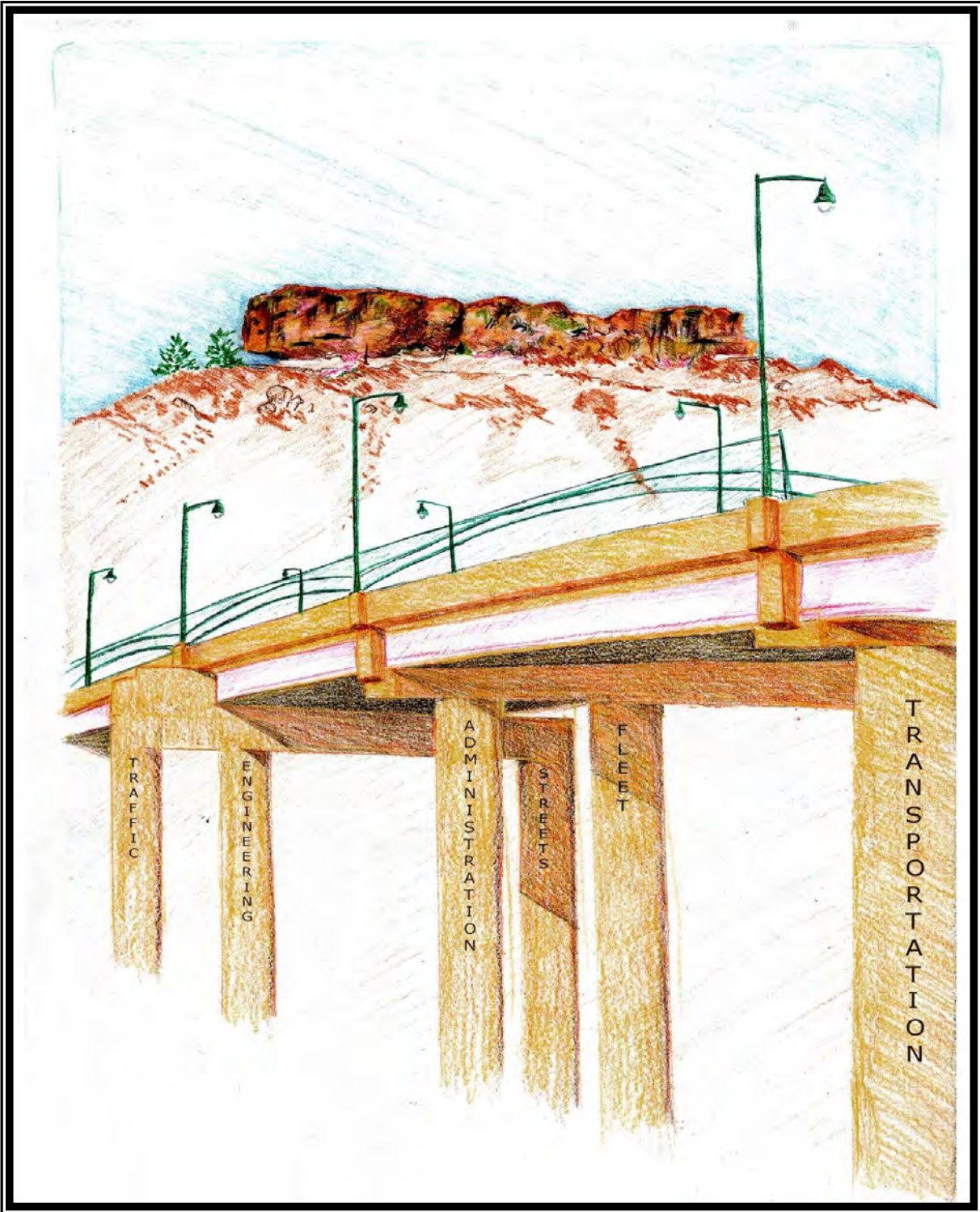


2012 TOWN OF CASTLE ROCK MOTOR VEHICLE ACCIDENT FACTS



PREPARED BY THE PUBLIC WORKS DEPARTMENT

ACKNOWLEDGEMENTS

This report was assembled from data provided by the Castle Rock Police Department accident report data from the year 2012. Each accident record, whether completed by a local police officer or a member of the Colorado State Patrol, was sent to Castle Rock and entered into a centralized database maintained by the Public Works Department.

The report itself was created by personnel in the Public Works Department.

For more information, please contact:

Transportation Engineering Division
Town of Castle Rock
4175 N. Castleton Ct.
Castle Rock, CO 80104
720-733-2473



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2012 TOWN OF CASTLE ROCK MOTOR VEHICLE ACCIDENT FACTS



Public Works Department

"Our mission is to provide outstanding service, safety and support for transportation infrastructure and maintenance."

July 1, 2013

It is our pleasure to provide you with the 8th Annual Castle Rock Motor Vehicle Accident Facts Report. The statistics provided will enable emergency services and design engineers alike gain a greater insight into the factors contributing to traffic accidents. This will then help both the Town and the Colorado Department of Transportation identify improvements that help reduce accidents in a high-hazard areas or intersections.

