cycles in case processing that affects the overall reporting rate. Reportable cases were transmitted to the MCMIS Crash file at a fairly uniform rate across the year. There was some variation, in that the rate was somewhat lower September through December, but the difference was not significant. (Table 15) Rates were somewhat above the overall average for January through June, dropped a bit in July, improved to almost 70 percent and then dropped again. However, none of these fluctuations seem to explain the overall rate of reporting to the MCMIS Crash file. Instead, they appear to be related to the ordinary variation that would be expected over the course of a year.

Table 15 Reporting Rate by Accident Month in Colorado Crash File, 2008

Crash month	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
January	187	64.2	67	11.1
February	184	66.8	61	10.1
March	158	69.0	49	8.2
April	160	68.8	50	8.3
May	132	68.2	42	7.0
June	136	68.4	43	7.2
July	131	62.6	49	8.2
August	147	69.4	45	7.5
September	113	60.2	45	7.5
October	137	64.2	49	8.2
November	105	61.9	40	6.7
December	154	60.4	61	10.1
Total	1,744	65.5	601	100.0

The MCMIS file used in this analysis was closed as of June 9, 2009, 159 days after the close of the year, which is well beyond the 90-day grace period within which reportable involvements are required to be reported. It is not known whether a significant number of records were submitted after June, 2009, but this seems improbable given the regularity with which cases were reported.

The last date on which records for 2008 were submitted to the MCMIS file was April 30, 2009, so a bit over a month elapsed between that date and the date of the MCMIS file used here. The conclusion is that the overall reporting rate is determined by factors other than the logistics of uploading cases to the MCMIS Crash file.

6. Data Quality and Reporting Latency of Reported Cases

In this section, we consider the quality of data reported to the MCMIS crash file, as well as reporting latency (time elapsed between crash occurrence and when the crash was reported). Two aspects of data quality are examined initially. The first is the amount of missing data in the cases reported. Missing data rates affect the usefulness of a data file because records with missing data cannot contribute to an analysis. The second aspect of data quality considered here is the consistency of coding between records as they appear in the Colorado crash file and in the MCMIS Crash file. Inconsistencies may indicate problems in translating information recorded on the crash report to the values in the MCMIS Crash file.

In this section of the evaluation, all cases reported to the MCMIS crash file from Colorado for 2008 are used, since the purpose of the analysis is to examine the quality of the data as reported.

Table 16 shows missing data rates for selected, important variables in the MCMIS Crash file. Missing data rates are generally low, with a handful of exceptions. On most fundamental, structural variables, such as date, time, number of fatalities and number of injuries, missing data rates are either zero or extremely low.

Four variables have missing data rates that are apparently high, but only one is actually a problem. Missing data rates for variables that have information for the sequence of events for events two, three, and four are apparently high, but in fact most crashes consist of only one harmful event, so the reason there is no information for these subsequent events is most likely that there were no subsequent events. The missing data rate for roadway access may be problematic, at 37.2 percent. This warrants examination to determine if this is a systematic problem. Roadway access does not appear to be captured directly on the DR 2447, so it may be a derived variable, based on crash location. Overall, rates of missing data are low, reflecting very complete data collection for most variables. The elevated rate for roadway access may be of concern, however.

Table 16 Missing Data Rates for Selected MCMIS Crash File Variables, Colorado 2008

Variable	Percent unrecorded	Variable	Percent unrecorded
Report number	0.0	Fatal injuries	0.0
Accident year	0.0	Non-fatal injuries	0.0
Accident month	0.0	Interstate	0.0
Accident day	0.0	Light	0.1
Accident hour	0.0	Event one	0.7
Accident minute	0.0	Event two	76.6
County	1.4	Event three	87.5
Body type	0.1	Event four	94.6
Configuration	0.1	Number of vehicles	0.0
GVWR class	0.1	Road access	37.2
DOT number *	1.0	Road surface	0.1

Variable	Percent unrecorded	Variable	Percent unrecorded
Carrier state	0.0	Road trafficway	0.1
Citation issued	2.0	Towaway	0.0
Driver date of birth	2.0	Truck or bus	0.0
Driver license number	2.8	Vehicle license number	0.1
Driver license state	2.8	Vehicle license state	0.2
Driver license class	2.9	VIN	0.1
Driver license valid	2.0	Weather	0.1

* Based on cases where the carrier is coded interstate.

Hazardous materials variable	Percent unrecorded
Hazardous materials placard	98.3
Percentages of hazmat placarded vehicles only:	
Hazardous cargo release	100.0
Hazardous materials class (1-digit)	100.0
Hazardous materials class (4-digit)	0.0
Hazardous materials name	100.0

The second section of the table shows missing data rates for the hazardous materials (hazmat) variables. Whether the vehicle displayed a Hazmat Placard was recorded only when the vehicle was displaying a placard. If the vehicle was not displaying a placard, that fact was never recorded, i.e., there were no cases where the variable indicated "N". The other missing data rates shown are limited to the thirty-four Colorado records showing the vehicle displayed a hazmat placard, indicating it was carrying hazmat. There were 34 records for vehicles transporting hazmat, and all were missing data for hazmat cargo release, 1-digit hazmat class code, and hazardous materials name. The 4-digit hazmat identifier was recorded in every case. Given the security and safety hazard associated with hazardous materials, this is of concern.

The second check on data quality is to compare values for the records in the Colorado data with values for comparable variables in the MCMIS Crash file. Inconsistencies between the files may indicate a problem in preparing the data for upload. This comparison was made for all substantive variables, other than those that were used to match records in the two files.

Code values for most of the variables checked matched precisely between the two files. However, there was a relative handful of inconsistencies for some variables, and one major problem for hazardous materials placard. Only 34 records in the MCMIS Crash file are coded "Y" to indicate that the vehicle displayed a hazmat placard, but 1,011 of the 1,921 matched Colorado cases had a one in the hazmat placard field. The origins of this inconsistency are not clear. It seems very unlikely that over half of the match records in the Colorado data actually displayed a hazmat placard, particularly since only 34 were reported to the MCMIS file as having a placard. Numerous checks were made to ensure there was no error in building the analysis file. It was determined that, while the overall incidence of hazmat placard in the Colorado data is reasonable (about 1.3 percent of the 192,660 vehicles), it is coded for a large number of unlikely vehicles, such as buses, dumps, grain/chips/gravel haulers, pole trailers and cases with no cargo body. While the instructions in the *Investigator's Manual* are clear and correct, it appears that hazmat placard is coded inappropriately for a large number of vehicles in the Colorado data.

