

Report For

# CDOT Region 3 Intersection Priority Study



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## LIST OF ACRONYMS

AADT .....	Annual Average Daily Traffic
ADA .....	Americans with Disabilities Act
CCTV.....	Closed-Circuit Television
CDOT .....	Colorado Department of Transportation
LOS .....	Level-of-Service
mph .....	miles per hour
MUTCD .....	Manual of Uniform Traffic Control Devices
RFTA .....	Roaring Forks Transportation Authority
TPR .....	Transportation Planning Region
TWLT.....	Two-Way Left-Turn Lane
vpd.....	vehicles per day
vph.....	vehicles per hour

# 1. INTRODUCTION

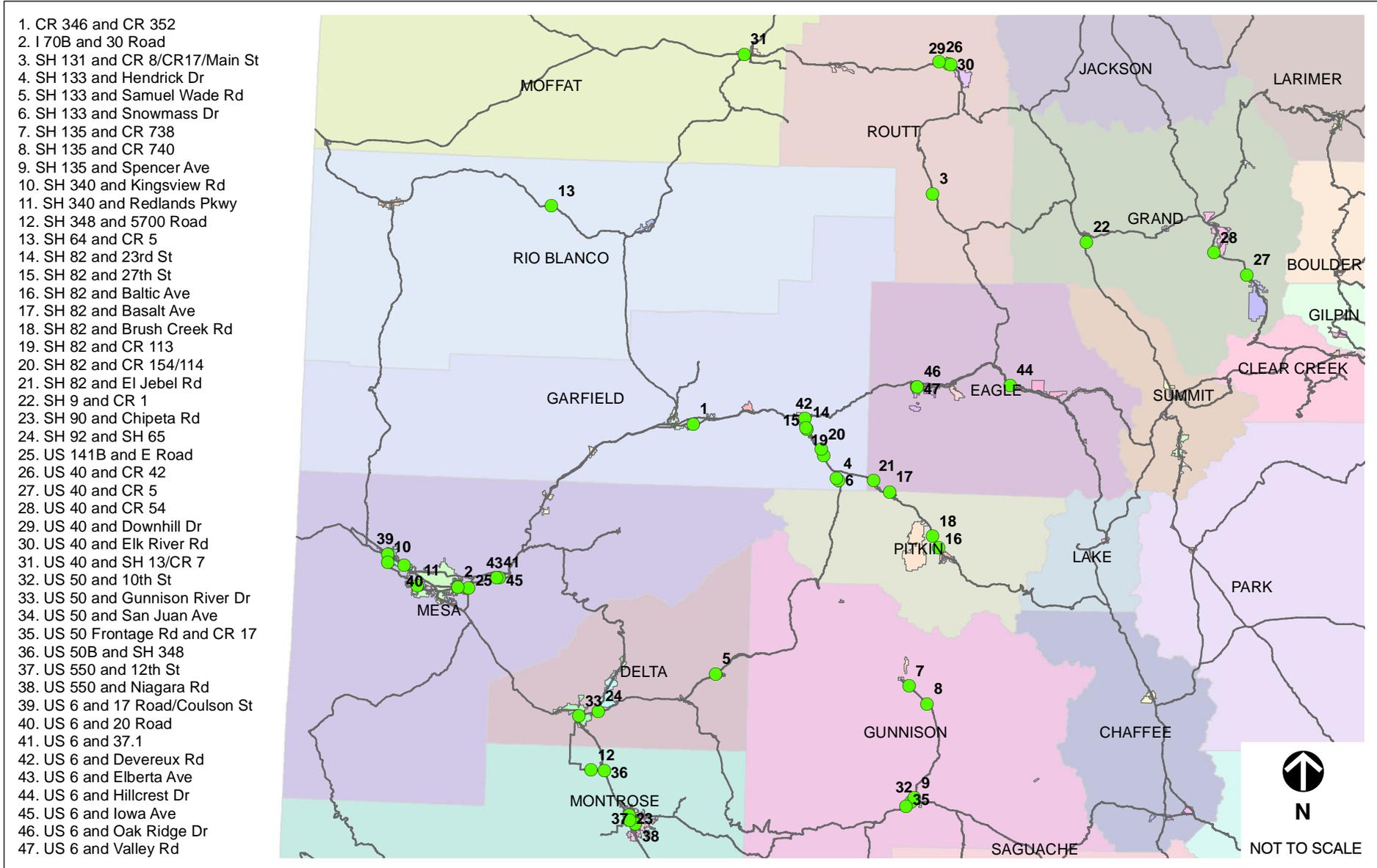
## PROJECT DESCRIPTION

Under Fehr & Peers' Non-Project Specific Engineering Services Contract for Traffic Engineering with the Colorado Department of Transportation (CDOT), Region 3 identified the need to prioritize intersection improvements that will be used by Transportation Planning Regions (TPR), similar to the project conducted in Region 5. The study investigated safety, geometric, and operational characteristics of 47 intersections within the Region 3 boundaries, which were submitted by the city, town, or county within each TPR. A preliminary investigation of each intersection was conducted by Fehr & Peers and was based upon input provided in the application. This was followed by an in-depth evaluation of the top three intersections per TPR, plus four other intersections. The major tasks of the prioritization project included:

- Review the received intersection prioritization applications,
- Develop an evaluation criteria as agreed upon by CDOT,
- Collect existing and historical data for each intersection,
- Identify the existing intersection deficiencies,
- Visit and observe the preliminarily top ranked intersections,
- Recommend mitigation strategies, generally including at least one short-term (lower cost) and one long-term (higher cost) alternative,
- Estimate costs for the intersection improvement alternatives,
- Evaluate the recommended long-term alternative for each intersection based on the developed criteria,
- Prioritize each intersection.

## INTERSECTION LOCATIONS

Intersections to be evaluated were identified by CDOT Region 3 based upon requests from the four TPRs, 11 counties, and many local municipalities within Region 3. There were 48 applications; however, one intersection was not within the boundaries of Region 3. Figure 1 shows the approximate location of all the intersections and Table 1 lists basic information of each intersection.



**Note: The list is in an arbitrary order. It is not the rankings of the intersections**

TABLE 1: LIST OF INTERSECTIONS

TPR	County	Highway Route	Milepost	Intersection
Grand Valley	Mesa	006A	19.955	US Highway 6 and 17 Road/Coulson Street
		006A	23.657	US Highway 6 and 20 Road
		340A	1.839	State Highway 340 and Kingsview Road
		340A	9.526	State Highway 340 and Redlands Parkway
		141B	161.361	US Highway 141B and E Road
		070B	9.501	Interstate 70 (Business Loop) and 30 Road
		006C	42.706	US Highway 6 and Elberta Avenue
		006C	42.957	US Highway 6 and Iowa Avenue
Gunnison Valley	Delta	133A	8.008	State Highway 133 and Samuel Wade Road/Pitkin Road
		050A	70.766	US Highway 50 and Gunnison River Drive
		065A/092A	0 / 3.814	State Highway 65 and State Highway 92
	Gunnison	050A	156.873	US Highway 50 and 10 <sup>th</sup> Street
		135A	0.740	State Highway 135 and Spencer Avenue
		135A	20.704	State Highway 135 and County Road 740 (Cement Creek Road)
		135A	25.468	State Highway 135 and County Road 738 (Brush Creek Road)
		N/A	156.302	US Highway 50 Frontage Road and County Road 17 (Antelope Creek Road)
		Montrose	550B	128.243
	050A		93.558	US Highway 50 and San Juan Avenue/Grand Avenue
	550B		128.418	US Highway 550 and 12th Street/Columbia Way
	090B		89.304	State Highway 90 and Chipeta Road
	348A		14.38	State Highway 348 and 5700 Road
	050D/348A		16.832 / 0.931	US Highway 50B and Highway 348
	Intermountain	Eagle	082A	19.044
006E			164.070	US Highway 6 and Hillcrest Drive
082A			23.080	State Highway 82 and Basalt Avenue
006E			142.608	US Highway 6 and Valley Road
006E			142.717	US Highway 6 and Oak Ridge Drive
Garfield		082A	1.714	State Highway 82 and 27 <sup>th</sup> Street
		006K	0	US Highway 6 and Devereux Road
		082A	1.405	State Highway 82 and 23 <sup>rd</sup> Street
		082A	7.870	State Highway 82 and County Road 113 (Cattle Creek Road)
		082A	6.655	State Highway 82 and County Road 154/County Road 114 (Colorado Mountain College)
		N/A	N/A	County Road 346 and County Road 315 (Mamm Creek Road)

**TABLE 1: LIST OF INTERSECTIONS**

TPR	County	Highway Route	Milepost	Intersection
		133A	67.494	State Highway 133 and Hendrick Drive/Sopris Avenue
		133A	67.044	State Highway 133 and Snowmass Drive//River Valley Ranch Road
	Pitkin	082A	37.630	State Highway 82 and Baltic Avenue
		082A	35.283	State Highway 82 and Brush Creek Road
Northwest	Grand	040A	226.188	US Highway 40 and County Road 5
		040A	217.970	US Highway 40 and County Road 54
		009D	136.608	State Highway 9 and County Road 1
	Moffat	040A/013A	89.322 / 88.635	US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)
	Rio Blanco	064A	56.243	State Highway 64 and County Road 5
	Routt	040A	130.285	US Highway 40 and Downhill Drive/Riverside Drive
		040A	130.773	US Highway 40 and County Road 129 (Elk River Road)
		040A	128.340	US Highway 40 and County Road 42
131B		42.655	State Highway 131 and County Road 8/County Road 17/Main Street	

Source: CDOT

### DATA COLLECTION

Depending on the identified improvement deficiencies and the preliminary ranking of the intersections, various data was collected. The following data was collected for the top ranked intersections:

- Annual Average Daily Traffic (AADT) and/or Average Daily Traffic (ADT)
- Turning movement counts (AM and PM peak hours)
- Accident history
- Existing intersection geometry
- Aerial photos

Certain intersections required other types of data to be collected based on their deficiencies. Other data that was collected for specific intersections was:

- Pedestrian and bicycle counts
- Signal timing (for studied intersection and at adjacent signal(s))

### ANALYSIS AND RECOMMENDATIONS

A review was performed for the intersection submitted, including the existing conditions, field observations, and collected data. Based on this analysis, short- and long-term improvements were recommended at each intersection. In most cases, both types of recommendations were able to be made, but for some intersections improvements applied to only one of the scenarios.

In the following chapters, the intersections are sorted by TPR. These chapters contain a section for each intersection, which includes the following:

- Written description of existing conditions, traffic volumes, accident history, long-term and short-term improvement recommendations, and cost estimates
- Aerial graphic showing existing conditions
- Aerial graphic(s) showing short-term recommendations
- Aerial graphic(s) showing long-term recommendations

### **SHORT- AND LONG-TERM RECOMMENDATIONS**

The potential for short- and long-term solutions were evaluated at each intersection, based on the data gathered and the evaluation criteria applied. Although the CDOT Regional Priority funds are dedicated to solving the long-term solutions, low-cost and easily implementable short-term solutions can help alleviate some of the traffic problems or identified deficiencies until the long-term solution can be implemented. However, the evaluation presented some intersections that did not require a long-term recommendation because they had very few accidents, minimal congestion, and no readily identifiable significant deficiencies. In these cases, the intersections were ranked based upon the short-term solution(s). This is a planning level document and further steps are required to determine the right-of-way boundaries, develop design plans, and identify environmental concerns.

Long-term recommendations frequently included significant modifications to the intersection, roadway, or geometry, or an installation of a traffic signal. These types of improvements generally need to be budgeted separately, and often require the assistance of contractors to design and construct. The graphics for the long-term solutions are conceptual illustrations of the improvements that include the extent of the project impact, but do not show project details (such as modifications to signs and pavement markings).

Short-term improvements typically involve signing, striping, street lighting, additional signal heads, and other modifications. These improvement types are relatively easy to implement by CDOT or the local agency. They generally do not involve a major capital investment requiring earthwork or roadway widening, or require the use of contractors to design or construct the improvements. The short-term graphics illustrate detailed improvements such as sign relocation, restriping, etc.

In many cases, the short-term solution is simply the first phase of the long-term solution. In these cases, the cost for the long-term solutions was reduced by a portion of the estimated investment. However, it is possible that an intersection's short-term solution may need to be constructed when the long-term solution is implemented. Thus, for purposes of this analysis, the long-term solution cost estimate for these cases is not reduced by the cost of the short-term solution.

### **ACCIDENT ANALYSIS**

Based upon the types of accidents that were encountered at each intersection, if possible, a specific countermeasure to reduce or eliminate that type of accident was suggested. These suggested countermeasures were developed based upon increasing the level of safety at the intersection, as well as correcting existing deficiencies at the intersection based upon the *CDOT State Highway Access Code* and design criteria.

CDOT requested accident data from other governmental entities with separate accident reporting databases. If the requested accident information was supplied to CDOT, that information was used in evaluating intersection related accidents correctable by traffic engineering countermeasures, and included in the Accident and Benefit/Cost rankings. If no additional accident information was supplied to CDOT, CDOT used only the information available in its own database for the analysis.

### **COST ESTIMATES**

A method similar to the previous intersection study was utilized to estimate costs for short term and long term recommendations. Typical costs were compiled for various improvements, and factors were applied to account for site specific items such as terrain, design speed, and adjacent land uses. As such, these cost estimates should be considered “planning” estimates for comparative review.

## 2. METHOD

Similar to the CDOT Region 5 Intersection Priority project, a method was developed to prioritize the intersections based on safety, functionality, funding, and cost factors. The criterion evaluation includes: accidents, congestion, truck usage, conformity to CDOT standards, local agency priority, local agency participation, and project cost and benefits. Each element was rated on its individual scale and then multiplied by a weighting factor. The weighted scores for an intersection were combined and compared to the other locations within the TPR.

### PRIORITIZATION CRITERIA

The intersection priority scoring and weighting to determine the priority list of projects was based upon the CDOT Region 5 layout of scoring and weighting, with minor changes based on input from Region 3. The following criterion was used for the evaluation process:

#### **Accidents** [weighting factor = 4.0]

Each accident that had occurred at the intersection was scored based on the severity. The accident severity value is as follows:

- Property Damage Only (PDO) = 0.50
- Injury (INJ) = 5.0
- Fatality (FAT) = 10.0

An unweighted aggregate score for each intersection was assigned by summing the severity values for all accident at that intersection then divided by the number of years of accident data. For example, if data was received for 1 year and there were 2 INJ and 3 PDO accidents at an intersection, then the intersection would receive an unweighted aggregate score of  $(2*5.0 + 3*0.5) / 1 \text{ year} = 10.5$ . The unweighted aggregate score at each intersection was translated into a rating score:

- 0 = 0 points
- 1 to 3 = 1 point
- 4 to 7 = 2 points
- 8 to 11 = 3 points
- 12 to 15 = 4 points
- 16 to 19 = 5 points
- 20 or greater = 6 points

For example, if the intersection has an unweighted aggregate score of 12, then it would receive a rating score of 4 points. The rating was multiplied by the 4.0 weighting factor to determine the total score for accidents.

**Congestion** [weighting factor = 2.5]

Since level-of-service (LOS) was not determined for all intersections, the Annual Average Daily Traffic (AADT) was used to determine the congestion factor.

The following rating was assigned for AADT at each intersection:

- 0 to 7,499 = 1 point
- 7,500 to 17,499 = 2 points
- 17,500 to 29,999 = 3 points
- 30,000 to 49,999 = 4 points
- 50,000 or greater = 5 points

The rating was multiplied by the 2.5 weighting factor to determine the total score for congestion.

**Truck Usage** [weighting factor = 1.0]

This score was based upon existing or historic vehicle classification percentages for the highway. Data from either the traffic counts or the CDOT website was used to determine the truck percentage on the state highways of each intersection. If truck information was not available, then it was assumed that highway carried two percent heavy vehicles. Each intersection was given a rating based on the following criteria:

- 0 to 4.99% = 1 point
- 5 to 9.9% = 2 points
- 10 to 14.99% = 3 points
- 15 to 19.99% = 4 points
- 20% or more = 5 points

The rating was multiplied by the 1.0 weighting factor to determine the total score for truck usage.

**Conformance to Current CDOT Standards** [weighting factor = 1.0]

Each intersection was reviewed and scored for conformance to various *CDOT Access Code* or design criteria. Intersections received a score for each element that were not in compliance. The following types of items were reviewed:

- Geometric design (no accel/ decel lanes) = 1 point
- Sight Distance (poor sight distance) = 1 point
- Lighting (no lighting) = 1 point
- Signing and Striping (needs upgraded) = 1 point
- Access Management (driveway too close to the intersection) = 1 point

The rating was multiplied by the 1.0 weighting factor to determine the total score for conformance.

**Local Agency Priority** [weighting factor = 1.0]

When local agencies submitted intersections they ranked them to reflect the local priority. The following rating was assigned based on the local jurisdiction rankings as provided in the application:

- Highest Rank = 5 points
- 2<sup>nd</sup> Rank = 3 points
- 3<sup>rd</sup> Rank = 1 point

The rating was multiplied by the 1.0 weighting factor to determine the total score for local agency priority.

**Local Funding Participation** [weighting factor = 1.0]

If the local agency mentioned participating in funding the intersection improvements, points were given based on the available local funding level (a maximum of five points). This commitment can be made by in-kind work, providing materials, or committing funds to help defer the improvement costs. Points were not awarded if the local agency was unable to provide a portion of the improvement funds. The rating was assigned based on the level of commitment for each intersection:

- No commitment = 0 points
- Commitment mentioned in application = 1 point
- Definite commitment in application = 5 points

The rating was multiplied by the 1.0 weighting factor to determine the total score for local funding participation.

**Project Cost and Benefits** [weighting factor = 1.5]

Two factors are involved in the project cost scoring: benefit-to-cost and constructability cost.