We will continue to dedicate our time and efforts toward the improvement of safety on our street system.

Sincerely,

A handwritten signature in blue ink, appearing to read "Robert Goebel".

Robert Goebel, PE
Public Works Director

A handwritten signature in blue ink, appearing to read "Bob T. Watts".

Bob T. Watts, PE
Transportation Planning and Traffic Engineering
Manager

EXECUTIVE SUMMARY

The mission of the Public Works Department is “To provide outstanding service, safety and support for transportation infrastructure and maintenance”. We believe that by analyzing our accident data on a regular basis we can help identify locations where the roadway environment may be a contributing factor to accidents. Following this we can then use the information to develop options for improvements and program projects for correction. Since 2004, when Public Works first reported accident statistics, the numbers of fatalities, and persons injured have been declining. Additionally, the crash rate per town population has also been generally decreasing since 2004. These trends are encouraging indications of the overall safety of travel on Town roadways.

Accidents are the result of many factors. These factors can generally be classified into three main categories: 1) human factors, 2) vehicle factors, and 3) roadway environment. By far, the largest percentage of accidents can be attributed to human factors. These are the factors that drivers can control and are usually the simplest to correct. Basic driver awareness and respect for all users of the Town’s roadways will go the farthest towards reducing the number of accidents. Education, Enforcement and Engineering, the three “E’s”, all play an important role in improving safety. However it will take conscious decisions by drivers to change their behavior in order to make our roadway system safer.

Addressing vehicle factors is the responsibility of everyone who owns and operates a motor vehicle. Regular vehicle inspections along with preventative maintenance procedures will help reduce the chances of an accident occurring as a result of a vehicle malfunction.

The roadway environment is something that is out of the driver’s control, but it is within the control of the Town, or CDOT in the case of the State system. We work to identify locations where roadways themselves could be a contributing factor in an accident and implement treatments to correct these. Public Works uses statistical modeling to identify the locations where corrections to the roadway environment may improve safety. This helps direct limited resources to the locations where the most benefit can be obtained and avoids directing these resources toward locations where problems may not exist.

In the 2011 Accident Report, the intersection of SH 86 / Crowfoot Valley Rd. was identified as a location where the accidents fell outside of the expected range. Last year, CDOT changed the phasing of the traffic signal so that eastbound left turns from SH 86 could only be made on a green arrow. The permissive movement, where the eastbound left turning vehicles could turn during the east-west green phase, was eliminated. This seems to have helped reduce the left-turn related accidents. Since this signal phasing change represented a change in conditions, this intersection has been moved back to the “1-year of data” category.

The Colorado Department of Transportation (CDOT) will be provided with these findings and support provided where possible to assist them with further review of these locations for improvements.

SECTION 1: Public Works Statistical Analysis

The first section of this report summarizes the statistical review of the 2012 raw data. The purpose of this is to provide an initial “screen” to identify the signalized intersections that are producing accident numbers that exceed the number that may be expected to occur when compared to a model intersection sharing similar characteristics. Since accidents are “expected” to occur, it’s important to determine which locations are experiencing accidents at a higher rate than should be expected.

ROAD & INTERSECTION SAFETY

One important goal from this accident data is to identify locations where the road environment may be a contributing factor to accidents. This is possible through statistical analysis. The goal in this regard is to identify locations where roadways could be a contributing factor and implement treatments to correct these.

The definition of the safety of a road section or intersection used by the Transportation Planning and Traffic Engineering Division is the number of accidents expected to occur at these locations during a specified period as compared to what actually has occurred. Because there are factors that are not related to the physical roadway environment that contribute to accidents, road sections and intersections are expected to have accidents occur. Since what is „expected“ cannot be known, safety can only be estimated, and estimation is in degrees of precision. The precision of an estimate is usually expressed by its standard deviation.

For practical reasons Traffic Engineering is interested in the safety of a road section or intersection that seems to have too many accidents. If the estimation of safety is based only on accident counts or accident rates, the estimate would be biased. The existence of this „regression-to-mean“ bias has been long recognized. It is known to produce inflated estimates of countermeasure effectiveness.

To estimate roadway safety, Traffic Engineering utilizes the Empirical Bayes (EB) method. This method increases the precision of the estimates and corrects for the regression-to-mean bias. The EB method recognizes that accident counts or rates are not the only clue to safety. Another clue is in what is known about the safety of similar entities. To identify the safety of similar entities, safety performance functions (SPFs), which are models, need to be developed from existing data (accidents, vehicle volumes, etc.). SPF models from other jurisdictions can also be adopted if these SPFs are found to fit the Town’s local trends.

The refinement of SPFs increases as more data becomes available. This is important in not only identifying locations with potential safety issues, but also in helping ensure that limited resources are not exhausted on problems that may not exist. As the Town’s Traffic Engineering Division collects more accident records and continues to develop these SPFs, locations that seem to stand out as having a high accident rate will be looked into closer to determine if any accident trends are occurring that may indicate an issue that should be further examined.