For the other variables compared, the largest number of inconsistencies was observed in the variables that capture vehicle type. There were inconsistencies in the coding of 52 cases, which is about 2.7 percent of the 1,921 records that could be matched. There was no particular pattern to the differences. In most of the cases, the vehicle was classified as a truck or bus in the MCMIS file and as some sort of passenger car or SUV in the Colorado crash data. For example, three records identified as a 3 or more axle single unit truck in the MCMIS file were coded as a passenger car or van in the Colorado data. Similarly, there were four records coded as a truck/trailer in the MCMIS data, two of which were coded as passenger car/van and two as a passenger car with trailer.

A small number of inconsistencies were also found in variables for road surface condition, weather, light condition, cargo body, and number of fatalities. The largest number was 32 cases with inconsistent cargo bodies. The number of cases with inconsistent values for the other variables ranged from two to 12. Again, there was no detectable pattern that might suggest a systematic problem in coding. Most likely, these inconsistencies are produced when records are manually reviewed and prepared for upload to the MCMIS Crash file. As such, they may be an indication of quality control problems, or corrections made in the record submitted to MCMIS, but not reflected in the Colorado crash data. But they are not frequent enough to pose a major issue.

Reporting latency also reflects data quality. All reportable crash involvements are required to be transmitted to the MCMIS Crash file within 90 days of the date of the crash. The MCMIS Crash file as of June, 2009, was used to identify records submitted from Colorado. The date of the file is about 160 days after the end of 2008, so all calendar year 2008 cases should have been reported by that date.

Figure 2 shows the cumulative percent of cases submitted by latency in days, i.e. the number of days between the crash date and the date the case was uploaded to the MCMIS Crash file. Over 98 percent of the records that were ultimately reported were submitted within 90 days of the crash, which is an excellent result. The median time between crash occurrence and record upload is 23 days. Two-thirds are submitted within 32 days, and 99 percent were submitted within 111 days.

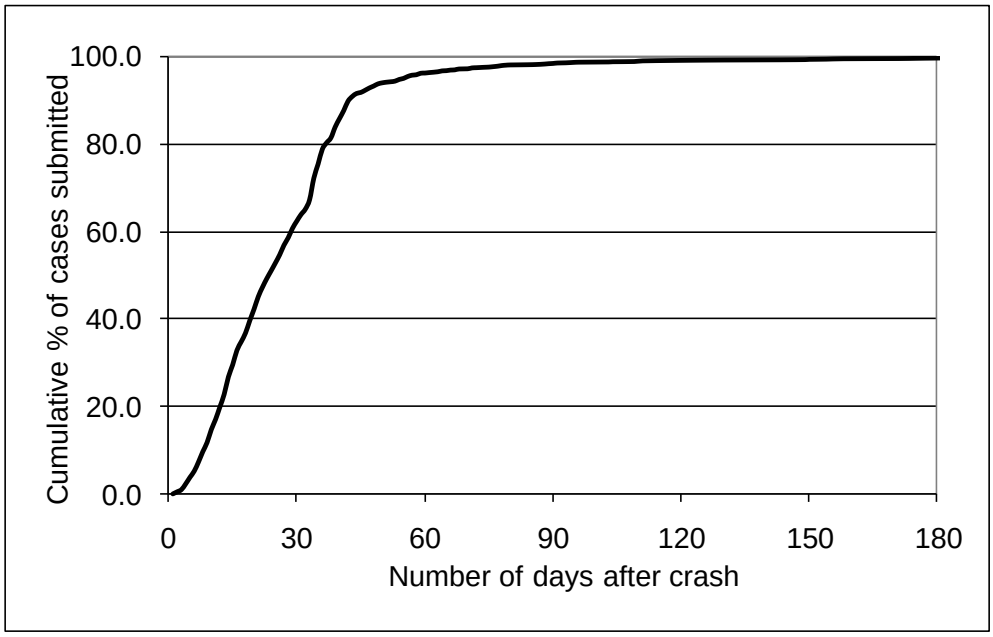

Figure 2 Cumulative Percentage of Cases Submitted to MCMIS Crash file by Number of Days After the Crash

The first date on which crash records from 2008 were uploaded was January 8, 2008, when one record was uploaded. On average, uploads occurred every 4.3 days between then and April 30, 2009, when the last upload occurred. An average of 18.5 records were uploaded per upload. About half the uploads were for one or two records. The largest single upload was of 88 records. Most uploads consisted of 20 to 40 records.

7. Summary and Discussion

Overall, it appears that Colorado reported about 65.5 percent of reportable crash involvements for 2008, though there is some uncertainty with respect to that rate. It is not possible to implement the full MCMIS reporting criteria in the coded Colorado crash data because the data do not include whether injuries were transported for medical treatment. However, it is possible to identify a subset of the MCMIS reportable cases that have a high probability of being reportable, even though it is not known whether an injury was transported. This subset consists of involvements with a fatality, A- or B-injury, or where a vehicle was transported due to damage. The Colorado data includes the information necessary to identify this group, and it is estimated from the national experience as captured by the GES file that over 98 percent of the subset meet the MCMIS reporting criteria. Based on the results for this subset, we estimate that Colorado reports about 65.5 percent of the cases that meet the MCMIS reporting threshold.

To identify reportable vehicles, we were able to use information decoded from the VIN, courtesy of David Hetzel of NISR, in addition to the coded data from the DR 2447 crash report. The VIN information results in greatly improved precision in identifying vehicles that meet the MCMIS reporting criteria, in part because the vehicle type variable in the Colorado data uses one level—vehicle or combination rated over 10,000 pounds—for all truck types. Through the use of the VIN information we were able to identify the large, class 3 pickups that are increasingly used for personal transportation and then check whether there was any indication they were used for non-personal reasons before including them as reportable. The VIN information also uncovered a

number of vehicles that met the GVWR reporting criteria that were misclassified as light vehicles.

The most significant factor affecting reporting rates is that less severe involvements are reported at a substantially lower rate than more serious crashes. Almost 90 percent of fatal involvements were reported, but only 60.3 percent of A/B injury involvements, and 67.8 percent of towed/disabled involvements. It is not unlikely that fatal involvements receive more investigation and review, so they are more likely to be recognized as being reportable. Towed/disabled may be overlooked, but they account for over half of the unreported cases.