The benefit-to-cost method utilizes the accident severity information of the intersection. The National Safety Council provides estimates of the impacts to society due to accidents being prevented or the severity being reduced by intersection enhancements. Using the most recent data from the National Safety Council, FHWA, and the CMF Clearinghouse, the total benefit gained from reduction in number and severity of accidents due to the implementation of the long-term recommendation is calculated at each intersection. This benefit gain, expressed in dollars, is divided by the cost of the long-term improvements to get a benefit-to-cost ratio. For the purposes of benefit-to-cost calculation only, if no long-term recommendation was made for an intersection, then the cost for the short-term improvement was used.

The constructability cost methodology is based on the estimated cost of the recommended long-term improvements. With the limited funding availability, the study looks at the greatest benefits for the least amount of cost. Projects with cheaper solutions allow more funding to be available for other intersections, dissimilar to projects with more expensive solutions. Therefore, projects with cheaper solutions received a higher score for constructability cost than projects with a higher construction cost. If the short-term recommendation supplemented the long-term recommendation then the cost was summed. The costs do not include the acquisition of right-of-way. The following rating will be assigned for benefit-to-cost and constructability cost at each intersection and then combined for a total project cost rating:

**Benefit-to-Cost:**

- 5 points = 500 or greater
- 4 points = 125 to 499
- 3 points = 75 to 125

**Constructability Cost:**

- 5 points = \$0 to \$199,999
- 4 points = \$200,000 to \$399,999
- 3 points = \$400,000 to \$699,999

- 2 points = 25 to 74
- 1 point = 5 to 24
- 0 points = 4 or less
- 2 points = \$700,000 to \$999,999
- 1 point = 1,000,000 or more

The benefit-to-cost point(s) were added to the constructability cost point(s). The combined rating is multiplied by the 1.5 weighting factor for the total score for the project cost.

## **SELECTION PROCESS**

Once the applications were received the intersections were initially analyzed based on the accident data and application documentation. The analysis provided preliminary rankings and developed a list of the intersections in need of further investigation. The “first round” list was then reduced to 15 intersections. The budget and scope of work for this project allotted resources to provide in-depth research on the top three intersections per TPR (based on preliminary ranking and CDOT’s suggestions), plus three more. Other intersections that were not visited still may need attention and may have safety and operational issues that could be addressed. This report is a suggested list of priority improvements to allocate the resources at locations with the greatest benefits.

Table 2 provides the intersection rankings per the TPR. Table 3 provides the ranking list with the individual scores for each criteria and intersection. Note that the cost estimate and benefit-to-cost ratio for Tier 2 and Tier 3 are based on the requested mitigation from the applications and were not reevaluated for the preliminary recommendations provided in this study.

### ***TIER 1: PRELIMINARY TOP 15 FOR FIELD OBSERVATIONS***

Field visits were conducted for 16 of the 47 intersections to observe the individual issues and identify potential improvements. A list of intersections to visit was determined by developing a preliminary ranking for all intersections using the prioritization criteria. The project cost scoring was estimated with potential recommendations developed from the information received in the applications. The top three intersections per TPR were included on the list, as well as four others that were requested by CDOT Region 3. For these preliminarily top ranked intersections, traffic and pedestrian counts were conducted in April and June 2011 by All Traffic Data during the morning and evening peak hours, unless traffic counts were collected and provided by others within the last three years. Evaluation was conducted on each of these intersections, which included verifying the auxiliary lanes conformance on the highways, determining the level-of-service for intersections with signal timing concerns, performing an accident analysis, and developing recommendations. Synchro models were developed for some of the intersections if there were concerns with the signal operations or queuing.

### ***TIER 2: PRELIMINARY TOP RANKED INTERSECTIONS***

These intersections have safety and operational deficiencies, but were not within the top three ranked intersection within their TPR. However, they were further investigated with limited resources. Recommendations are preliminary and based on the available data. Other improvements may be found with more in-depth evaluation and a site visit.

### ***TIER 3: NO FURTHER INVESTIGATION AT THIS TIME***

These intersections have safety and operational deficiencies that may need to be investigated, but were not in the top half of the ranked list of intersections. Without thorough review the given rankings for these intersections are very preliminary and several of the ranking criteria were estimated.

**TABLE 2: CLASSIFICATIONS OF INTERSECTIONS WITH INITIAL ANALYSIS**

**Tier 1**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Interstate 70 (Business Loop) and 30 Road</li> <li>• State Highway 64 and County Road 5</li> <li>• State Highway 82 and 23<sup>rd</sup> Street</li> <li>• State Highway 82 and 27<sup>th</sup> Street</li> <li>• State Highway 82 and Basalt Avenue</li> <li>• State Highway 82 and County Road 154/County Road 114 (Colorado Mountain College)</li> <li>• State Highway 82 and El Jebel Road</li> <li>• State Highway 135 and Spencer Avenue</li> <li>• State Highway 340 and Redlands Parkway</li> <li>•</li> </ul> | <ul style="list-style-type: none"> <li>• US Highway 6 and Valley Road</li> <li>• US Highway 40 and County Road 129 (Elk River Road)</li> <li>• US Highway 40 and Downhill Drive/Riverside Drive</li> <li>• US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)</li> <li>• US Highway 141B and E Road</li> <li>• US Highway 50 and San Juan Avenue/Grand Avenue</li> <li>• US Highway 550 and 12th Street/Columbia Way</li> </ul> |
|--|---|

**Tier 2**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• State Highway 9 and County Road 1</li> <li>• State Highway 90 and Chipeta Road</li> <li>• State Highway 65 and State Highway 92</li> <li>• State Highway 82 and Baltic Avenue</li> <li>• State Highway 82 and Brush Creek Road</li> <li>• State Highway 133 and Samuel Wade Road/Bethlehem Road</li> <li>• State Highway 135 and County Road 740 (Cement Creek Road)</li> </ul> | <ul style="list-style-type: none"> <li>• US Highway 40 and County Road 5</li> <li>• US Highway 40 and County Road 42</li> <li>• US Highway 40 and County Road 54</li> <li>• US Highway 50 and 10<sup>th</sup> Street</li> <li>• US Highway 50 and Gunnison River Drive</li> </ul> |
|--|---|

**Tier 3**

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• County Road 346 and County Road 315 (Mamm Creek Road)</li> <li>• State Highway 82 and County Road 113 (Cattle Creek Road)</li> <li>• State Highway 131 and County Road 8/County Road 17/Main Street</li> <li>• State Highway 133 and Hendrick Drive/Sopris Avenue</li> <li>• State Highway 133 and Snowmass Drive/River Valley Ranch Road</li> <li>• State Highway 135 and County Road 738 (Brush Creek Road)</li> <li>• State Highway 340 and Kingsview Road</li> </ul> | <ul style="list-style-type: none"> <li>• State Highway 348 and 5700 Road</li> <li>• US Highway 6 and 17 Road/Coulson Street</li> <li>• US Highway 6 and 20 Road</li> <li>• US Highway 6 and 37.1 Road</li> <li>• US Highway 6 and Devereux Road</li> <li>• US Highway 6 and Hillcrest Drive</li> <li>• US Highway 6 and Iowa Avenue</li> <li>• US Highway 6 and Oak Ridge Drive</li> <li>• US Highway 50B and Highway 348</li> <li>• US Highway 50 Frontage Road and County Road 17 (Antelope Creek Road)</li> <li>• US Highway 550 and Niagara Road</li> </ul> |
|---|---|

TABLE 3: INTERSECTION PRIORITY RANKING

TPR	County (Jurisdiction)	Intersection	Accident Score	Congestion (LOS & ADT)	Truck Usage	Conformance to CDOT Standards	Benefit/Cost & Constructability Cost	Local Agency Priority	Local Funding Participation	Total Overall Score	Ranking
		<b>Weighting Factor</b>	<b>4.0</b>	<b>2.5</b>	<b>1.0</b>	<b>1.0</b>	<b>1.5</b>	<b>1.0</b>	<b>1.0</b>		
Grand Valley	Mesa (County)	Interstate 70 (Business Loop) and 30 Road	6	3	1	1	9	3	0	50.0	1
	Mesa (County)	US Highway 141B and E Road	4	3	2	1	5	5	2	41.0	2
	Mesa (Grand Junction)	State Highway 340 and Redlands Parkway	1	2	1	3	4	5	0	24.0	3
	Mesa (City of Fruita)	State Highway 340 and Kingsview Road	0	2	1	1	5	1	5	20.5	4
	Mesa (City of Fruita)	US Highway 6 and 20 Road	1	2	2	2	3	3	0	20.5	5
	Mesa (Palisade)	US Highway 6 and Elberta Avenue	1	1	1	2	2	5	0	17.5	6
	Mesa (City of Fruita)	US Highway 6 and 17 Road/Coulson St	0	1	2	1	2	5	1	14.5	7
	Mesa (Palisade)	US Highway 6 and 37.1 Road	1	1	1	1	2	3	0	14.5	8
	Mesa (Palisade)	US Highway 6 and Iowa Avenue	0	1	1	2	2	1	0	9.5	9
Gunnison Valley	Montrose (City of Montrose)	US Highway 50 and San Juan Avenue/Grand Avenue	5	3	2	2	10	3	1	50.5	1
	Montrose (City of Montrose)	US Highway 550 and 12th Street/Columbia Way	3	3	1	2	5	1	1	32.0	2
	Gunnison (City of Gunnison)	State Highway 135 and Spencer Avenue	2	2	2	3	6	3	0	30.0	3
	Gunnison (City of Gunnison)	US Highway 50 and 10th Street	2	2	2	1	6	5	0	30.0	4
	Delta	State Highway 65 and State Highway 92	2	2	2	3	7	1	0	29.5	5
	Montrose (County)	State Highway 90 and Chipeta Road	1	2	1	2	6	5	0	26.0	6
	Delta	State Highway 133 and Samuel Wade Road/Bethlehem Road	1	1	2	2	6	5	0	24.5	7
	Montrose (County)	State Highway 348 and 5700 Road	1	1	2	2	6	5	0	24.5	8
	Montrose (City of Montrose)	US Highway 550 and Niagara Road	0	3	2	1	5	5	0	23.0	9
	Delta	US Highway 50 and Gunnison River Drive	1	2	2	2	4	3	1	23.0	10
	Gunnison (County)	State Highway 135 and County Road 740 (Cement Creek Road)	0	1	2	1	4	5	0	16.5	11
	Gunnison (County)	State Highway 135 and County Road 738 (Brush Creek Road)	0	1	2	2	4	3	0	15.5	12
	Montrose (Town of Olathe)	US Highway 50B and State Highway 348	0	1	1	1	4	5	0	15.5	13
Gunnison (County)	US Highway 50 Frontage Road and County Road 17 (Antelope Creek Road)	0	1	1	1	5	1	0	13.0	14	
Intermountain	Garfield (County)	State Highway 82 and County Road 154/County Road 114 (CMC Road)	4	3	1	2	9	3	1	44.0	1
	Eagle (Town of Basalt)	State Highway 82 and Basalt Avenue	3	3	1	2	6	5	5	41.5	2
	Garfield (City of Glenwood Springs)	State Highway 82 and 27th Street	3	3	1	3	6	5	1	38.5	3
	Eagle (County)	State Highway 82 and El Jebel Road	3	3	1	2	4	5	0	33.5	4
	Garfield (City of Glenwood Springs)	State Highway 82 and 23rd Street	2	3	1	2	7	1	1	31.0	5
	Pitkin	State Highway 82 and Brush Creek Road	3	2	1	1	5	3	1	30.5	6
	Eagle (Town of Gypsum)	US Highway 6 and Valley Road	1	2	2	2	4	5	5	29.0	7
	Garfield (County)	State Highway 82 and County Road 113 (Cattle Creek Road)	1	3	1	1	6	5	1	28.5	8
	Eagle (County)	US Highway 6 and Hillcrest Drive	2	2	1	1	6	3	0	27.0	9
	Eagle (Town of Gypsum)	US Highway 6 and Oak Ridge Drive	0	2	2	2	4	3	5	23.0	10
	Pitkin	State Highway 82 and Baltic Avenue	1	3	1	1	2	5	1	22.5	11
	Garfield (City of Glenwood Springs)	US Highway 6 and Devereux Road	0	2	2	4	4	3	1	21.0	12
	Garfield (Town of Carbondale)	State Highway 133 and Snowmass Drive	1	2	1	1	4	3	1	21.0	13
	Garfield (Town of Carbondale)	State Highway 133 and Hendrick Drive	0	2	1	1	5	5	1	20.5	14
	Garfield (County)	County Road 346 and Mamm Creek Road	0	0	1	3	7	1	1	16.5	15
Northwest	Routt (County)	US Highway 40 and Downhill Drive/Riverside Drive	3	2	1	2	9	5	0	38.5	1
	Routt (County)	US Highway 40 and County Road 129 (Elk River Road)	2	3	1	1	4	3	5	31.5	2
	Routt (County)	US Highway 40 and County Road 42	1	2	1	1	8	1	0	24.0	3
	Rio Blanco	State Highway 64 and County Road 5	0	1	4	1	3	5	5	22.0	4
	Grand	US Highway 40 and County Road 5	0	2	2	1	5	5	0	20.5	5
	Grand	US Highway 40 and County Road 54	1	1	1	1	6	3	0	20.5	6
	Moffat (City of Craig)	US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)	0	2	2	1	3	5	1	18.5	7
	Routt (Town of Yampa)	State Highway 131 and County Road 8/County Road 17/Main Street	0	1	2	2	4	5	0	17.5	8
	Grand	State Highway 9 and County Road 1	0	1	3	1	4	1	0	13.5	9

### 3. TRANSPORTATION PLANNING REGION: GRAND VALLEY

The Grand Valley TPR (#5) includes the one county, Mesa. This county has several cities and towns, including Grand Junction, Fruita, Palisade, Clifton, Gateway, and Whitewater.

The following submitted intersections are located within the Grand Valley TPR:



- Tier 1:**
- Interstate Highway 70B and 30 Road
  - US Highway 141B and E Road
  - State Highway 340 and Redlands Parkway

- Tier 3:**
- State Highway 340 and Kingsview Road
  - US Highway 6 and 17 Road/Coulson Street
  - US Highway 6 and 20 Road
  - US Highway 6 and 37.1 Road
  - US Highway 6 and Elberta Avenue
  - US Highway 6 and Iowa Avenue

## INTERSTATE 70 BUSINESS LOOP AND 30 ROAD

### EXISTING CONDITIONS

Interstate 70 Business Loop (I-70 B) and 30 Road is a very busy intersection with traffic traveling to Grand Junction from I-70 and from the Clifton area. I-70 B is a four-lane divided highway and serves as a primary route to and from Grand Junction and US Highway 50. 30 Road is an arterial that serves the residents and businesses of Clifton. The northbound approach (30 Road) is an upgrade into the intersection because the road travels under the railroad tracks. Just north of the intersection, there is a Frontage Road that travels parallel to I-70 B with only right-in-right-out access to 30 Road.

The signalized intersection has dual left-turn lanes on the eastbound and northbound approaches; therefore, all left-turns have protected phases. It has adequate lighting, a well designed signal, good sight distance, and excellent lane alignment. There are pedestrian signal heads, push buttons, and crosswalks in all directions. Sidewalks are on 30 Road, both sides to the north and just on the west side to the south. It is within one-quarter mile of the signalized intersection at North Avenue (to the east) and within one-sixth mile of the signalized intersection at E Road (to the south). Many businesses, residences, and offices rely on this intersection. Refer to Figure 2 for existing conditions.

It should be noted that 29 Road will have access to I-70B in the near future. This will change the traffic patterns and intersection needs once this roadway is opened. It is expected that a significant amount of traffic using 30 Road today will use 29 Road in the future.

### ISSUES PER THE APPLICATION

Mesa County submitted this intersection for improvement consideration. According to the application, this intersection has higher than the national average of rear-end accidents, inefficiencies due to the protected lefts, and issues with driver's cutting through a parking lot. The County suggested that northbound left-turning vehicles are traveling through the intersection and turning left into a shopping center parking lot and cutting-through to get to westbound I-70B from the Frontage Road. The cut-through is believed to occur because of the inefficiency of the protected only phasing for northbound left. The County's data indicated that 71 percent of the accidents at this location are rear-ends; however, the state average for a four-lane, four-leg, signalized intersection is 45 percent

### ANALYSIS AND OBSERVATIONS

According to the data received from CDOT, the majority of the rear-end accidents occur in the eastbound direction with 11 in two years (January 2007 to December 2008). Some of this may be a result of the approach curve between North Ave and 30 Road.

In the field it was also observed that the eastbound right-turn lane is a channelized free movement with a receiving lane, but some vehicles are treating it as a yield lane. The appropriate W4-6 sign is installed on the

**Ranking: 1**

**County: Mesa**

**ADT: 19,000 (Year 2010)**

**Heavy Vehicles: 3.8%**

**Classification: EX**

**Milepost: 9.501**

**Accidents: 2001 – 2008**

*Total – 140*

*Rear End – 96*

*Approach Turn – 14*

*Broadside – 13*

*Sideswipe – 10*

*Head On – 1*

*Other – 6*

**LOS (Delay):**

*AM Overall – C (31.3s)*

*EB – B (19.1s)*

*WB – C (32.6s)*

*NB – D (39.8s)*

*SB – C (22.6s)*

*PM Overall – D (40.6s)*

*EB – C (29.8s)*

*WB – D (40.6s)*

*NB – D (49.3s)*

*SB – E (60.5s)*

inside corner of this lane; however, the angle of the sign was incorrect and unnoticed by drivers. This may also contribute to the rear-end crashes in the eastbound direction if drivers are not paying attention to those that slow or stop for the right-turn. There were 16 incidents in the eastbound right turn lane, just over a third of the eastbound direction rear-end crashes. Figure 3 provides a crash diagram for the intersection of I-70B and 30 Road.

30 Road (northbound) also experiences rear-end accidents with five in one year. As vehicles travel north on 30 Road, their view of the signalized intersection is blocked by the railroad bridge; however, the signs on the bridge indicate a junction is approaching. Approaching vehicles can see the signal heads at approximately 500 feet from the stop bar. Vehicles near or approaching the end of a northbound queue may not be able to see when the signal changes to be able to react correctly.