Currently, only a model for signalized intersections has been developed. This is natural as signalized intersections exist on higher volume roads where accident probability is higher due to normal exposure. The Transportation Planning and Traffic Engineering Division will continue to collect data in hopes of developing SPFs for non-signalized intersections, and roadway segments when possible.

An SPF has been developed for signalized intersections within the Town. This SPF provides an indication of the average number of accidents that are expected at similar signalized intersections. This combined with the actual accident records of each signalized site allows for a more precise safety estimate of each signalized intersection utilizing the EB method. The estimates improve as more annual records become available. The table on page seven summarizes the signalized intersections with the highest accident rates.

The result of the analysis shows that the majority of signalized intersections have accident rates that are consistent, or better, than signalized intersections of a similar nature. None of the intersections had an accident experience worse than what could be expected.

From the data collected, there is no indication that the roadway environment or design is the primary cause of accidents at the highest accident locations. This does not mean that changes to the roadway environment could not increase intersection safety. However, since these accidents are more likely to be related to vehicle or human factors, spending resources on the roadway environment would not likely be cost effective.

This information will be passed onto the Colorado Department of Transportation for their use along with intersections' accident diagrams to allow for further assessment to determine if any improvements may be beneficial.

In summary, everyone that utilizes the public roadway system has a responsibility when it comes to reducing the number of accidents. There are agencies that specialize in certain areas such as police enforcement, communications, education, and engineering that through their combined efforts will go a long way toward increasing the safety of the Town's roads.

ANNUAL DATA FOR INTERSECTIONS WITH THE HIGHEST ACCIDENT RATES

The following tables summarize the 2012 highest accident rate locations (signalized). The actual accident total is shown for informational purposes only. The EB model uses this total within the formulas itself along with a weight to adjust for the fluctuation around the mean. As more years get added, the actual weighting decreases and the total number of accidents gets closer to the total expected.

Locations with 1-year of accident data

2012 Rank	Intersection	Actual # Accidents	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
14	SH 86 / Crowfoot Valley	10	15	11-19	17	Similar
11	Front / Scott St.	8	12	9-16	13	Similar

Locations with 2-years of accident data

2012 Rank	Intersection	Actual # Accidents (2 years)	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
8	SH 86 / Woodlands / Allen	22	29	22-36	35	Similar

Locations with 3-years of accident data

2012 Rank	Intersection	Actual # Accidents (3 years)	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
	I-25 / SH 86 (NB off Ramp)	21	46	34-57	111	Better
1	Factory Shops / New Memphis	30	17	13-21	13	Similar
10	Front St. / Blackfeather	25	27	20-33	28	Similar

Locations with 4-years of accident data

2012 Rank	Intersection	Actual # Accidents (4 years)	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
3	I-25 NB off-ramp / Wolfensberger	54	54	43-65	54	Similar
13	Plum Creek Pkwy. / Wilcox	40	48	38-59	60	Similar

Locations with 5-years of accident data

2012 Rank	Intersection	Actual # Accidents (5 years)	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
	Meadows Blvd. / Prairie Hawk	71	69	56-81	65	Similar
7	Wolfensberger / Park St.	47	49	38-59	50	Similar
9	I-25 / US 85 (SB off ramp)	105	118	99-138	173	Better

Locations with 6-years of accident data

2012 Rank	Intersection	Actual # Accidents (6 years)	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
	Plum Creek Pkwy. / Perry St.	56	57	45-68	57	Similar
5	SH 86 / Fifth St. / Ridge Rd.	80	74	60-87	64	Similar

Locations with 7-years of accident data

2012 Rank	Intersection	Actual # Accidents (7 years)	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
15	SH 86/Trailboss	62	77	62-92	118	Better
	Wilcox / Fifth St.	60	63	50-75	67	Similar

Locations with 8-years of accident data

2012 Rank	Intersection	Actual # Accidents (8 years)	Expected # Accidents	Range of Expected #	Expected # at Similar Location	Peer Comparison
2	US 85 / Factory Shops Blvd.	217	218	191-245	223	Similar
4	SH 86 / Allen Way	195	199	173-225	221	Similar
12	SH 86 / Front St.	136	145	123-167	186	Better
6	US 85 / Meadows Pkwy.	151	153	131-175	161	Similar

Factory Shops Blvd. / New Memphis Ct.

This is the intersection with the highest accident rate, and although it doesn't exceed the total that could be expected, we feel that some improvements need to be considered. Our data showed us that nine of the accidents at this intersection involved left turning vehicles and through vehicles. We are investigating the sight distances for the left turning vehicles from the south and west approaches, as vehicles waiting to turn on the north and east approaches may be blocking the view of these drivers.

We are also looking to make adjustments in the signal timing plan for this intersection in hopes of improving the coordination between this signal and the Meadows/Factory Shops traffic signal. The southbound vehicle queues often back from Meadows to New Memphis. CDOT is planning to add an additional lane to eastbound Meadows from Factory Shops to the I-25 northbound on-ramp, and this should help relieve the backups on Factory Shops as traffic will be able to turn left easier.

We plan to eventually build a round-a-bout at this intersection. This information will help us in prioritizing this project.