Overall, trucks are reported at a significantly higher rate than buses. About 68 percent of truck involvements are reported, while about 49 percent of bus involvements are reported. In addition, it appears that large trucks are more readily recognized as being reportable than smaller trucks. Using the VIN classification of the vehicles, it was found that almost 80 percent of truck tractors (mostly probably tractor-semitrailers) meeting the reporting criteria (at least for the subset evaluated) were reported, but only about 53 percent of single unit trucks with a GVWR from 19.5K to 26K, and 24.1 percent of single unit trucks with a GVWR from 10K to 19.5K.

Colorado collects much of the information uploaded to the MCMIS Crash file on the FMC Information page of the DR 2447, which the reporting officer is instructed to complete for certain vehicle types. Analysis showed that completing this area improves the chance that a reportable case would be reported, but it was not decisive. Where none of the items in the FMC area were filled in, about 20 percent of reportable records were reported, while rates ranged from 42 to 81 percent for reportable cases with one or more items filled in. Clearly, how well the reporting officer recognizes cases that meet the reporting criteria is influential in determining whether a case is reported, though it is not decisive, since cases with some of the information entered accounted for almost 60 percent of the unreported cases. It appears that there is some secondary selection process that does not identify a number of cases that meet the MCMIS reporting criteria.

The timeliness of uploading the records from Colorado is very good. Over 98 percent of the cases that were uploaded to the MCMIS file were uploaded with 90 days of the crash. The median time between crash occurrence and when the record was uploaded was only 23 days. Examination of reporting by month showed that uploads occur on a regular basis with only minor variation over the course of the year.

With respect to the reported data itself, missing data rates for most fields reported to the MCMIS Crash file are quite low for most variables. The rate was high for roadway access and the variables capturing information about hazardous materials. Hazardous material 1-digit code, hazmat name, and hazmat release is missing in all cases where the vehicle was coded as displaying a hazmat placard. There is also an apparent problem in the Colorado crash file with coding hazmat placard inappropriately. Though hazmat crash involvements are relatively few (only 34 were reported to the MCMIS file), they are very significant. These data are critical for identifying hazmat safety risks.

The primary problem identified in Colorado crash reporting is simply the overall reporting rate. The analysis of available information did not identify any single factor that might explain the rate. Instead, it appears that reportable cases are not being identified at some point in the review

process. There is some tendency for less severe crashes to be reported at lower rates than more severe, but the difference is primarily between fatal and nonfatal crashes, and it is likely that fatal crashes are investigated at greater depth. There is also some tendency for larger vehicles to be more readily identified as reportable than smaller, and out of state trucks to be reported more often than those registered in-state. But again, even for large trucks such as tractor-semitrailers, only about 80 percent are reported.

Judging by the pattern of evidence in the Colorado data, it appears that reporting officers are overlooking a substantial number of cases and not completing the FMC overlay fields. Almost 40 percent of the unreported records in the subset examined had no information in those fields. But then about 60 percent of the unreported records had one or more of those fields filled out, but they were not selected for upload.

The Colorado system of reporting has several strong points. The regularity and timeliness of uploads is outstanding. The investigating officers reporting manual is thoughtful, comprehensive, and very well done. The approach of requiring the FMC area to be completed for certain vehicle types, regardless of crash severity, is also very good, in that it relieves the officer of the burden of deciding whether the crash meets the crash severity threshold. More detailed code levels for trucks might help the officer recognize the vehicles to be reported more consistently. Including a variable for transported to hospital would then put all the factors in place to select reportable cases via a computer selection algorithm, rather than through a manual review. This would result in substantially improving the reporting rate, while also reducing the amount of manual case selection, which is prone to error and inconsistency.

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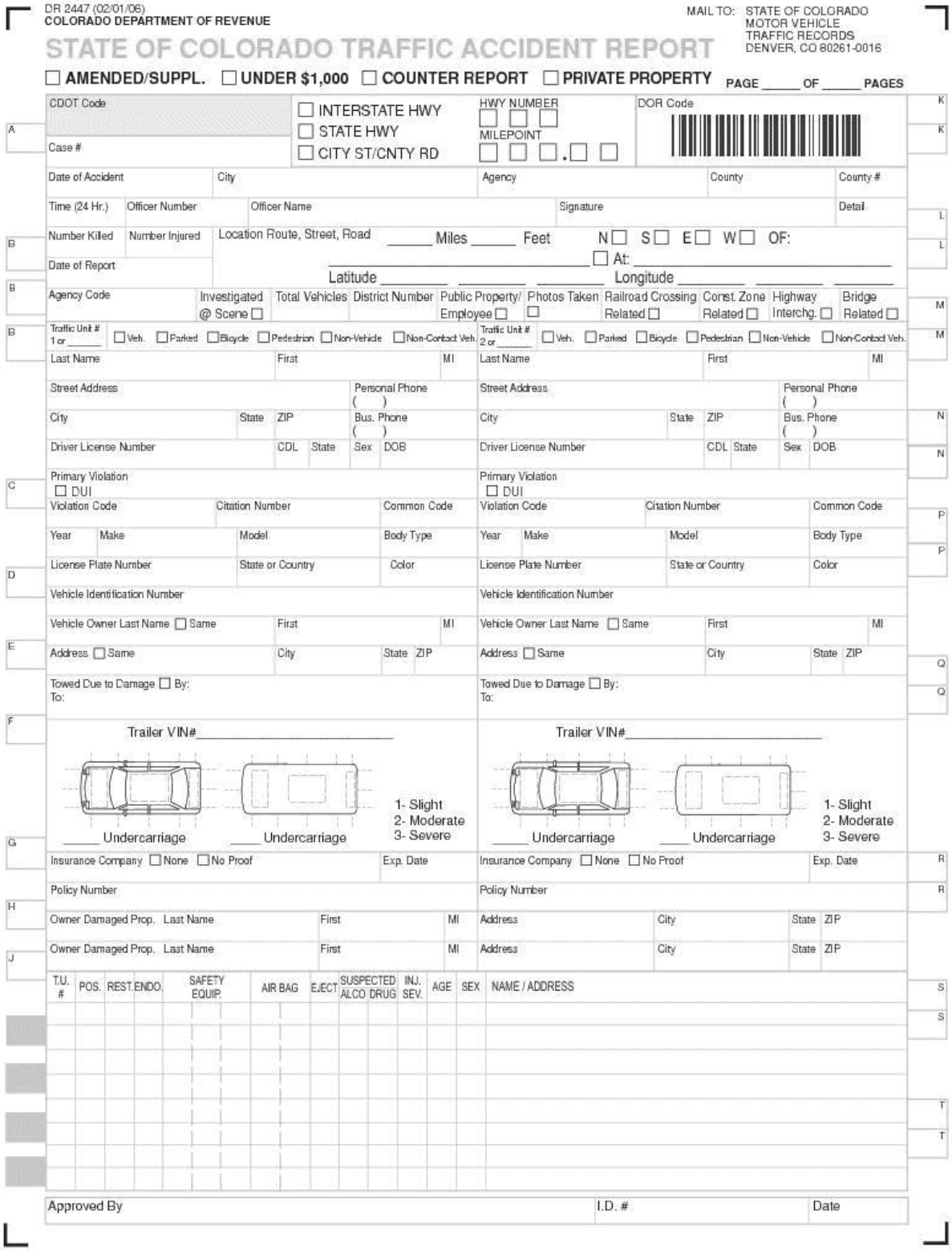
Appendix A Colorado Traffic Accident Reports (rev. 2/01/2006)