The County presented the scenario that vehicles are cutting through the shopping center parking lot on the northwest corner of the intersection and mentioned 13 accidents that have occurred at the shopping center driveway. It is perceived that vehicles wanting to travel west on I-70 B from northbound 30 Road are cutting through the parking lot when they do not clear the intersection during the green phase for the northbound left-turn movement. In the field, cut-through vehicles were not observed. Majority of the northbound vehicles that turned into the parking lot went to the gas station and continued north on 30 Road. Unless vehicles are destined to travel west on North Avenue, cutting through the parking lot to skip the signal delay at the 30 Road intersection does not appear to be beneficial. Vehicles can make a left out of the gas station onto the Frontage Road and then turn right onto 30 Road, onto I-70B; however, this was not observed.

A Synchro model was developed to analysis the queues and green times. The Synchro model shows that northbound left-turn movement operates at LOS E (55.2 seconds) in the AM and LOS E (73.5 seconds) in the PM. The queue does extend past the given storage lengths; however, the simulation (SimTraffic) model concluded that there was adequate green time to clear vehicles during the peak hours. Due to the upgrade into the intersection, the saturation flow rate is less than the other approaches which does not seem to greatly affect the ability for vehicles to enter the intersection during their green phase. The other left-turn movements operate at LOS E in the PM peak hour due to the protected only phasing.

The acceleration and deceleration lanes were measured and compared to the design criteria of the *CDOT Access Code*. The auxiliary lanes on 30 Road provide adequate storage lengths for the existing traffic volumes. The auxiliary lanes for the westbound direction are less than the required lengths per the *CDOT Access Code*. Both right-turn acceleration lanes on I-70B are shorter than the CDOT criteria however, they are limited by adjacent intersections. Table 4 provides the existing and required lengths.

TABLE 4: ACCELERATION AND DECELERATION LANES FOR I-70B AND 30 ROAD								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	740	300	Yes	N/A	N/A	N/A
		Required	435+150	162		N/A	N/A	
	Right	Existing	640	170	Yes	570	610	Yes
		Required	338	162		550	162	
Westbound	Left	Existing	175	170	No	N/A	N/A	N/A
		Required	435+150	162		N/A	N/A	
	Right	Existing	300	100	No	435	*	No
		Required	338	162		550	162	

\* Ends at North Avenue as a trap lane; therefore, there is not a taper.  
Source: Google Earth Pro and CDOT Access Code

Other observations:

- The southbound right-turn lane is a trap lane and may cause some confuse to drivers if they are unaware that they are forced to turn right on either the Frontage Road or I-70 B.
- There are long queues on all approaches during the red phases; however, the queue cleared within the allotted green time. Northbound left-turn lanes had the longest queue, but had adequate green time to clear the vehicles within the queue. Vehicles that arrived at the back of the northbound left queue after the left-turn phase began would sometimes get through the intersection, but sometimes had to wait until the next cycle. The turning movement counts indicate that the northbound left-turn has 656 vehicles in the peak morning hour and 448 vehicles in the peak evening hour.
- The Frontage Road had a minimal amount of traffic.



Photo 1: I-70B and 30 Road

### **RECOMMENDED IMPROVEMENTS**

Due to the imminent completion of the construction of 29 Road to connect to I-70B, this intersection and these recommendations should be re-evaluated once traffic has been re-distributed and has a chance to equalize. The following recommendations are based on the existing geometric conditions and travel patterns.

#### **Short-Term Recommendations**

Figure 4 illustrates the short-term recommendations and Figure 5 illustrates the long-term recommendations.

- Re-orient the existing W4-6 (Entering Roadway Added Lane) for the eastbound free right-turn lane to face the turning vehicles properly.
- Evaluate the signal timing for North Avenue and 30 Road. Update to enhance the progression between the signals.
- Extend median on 30 Road to the north by 125 feet or more to reduce the cut-through traffic
- Extend southbound left-turn lane storage length by 70 feet by restriping the TWLTL lines.
- Provide a ¾ movement for the shopping center driveway (right-in, right-out, left-out).

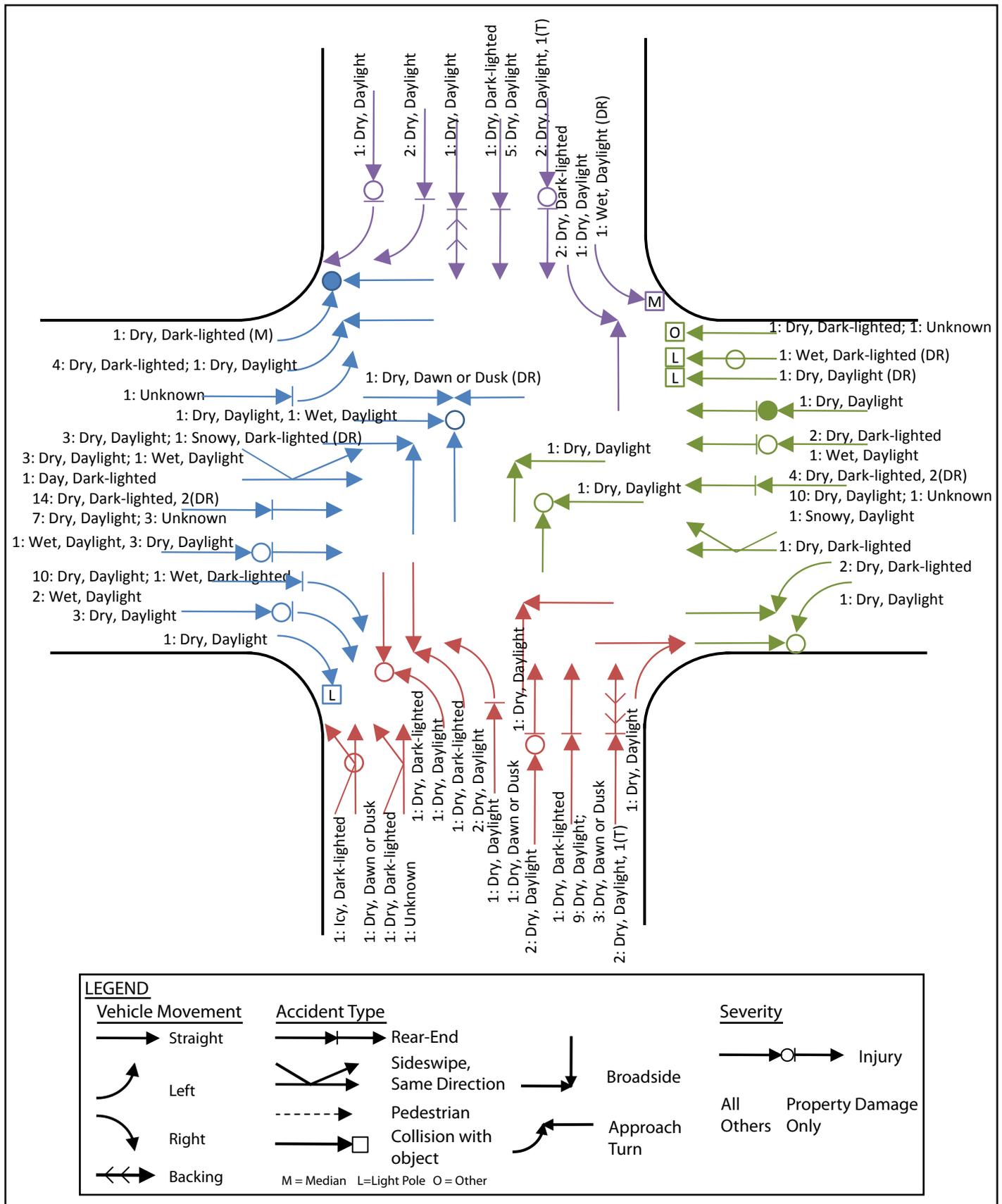
Estimated Cost = \$300 (sign) + \$8,000 (signal timing) + \$10,000 (median) + \$5,000 (striping) + \$7,000 (driveway) = \$30,500

#### **Long-Term Recommendations**

- Update the detection loops and install advanced detection for the off peak hours.
- Lengthen the westbound left-turn lane to meet CDOT requirements. Investigate the use of existing median.
- Apply access management techniques.
- Provide signal interconnection to the signal at North Avenue.
- After 29 Road is open:
  - Develop a corridor signal coordination and timing plan.
  - Reevaluate the traffic patterns and operational needs.
  - Evaluate westbound left-turn volumes to determine the need for a second turn lane. If the current geometry can be stay the same by re-striping the south to have two receiving lanes; however, this will impact the eastbound right-turning vehicles will no longer have a free-flow right. Due to the high volume of eastbound right-turning vehicles, the free flowing operation is desired; therefore, dual westbound left-turn lanes would require the south leg to be widened to three lanes which requires the railroad bridge being widened. As volumes change at this intersection due to 29 Road, the recommended design for these turning movements could be altered.

Estimated Cost = \$100,000 (access management) + \$15,000 (interconnection - wireless) + \$25,000 (detection) + \$30,000 (left-turn) = \$170,000









## STATE HIGHWAY 141 AND E ROAD

### EXISTING CONDITIONS

State Highway 141 is a four-lane highway with a TWLTL through Clifton. There is a considerable amount of traffic traveling on State Highway 141 because it connects I-70B to US Highway 50, bypassing Grand Junction. This highway is the designated route for westbound I-70 travelers to get to Delta, Montrose, and other destinations in southwest Colorado and has a speed limit of 45 mph. E Road is a two-lane collector street traversing east-west through Clifton. It provides access to residential neighborhoods, local businesses, and churches.

This intersection is signalized with left and right-turn lanes and right-turn acceleration lanes on the north- and southbound approaches. The mainline lefts are protected+permitted and the minor approaches are permitted only. The road alignments and sight distance are adequate. There are painted crosswalks for east- and westbound pedestrians, pedestrian curb ramps on all corners, and pedestrian push buttons and signals for all directions. Refer to Figure 6 for existing conditions.

It should be noted that the County has preliminary construction plans for this intersection.

### ISSUES PER THE APPLICATION

This intersection was submitted by Mesa County. According to the application, there is an over representation of broadside accidents, issues associated with the deep gutter pans, closely spaced commercial accesses, out-dated signal equipment, and a need to upgrade the side street radius. The application states that 33 percent of accidents are broadside and the statewide average is 25 percent.

### ANALYSIS

According to the information provided by Mesa County, broadside accidents are greater than the statewide average of locations similar to this intersection. The accident data received from CDOT (2001-2008) indicates that 42 percent of the accidents are rear end, 22 percent are broadside, and 29 percent are approach turn. Most of these accidents occurred in either the north- or southbound directions (21 and 19, respectively). The frequency of these accident types may be impacted by the visibility of the out-dated traffic signal and lack of left-turn phases on the mainline. The east- and westbound accidents could be a result of the slowing created by the cross pans on E Road. Figure 7 provides the crash diagram for this intersection.

Deep cross pans run parallel to State Highway 141 on both sides of the intersection at E Road. It was observed that these pans cause vehicles to slow as they make left-turns from the highway onto E Road, as well as vehicles making any movement from the east- and westbound approaches. This may contribute to the broadside accidents on the mainline since turning vehicles slow more than they or the oncoming driver expects. Vehicles traveling on or from E Road must proceed at very low speeds through the gutter pans, which reduces the capacity of the lanes and green times. It was observed that the deep gutter pans across E Road were providing insufficient drainage

**Ranking: 2**

**County: Mesa**

**ADT: 18,000 (Year 2010)**

**Heavy Vehicles: 5.2%**

**Classification: NRA**

**Milepost: 161.361**

**Accidents: 2001 – 2008**

*Total – 55*  
*Rear End – 23*  
*Broadside – 12*  
*Approach Turn – 16*  
*Pedestrian (school) – 1*  
*Sideswipe – 1*  
*Other – 2*

**LOS (Delay):**

*AM Overall – B (19.9s)*  
*EB – C (26.5s)*  
*WB – B (17.6s)*  
*NB – C (21.1s)*  
*SB – B (17.9s)*

*PM Overall – C (25.7s)*  
*EB – C (30.9s)*  
*WB – C (28.7s)*  
*NB – C (28.1s)*  
*SB – C (21.9s)*

evident by the sitting water and large amounts of gravel. There sediment building in and around the gutter pans could potentially create a safety issue with stopping vehicles by reducing traction.

East of State Highway 141, there are four access points on E Road within 325 feet of the intersection. There are driveways for a gas station, car wash, auto service center, and a building for the local IBEW association (International Brotherhood of Electrical Workers) and the fourth is a road into a residential neighborhood. The nearest access is for the gas station, auto service center, and car wash located approximately 120 feet from the intersection. The residential road aligns with the second auto services driveway at 240 feet from the intersection. The IBEW driveway is 325 feet from the intersection. Conflicts may occur between vehicles turning at any of the accesses and vehicles queued for the signal.

The signal equipment is out dated. There is only one signal head for the westbound approaches that meets the CDOT standards; all other signal heads are missing back plates. The signal poles and mast arms are an older design, but the alignment of the signal heads were verified that they are correctly located over the appropriate lane(s). Typically there is one signal head per lane plus one; the north- and southbound approaches do not have the "plus one" signal head.

Synchro was utilized to determine if split phasing would enhance the operations for the minor approaches; however, the traffic models did not show significant operational benefits. The FHWA guidelines were utilized to evaluate the appropriate phasing for the left-turns at this intersection. It was determined that the north- and southbound left-turns are recommended to remain as protected+permitted. According to the CDOT Access Code, east- and westbound approach volumes are above the criteria for a right and left-turn lane and currently there is only right-turn lanes on each of these approaches.

The radii at this intersection seem to be satisfactory (need to be surveyed) and there are no signs of vehicles driving on the curbs. The acceleration and deceleration lanes were measured and compared to the design criteria of the *CDOT Access Code*. The north- and southbound right-turn deceleration and acceleration lanes are shorter than required. Table 5 provides the existing and required lengths of the auxiliary lanes.

TABLE 5: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 141 AND E ROAD								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Northbound	Left	Existing	160	TWLTL	Yes	N/A	N/A	N/A
		Required	435+75	162		N/A	N/A	
	Right	Existing	100	170	No	200	200	No
		Required	435	162		338	162	
Southbound	Left	Existing	170	TWLTL	Yes	N/A	N/A	N/A
		Required	435+200	162		N/A	N/A	
	Right	Existing	170	90	No	260	165	No
		Required	435	162		388	162	

\* Ends at North Avenue as a trap lane; therefore, there is not a taper.  
Source: Google Earth Pro, and CDOT Access Code

Other observations:

- There is an electric utility wire resting upon the mast arm directly above the eastbound approach.
- State Highway 141 has narrow sidewalks on both sides. There are no sidewalks along E Road, except a small portion at the community center on the northwest corner.
- Pedestrians were seen crossing E Road mid-block and not utilizing the pedestrian facilities at the signalized intersection.
- The pavement markings at the intersection are worn and in poor condition.
- There are irrigation ditches on the northeast and southwest corners. Inlets exist on State Highway 141.
- The property on the southwest corner has been sold and may be redeveloped.
- The property on the southeast corner is a historical site.



**Photo 2: State Highway 141 and E Road**

#### ***RECOMMENDED IMPROVEMENTS***

Figure 8 illustrates the short-term and long-term recommendations.

#### **Short-Term Recommendations**

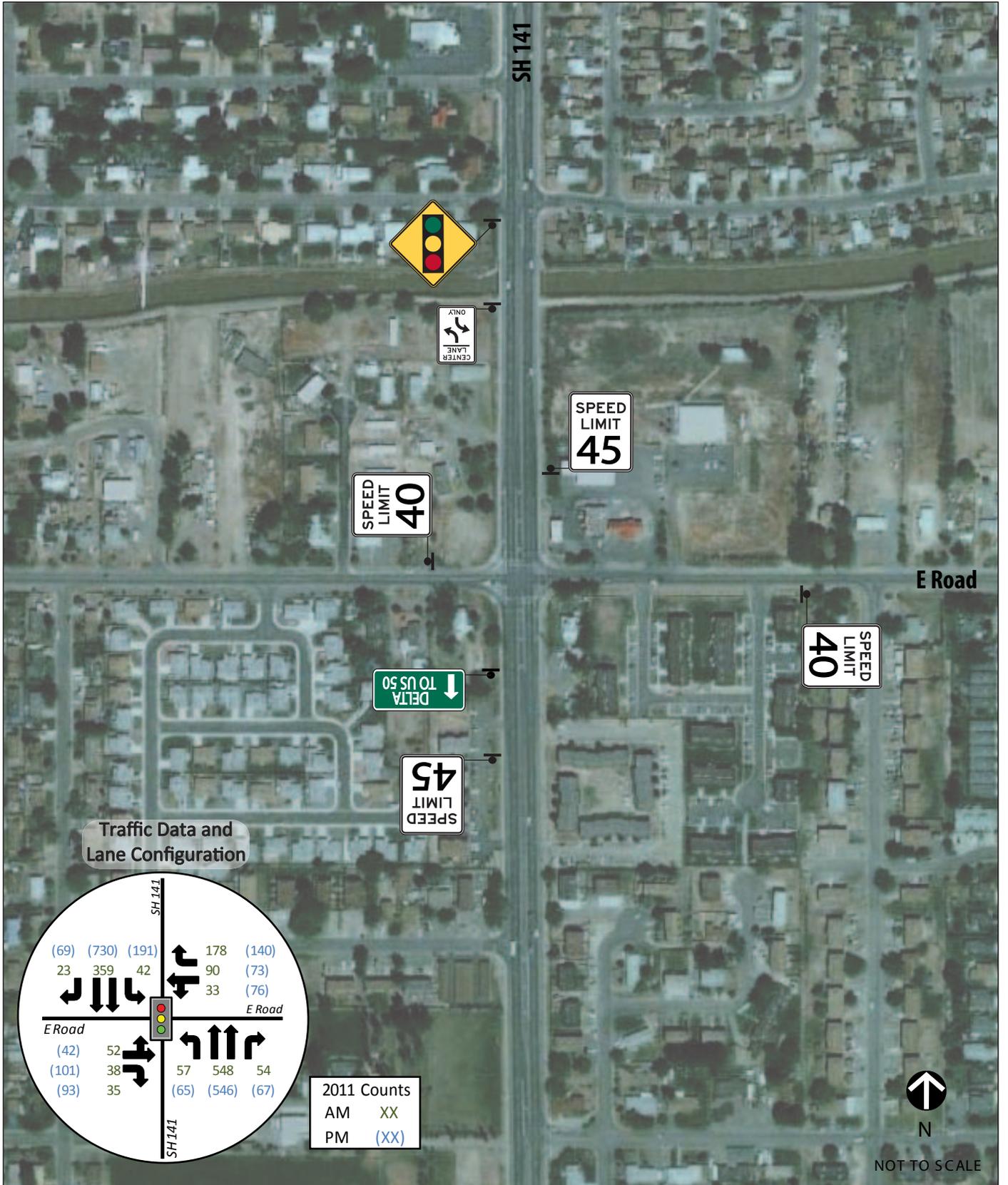
- Fix drainage and remove cross pans.
- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection, and controller.