SECTION 2: 2012 Raw Data Summaries

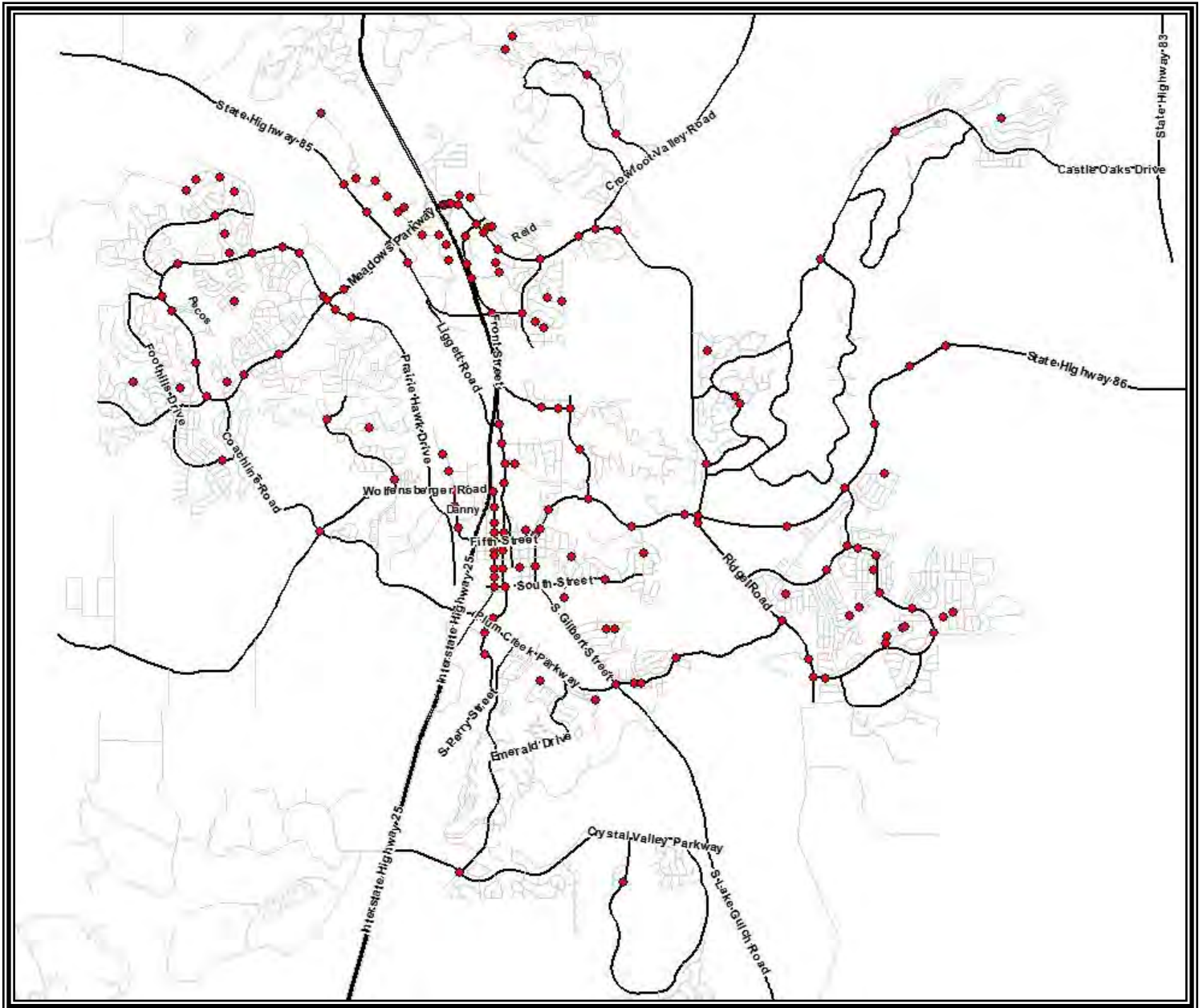
This section summarizes the raw accident data for 2012 by various categories. The totals include all forms of transportation and include pedestrian, bicycle and motorcycle accidents. The purpose of this is for general public interest as well as for use by other staff departments that may use this information to assist with improving their operations.

QUICK FACTS

	2012	2011	2010
Persons Killed	0	1	0
Persons Injured	46	51	42
Reported Accidents	565	591	541

- On average, one traffic accident was reported every 15.5 hours.
- For every hundred accidents, eight injuries occurred.
- Of all drivers involved in accidents, 7.5% were age 19 years old, or less; 28% were under 25 years of age; and 14% were over the age of 60.
- Of all accidents 24% occurred at night.