DR 2447 (02/01/06)
COLORADO DEPARTMENT OF REVENUE

MAIL TO: STATE OF COLORADO
MOTOR VEHICLE
TRAFFIC RECORDS
DENVER, CO 80261-0016

STATE OF COLORADO TRAFFIC ACCIDENT REPORT

☐ AMENDED/SUPPL. ☐ UNDER $1,000 ☐ COUNTER REPORT ☐ PRIVATE PROPERTY PAGE _____ OF _____ PAGES

CDOT Code
Case #
☐ INTERSTATE HWY
☐ STATE HWY
☐ CITY ST/CNTY RD
HWY NUMBER
MILEPOINT
DOR Code

Date of Accident | City | Agency | County | County #

Time (24 Hr.) | Officer Number | Officer Name | Signature | Detail

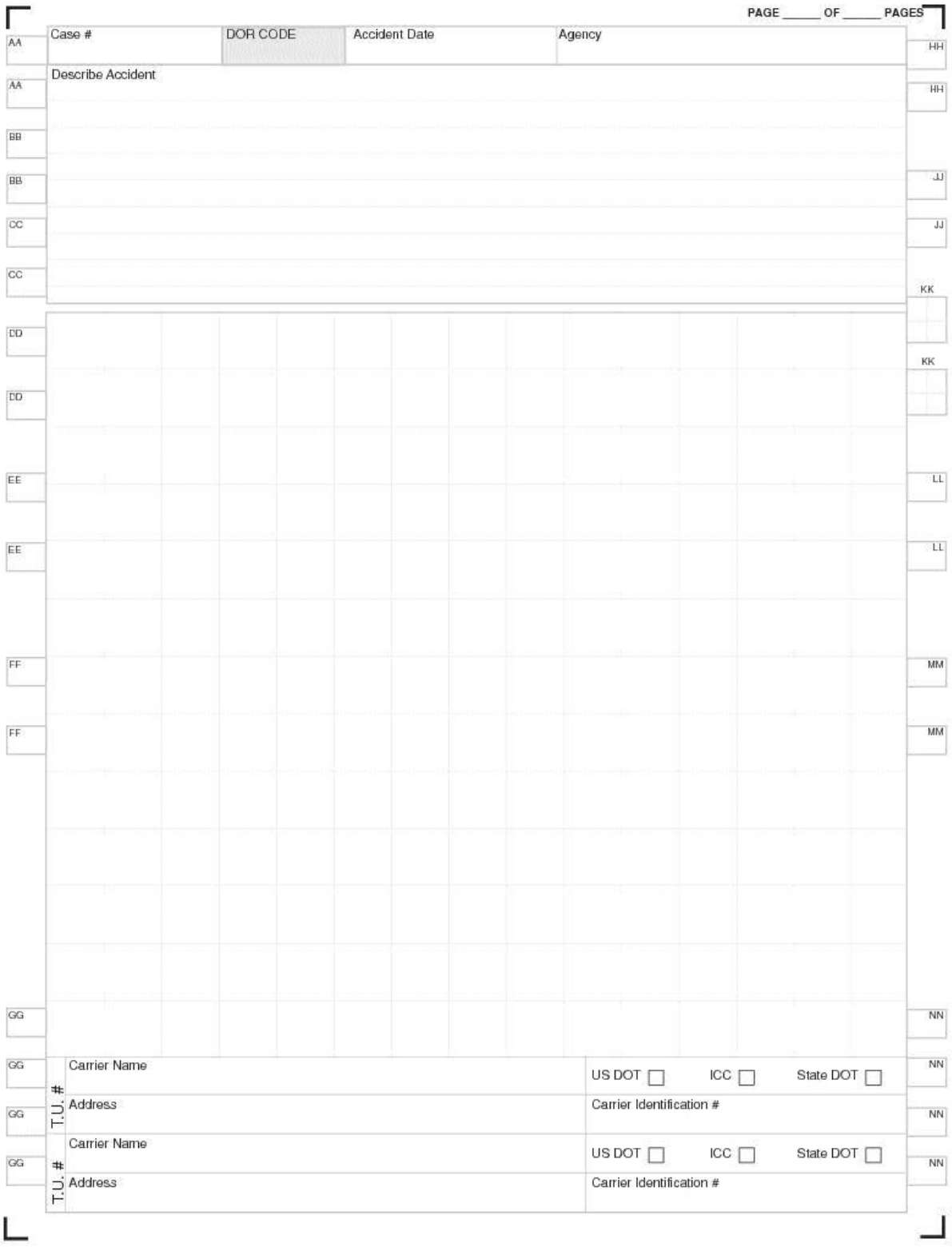
Number Killed | Number Injured | Location Route, Street, Road _____ Miles _____ Feet N☐ S☐ E☐ W☐ OF:
☐ At: _____
Date of Report | Latitude _____ _____ _____ Longitude _____ _____ _____

Agency Code | Investigated @ Scene ☐ | Total Vehicles | District Number | Public Property/ Employee ☐ | Photos Taken ☐ | Railroad Crossing Related ☐ | Const. Zone Related ☐ | Highway Interchg. ☐ | Bridge Related ☐