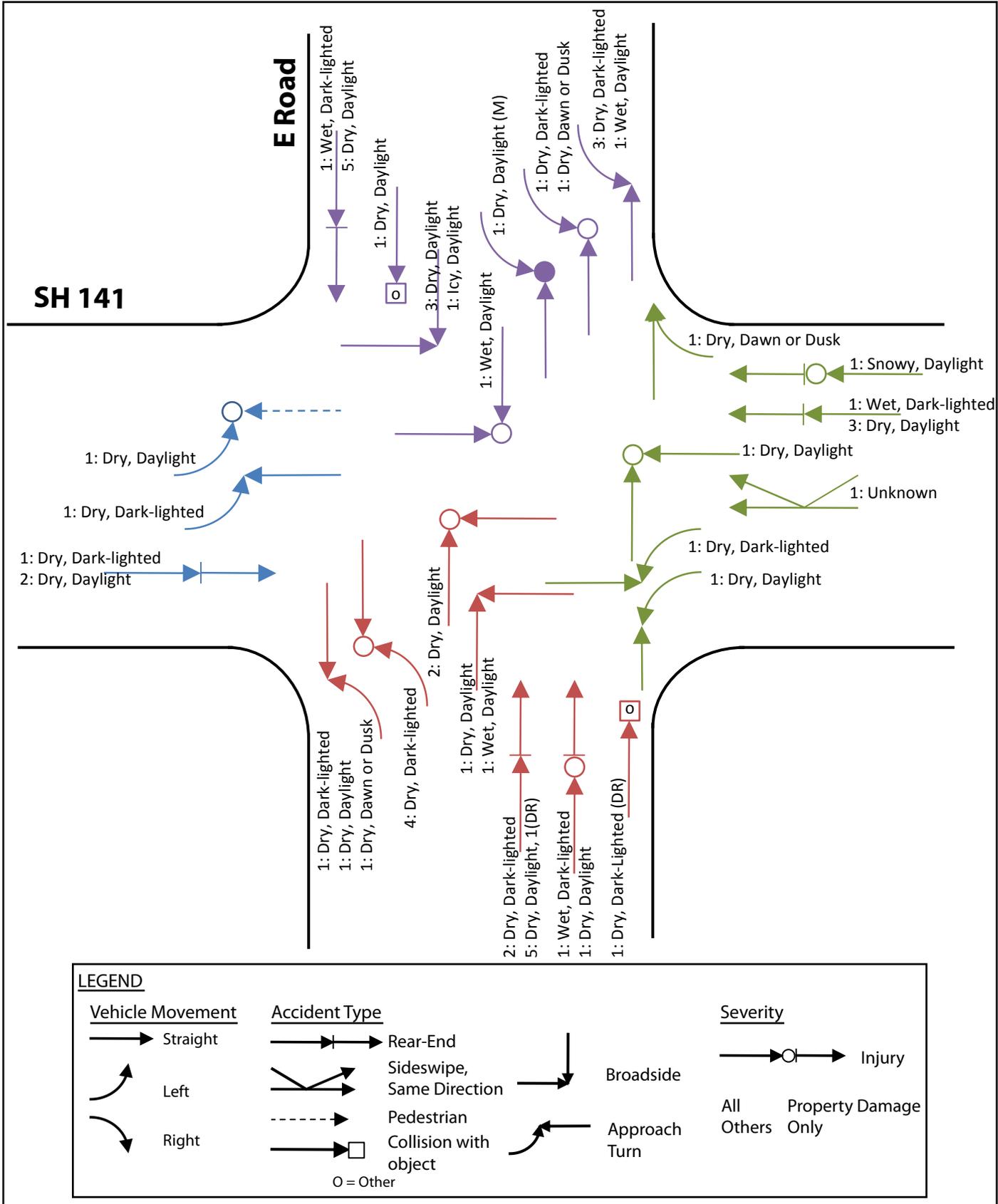
Estimated Cost = \$300,000 (signal) + \$75,000 (drainage) = \$375,000

#### **Long-Term Recommendations**

- Apply access management techniques to E Road.
- Lengthen the deceleration and acceleration lanes to conform to *CDOT Access Code*.

Estimated Cost = \$200,000 (access management) + \$5,000 (striping) = \$205,000

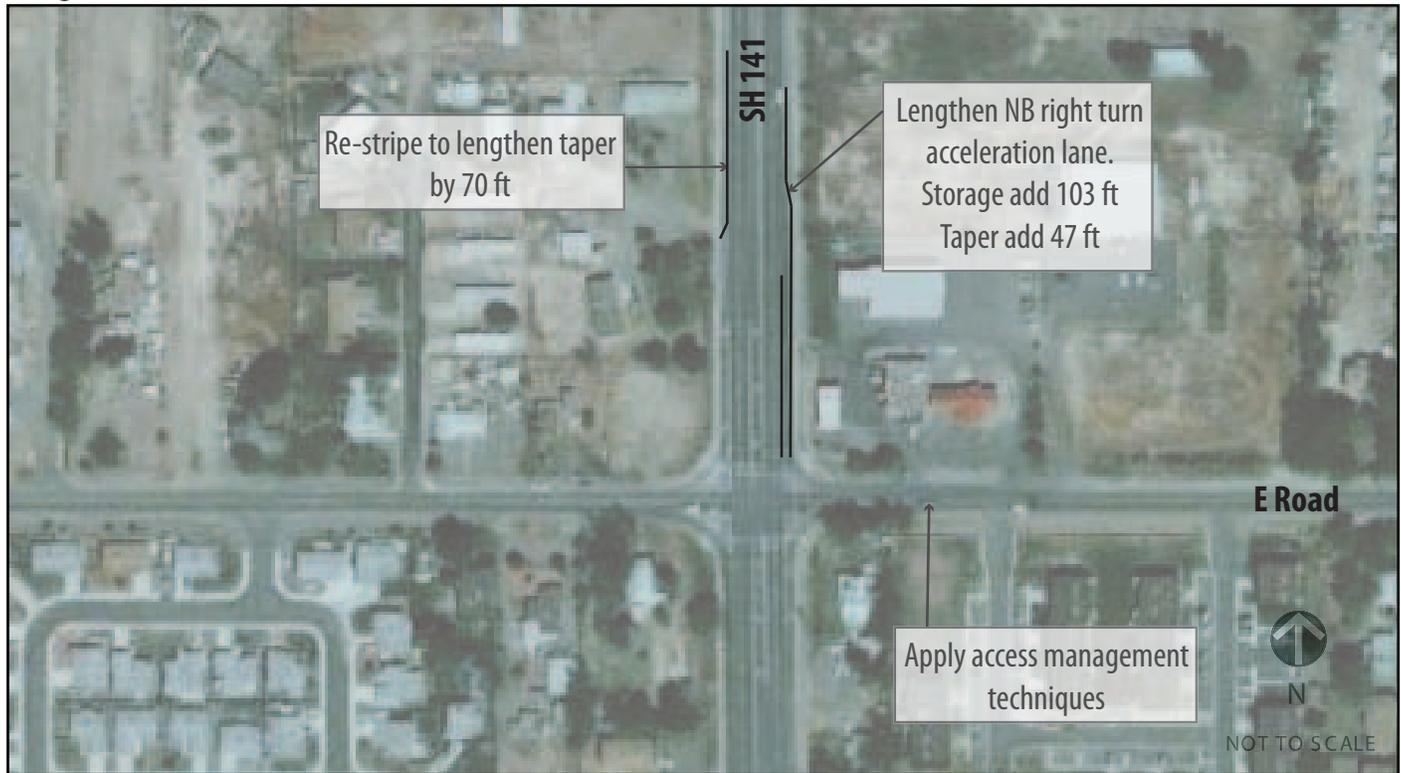




Short-Term Recommendations



Long-Term Recommendations



## STATE HIGHWAY 340 AND REDLANDS PARKWAY

### EXISTING CONDITIONS

State Highway 340 is a two-lane roadway through this intersection that connects Grand Junction to Redlands and then to Fruita. The highway travels east-west and has a speed limit is 45 mph. It provides access to residential neighborhoods, local businesses, schools, wineries, and vineyards. Redlands Parkway is a collector arterial that provides access to residential neighborhoods, a golf course, and recreational areas. It travels over the Colorado River and I-70, providing direction admission into northern Grand Junction.

Grand Junction's Riverfront Trail System travels parallel to Redlands Parkway on the eastern side. The western side does not have a trail or sidewalks. The highway does not have sidewalks or bike lanes west of the intersection.

This signalized intersection has left-turn lanes and channelized right-turn lanes (defined by pork chop islands) on all approaches. There are crosswalks on all approaches, except the northeast side, along with pedestrian signals for all directions. Pedestrian push buttons are installed for the crosswalks parallel to Redlands Parkway. Only the eastbound direction has a protected+permitted phase, while the other directions are permitted only. Refer to Figure 9 for existing conditions

### ISSUES PER THE APPLICATION

According to the application, the City of Grand Junction submitted this intersection for improvements to the safety and operational issues presented by inadequate pedestrian facilities, non-standard acceleration lanes, changing grades, and lack of westbound left-turn phasing. The City identified that the acceleration lanes may not meet the requirements of the *CDOT Access Code*.

### ANALYSIS

According to the accident data provided by the City, there were six approach turn accident between November 2007 and November 2010 (three for eastbound left, one for westbound left, and two for southbound left). Half of these incidents occurred at night. There are two luminaries at this intersection, one on southwest corner and the other on the northeast corner. The accident data received from CDOT indicates that the majority of the accidents are rear-ends, which are evenly split between all the approaches. In the eight years of accident data, there was only one injury collision.

There are pedestrian features (push buttons, signal heads, and crosswalks) at the intersection; however, the pork chops do not have curb ramps which hinders trail users' ability to utilize the pedestrian push buttons. There is also a safety concern for pedestrians and bicyclists as they must cross two channelized right-turn lanes, which are free-flowing into acceleration lanes.

The acceleration and deceleration lanes on State Highway 340 were evaluated and Table 6 summarizes the existing and required lengths for each lane. The existing measurements were taken from an aerial photograph and the required lengths are from the *CDOT Access Code*. Both the left-turn deceleration lanes are substandard

**Ranking: 3**

**City: Grand Junction**

**County: Mesa**

**ADT: 12,000 (Year 2010)**

**Heavy Vehicles: 2.9%**

**Classification: NRA**

**Milepost: 9.526**

**Accidents: 2001 to 2008**

*Total – 14*

*Rear End – 7*

*Broadside – 2*

*Approach Turn – 3*

*Head On – 1*

*Other – 1*

to the CDOT criteria. The eastbound left-turn can easily be increased by re-striping the TWLTL lines; however, the westbound left-turn is limited by the back-to-back left-turn lane for a downstream driveway. All the right-turn acceleration and deceleration lanes on the highway do not have tapers because they either begin or end at a driveway (as known as trap lanes). The right-turn deceleration lanes provide adequate deceleration length, but the eastbound acceleration lane is short due to it ending at a driveway. For the minor approaches the storage lengths are as follows: the left turn lanes are 80 feet and the right turn lanes are 100 feet. According to the traffic data, the northbound left-turn and right-turn lanes should be 50 feet, the southbound left-turn should be 200 feet, and the southbound right-turn lane should be 300 feet.

TABLE 6: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 340 AND REDLANDS PARKWAY								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	65	TWLTL	No	N/A	N/A	N/A
		Required	273+400	162		N/A	N/A	
	Right	Existing	400	*	Yes	260	*	No
		Required	273	162		338	162	
Westbound	Left	Existing	150	100	No	N/A	N/A	N/A
		Required	273+200	162		N/A	N/A	
	Right	Existing	275	*	Yes	440	*	Yes
		Required	273	162		338	162	

\* Starts/ends at a driveway; therefore, there is not a taper.  
Source: Google Earth Pro, and CDOT Access Code

Due to the varying grades of the roadways, this intersection is located “in a hole”. The highway is on a steep downgrade into the intersection from the west (4.6 percent), and then changes to an upgrade at the intersection for the east leg (3.2 percent). Redlands Parkway is at slight grade through the intersection (3.8 percent to the north and 2.3 percent to the south).

The signal currently does not have any advanced detection or a left-turn phase for the westbound approach. According to the FHWA guidelines, the westbound left-turn lane should operate as protected+permitted due to the conflicting volumes between the left-turning vehicles and the opposing through/right-turning vehicles. The FHWA guidelines suggest protected+permitted phasing if the left-turning volume multiplied by the opposing through and right-turning volumes is greater than 50,000 during the peak hour. In the PM peak hour there are 181 westbound left-turning vehicles and 459 eastbound vehicles (23 right-turns and 436 through); when multiplied the resulting value is 70,409. For that reason the westbound left-turn phasing should be upgraded.



**Photo 3: State Highway 340 and Redlands Parkway**

### **RECOMMENDED IMPROVEMENTS**

Figure 10 and Figure 11 illustrate the recommendations for State Highway 340 and Redlands Parkway

#### **Short-Term Recommendations**

- Construct ADA compliant curb ramps on the trail and on the pork chop islands.
- Install trail crossing signs (W11-1 and W16-7p) at free right-turn lanes (northbound and westbound approaches).
- Add crosswalk pavement markings on free right-turn lanes (northbound and westbound approaches).
- Change the westbound left-turn lane to have protected+permitted phasing. This will require a new signal head to be installed for this lane.
- Extend the eastbound left-turn lane on the highway to conform to *CDOT Access Code*. Explore the opportunity to re-stripe the TWLTL lines.
- Extend the southbound left-turn lane to conform to *CDOT Access Code*. Investigate the ability to use the existing median.

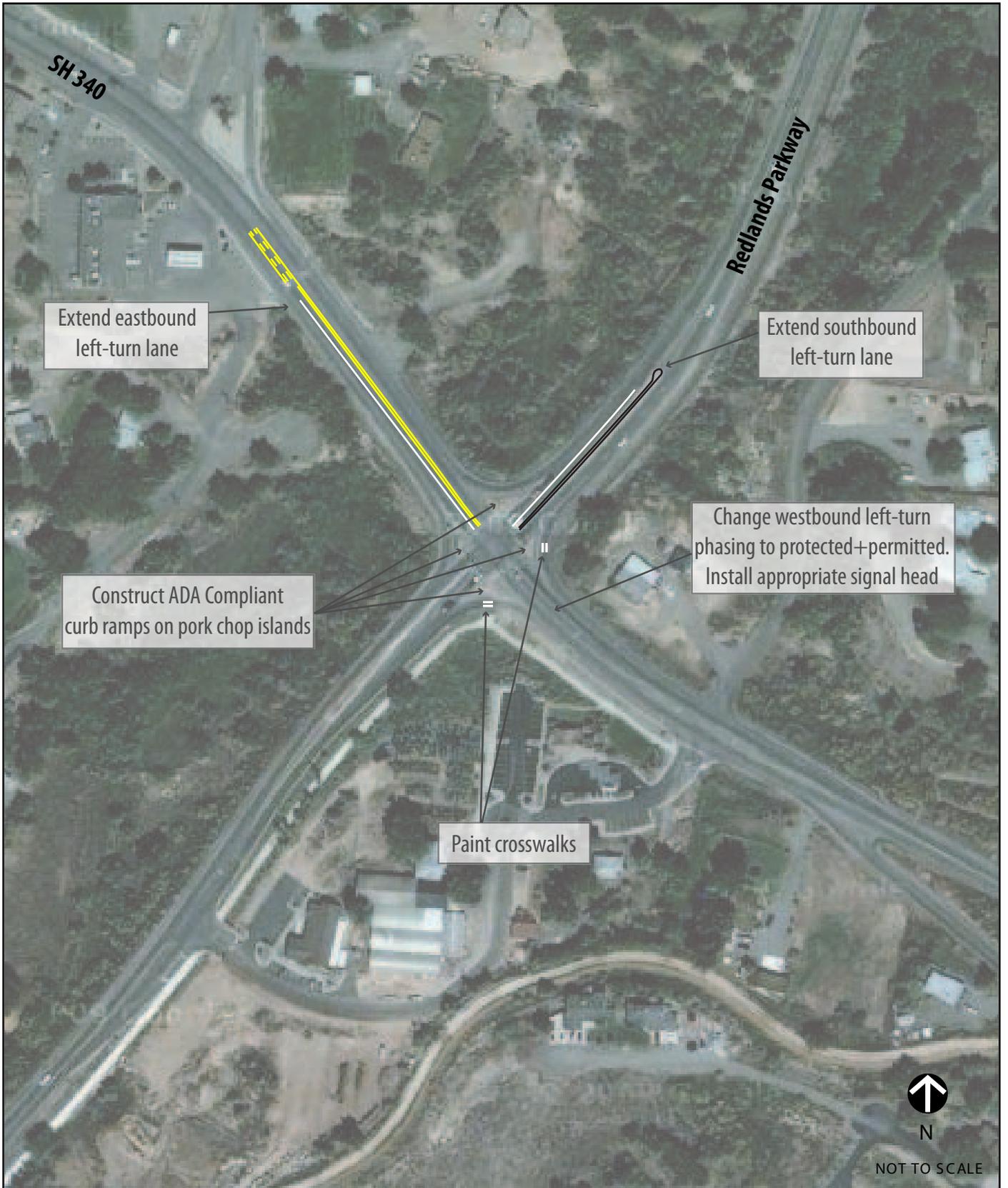
Estimated Cost = \$10,000 (curb ramps) + \$1,200 (signs) + \$1,000 (striping) + \$2,000 (signal head/phasing) + \$10,000 (left-turn lane) = \$25,200

#### **Long-Term Recommendations**

- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection (include advanced detection), and controller.
- Add a four-foot median on State Highway 340.
- Construct dual left turn lanes for the eastbound approach to provide increase the capacity and reduce the green time. This will require constructing a second north receiving lane.
- Extend the southbound right-turn lane to conform to *CDOT Access Code*.