Accident Pin Map for 2012



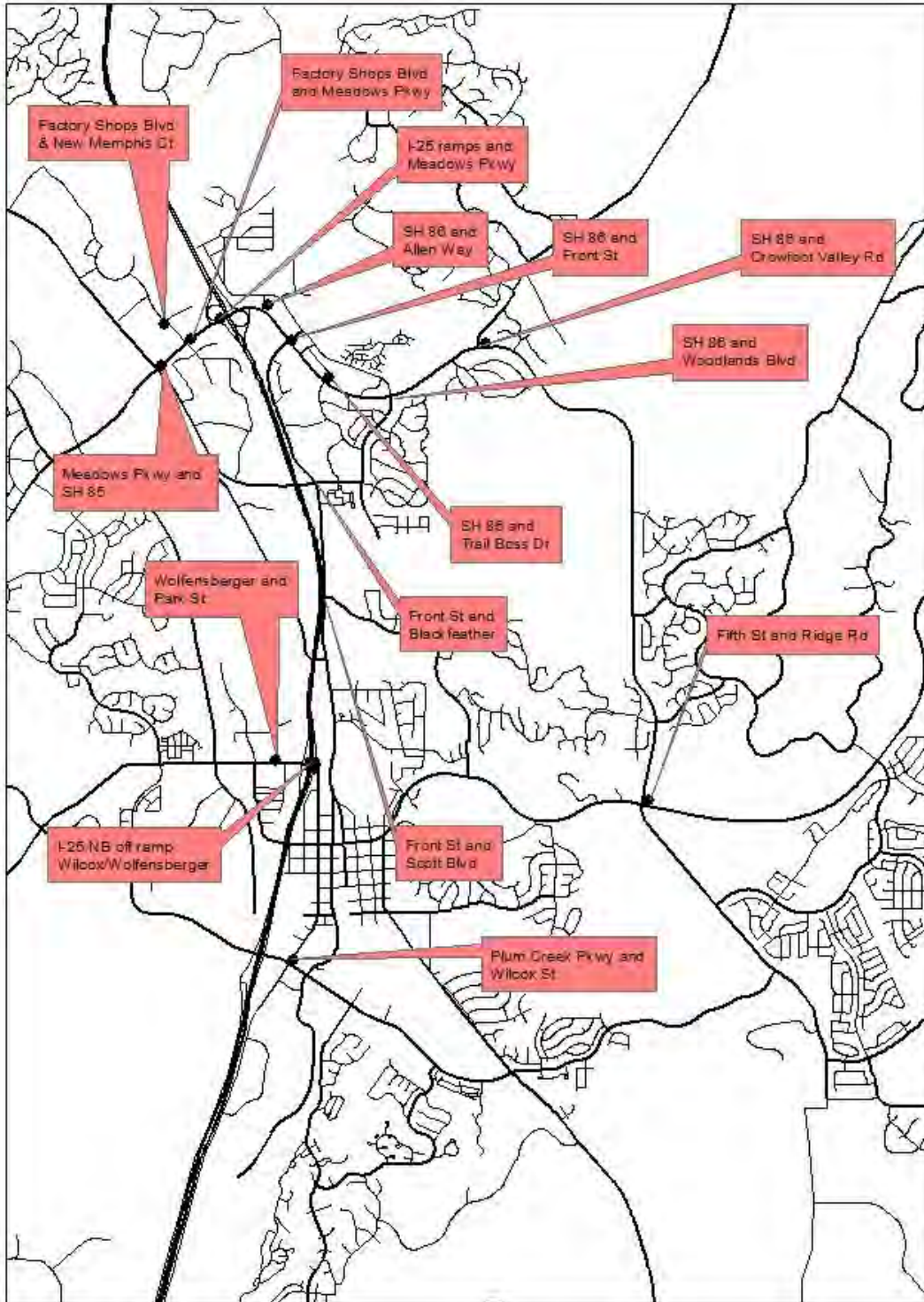
This map shows the accident locations throughout the town. Many of these locations had several accidents reported. The arterial and collector streets have the highest incident of accidents, which is expected considering that they also have the highest traffic volumes. When reviewing new developments, we limit the number of new access points on these classifications of streets. By doing this, the potential for accidents decreases.

ACCIDENT RATES BY LOCATION

At Intersections

Intersections	Number of Accidents	Avg. Volume through intersection	Rate	Rank (2012)/(2011)
US 85 @ Factory Shops Blvd	44	62,177	0.0007077	2/4
SH 86 @ Allen Way	36	55,348	0.0006504	4/8
I-25 SB off-ramp @ US 85	26	65,305	0.0003981	9/11
US 85 @ Meadows Pkwy.	20	41,163	0.0004859	6/5
SH 86 @ Fifth St. / Ridge Rd.	16	31,023	0.0005157	5/9
I-25 NB off ramp @ Wilcox / Wolfensberger	15	22,657	0.0006621	3
SH 86 @ Front St.	14	43,932	0.0003187	12/3
Factory Shops Blvd. @ New Memphis Ct.	12	16,020	0.0007491	1/1
SH 86 @ Woodlands Blvd.	12	27,785	0.0004319	8
Plum Creek Pkwy. @ Wilcox	12	39,641	0.0003027	13/12
SH 86 @ Crowfoot Valley	10	34,111	0.0002932	14/14
SH 86 @ Trailboss	9	32,000	0.0002812	15/10
Front St. @ Blackfeather	9	22,620	0.0003979	10
Wolfensberger @ Park	9	19,287	0.0004666	7
Front St. @ Scott Blvd.	8	22,195	0.0003904	11