Traffic Unit # 1 or _____ ☐ Veh. ☐ Parked ☐ Bicycle ☐ Pedestrian ☐ Non-Vehicle ☐ Non-Contact Veh.	Traffic Unit # 2 or _____ ☐ Veh. ☐ Parked ☐ Bicycle ☐ Pedestrian ☐ Non-Vehicle ☐ Non-Contact Veh.
Last Name / First / MI	Last Name / First / MI
Street Address / Personal Phone ( )	Street Address / Personal Phone ( )
City / State / ZIP / Bus. Phone ( )	City / State / ZIP / Bus. Phone ( )
Driver License Number / CDL / State / Sex / DOB	Driver License Number / CDL / State / Sex / DOB
Primary Violation ☐ DUI	Primary Violation ☐ DUI
Violation Code / Citation Number / Common Code	Violation Code / Citation Number / Common Code
Year / Make / Model / Body Type	Year / Make / Model / Body Type
License Plate Number / State or Country / Color	License Plate Number / State or Country / Color
Vehicle Identification Number	Vehicle Identification Number
Vehicle Owner Last Name ☐ Same / First / MI	Vehicle Owner Last Name ☐ Same / First / MI
Address ☐ Same / City / State / ZIP	Address ☐ Same / City / State / ZIP
Towed Due to Damage ☐ By: To:	Towed Due to Damage ☐ By: To:
Trailer VIN#_____	Trailer VIN#_____
_____ Undercarriage _____ Undercarriage 1- Slight 2- Moderate 3- Severe	_____ Undercarriage _____ Undercarriage 1- Slight 2- Moderate 3- Severe
Insurance Company ☐ None ☐ No Proof / Exp. Date	Insurance Company ☐ None ☐ No Proof / Exp. Date
Policy Number	Policy Number
Owner Damaged Prop. Last Name / First / MI	Address / City / State / ZIP
Owner Damaged Prop. Last Name / First / MI	Address / City / State / ZIP

T.U. #	POS.	REST.	ENDO.	SAFETY EQUIP.	AIR BAG	EJECT	SUSPECTED ALCO	SUSPECTED DRUG	INJ. SEV.	AGE	SEX	NAME / ADDRESS

Approved By | I.D. # | Date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AA
Case #
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Accident Date
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US DOT
ICC
State DOT
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Carrier Identification #

TRAFFIC ACCIDENT REPORT

OVERLAY A

A. LOCATION
01. On Roadway
02. Ran Off Left Side
03. Ran Off Right Side
04. Ran Off 'T' Intersection
05. Vehicle Crossed Center Median Into Opposing Lanes
06. On Private Property

B. HARMFUL EVENT SEQUENCE
NON-COLLISION ACCIDENT
01. Overturning
02. Other Non-Collision

COLLISION WITH PEDESTRIAN
03. School Age To / From School
04. Pedestrian on Toy Motorized Veh.
05. All Other Peds

COLLISION WITH MOTOR VEHICLE IN TRANSPORT
06. Front to Front
07. Front to Rear
08. Front to Side
09. Rear to Side
10. Rear to Rear
11. Side to Side-Same Direction
12. Side to Side-Opposite Direction

COLLISION WITH OTHER VEHICLE
13. Parked Motor Vehicle
14. Railway Vehicle/Light Rail
15. Bicycle
16. Road Maintenance Equipment

COLLISION WITH ANIMAL
17. Domestic Animal
18. Wild Animal

COLLISION WITH OBJECT
19. Light Pole / Utility Pole
20. Traffic Signal Pole
21. Sign
22. Guard Rail
23. Cable Rail
24. Concrete Highway Barrier
25. Bridge Structure
26. Vehicle Debris or Cargo
27. Culvert or Headwall
28. Embankment
29. Curb
30. Delineator Post
31. Fence
32. Tree
33. Large Rocks or Boulder
34. Railroad Crossing Equipment
35. Barricade
36. Wall or Building
37. Crash Cushion / Traffic Barrel
38. Mailbox
39. Other Fixed Object (Specify in Narrative)
40. Other Object (Specify in Narrative)

1st / 2nd / MOST

C. APPROACH/OVERTAKING TURN
01. Approach Turn
02. Overtaking Turn
03. Not Applicable

D. ROAD DESCRIPTION
01. At Intersection
02. Driveway Access Related
03. Intersection Related
04. Non-Intersection
05. Alley Related
06. Roundabout
07. Highway Interchange
08. Parking Lot

E. ROAD CONTOUR
01. Straight On-Level
02. Straight On-Grade
03. Curve On-Level
04. Curve On-Grade
05. Hillcrest

F. ROAD SURFACE
01. Concrete
02. Blacktop
03. Brick or Block
04. Gravel, Slag or Stone
05. Dirt
06. Other (Describe in Narrative)
07. Unknown

G. ROAD CONDITION
01. Dry
02. Wet
03. Muddy
04. Snowy
05. Icy
06. Slushy
07. Foreign Material
08. Dry W/Visible Icy Road Treatment
09. Wet W/Visible Icy Road Treatment
10. Snowy W/Visible Icy Road Treatment
11. Icy W/Visible Icy Road Treatment
12. Slushy W/Visible Icy Road Treatment

H. LIGHTING CONDITION
01. Daylight
02. Dawn or Dusk
03. Dark - Lighted
04. Dark - Unlighted

J. ADVERSE WEATHER CONDITION
00. None
01. Rain
02. Snow / Sleet / Hail
03. Fog
04. Dust
05. Wind

K. VEHICLE / VEHICLE COMBINATION
FMC (Overlay C) Required
01. Vehicle / Vehicle Combination (10,001 lbs. and over)
02. School Bus (all school buses)
03. Non-school Bus (9 occupants or more including driver) in commerce
04. Transit Bus

GVWR 10,000 lbs. or Less
05. Passenger Car / Passenger Van
06. Passenger Car / Passenger Van W/ Trailer
07. Pickup Truck / Utility Van
08. Pickup Truck / Utility Van W/Trailer
09. SUV
10. SUV W/Trailer
11. Motor Home
12. Motorcycle
13. Bicycle
14. Motorized Bicycle
15. Farm Equipment
16. Hit & Run Unknown
17. Light Rail
18. Other (Describe in Narrative)

L. DIRECTION OF TRAVEL – PRIOR TO IMPACT
01. North
02. Northeast
03. East
04. Southeast
05. South
06. Southwest
07. West
08. Northwest