Estimated Cost = + \$300,000 (signal) + \$8,000 (median) + \$400,000 (turn lanes) = \$708,000







## STATE HIGHWAY 340 AND KINGSVIEW ROAD

### EXISTING CONDITIONS

State Highway 340 is a two-lane roadway through this intersection that connects Fruita to Redlands and Grand Junction. At Kingsview Road, the highway is on a downgrade, greater than eight percent, to the north and is without acceleration and deceleration lanes. Kingsview Road is a local street that serves a small residential neighborhood, as well as an open space area and recreationally-used BLM properties.

This intersection is stop-controlled on the minor approaches. There are no acceleration or deceleration lanes. Refer to Figure 12 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Fruita submitted this intersection for improvements due to the safety and operational issues presented by the lack of acceleration and deceleration lanes, steep grade, and the high speed on the highway (55 mph).

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic counts (turning movement) to determine if the requirements for acceleration and deceleration lanes on State Highway 340 are met per the *CDOT Access Code*. Construct the lanes if they are required or desired.
- Evaluate the sight distance for each approach based on the guidelines of the AASHTO Policy on Geometric Design for Streets and Highways and *CDOT Access Code*.
  - Modify the grading.
  - Redesign the intersection if necessary.

**Ranking: 4**

**City: Fruita**

**County: Mesa**

**ADT: 8,200 (Year 2010)**

**Heavy Vehicles: 2.6%**

**Classification: RA**

**Milepost: 1.839**

**Accidents: 2001 to 2008**

Total – 2

Overtaking Turn – 2



## US HIGHWAY 6 AND 20 ROAD

### EXISTING CONDITIONS

US Highway 6 serves as a primary connection between local cities and to I-70. 20 Road serves local traffic to residential and agricultural areas, as well as providing a bridge over I-70. There is a high volume of vehicles traveling through this intersection due to the bridge crossing that provides access to the south side of I-70.

Currently, this intersection is stop-controlled on 20 Road and the highway has a speed limit of 55 mph. The Union Pacific railroad crosses 20 Road just south of the intersection (130 feet). The railroad currently has gates and red signal. Refer to Figure 13 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Fruita submitted this intersection due to the safety issues pertaining to the close proximity to a railroad crossing, the odd alignment of the minor approaches, and absence of left-turning acceleration lanes. The north leg of 20 Road has a 32 degree skew angle and is offset from south leg which is perpendicular to the highway. The alignment and high speeds create difficulties for left-turning vehicles.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic counts (turning movement and hourly directional) to determine if the requirements for acceleration and deceleration lanes on US Highway 6 are met (per the CDOT Access Code) and analyze signal warrants (per the MUTCD).
- Realign 20 Road to remove the offset and upgrade the railroad gates and signal.

**Ranking: 5**

**City: Fruita**

**County: Mesa**

**ADT: 15,000 (Year 2010)**

**Heavy Vehicles: 5.6%**

**Classification: RA**

**Milepost: 23.657**

**Accidents: 2001 to 2008**

*Total – 12*

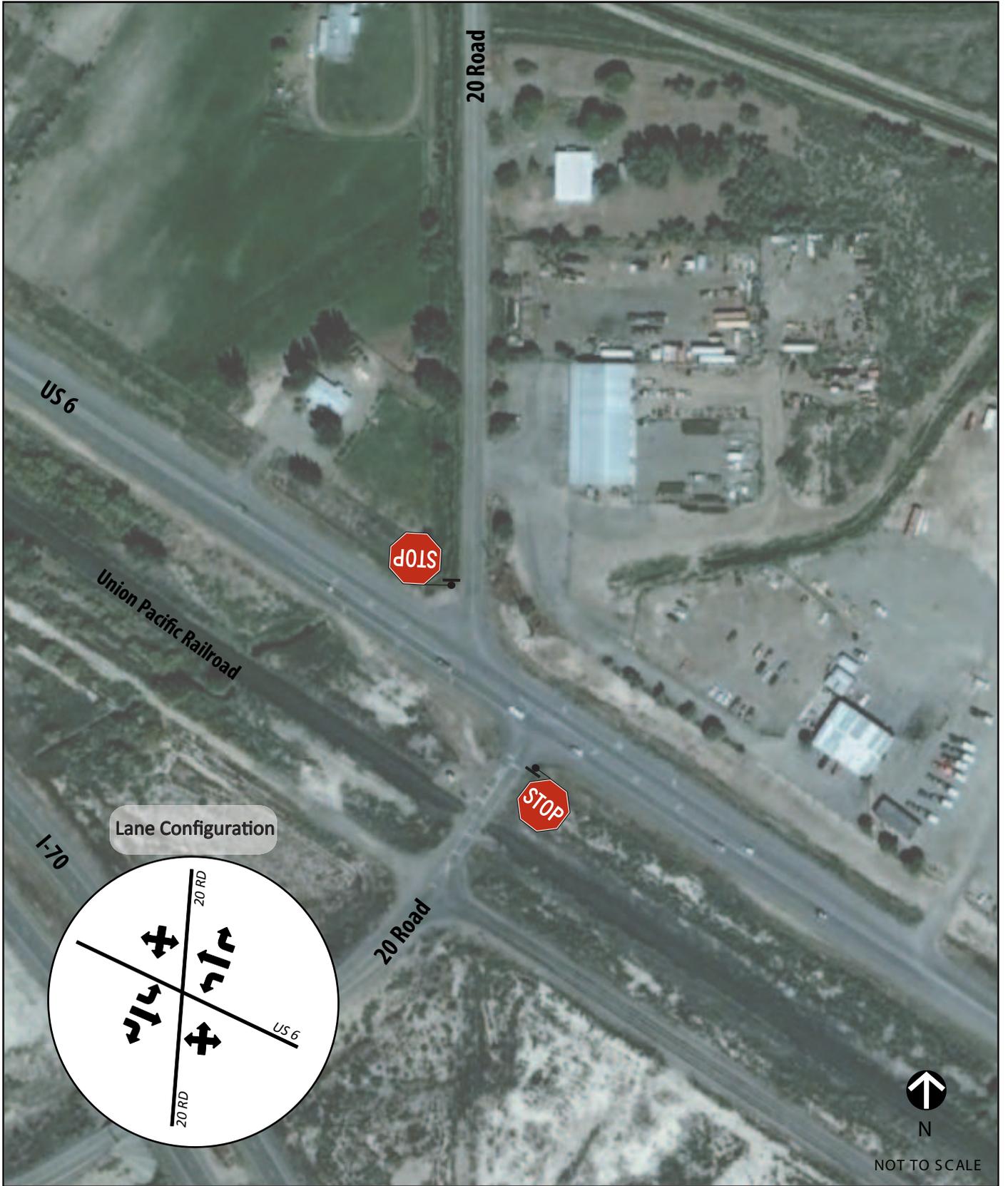
*Broadside – 6*

*Overtaking – 3*

*Rear End – 1*

*Sideswipe – 1*

*Other – 1*



## US HIGHWAY 6 AND ELBERTA AVENUE /37<sup>3</sup>/<sub>10</sub> ROAD

### EXISTING CONDITIONS

US Highway 6 is the primary east-west arterial through Palisade and connects to Grand Junction. At this location, the highway is two-lanes wide with a speed limit of 40 mph. There are two frontage roads associated with this intersection, one north and one south, and both are parallel to US Highway 6. Both frontage roads extend from 37.1 Road to Iowa Avenue (approximately one-half mile) and Elberta Avenue is the midpoint. 37<sup>3</sup>/<sub>10</sub> Road, southbound approach, leads to a bank, wineries, residential neighborhoods, community recreation center, and provides access to I-70. Elberta Avenue, the northbound approach, provides access to the south frontage road, wineries, and residential areas. Due the number of wineries and orchards in the area, this intersection experiences a high volume of tourist traffic.

Currently, the intersection is stop-controlled on the minor approaches. The approaches of the frontage roads are also stop-controlled. The only turn lanes are the right-turn lanes on the highway. Crosswalks are painted on US Highway 6 for north- and southbound pedestrians. Refer to Figure 14 for existing conditions.

### ISSUES PER THE APPLICATION

This intersection was submitted by the City of Palisade for evaluation. According to the application, there are conflicts with the frontage roads, a lack of left-turn lanes on the highway, an absence of bike lanes, concerns for pedestrian safety, and close spacing with other intersections.

### ANALYSIS

Both frontage roads create present additional conflicts for vehicles turning on and off the highway. Left-turn lanes currently do not exist on the highway and vehicles must slow or stop for those waiting for a gap to turn left onto Elberta Avenue. Elberta Avenue does not align with 37<sup>3</sup>/<sub>10</sub> Road; it is offset by approximately 50 feet to the west and connects to the south frontage road. The northbound approach from the frontage road does align with 37<sup>3</sup>/<sub>10</sub> Road. There are many other roadways accessing US Highway 6 and the frontage roads within close proximity (one-half mile or less) to the studied intersection in both directions. There are no bike lanes or sidewalks for bicyclists on the highway. Pedestrians have two crosswalks to traverse US Highway 6, however, the high speeds and width of the highway and frontage roads create a challenging crossing situation.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic, pedestrian, and bicycle counts (turning movement and hourly directional) to determine the operational needs for each.
- Consider closing the west side access of the north frontage road to 37<sup>3</sup>/<sub>10</sub> Road.

**Ranking: 6**

**City: Palisade**

**County: Mesa**

**ADT: 6,300 (Year 2010)**

**Heavy Vehicles: 1.7%**

**Classification: RA**

**Milepost: 42.706**

**Accidents: 2001 – 2008**

*Total – 8*

*Rear End – 1*

*Broadside – 2*

*Approach Turn – 2*

*Sideswipe – 1*

*Head On – 1*

*Other - 1*



## US HIGHWAY 6 AND 17 ROAD/COULSON STREET

### EXISTING CONDITIONS

The intersection of US Highway 6 and 17 Road/Coulson Street is located just northwest of the I-70 interchange with State Highway 340, which is the only interstate access to the City of Fruita. US Highway 6 serves as a primary connection to I-70 and accommodates a high volume of heavy vehicles. Currently, 17 Road and Coulson Street do not align since the north leg was recently redesigned to intersect the highway at a 90 degree angle. The south leg (17 Road) continues to be at a skew with US Highway 6 and is offset from Coulson Street. 17 Road is currently a gravel road and provides access to Heritage Park and a large developable industrial-zoned parcel. Coulson Street leads to businesses and residential areas.

Currently, this intersection is stop-controlled on 17 Road and Coulson Street, with a speed of 35 mph on the highway. The Union Pacific railroad crosses 17 Road just south of the intersection (170 feet). Refer to Figure 15 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Fruita submitted this intersection due to the safety issues pertaining to the close proximity to a railroad crossing, the odd alignment of the minor approaches, the anticipated future traffic demand, and the lack of acceleration and deceleration lanes. The railroad is within 150 feet from the center of the intersection. 17 Road has a 38 degree skew angle and is offset to the east of Coulson Street by approximately 30 feet. It is expected that the traffic will increase once the business park development is constructed on 17 Road.

### ANALYSIS

Recently, Coulson Street was realigned to be 90 degrees with US Highway 6, which included adding a TWLTL to accommodate left-turns onto the minor approaches. The current geometry adequately serves the current traffic demand. Acceleration/deceleration lanes should be constructed as development occurs and traffic volumes increase. Current traffic volumes may not warrant acceleration or deceleration lanes for 17 Road per the *CDOT Access Code* standards; therefore, the growth should be monitored to provide adequate capacity. Since the highway speed limit is less than 40 mph, the greater thresholds must be met. When Coulson Street was realigned, US Highway 6 was widened to accommodate an eastbound left-turn lane. The additional width extends east of the intersection and provides space for a future westbound left-turn lane to 17 Road if it were realigned with Coulson Street.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Once development begins, utilize the existing traffic study to upgrade the intersection. Realign 17 Road, signalize, install railroad gates and signal, and provide the necessary deceleration and acceleration lanes.

**Ranking: 7**

**City: Fruita**

**County: Mesa**

**ADT: 5,600 (Year 2010)**

**Heavy Vehicles: 8.9%**

**Classification: NRB**

**Milepost: 19.955**

**Accidents: 2001 to 2008**

Total – 5

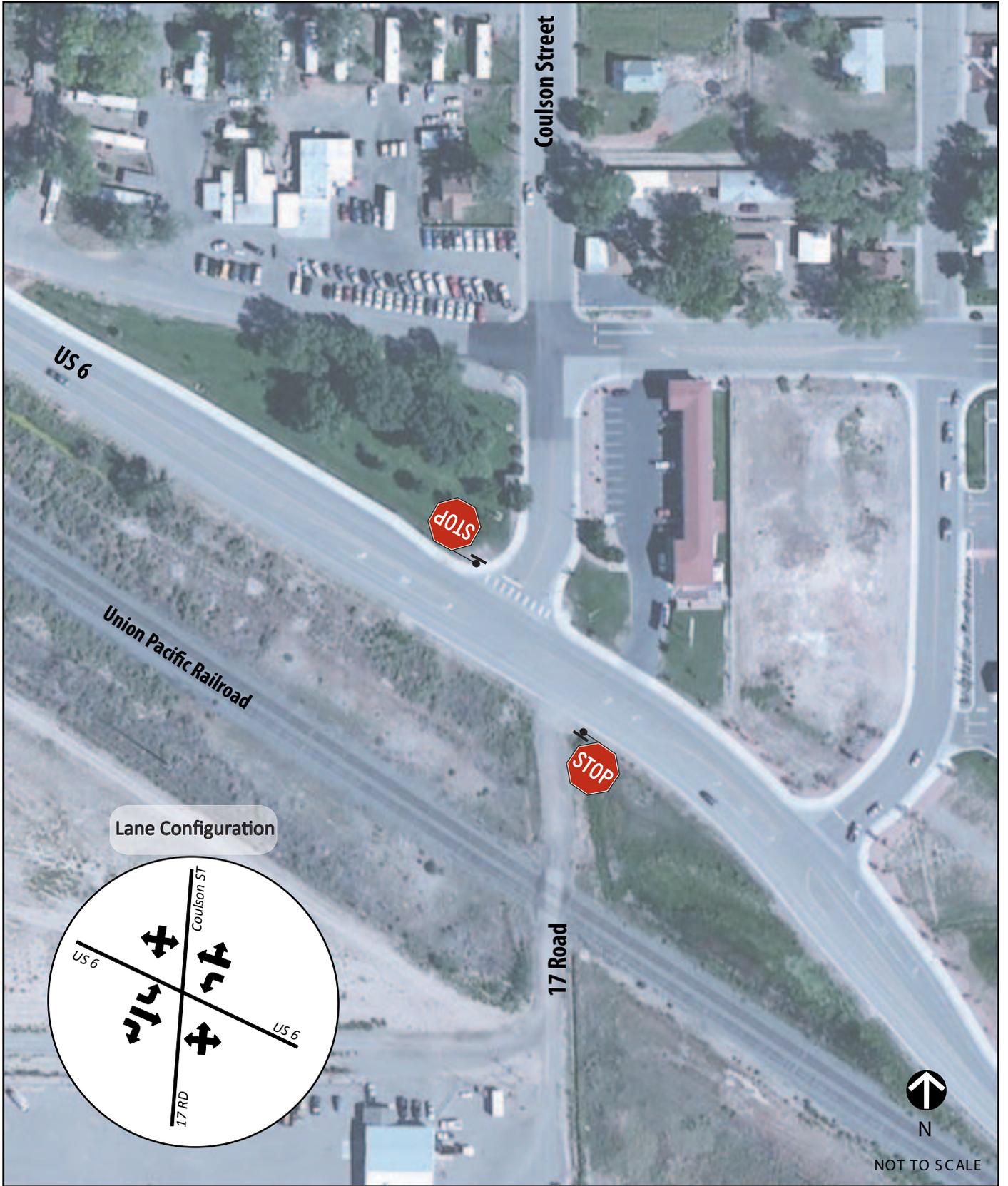
Rear End – 1

Broadside – 1

Approach Turn – 1

Sideswipe – 1

Head On - 1



## US HIGHWAY 6 AND 37.1 ROAD

### EXISTING CONDITIONS

US Highway 6 is the primary east-west arterial through Palisade and connects the City to Grand Junction. At this location, the highway is two-lanes wide with a speed limit of 40 mph. There are two frontage roads associated with this intersection, one north and one south, and both parallel to US Highway 6. Both frontage roads extend from 37.1 Road to Iowa Avenue (about one-half mile). The north Frontage Road only has a westbound approach on 37.1 Road. 37.1 Road travels north from the highway and is a two lane local roadway that provides access to residences and wineries. There is a high volume of tourist traffic.

This intersection is an off-set T with 37.1 Road to the west and the south frontage road to the east by 150 feet. Currently, the intersection is stop-controlled on the minor approaches. The frontage roads' approaches are also stop-controlled. There is one crosswalk on US Highway 6 on the east side, which is mostly used by school children for both the high school (to the west) and the elementary school (to the east). The westbound approach of US Highway 6 provides a right-turn deceleration lane. There are no other auxiliary lanes at this intersection. Refer to Figure 16 for existing conditions.