15 Highest Accident Rate Locations



TIME TRENDS

By Month

	Accidents	%	Deaths	%
January	42	7%	0	0%
February	38	7%	0	0%
March	34	6%	0	0%
April	43	8%	0	0%
May	46	8%	0	0%
June	47	8%	0	0%
July	51	9%	0	0%
August	49	9%	0	0%
September	39	7%	0	0%
October	51	9%	0	0%
November	52	9%	0	0%
December	73	13%	0	0%
Total	565	100%	0	100%

By Time of Day

	Accidents	%	Deaths	%
Midnight	5	1%	0	0%
1:00am	3	1%	0	0%
2:00am	7	1%	0	0%
3:00am	4	1%	0	0%
4:00am	1	0%	0	0%
5:00am	4	1%	0	0%
6:00am	11	2%	0	0%
7:00am	25	4%	0	0%
8:00am	23	4%	0	0%
9:00am	28	5%	0	0%
10:00am	29	5%	0	0%
11:00am	43	8%	0	0%
12:00pm	41	7%	0	0%
1:00pm	40	7%	0	0%
2:00pm	36	6%	0	0%
3:00pm	50	9%	0	0%
4:00pm	52	9%	0	0%
5:00pm	48	8%	0	0%
6:00pm	32	6%	0	0%
7:00pm	26	5%	0	0%
8:00pm	18	3%	0	0%
9:00pm	20	4%	0	0%
10:00pm	13	2%	0	0%
11:00pm	6	1%	0	0%
Total	565	100%	0	100%

By Day of Week

	Accidents	%	Deaths	%
Sunday	66	12%	0	0%
Monday	82	15%	0	0%
Tuesday	77	13%	0	0%
Wednesday	83	15%	0	0%
Thursday	91	16%	0	0%
Friday	85	15%	0	0%
Saturday	81	14%	0	0%
Total	565	100%	0	100%

TYPES OF CRASHES

First Harmful Event

	Number of Fatalities	Number of Injuries	Number of Accidents	% of Accidents
Hit Other Vehicle	0	27	439	78%
Hit Fixed or Other Object	0	8	79	14%
Rollover	0	0	2	0%
Hit Animal	0	0	15	3%
Hit Pedestrian	0	2	2	0%
Hit Bicyclist	0	3	3	1%
Hit Railway Train	0	0	0	0%
Hit Parked Vehicle	0	2	18	3%
All Others	0	1	7	1%
TOTAL	0	51	565	100%

Vehicle Type

	Vehicles Involved in Accidents	% of Vehicles
Auto	528	51%
SUV	302	29%
Pick-up	135	13%
Truck(over 10,000 lbs)	17	2%
Motorcycle/Moped	15	1.5%
Bicycle	3	0.5%
Other	29	3%
TOTAL	1,029	100%

ACCIDENT LOCATION

At Intersections

Intersections By Classification	Number Of Accidents	Number Of People Killed	Number Of People Injured
Arterial/Arterial	169	0	13
Arterial/Collector	119	0	10
Arterial/ Local	112	0	14
Collector/Collector	12	0	0
Collector/Local	30	0	2
Local/Local	52	0	5
Total	494	0	44

Non-Intersections

Segments	Number of Accidents	Number of People Killed	Number of People Injured
Multi-lane Arterial or Collector	30	0	0
Two-lane Arterial Or Collector	26	0	2
Local	15	0	0
Total	71	0	2

ACCIDENT ENVIRONMENT

Traffic control

	Accidents	%
Railroad Device	1	0.5%
Yield Sign	1	0.5%
Stop Sign	53	9%
Traffic Signal	226	40%
None*	284	50%
Total	565	100%

*These include accidents not occurring at a controlled location, such as rear-end accidents and accidents where a vehicle left the roadway and hit a fixed object.

Weather

	Accidents	%
Clear	506	90%
Rain	20	3%
Snow/Sleet	38	7%
Other	1	0%
Total	565	100%

Road Conditions

	Accidents	%
Dry	477	84%
Wet	32	6%
Icy/Slushy	56	10%
Other	0	0%
Total	565	100%

Lighting Condition

	Accidents	%
Day	431	76%
Night	134	24%
Total	565	100%

THE DRIVER

Primary Cause of Accidents

	Accidents	%
Failed to Yield Right of Way	87	15%
Careless/Reckless Driving	148	27%
Violation of Red Signal	22	4%
Unsafe Backing	13	2%
Speeding too fast for conditions	25	4%
Following too closely	58	10%
Turned Left in Front of Approaching Traffic	3	1%
All Other/Unknown	209	37%
Total	565	100%

Condition of Drivers

	Drivers	%
No Defect or Unknown	601	66%
Other* (includes: aggressive driving, fatigue, inexperienced drivers, distractions, illness)	300	33%
Cell Phone	8	1%