M. VEHICLE MOVEMENT – PRIOR TO IMPACT
01. Going Straight
02. Slowing
03. Stopped In Traffic
04. Making Right Turn
05. Making Left Turn
06. Making U-Turn
07. Passing
08. Backing
09. Entering / Leaving Parked Position
10. Parked
11. Changing Lanes
12. Avoiding Object In Roadway
13. Weaving
14. Spun Out of Control
15. Drove Wrong Way
16. Other (Describe in Narrative)

N. ROADWAY SPEED LIMIT - Vehicles Only
Traffic Unit #1 or _____
Traffic Unit #2 or _____

P. ESTIMATED VEHICLE SPEED - Vehicles Only
Traffic Unit #1 or _____
Traffic Unit #2 or _____

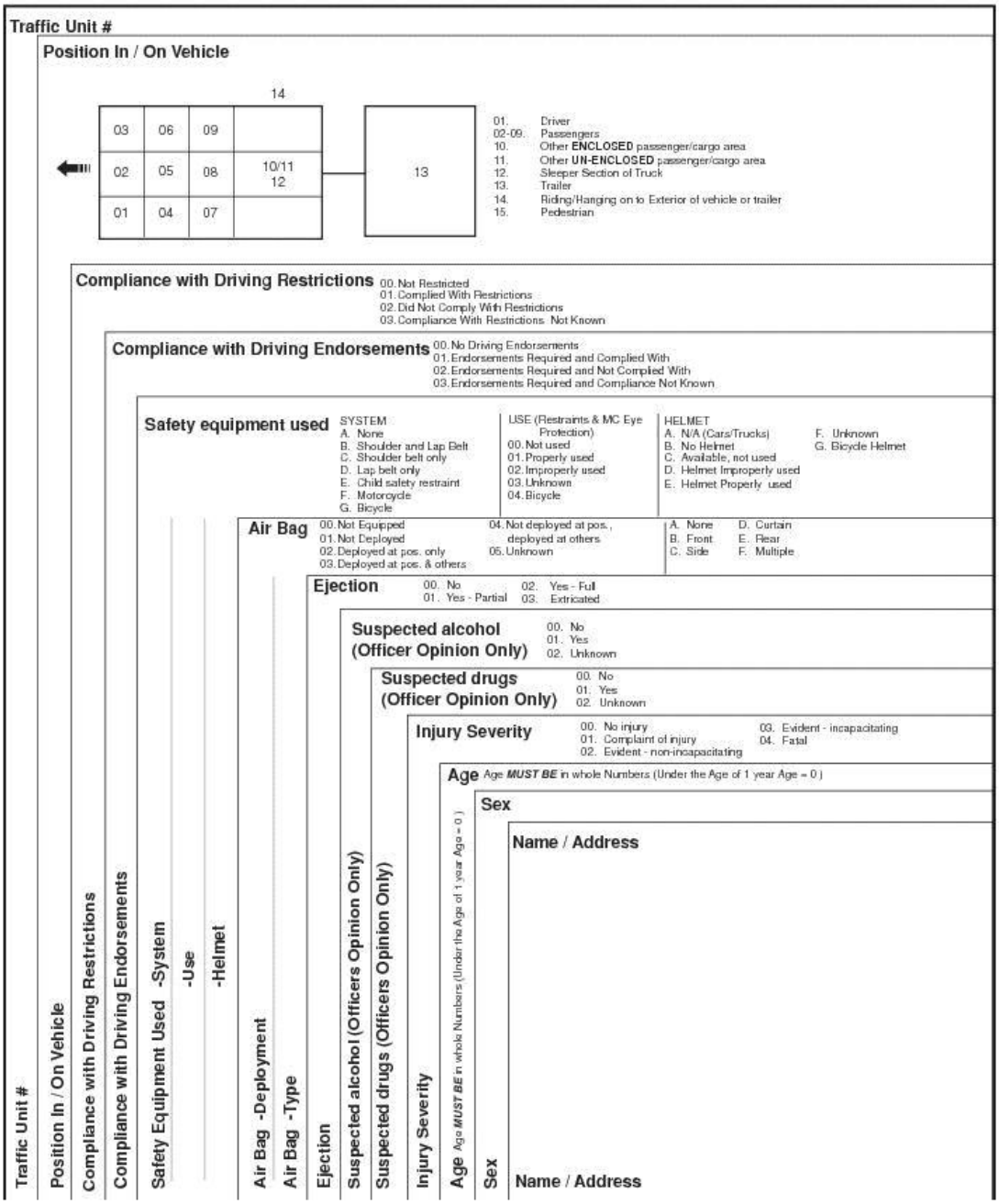
Q. DRIVER ACTIONS (Officer Opinion Only)
00. No Action
01. Exceeded Safe/ Posted Speed
02. Impeded Traffic
03. Failed to Yield ROW
04. Disregard Stop Sign
05. Failed to Stop at Signal
06. Disregarded Other Device
07. Improper Turn
08. Turned from Wrong Lane or Position
09. Other Improper Turns
10. Lane Violation
11. Improper Passing on Left
12. Improper Passing on Right
13. Followed Too Closely
14. Improper Backing
15. Signaling Violation
16. Reckless Driving
17. Careless Driving (if used, block R can not be coded "00")

R. DRIVER - MOST APPARENT HUMAN CONTRIBUTING FACTOR (Officer Opinion Only)
00. No Apparent Contributing Factor
01. Asleep at the Wheel
02. Driver Fatigue
03. Illness / Medical
04. Driver Inexperience
05. Aggressive Driving
06. Driver Unfamiliar With Area
07. Driver Emotionally Upset
08. Evading Law Enforcement Officer
09. Physical Disability
10. DUI, DWAI, DUID
11. Distracted / Passenger
12. Distracted / Cell Phone
13. Distracted / Radio
14. Distracted / Other i.e. Food, Objects, Pet, etc.
15. Other Factor (Describe in Narrative)

S. BY PEDESTRIAN ACTION (Officer Opinion Only)
01. Cross Against Signal
02. Cross / Enter at Intersection
03. Cross / Enter NOT at Intersection
04. Standing In Roadway
05. Playing In Roadway
06. Soliciting Rides
07. Walking In Roadway In Direction of Traffic
08. Walking In Roadway Against Direction of Traffic
09. Entering / Exiting Vehicle
10. Pushing / Working on Vehicle
11. Lying In Roadway
12. Other (Describe in Narrative)