### ISSUES PER THE APPLICATION

This intersection was submitted by the City of Palisade for evaluation. According to the application, this intersection has conflicts with the frontage roads, an absence of left-turn lanes on the highway, lack of bike lanes, and difficult pedestrian crossing.

### ANALYSIS

The northern frontage road presents additional conflicts for vehicles turning on and off the highway. Since the northbound approach does not have another intersection with the south frontage road there are fewer conflicts than those on the southbound approach. Left-turn lanes currently do not exist on the highway and vehicles must slow or stop for those waiting for a gap to turn left onto 37.1 Road or the southern Frontage Road. Bicyclists do not have bike lanes or sidewalks along the highway. The local high school is located on US Highway 6 about 900 feet to the east 37.1 Road. The existing crosswalk is highly utilized by young students and adults during school and for events in the park. Pedestrians have to cross the highway and both frontage roads. The high speed and heavy truck traffic also add to the risk of crossing at this intersection.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic, pedestrian, and bicycle counts (turning movement and hourly directional) to determine the operational needs for each and evaluate different intersection designs.
  - Construct left-turn lanes on the east- and westbound approaches if volumes meet the criteria of the *CDOT Access Code*.

**Ranking: 8**

**City: Palisade**

**County: Mesa**

**ADT: 6,300 (Year 2010)**

**Heavy Vehicles: 1.7%**

**Classification: RA**

**Milepost: 42.464**

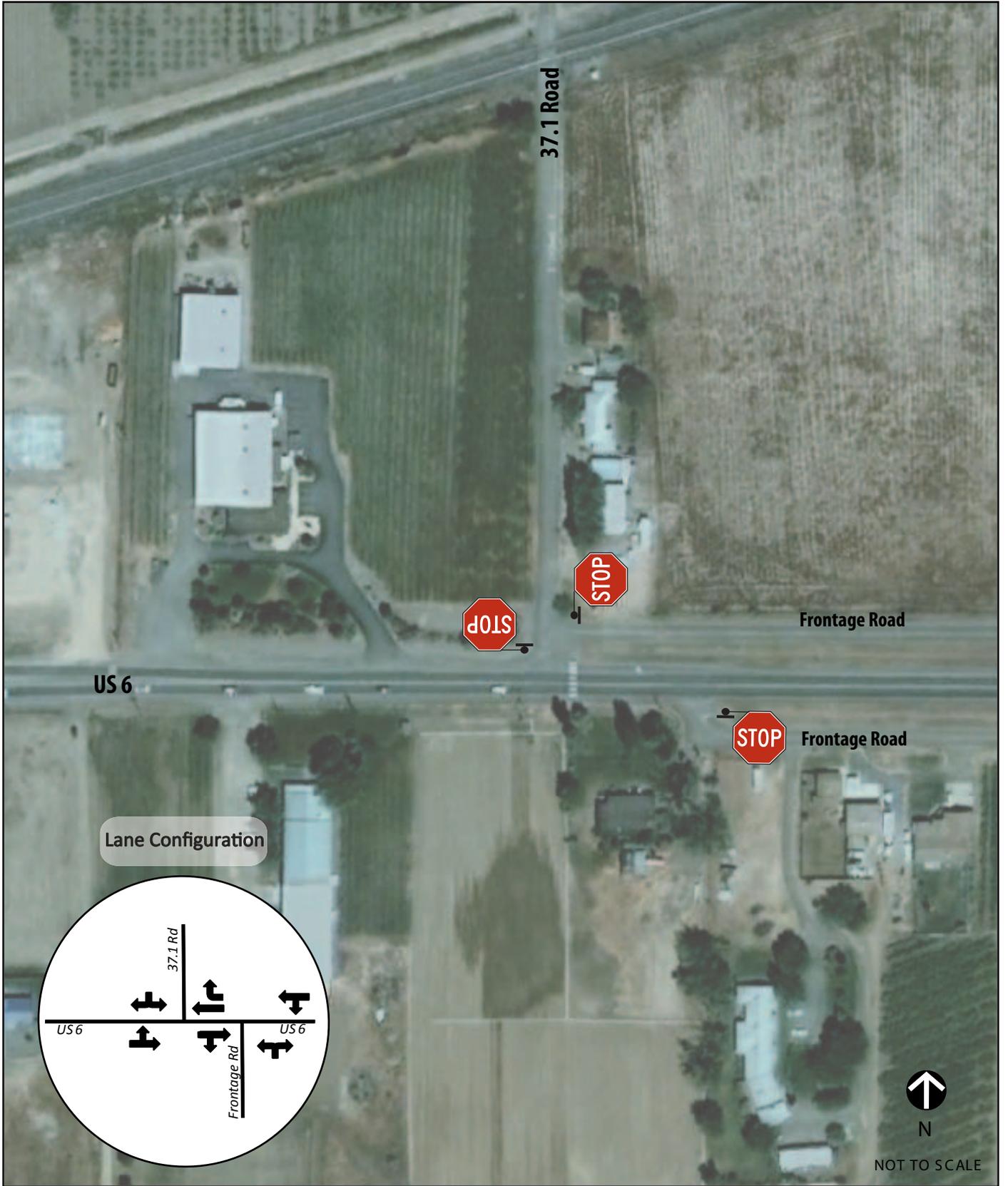
**Accidents: 2001 – 2008**

Total – 6

Rear End – 5

Other – 1

- Close the frontage road access to 37.1 Road.
- Realign the minor approaches to have matching centerlines.



## US HIGHWAY 6 AND IOWA AVENUE

### EXISTING CONDITIONS

US Highway 6 is the primary east-west arterial through Palisade and connects the City to Grand Junction. At this location, eastbound becomes two lanes and westbound changes from two lanes (east of the intersection) to one lane (west of the intersection) with a speed limit of 40 mph. There are two frontage roads associated with this intersection, one north and one south, and both parallel to US Highway 6. Both frontage roads extend from 37.1 Road to Iowa Avenue (about one-half mile) and only have eastbound approaches. Iowa Avenue is a two-lane local street that provides access to residences and the library. The southbound approach of Iowa Avenue is perpendicular with US Highway 6. The northbound approach is south Frontage Road and Iowa Avenue connects to it west of the highway intersection. Due to the number of wineries in the area, there is a high volume of tourist traffic.

Currently, the intersection is stop-controlled on the minor approaches. The approaches of the frontage roads are stop-controlled. There is one crosswalk across US Highway 6 on the east that is used to get to the library and elementary school. Refer to Figure 17 for existing conditions.

### ISSUES PER THE APPLICATION

This intersection was submitted by the City of Palisade for evaluation. According to the application, this intersection has conflicts with the frontage roads, absence of left-turn lanes on the highway, lack of bike lanes, difficult pedestrian crossing, heavy truck traffic, and close spacing to other intersections.

### ANALYSIS

Both frontage roads present additional conflicts with vehicles turning on and off the highway. Left-turn lanes currently do not exist on the highway and vehicles must slow or stop for those waiting to turn left onto Iowa Avenue. There are many other roadways accessing US Highway 6 and the frontage roads within close proximity (one-half mile or less) to the studied intersection in both directions. Bicyclists do not have bike lanes or sidewalks on the highway. The local elementary school is located south of US Highway 6 (east of Iowa Avenue), the library is at the northeast corner of the intersection, and the City Park is south. The existing crosswalk is utilized by students and adults during school and for events in the park. Pedestrians have to cross the highway and both frontage roads. The high speed and heavy truck traffic also add to the challenge of crossing at this intersection.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic, pedestrian, and bicycle counts (turning movement and hourly directional) to determine the operational needs for each and evaluate different intersection designs.
- Consider changing the north frontage road to one-way in the eastbound direction and make the access at 37.1 Road a right-in-right-out or close the frontage road access to Iowa Avenue. Consider making the south frontage road access a right-in-right-out.

**Ranking: 9**

**City: Palisade**

**County: Mesa**

**ADT: 6,300 (Year 2010)**

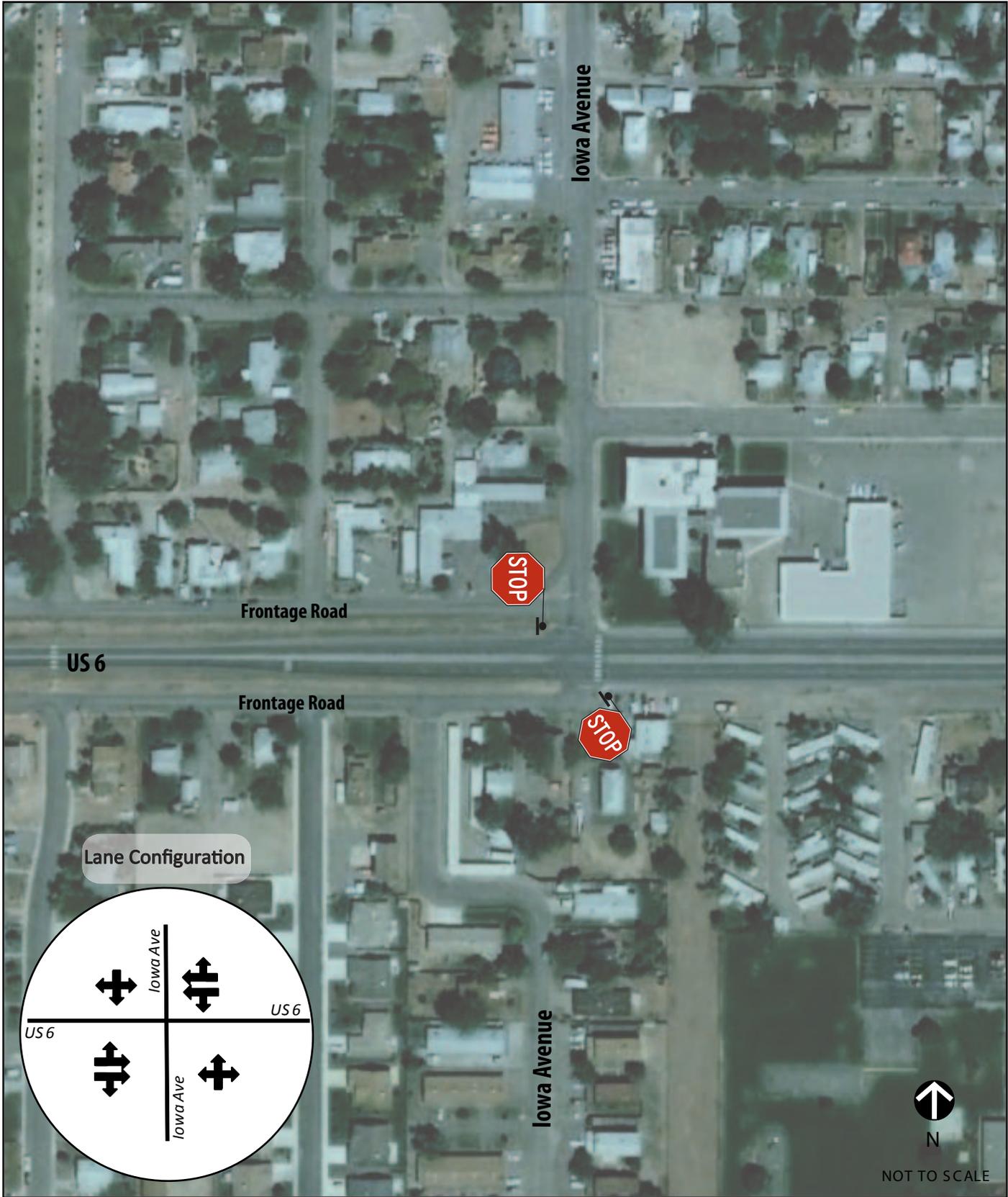
**Heavy Vehicles: 1.7%**

**Classification: EX**

**Milepost: 42.957**

**Accidents: 2001 – 2008**

**Total – 0**



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## 4. TRANSPORTATION PLANNING REGION: GUNNISON VALLEY

The Gunnison Valley TPR (#9) includes the counties of Delta, Gunnison, Hinsdale, and a portion of Montrose. This TPR also includes counties within Region 5 that are not included in this study (Ouray and San Miguel). Many cities/towns are located within these counties, such as Gunnison, Delta, Montrose, Hotchkiss, Olathe, and Crested Butte.

The following submitted intersections are located within the Gunnison Valley TPR:



- Tier 1:**
- State Highway 135 and Spencer Avenue
  - US Highway 50 and San Juan Avenue/Grand Avenue
  - US Highway 550 and 12th Street/Columbia Way
- Tier 2:**
- State Highway 133 and Samuel Wade Road/Bethlehem Road
  - State Highway 135 and County Road 740 (Cement Creek Road)
  - State Highway 65 and State Highway 92
  - State Highway 90 and Chipeta Road
  - US Highway 50 and 10<sup>th</sup> Street
  - US Highway 50 and Gunnison River Drive
- Tier 3:**
- State Highway 135 and County Road 738 (Brush Creek Road)
  - State Highway 348 and 5700 Road
  - US Highway 50 (Business Route) and Highway 348
  - US Highway 50 Frontage Road and County Road 17 (Antelope Creek Road)
  - US Highway 550 and Niagara Road

## US HIGHWAY 50 AND SAN JUAN AVENUE/GRAND AVENUE

### EXISTING CONDITIONS

This signalized intersection is located just south of the Montrose County Airport on the north end of town. US Highway 50 is a four-lane roadway, transverses north-west/south-east through Montrose, and carries a high volume of local and regional traffic. Grand Avenue is a local collector that provides access to the offices, businesses, and residences. San Juan Avenue provides access to City Public Works, many businesses, and the local fairgrounds. Recently, the route for US Highway 50 in Montrose was changed from Main Street and Townsend Avenue to San Juan Avenue. Travelers on westbound US Highway 50, from Gunnison, are directed to turn onto San Juan Avenue to by-pass downtown Montrose and then turn onto the highway at this studied intersection. San Juan Avenue/Grand Avenue does not intersect the highway perpendicularly. Parallel to and west of the highway, an at-grade railroad crossing exists. Refer to Figure 18 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Montrose submitted the intersection of US Highway 50 and San Juan Avenue/Grand Avenue for improvement consideration due to the repeated occurrence of rear-end crashes in the westbound right-turn lane. The City's data indicates there were 16 crashes between January 1, 2010, and December 9, 2010, and 12 of them were rear-ends accidents in the westbound approach (4 had injuries). The City identified the cause of the high rear-end accident rate is the skew between westbound and northbound approaches.

### ANALYSIS

The traffic counts captured approximately 300 westbound right-turning vehicles in each of the morning and evening peak hours. In the same peak hours, the northbound approach had 409 vehicles in the AM and 713 vehicles in the PM. According to the accident data from CSP there were 105 accidents between January 2001 and December 2008, with a total of 76 rear-ends and 20 of those were in the westbound right-turn lane. Of the 44 accidents on the westbound approach, 45 percent occurred in the right-turn lane. The shift of the highway route has changed the volumes for all movements and it is understood that the westbound right-turn and southbound left-turn had an increase in traffic since these vehicles previously would have been north- or southbound through vehicles at this intersection. Figure 19 provides the crash diagram for this intersection.

During the field visit, it was observed that the westbound right-turn has an overlap phase with a green arrow, which some drivers did not recognize. The right-turning vehicles stop near or over the stop bar to be able to view the oncoming northbound vehicles. As drivers are watching for a gap in traffic, they are not noticing when the green arrow is on. Following drivers may assume the front vehicle sees the green arrow or will take a certain gap, but do not, which may contribute to the rear-end collisions. Visibility of northbound traffic may be hindered by the vehicles waiting in the westbound through and left lanes, as well as the trees and shrubs at the motel on the southeast corner of the intersection.

**Ranking: 1**

**City: Montrose**

**County: Montrose**

**ADT: 11,000 (Year 2010)**

**Heavy Vehicles: 6.1%**

**Classification: NRA**

**Milepost: 93.558**

**Accidents: 2001 – 2008**

*Total – 105*

*Rear End – 76*

*Broadside – 14*

*Sideswipe – 8*

*Approach Turn – 2*

*Bicycle – 2*

*Other – 3*

The acceleration and deceleration lanes were measured and compared to the design criteria of the *CDOT Access Code*. The existing auxiliary lanes are adequate in length, except for the southbound left-turn deceleration lane which needs an additional 266 feet of storage. The westbound approach was included since the US Highway 50 route has changed to travel on San Juan Avenue. The westbound left-turn deceleration is shorter than required per the *CDOT Access Code*, but it provides more storage than is required for its previous roadway classification and traffic volumes.

Approach	Lane	Condition	Deceleration			Acceleration		
			Decel +Storage	Taper	Met?	Accel	Taper	Met?
Northbound	Left	Existing	290	150	Yes	N/A	N/A	N/A
		Required	226+25	144		N/A	N/A	
	Right	Existing	225	150	Yes	N/A	N/A	N/A
		Required	226	144		N/A	N/A	
Southbound	Left	Existing	260	120	No	N/A	N/A	N/A
		Required	226+ 300	144		N/A	N/A	
	Right	Existing	300	200	Yes	280	*	Yes
		Required	226	144		236	144	
Westbound	Left	Existing	130	140	No	N/A	N/A	N/A
		Required	226+ 50	144		N/A	N/A	
	Right	Existing	350	*	Yes	N/A	N/A	N/A
		Required	226	144		N/A	N/A	

\*Lane ends at a driveway; therefore, there is not a taper.  
Source: Google Earth Pro and *CDOT Access Code*

Other observations:

- It is easy for eastbound vehicles to stop on the railroad tracks with the current configuration.
- There are pedestrian signal heads installed for the east, west, and south crosswalks; however, the crosswalk is not painted on the west side.



**Photo 4: US Highway 50 and San Juan Avenue/Grand Avenue**

### **RECOMMENDED IMPROVEMENTS**

Figure 20 illustrates the short-term recommendations and Figure 21 illustrates the long-term recommendations.