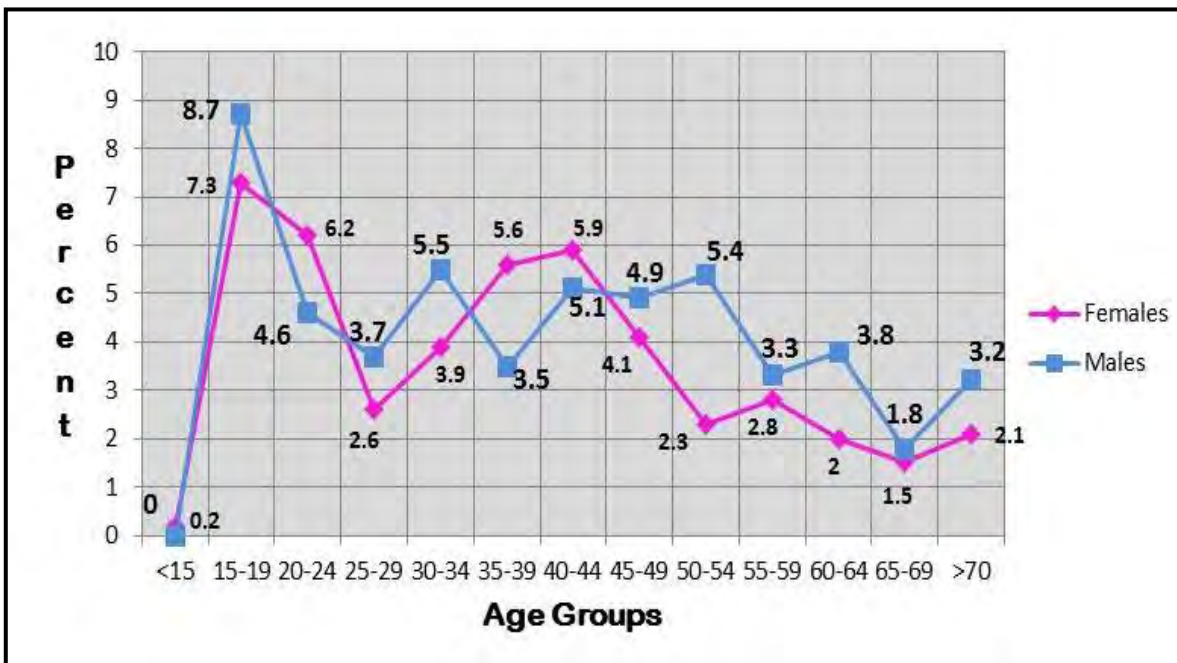
*Alcohol related accidents are found in a separate table on the next page

Drivers Influenced by Alcohol or Drugs

Age	All Drivers	Male	Female
<14	0	0	0
15-19	0	0	0
20-24	5	4	1
25-29	2	1	1
30-34	6	5	1
35-39	2	2	0
40-44	3	2	1
45-49	2	1	1
50-54	2	1	1
55-59	0	0	0
60-64	2	2	0
65-69	0	0	0
>70	0	0	0
Total	24	18	6

Less than 5% of the total accidents reported in 2012 involved alcohol or drugs. This was the same as reported in 2011 and is approximately the same as the national average.