T. VEHICLE DEFECT / CONDITION (Officer Opinion Only)
00. No Vehicle Defects
01. Defective Head Light(s)
02. Defective Brake/Tail Light(s)
03. Defective Signaling Device
04. Brakes Defective/Out of Adjustment
05. Defective Tires
06. Sudden Tire Failure
07. Improper Tires for Conditions
08. Mechanical Failure
09. Obstructed Window(s)
10. Improper Load
11. Spilled Load – Commercial Aggregate
12. Spilled Load – Commercial Non- Aggregate
13. Spilled Load – Other
14. Parking Violation
15. Other Defect(s) (Describe in Narrative)

OVERLAY B


Traffic Unit #
Position In / On Vehicle
14
03 06 09
02 05 08 10/11 12
01 04 07
13
01. Driver
02-09. Passengers
10. Other ENCLOSED passenger/cargo area
11. Other UN-ENCLOSED passenger/cargo area
12. Sleeper Section of Truck
13. Trailer
14. Riding/Hanging on to Exterior of vehicle or trailer
15. Pedestrian
Compliance with Driving Restrictions
00. Not Restricted
01. Complied With Restrictions
02. Did Not Comply With Restrictions
03. Compliance With Restrictions Not Known
Compliance with Driving Endorsements
00. No Driving Endorsements
01. Endorsements Required and Complied With
02. Endorsements Required and Not Complied With
03. Endorsements Required and Compliance Not Known
Safety equipment used
SYSTEM
A. None
B. Shoulder and Lap Belt
C. Shoulder belt only
D. Lap belt only
E. Child safety restraint
F. Motorcycle
G. Bicycle
USE (Restraints & MC Eye Protection)
00. Not used
01. Properly used
02. Improperly used
03. Unknown
04. Bicycle
HELMET
A. N/A (Cars/Trucks)
B. No Helmet
C. Available, not used
D. Helmet Improperly used
E. Helmet Properly used
F. Unknown
G. Bicycle Helmet
Air Bag
00. Not Equipped
01. Not Deployed
02. Deployed at pos. only
03. Deployed at pos. & others
04. Not deployed at pos., deployed at others
05. Unknown
A. None
B. Front
C. Side
D. Curtain
E. Rear
F. Multiple
Ejection
00. No
01. Yes - Partial
02. Yes - Full
03. Extricated
Suspected alcohol (Officer Opinion Only)
00. No
01. Yes
02. Unknown
Suspected drugs (Officer Opinion Only)
00. No
01. Yes
02. Unknown
Injury Severity
00. No injury
01. Complaint of injury
02. Evident - non-incapacitating
03. Evident - incapacitating
04. Fatal
Age Age MUST BE in whole Numbers (Under the Age of 1 year Age = 0)
Sex
Name / Address
Traffic Unit #
Position In / On Vehicle
Compliance with Driving Restrictions
Compliance with Driving Endorsements
Safety Equipment Used -System
-Use
-Helmet
Air Bag -Deployment
Air Bag -Type
Ejection
Suspected alcohol (Officers Opinion Only)
Suspected drugs (Officers Opinion Only)
Injury Severity
Age Age MUST BE in whole Numbers (Under the Age of 1 year Age = 0)
Sex
Name / Address

FEDERAL MOTOR CARRIER INFORMATION

OVERLAY C

AA. CARRIER TYPE
01. Interstate
02. Intrastate
03. Government Vehicle (10,001lbs. GVWR and over)
04. Not In Commerce (10,001lbs. GVWR and over)
(If #4 is chosen, complete ***only*** blocks CC, DD, EE, FF, and GG or NN.)

BB. SOURCE OF NAME
01. Log Book
02. Shipping Papers, Truck, Bus, or Trip Manifest
03. Driver
04. Side of Vehicle

CC. GROSS VEHICLE WEIGHT RATING
01. Under 10,001 Pounds
02. 10,001 to 26,000 Pounds
03. 26,001 Pounds and Over

DD. TOTAL NUMBER OF AXLES
Enter the total number of axles including truck and trailer.

EE. VEHICLE CONFIGURATION
01. Passenger Car (only if HM placarded)
02. Light Truck (only if HM placarded)
03. Bus/ Limousine
04. Single-unit Truck (2 axles)
05. Single-unit Truck (3 or more axles)
06. Truck and Trailer
07. Truck Tractor (Bobtail)
08. Truck Tractor and Semi-Trailer
09. Truck Tractor and Double Trailers
10. Truck Tractor and Triple Trailers
11. Other (Describe in narrative)

FF. CARGO BODY TYPE
01. Bus/ Limousine (seats 9-15 occupants including the driver)
02. Bus/Limousine (seats 16 or more occupants including the driver)
03. Van/ Enclosed Box
04. Cargo Tank
05. Flatbed/Pickup
06. Dump Bed
07. Concrete Mixer
08. Auto Transporter
09. Garbage Refuse
10. Grain, Chips, Gravel
11. Pole
12. Intermodal Container
13. Vehicle Towing another Vehicle
14. Fire Aparatus
15. Ambulance
16. No Cargo Body
17. Other (Describe in Narrative)

HH. HAZARDOUS MATERIALS
Did the vehicle have a hazardous material placard?
00. No
01. Yes

JJ. HAZARDOUS MATERIALS
Was hazardous cargo from the placarded truck released?
(Do not count fuel from the vehicle fuel tank)
00. No
01. Yes

KK. HAZARDOUS MATERIALS
Enter the ***four*** digit number from the placard. If no number on the placard enter the ***four*** digit identification number from the shipping paper(s).

LL. HAZARDOUS MATERIALS
Enter the one digit number taken from the bottom of the placard.

MM. LIQUID HAZARDOUS MATERIALS
Enter the amount of bulk liquid cargo at time of accident.
01. 0 to 1,000 gallons
02. 1,001 to 2,000 gallons
03. 2,001 to 3,000 gallons
04. 3,001 to 4,000 gallons
05. 4,001 to 5,000 gallons
06. 5,001 to 6,000 gallons
07. 6,001 to 7,000 gallons
08. 7,001 to 8,000 gallons
09. 8,001 gallons and over

SEQUENCE OF ACCIDENT EVENTS

GG. Block AA Top

NN. Block AA Bottom

1st
2nd
3rd
4th

NON-COLLISION
01. Ran Off the Road
02. Jackknifed
03. Overturning
04. Downhill Runaway
05. Cargo Loss or Shift
06. Explosion or Fire
07. Separation of Units
08. Crossed the Median/Center Line
09. Equipment Failure (Tires, etc.)
10. Other (Describe in Narrative)