#### **Short-Term Recommendations**

- Remove landscaping on the southeast corner which limits the visibility between westbound right-turning vehicles and northbound through vehicles.
- Narrow the westbound right-turn lane to 16 feet by painting a median between the through and the right lanes.
- Lengthen the southbound left-turn deceleration lane by 266 feet.

Estimated Cost = \$1,000 (trees) + \$1,000 (striping) + \$1,000 (striping of left-turn) = \$3,000

#### **Long-Term Recommendations**

- Construct a northbound right-turn acceleration lane for vehicles turning right from San Juan Avenue.
  - Allow westbound right-turns to be free flowing.
- The skew does not appear to be causing any issues currently, however if operational or safety issues develop in the future due to the skew, the intersection should be realigned to address the geometric deficiencies. Realign of San Juan Avenue and Grand Avenue to be perpendicular with US Highway 50. Consider redesigning the intersection as a traditional design or as an off-set T-intersection.

Estimated Cost = \$150,000









## US HIGHWAY 550 AND 12<sup>TH</sup> STREET/COLUMBIA WAY

### EXISTING CONDITIONS

US Highway 550 is a north-south regional highway that traverses from the New Mexico border, south of Durango, to Montrose. Near the studied location, US Highway 550 is the main arterial through the City with a five-lane cross-section. It provides access to businesses and residential neighborhoods within Montrose, as well as providing a connection to other towns and highways. 12<sup>th</sup> Street (westbound) is a local collector that provides access to businesses, residential areas, and Columbine Middle School. Columbia Way (eastbound) is a local residential street.

This intersection is currently signalized with a span wire design. The southbound left-turn is phased with protected+permitted, while the other approaches have permitted only left-turns. There are pedestrian signal heads and push buttons on all directions. There are painted crosswalks and curb ramps. The east-west crosswalks are considered school crossing locations due to the close proximity to the middle school. Westbound has "No Right-turn on Red when Pedestrians are Present" to mitigate the conflicts between pedestrians and vehicles. Refer to Figure 22 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Montrose submitted this intersection due to the safety and operational concerns pertaining to the poor visibility of the traffic signal, lack of northbound left-turn protected phase, and skewed alignment of the minor streets.

### ANALYSIS

The traffic signal has a single span wire design and in the field it was observed that the wind can blow the signal heads to an angle that may impact drivers' visibility and understanding of the phase in progress. The majority of the rear end accidents occurred on the northbound approach, which may be a result of visibility of the signal equipment as they travel around the curve. The 13 broadside accidents were evenly distributed amongst the four directions (with westbound having four). If drivers are not able to see the signal heads, then they may be running through the intersection on a red light without realizing it.

Local residents on Columbia Way have requested a protected left-turn phase for the northbound approach. Based on the low turning volume and low number of left-turn related accidents, this movement does not warrant a protected+permitted or protected only phase per the FHWA and CDOT guidelines.

Centerlines of 12<sup>th</sup> Street and Columbia Way are offset by approximately 20 feet, with 12<sup>th</sup> Street more to the north. This skew in the roadways causes the left-turn lanes to be aligned with the shared through/right lane, which is unconventional and may cause some confusion to drivers traveling from the minor approaches. The current signal phasing allows both the east- and westbound movements to occur simultaneously. In the field, it was

**Ranking: 2**

**City: Montrose**

**County: Montrose**

**ADT: 27,000 (Year 2010)**

**Heavy Vehicles: 4.1%**

**Classification: NRA**

**Milepost: 128.418**

**Accidents: 2001 – 2008**

Total – 43  
Rear End – 17  
Broadside – 13  
Approach Turn – 5  
Head On – 3  
Pedestrian – 2  
Bicycle – 1  
Other – 2

**LOS (Delay):**

AM Overall – B (10.0s)  
EB – C (27.0s)  
WB – C (26.0s)  
NB – A (9.1s)  
SB – A (4.8s)  
PM Overall – B (13.8s)  
EB – C (20.2s)  
WB – C (28.3s)  
NB – B (14.3s)  
SB – A (7.8s)

observed that left-turning vehicles from the minor approaches would overtake their turn from through vehicles. However, the accident data indicates that there were no approach turn incidents for the east- and westbound directions. It was observed that vehicles on 12<sup>th</sup> Street and Columbia Way hesitate as they enter the intersection due to their uncertainty of where other drivers are going.

The acceleration and deceleration lanes were measured and compared to the design criteria of the *CDOT Access Code*. The left-turn deceleration lanes on US Highway 550 are in the TWLTL that extends throughout town. The designated storage lengths are shorter than the CDOT criteria; however, the TWLTL can be used as storage if the queues extend past the white lane line. Table 8 summarizes the existing and required lengths for each lane. The existing measurements were verified on an aerial photograph and the required lengths are from the *CDOT Access Code*.

<b>TABLE 8: ACCELERATION AND DECELERATION LANES FOR US HIGHWAY 550 AND 12<sup>TH</sup> STREET/COLUMBIA WAY</b>					
<b>Approach</b>	<b>Lane</b>	<b>Condition</b>	<b>Deceleration</b>		
			<b>Storage + Decel</b>	<b>Taper</b>	<b>Met?</b>
Northbound	Left	Existing	100	TWLTL	Yes
		Required	154	96	
Southbound	Left	Existing	100	TWLTL	Yes
		Required	154	96	

Source: Field Measurements, Google Earth Pro, and *CDOT Access Code*

Other observations:

- Pedestrian curb ramps do not meet the current design standards.
- The corner radii are small and it appears they are driven on frequently.
- Utility poles, lighting poles, and the southwest traffic signal pole are located within the sidewalk.
- All four corners have multiple commercial businesses with many driveways.



**Photo 5: US Highway 550 and 12th Street/Columbia Way**

#### ***RECOMMENDED IMPROVEMENTS***

Figure 23 and Figure 24 illustrate the short-term and long-term recommendations, respectively.

#### **Short-Term Recommendations**

- Add second span wire to all four directions to stabilize the signal heads.
- Add signage on mast arm for lane designation for the east- and westbound approaches.
- Add specialized signs to warn drivers of the skew.
- Change to split phasing for the east- and westbound approaches. This would require further investigation and a signal coordination plan for the corridor. Pedestrian calls may increase the required minimum green for the minor approaches, which could alter the coordination with other signals.

Estimated Cost = \$8,000 (span wire) + \$3,900 (signs) + \$25,000 (drainage) + \$5,000 (signal phase) = \$41,900

#### **Long-Term Recommendations**

- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection, and controller. Install pole mounted signal heads.
- Re-align 12<sup>th</sup> Street to match the centerline of Columbia Way by moving 12<sup>th</sup> Street to the north.

- Align the sidewalks on the north side of the minor streets.
  - Provide one left-turn lane, one through lane, and one right-turn lane for the westbound approach.
  - The extra pavement width from the realignment can be used by the City as they see fit based on the local needs.
- Increase the curb radii on all corners.

Estimated Cost = \$300,000 (signal) + \$400,000 (re-design, excluding right-of-way) = \$700,000







## US HIGHWAY 135 AND SPENCER AVENUE

### EXISTING CONDITIONS

State Highway 135 is a two-lane north-south highway that connects Gunnison to Crested Butte. There are many commuters between the two towns, tourists, and local traffic. In Gunnison, State Highway 135 is Main Street and provides access to businesses, residential areas, shopping, and Western State College. Through town, it has a five-lane cross section with a speed limit of 40 mph. Spencer Avenue is a local roadway that leads to residential neighborhoods, local businesses, large retail stores, the City Community Center and pool, and Gunnison Middle School.

This is a signalized intersection with all the left-turns as permitted only. There are pedestrian signal heads, push buttons, and crosswalks for all directions. Pedestrian ramps exist on the on three corners (southeast, southwest, and northeast). There are sidewalks on US Highway 135 south of intersection and on the north side of Spencer Avenue. Spencer Avenue is slightly offset due to the median on the westbound approach. There is a bus stop with a bench and bike rack on the east side of US Highway 135, just north of Spencer Avenue. Refer to Figure 25 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Gunnison submitted this intersection due to the safety and operational issues associated with the left-turning movements, high volume of pedestrians, and inadequate pedestrian facilities. The City states that the left-turns from Spencer Avenue are restricted.

### ANALYSIS

The City states that the left-turns from Spencer Avenue are restrictive since the lane shares with the through movement. The minor approaches have one shared left-turn/through lane and one right-turn lane. According to the 2011 traffic data, left-turn volumes on Spencer Avenue meet the requirements in the *CDOT Access Code* for installation of left-turn lanes. There is a relatively equal amount of right-turning vehicles on both approaches compared to the left-turn volumes, and meet the requirements for a separate lane. The left-turn movements on US Highway 135 were analyzed to verify the correct phasing was being utilized and according to the FHWA guidelines these left-turns should remain permitted only.

Collected traffic data did not show a large amount of pedestrians at this intersection, however, it's within close proximity to locations that attract pedestrians and bicyclists. Therefore, the counts may not reflect the peak pedestrian traffic. There are some sidewalks at this intersection, but it was observed that they are substandard. The sidewalk on the west side of the US Highway 135 is narrow and covered in gravel. The gravel is collecting on the sidewalk because it is at a lower elevation than the roadway and there is a gravel buffer between the sidewalk and road. On the east side of the highway, the sidewalk is roughly five feet in width and it also is lower than the roadway with gravel buffer. It does not extend north to the bus stop. The sidewalk on Spencer Avenue is approximately three feet wide, west of the intersection. East of the intersection, the Spencer Avenue sidewalk is four feet wide and winds around the drainage elements and a fire hydrant.

**Ranking: 3**

**City: Gunnison**

**County: Gunnison**

**ADT: 8,100 (Year 2010)**

**Heavy Vehicles: 6.5%**

**Classification: NRB**

**Milepost: 0.740**

**Accidents: 2004 – 2008**

Total – 17  
Broadside – 7  
Wildlife – 3  
Rear End – 2  
Approach Turn – 1  
Overtaking Turn – 1  
Sideswipe – 1  
Bicycle – 1  
Other – 1

At the intersection there are three pedestrian ramps, with the one on the southwest corner being substandard. There is no pedestrian ramp on the northwest corner. The two ramps on the east side have recently been constructed and are in good condition. On the southeast corner, the ramp includes a curbed section that hinders pedestrians from easily accessing the push buttons.

The acceleration and deceleration lanes on State Highway 135 were evaluated and Table 9 summarizes the existing and required lengths for each lane. The existing measurements were taken in the field and verified on an aerial photograph and the required lengths are from the *CDOT Access Code*. The only auxiliary lane that is substandard is the right-turn acceleration lane for northbound.

TABLE 9: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 135 AND SPENCER AVENUE								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Northbound	Left	Existing	120	TWLTL	Yes	N/A	N/A	N/A
		Required	50	144		N/A	N/A	
	Right	Existing	300	*	Yes	180	*	No
		Required	100	144		236	144	
Southbound	Left	Existing	150	TWLTL	Yes	N/A	N/A	N/A
		Required	30	144		N/A	N/A	

\*No taper, however the pavement width continues prior to or after the auxiliary lane.  
Source: Field Measurements, Google Earth Pro, and *CDOT Access Code*

Other observations:

- Drainage issues exist and are deteriorating the pavement on the west corners.
- There are a large amount of utilities located at the intersection.
- Crosswalk paint is faded.
- The northbound left-most signal head does not align properly with the left-turn and through lane.
- There is a R3-5L sign (left-turn only) on the backside of the southbound mast arm.
- The minor approaches are slightly skewed due to the different approach designs. Westbound has a center median; however, eastbound does not have a median.



**Photo 6: US Highway 135 and Spencer Avenue**

### ***RECOMMENDED IMPROVEMENTS***

Figure 26 shows the short-term recommendations and Figure 27 shows the long-term recommendations.

#### **Short-Term Recommendations**

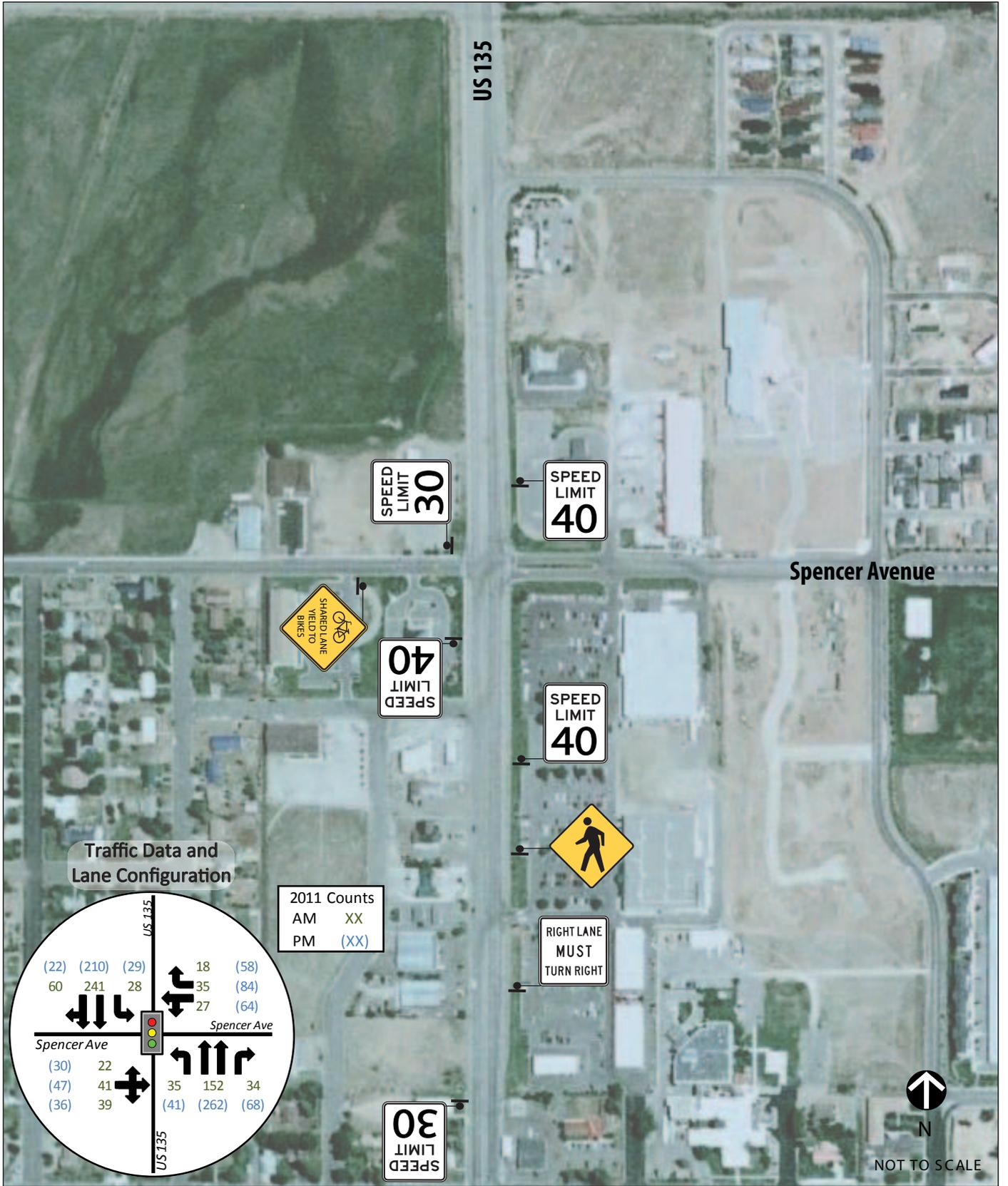
- Improve the drainage and cross pans.
- Install curb ramps on the east side of the intersection per the CDOT and ADA design standard.
- Reconstruct southeast curb ramp and sidewalk to comply with ADA standards.
- Install street name signs (D-3) to all mast arms.
- Re-stripe the crosswalks and add one to the east side of the intersection.
- Install a longer mast arm for the northbound approach.
  - Align the signal heads appropriately.
  - Move the R3-5L sign (left-turn only) to the northbound mast arm.
- Add and continue the bike lanes.

Estimated Cost = \$75,000 (drainage) + \$16,000 (curb ramps) + \$8,000 (removal) + \$1,200 (signs) + \$1,000 (striping) + \$50,000 (mast arm, includes a new pole) + \$2,000 (bike lanes) = \$153,200

### Long-Term Recommendations

- Construct new sidewalks on US Highway 135 with curb and gutter and elevated above the roadway. The design should provide a wide shoulder to accommodate bicyclists.
- Construct a sidewalk on the east side of US Highway 135, to the north, to connect to the bus stop.
- Construct sidewalks on the south side of Spencer Avenue.
- Lengthen the northbound acceleration lane to conform to *CDOT Access Code*.
- The skew does not appear to be causing any issues currently, however if operational or safety issues develop in the future due to the skew, the intersection should be realigned to address the geometric deficiencies. Widen the eastbound approach to reduce the offset with the westbound approach. This may include adding a similar median as currently exists on the westbound approach.

Estimated Cost = \$110,000 (sidewalk – 2,240 linear ft) + \$4,000 (median) - \$114,000







## US HIGHWAY 50 AND 10<sup>TH</sup> STREET

### EXISTING CONDITIONS

US Highway 50 an east-west regional route that travels across the entire state of Colorado. It travels through Gunnison and connects west to Montrose and east to Salida. It provides access to downtown, residential neighborhoods, local businesses, Western State College, and other highways. At the studied intersection, the highway curves from the southwest and has two lanes per direction, a TWLTL, and a speed limit of 35 mph. 10<sup>th</sup> Street travels north-south and is a two-lane local street that provides access to retail, businesses, residences, and Gunnison High School. At this intersection Tomichi Avenue connects to 10<sup>th</sup> Street and travels west.

10<sup>th</sup> Street is stop-controlled and eastbound Tomichi Avenue has a free-flow lane connecting to southbound US Highway 50. There is a crosswalk on the north side of the intersection. Refer to Figure 28 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Gunnison submitted this intersection due to the safety and operational concerns related to the difficulty turning left from minor approaches and odd geometric design and angles. Left-turns from 10<sup>th</sup> Street are prohibited, but enforcement is difficult.