Percent of Drivers Involved in Traffic Accidents by Age and Gender

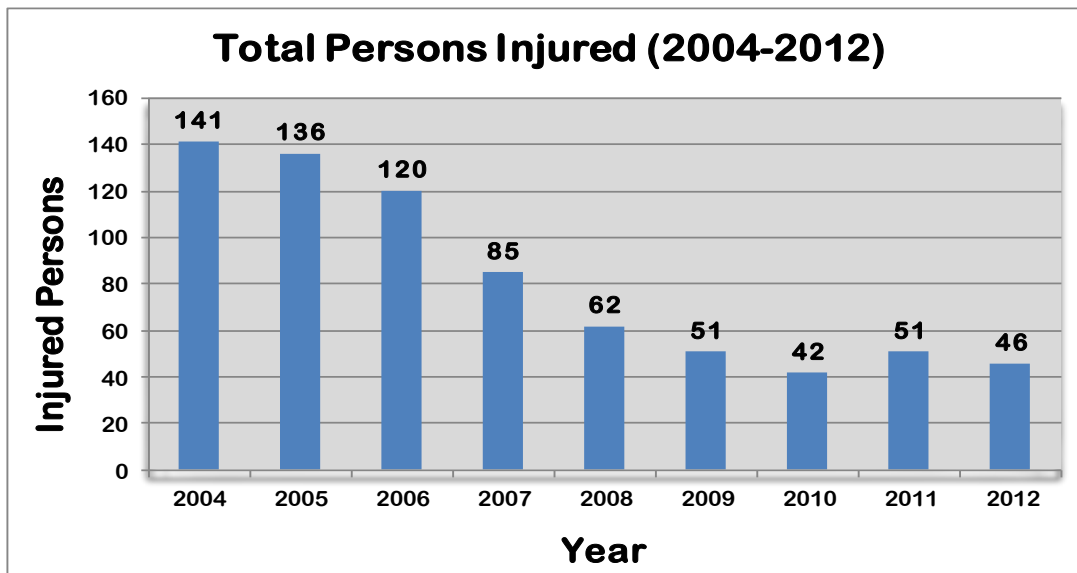


ANNUAL TRENDS

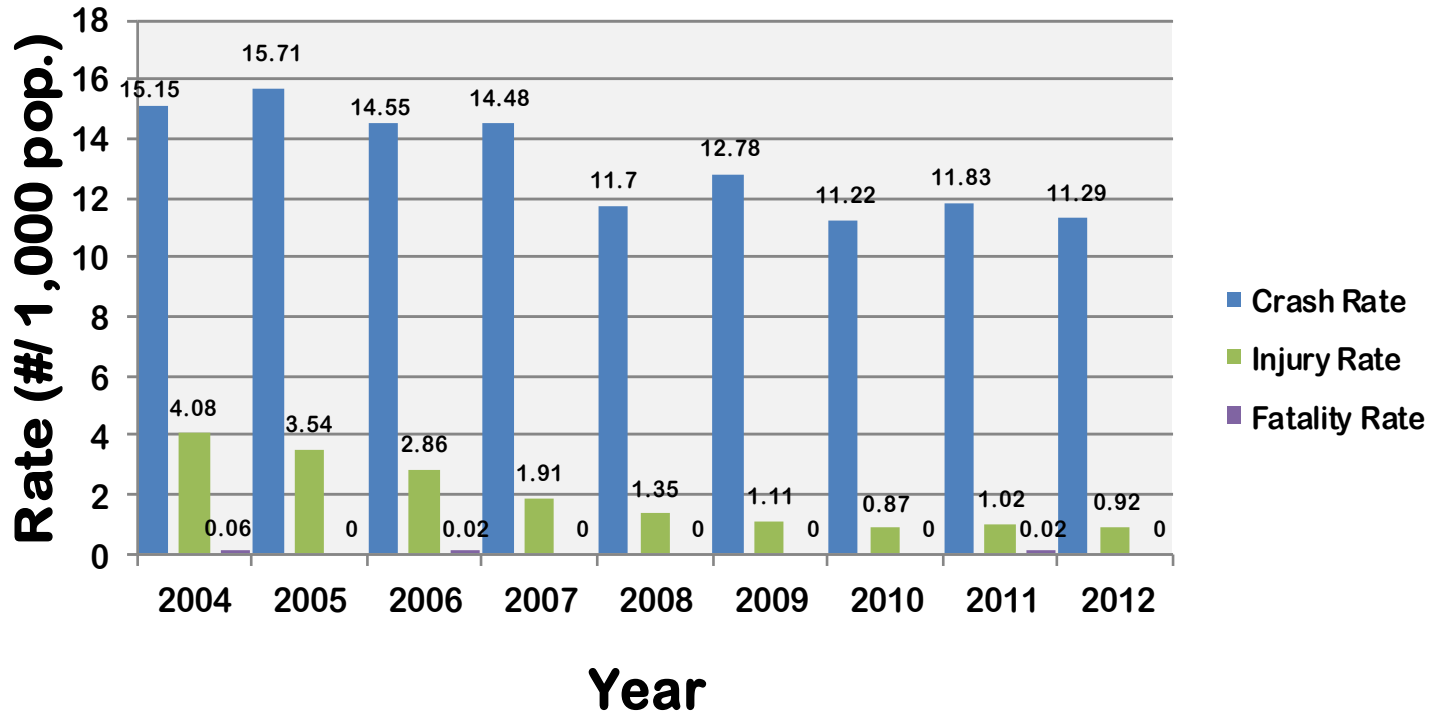
The Town of Castle Rock reached a milestone in 2012 by reaching a population of 50,000. Considering the fact that an increase in accidents usually follows an increase in population in accordance with more people traveling on the Town's roads, our residents are not doing all that badly. As can be seen in the graph below, the number of accidents has remained within a fairly constant range for the past five years.



The number of injury accidents and the corresponding injury accident rate have dramatically decreased since 2004. There was a 10% decrease from 2011 to 2012 reported injuries. This could be as a result of increased enforcement of the seat belt law, better observance of the speed limits and traffic control devices.



Total Crash, Fatality, & Injury Rates per Population



DEFINITIONS

The following special terms are used throughout this report, and are provided to clarify the meaning of the data.

1. **Accident (or traffic accident):** An unintended event involving a motor vehicle that causes death, injury, or property damage.
2. **Alcohol Involvement Accident:** Any motor vehicle accident in which a driver, pedestrian, or bicyclist had consumed alcohol.
3. **Fatal Accident:** A traffic accident which involving the death of one or more persons.
4. **Hit-Other-Vehicle:** A type of collision in which the first harmful event involves a collision between two or more vehicles.
5. **Injury Accident:** An accident involving injuries to one or more persons which may or may not require transportation to a medical facility.
6. **Motor Vehicle:** Any motorized (mechanically or electrically powered) vehicle not operated on rails.
7. **Other Non-collision:** An event during an accident sequence which does not involve a collision with another vehicle or object.
8. **Property Damage Accident:** An accident not involving either a fatality of an injury to any party but which does include damage to one or more vehicles.
9. **Rollover:** An accident in which the overturning of a vehicle was the first harmful event.
10. **Type of Crash:** The category which best describes the general type of collision which was the first event.