COLLISION
11. Pedestrian
12. Motor Vehicle InTransport
13. Parked Motor Vehicle
14. Train
15. Pedal Cycle (Bicycle, Tricycle, etc.)
16. Animal
17. Fixed Object
18. Work Zone Maintenance Equipment
19. Other Movable Object
20. Other (Describe in Narrative)

COLORADO INVESTIGATOR'S FATAL TRAFFIC ACCIDENT SUPPLEMENTAL REPORT

PAGE _____ OF _____ PAGES

Case #	DOR CODE	Accident Date	Agency

EMERGENCY MEDICAL SERVICES
(Record all time using 24 Hr. time)

Time Notified	Time Arrived @ Scene	Time Arrived @ Hospital

If times are unknown provide name of responding services

TRAFFICWAY FLOW
01. Not Divided (Two Way)
02. Divided, Median W/O Barrier
03. Divided, Median W/Barrier
04. One Way

NUMBER OF TRAVEL LANES
If the accident is totally contained on half of a divided highway (physical barrier not painted median), only count the number of travel lanes on that half.

ACCIDENT AVOIDANCE MANEUVER
00. No Avoidance Maneuver
01. Braking (Skid marks evident)
02. Braking (Per driver, no skid marks evident)
03. Braking (Per witness, no skid marks evident)
04. Steering (Evidence or stated)
05. Steering & Braking (Evidence or stated)
06. Other Avoidance Maneuver

Traffic Unit #1 or ___ | Traffic Unit #2 or ___ | Traffic Unit #3 or ___ | Traffic Unit #4 or ___

FIRE/HAZARDOUS MATERIALS INVOLVEMENT
00. No Fire/No Haz-Mat Cargo
01. No Fire/Haz-Mat Cargo Not Involved
02. No Fire/Haz-Mat Incident
03. Vehicle Fire/No Haz-Mat Cargo
04. Vehicle Fire/Haz-Mat Cargo Not Involved
05. Vehicle Fire/Haz-Mat Incident

Traffic Unit #1 or ___ | Traffic Unit #2 or ___ | Traffic Unit #3 or ___ | Traffic Unit #4 or ___

TRAFFIC CONTROL DEVICE FUNCTIONING
01. No Controls
02. Not Functioning
03. Functioning Improperly
04. Functioning Properly
05. Unknown

List the Most Significant Types of Traffic Control Devices

MUST BE COMPLETED FOR ALL PERSONS INVOLVED EXCEPT UNINJURED BUS/RAILWAY PASSENGERS.

(A) Traffic Unit Number (list Traffic Unit Number as on DR 2447)

(B) Position in Vehicle

03	06	09	
02	05	08	10/11 12
01	04	07	

14 — 13

01. Driver
02-09. Passengers
10. Other **ENCLOSED** passenger/cargo area
11. Other **UN-ENCLOSED** passenger/cargo area
12. Sleeper Section of Truck
13. Trailer
14. Riding/Hanging on to Exterior of Vehicle or Trailer
15. Pedestrian

(C) Ejection Path 00. Not Ejected/ Not applicable; 01. Through Side Door Opening; 02. Through Side Window; 03. Through Windshield; 04. Through Back Window; 05. Through Back Door/Tailgate Opening; 06. Through Roof Opening (sun roof/convertible top down); 07. Through Roof (convertible top up); 08. Other Path (e.g. back of pickup truck); 09. Unknown

(D) Alcohol Suspected (Officer Opinion Only)
Yes > 01. Preliminary Breath Test; 02. SFST; 03. Observed; 04. Passive Alcohol Sensor; 05. Other method
No > 06. Preliminary Breath Test; 07. SFST; 08. Observed; 09. Passive Alcohol Sensor; 10. Other method

(E) Tested for Alcohol 00. Not Tested; 01. Blood; 02. Breath; 03. Urine; 04. Other; 05. Refusal; 06. By Coroner

(F) Other Drug/Impairment Suspected (Officer Opinion Only)
Yes > 01. Drug Recognition Expert; 02. SFST; 03. Observed; 04. Other
No > 05. Drug Recognition Expert; 06. SFST; 07. Observed; 08. Other Method

(G) Tested for Other Drugs 00. Not Tested; 01. Blood; 02. Breath; 03. Urine; 04. Other; 05. Refusal; 06. By Coroner

(H) Dead at Scene 00. No; 01. Yes

Name	Taken to	Expired Date	Expired Time

Appendix B Reportable Vehicle Identification Algorithm

Table showing the vehicle types Hetzel assigns.

1. Include where VehicleType is 0 or blank AND
   a. VIN_vehicle =Truck or bus, OR
   b. (VIN_vehicle=(van, step van, walk-in van), only if BodyType =TK, TR, TT.

2. Include where VehicleType is veh/vehcomb10K+, except where VIN_vehicle=(Motorhome, Pickup10K, Trailer, Van, Step Van, Walk-in Van, Non-heavy vehicle, or Unrecorded VIN). Classify as a Bus where VIN_vehicle indicates a Bus or BodyType is BU or BUS.
   If VehicleType is veh/vehcomb10K+ and VIN_vehicle =Unrecorded VIN and BodyType in (Semi, TK, TRK, or TT) then take it as a truck.

   If VehicleType =veh/vehcomb10K+ and VIN_vehicle= (Large van, Step or Walk-in van) and BodyType in (TK,TR,TT) then include as a truck.

3. Include all VehicleType = bus (school, non-school, and transit), unless VIN_vehicle classifies as a Motorhome.

4. Include if VehicleType is (Pass car/van, pass car w/trlr, pickup/util van, or PU util van w/trlr), AND:
   a. if VIN_vehicle indicates a Truck or Bus, OR
   b. if VIN_vehicle indicates a (Large van, Step or Walk-in van) AND veh body = TK,TR,TT.

5. Pickups: Take as a truck if VIN_vehicle =Pickup(>10K) only if c_cargobody variable is not in (.,0,5) and c_namesource is in (1,2,4). If VIN_vehicle =pickup(>10K) and VehicleType=Bus, then include as a bus.

6. Trailers: Include if VehicleType= veh/vehcomb(10K+) and VIN_vehicle =Trailer and BodyType=TK, TR, TT.

7. If VehicleType=Other and VIN_vehicle = truck, take it as a truck. If VehicleType=Other and VIN_vehicle =bus, then take it as a bus.