### ANALYSIS

With the width and curve of the highway contribute to the challenges of left-turning vehicles since drivers must cross many lanes on the curve and they may not be able to judge approaching vehicles' speed. There are many other roadways that connect to US Highway 50 and provide left-turn protection or an alternate turning option.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Either close northbound 10<sup>th</sup> Street access and create a cul-de-sac or construct a splitter island to create a right-in-right-out access.
- Either extend the median to close the southbound 10<sup>th</sup> Street access or make 10<sup>th</sup> Street one-way in the northbound direction.

**Ranking: 4**

**City: Gunnison**

**County: Gunnison**

**ADT: 8,100 (Year 2010)**

**Heavy Vehicles: 6.0%**

**Classification: NRB**

**Milepost: 156.873**

**Accidents: 2004 – 2008**

Total – 21

Rear End – 2

Broadside – 9

Approach Turn – 1

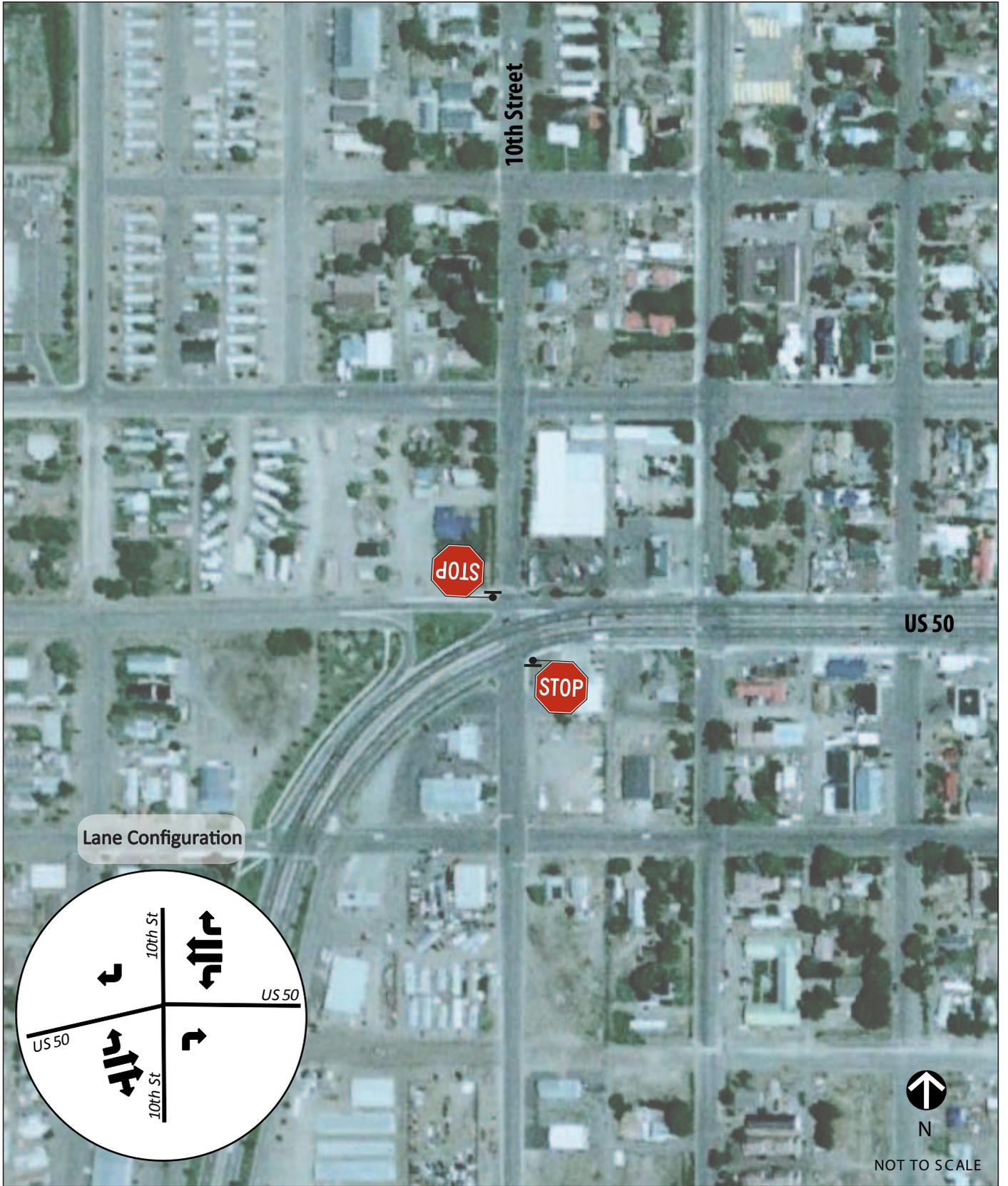
Sideswipe – 2

Head On – 2

Overtaking Turn - 1

Wild Animal – 3

Other – 1



Option 1



Option 2



## STATE HIGHWAY 92 AND STATE HIGHWAY 65

### EXISTING CONDITIONS

State Highway 92 is an east-west regional highway that begins in Delta and traverses to Sapinaro (small town on the Blue Mesa Reservoir). It serves as access to rural mountain communities, as well as recreational destinations. State Highway 65 travels north-south from State Highway 92, near Delta, to US Highway 6, at De Beque. It navigates through Orchard City and Cedaredge, over the Grand Mesa, and through Mesa. This highway attracts many tourists because it is considered a scenic route and historic bypass. Parallel to and north of State Highway 92, there are Union Pacific railroad tracks.

State Highway 65 creates a T-intersection with State Highway 92, is stop-controlled, and provides a left-turn lane and a channelized free right-turn lane. At this location, State Highway 92 is a four-lane divided highway with a grassy median. This highway has a left and right-turn deceleration lanes and a right-turn acceleration lane. Refer to Figure 30 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Delta County submitted this intersection due to the safety and operational concerns related to the highway speeds on State Highway 92, close proximity to the railroad crossing, difficulty turning left, and inadequate geometry. The speed limit on State Highway 92 is 55 mph. Railroad tracks are within 100 feet from the studied intersection. Delta County states that it is challenging for vehicles to turn left from State Highway 65 due to high volumes and the large crossing width of State Highway 92. The configuration does not provide left-turn storage on State Highway 65 and vehicles queue past the railroad tracks, sometimes sitting on the tracks. There is no left-turn acceleration lane on State Highway 92.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. Figure 31 shows short-term recommendations.

#### Short-Term Recommendations

- Collect traffic counts (turning movement and hourly directional) to determine the turning lane and operational needs.
- Provide a left-turn acceleration lane on State Highway 92 for vehicles turning east from State Highway 65. Two options to evaluate for this improvement are: (1) Utilize inside eastbound lane and force eastbound to taper to one lane prior to the intersection, or (2) construct the new lane in the median with consideration of tapering eastbound lanes to one lane prior to the merging location of the new left acceleration. Further investigation is needed to determine use of the median. There must continue to be a four-foot separation between both directions per the CDOT design standards.

**Ranking: 5**

**County: Delta**

**ADT: 13,000 (SH 92)  
7,300 (SH 65)  
(Year 2010)**

**Heavy Vehicles:**  
6.6% (SH 92)  
1.7% (SH 65)

**Classification:**  
RA (SH 92)  
NRB (SH 65)

**Milepost: 3.814 (SH 92)  
0.000 (SH 65)**

**Accidents: 2001 – 2008**

Total – 18  
Rear End – 3  
Broadside – 3  
Approach Turn – 8  
Sideswipe – 1  
Other – 3



Option 1: Build In Median



Note: Median must continue to provide a minimum of four-foot separation between directions.

Option 2: Re-Stripe



## STATE HIGHWAY 90 AND CHIPETA ROAD

### EXISTING CONDITIONS

State Highway 90 is an east-west highway traveling from the Utah border, through Naturita, and ends in Montrose. In the vicinity of the studied intersection, the highway provides one lane per direction. Chipeta Road is a local collector street that serves residential neighborhoods.

Chipeta Road creates a T-intersection with State Highway 90 and is stop-controlled. Both highway approaches enter are at different angles. Many driveways are located close to the intersection on the highway. Refer to Figure 32 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Montrose County submitted this intersection due to the safety and operational issues related to the turning conflicts and near-by driveways. There is concern that the westbound left-turn vehicles are encroaching onto the eastbound through lane and impeding eastbound vehicles. There is also concern with the merging conflict between the eastbound through vehicles and northbound right-turning vehicles.

### ANALYSIS

Chipeta Road connects to State Highway 90 on a curve and a location that has odd angles. The intersection appears to have faded pavement markings, which may contribute to westbound left-turn vehicles impeding on the eastbound through vehicles. These eastbound vehicles also have to pay attention to the vehicle merging from Chipeta Road onto the highway. There are no pedestrian facilities and the closest protected crossing is 0.3 miles to the east; there was one pedestrian accident. The broadside and sideswipe accidents all occurred on the northbound approach as vehicles attempted to turn onto the highway from Chipeta Road.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. Figure 39 illustrates the short-term recommendations.

#### Short-Term Recommendations

- Improve the striping to better define the lanes.
- Apply access management principles.
- Collect traffic data to further investigate geometric and traffic control improvements.

**Ranking: 6**

**City: Montrose**

**County: Montrose**

**ADT: 13,000 (Year 2010)**

**Heavy Vehicles: 3.4%**

**Classification: NRB**

**Milepost: 89.304**

**Accidents: 2001 – 2008**

*Total – 10*

*Rear End – 2*

*Sideswipe – 2*

*Wild Animal – 2*

*Broadside – 1*

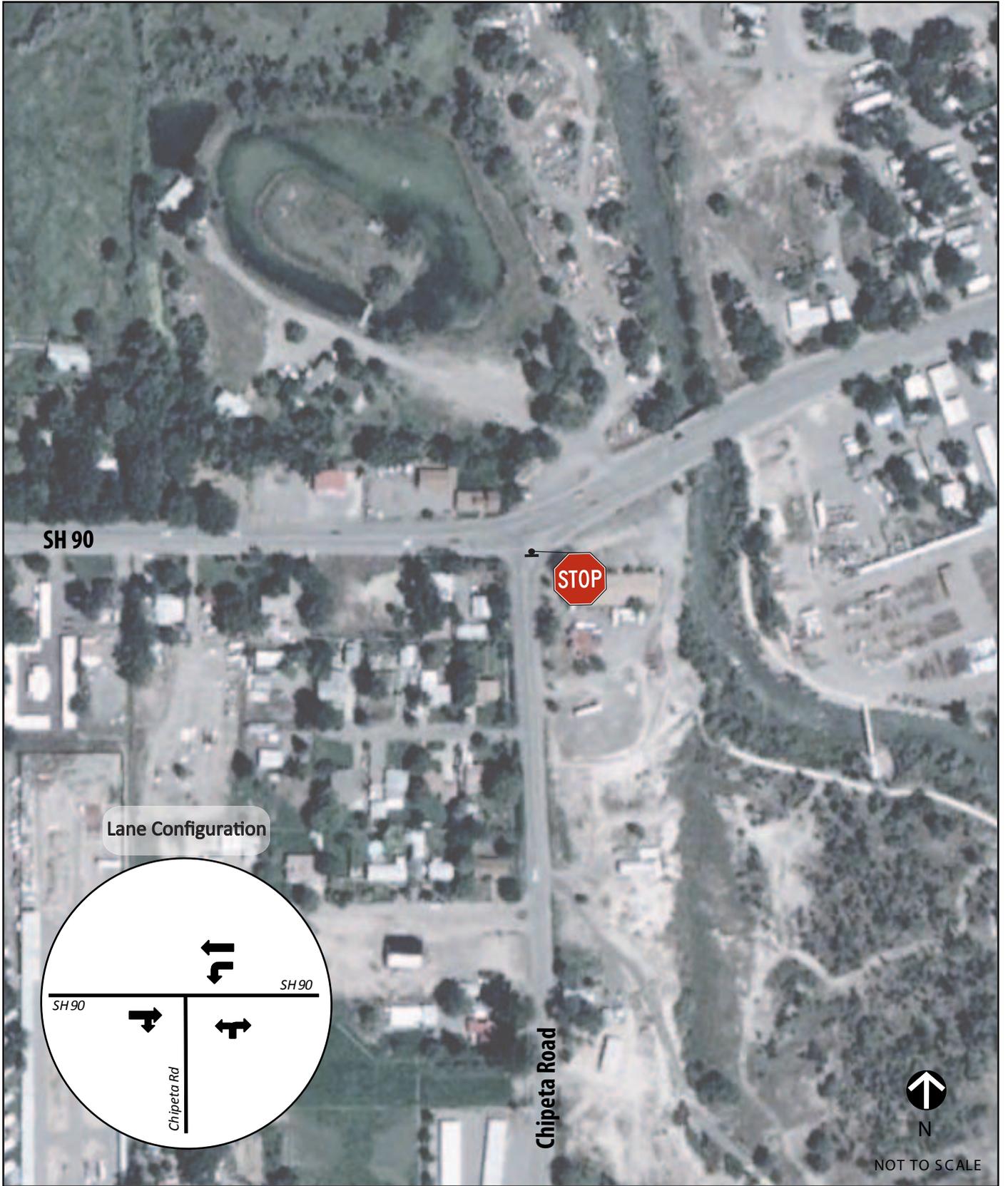
*Pedestrian – 1*

*Other – 2*

### Long-Term Recommendations

With the appropriate data, consider evaluating the following options:

1. Improved alignment and continue as a T-intersection
2. Florida-T configuration
3. Roundabout
4. Signalized Intersection
5. Removal of the westbound left-turn lane. This option will require a median and an evaluation of the impacts on the adjacent intersections. Chipeta Road may need to become a right-in-right-out.





## STATE HIGHWAY 133 AND SAMUEL WADE ROAD/BETHLEHEM ROAD

### EXISTING CONDITIONS

State Highway 133 is a north-south regional highway that connects State Highway 82 (Carbondale) and State Highway 92 (Hotchkiss). It provides access to recreational areas, rafting sites, and other rural towns. Through Paonia this highway provides one lane per direction. Samuel Wade Road/Bethlehem Road is a local two-lane street that leads to residential areas and into the center of town.

This intersection is stop-controlled on the minor approaches. There is a right-turn deceleration lane on the northbound approach. Refer to Figure 34 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Delta County submitted this intersection due to the safety issues associated with vehicles turning left from the minor approach or traveling across State Highway 133. The safety concerns are related to the high volume of vehicles on the highway, curvature of the highway, visibility of oncoming vehicles, large percentage of truck traffic, and speed limit (45 mph).

### ANALYSIS

Samuel Wade Road is considered the busiest county road with an ADT of 3,361 in 2010. The highway experiences less traffic than this county road. There may be a sight distance issue with the grades and curve of the highway as it approaches Samuel Wade Road from the north. Drivers may not be able to judge the speed of oncoming vehicles and enter the intersection without an adequate gap. The broadside accidents occurred when vehicles turned from the east- or westbound approaches onto the highway. Two of the five accidents on the westbound approach had injuries (40 percent). There are no obstacles within the sight distance triangle, however, the curve of the highway creates an odd angle for drivers to view oncoming southbound vehicles.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. Figure 35 illustrate recommendations.

#### Short-Term Recommendations

- Clear some of the trees on the northwest corner that may be limiting the visibility of oncoming vehicles.

#### Long-Term Recommendations

- Construct a left-turn acceleration lane for vehicles turning south from Samuel Wade Road.
- Collect traffic counts (turning movement and hourly directional) to determine if a signal is warranted per the guidelines in the Manual on Uniform Traffic Control Devices (use the most recently accepted version).

**Ranking: 7**

**Town: Paonia**

**County: Delta**

**ADT: 2,900 (Year 2010)**

**Heavy Vehicles: 8.3%**

**Classification: RA**

**Milepost: 8.008**

**Accidents: 2001 – 2008**

*Total – 8*

*Rear End – 2*

*Broadside – 4*

*Approach Turn – 1*

*Sideswipe – 1*



Short-Term Recommendations



Long -Term Recommendations



## STATE HIGHWAY 348 AND 5700 ROAD

### EXISTING CONDITIONS

State Highway 348 extends east-west for 17 miles and connects Delta to Olathe. It is a two-lane highway that provides access to agriculture and residential areas with a speed limit of 45 mph within the study area. 5700 Road is a local roadway that provides access to residences, farm land, and a commercial dairy with a public store. The two approaches of 5700 Road are offset on State Highway 348 and connect to the highway at the bridge over an irrigation ditch.

The offset T-intersections are stop-controlled and the highway is free flowing. There are no auxiliary lanes on any of the approaches. Refer to Figure 36 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Montrose County submitted this intersection for evaluation due to the concerns related to the poor geometry and alignment, limited sight distance, lack of turn lanes, and non-conformance with CDOT standards.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic counts (turning movement) to determine if the requirements for acceleration and deceleration lanes on State Highway 340 are met per the CDOT Access Code.
- Evaluate the sight distance for each approach based on the guidelines of the AASHTO Policy on Geometric Design for Streets and Highways.
- Realign the 5700 Road approaches.

**Ranking: 8**

**Town: Olathe**

**County: Montrose**

**ADT: 1,200 (Year 2010)**

**Heavy Vehicles: 7.3%**

**Classification: RA**

**Milepost: 14.380**

**Accidents: 2001 – 2008**

*Total – 6*

*Rear End – 2*

*Broadside – 1*

*Other – 3*



## US HIGHWAY 550 AND NIAGARA ROAD

### EXISTING CONDITIONS

US Highway 550 is a north-south regional highway that traverses from the New Mexico border, south of Durango, to Montrose. Near the studied location, US Highway 550 is the main arterial through the City with a five-lane cross-section. It provides access to businesses and residential neighborhoods within Montrose, as well as providing a connection to other towns and highways. Niagara Road is a minor arterial that provides access to businesses, residential neighborhoods, and private schools.

This intersection is signalized and Niagara Road creates a T-intersection with US Highway 550. The southbound approach provides a protected+permitted left-turn phase. There are pedestrian signal heads, push buttons, and crosswalks on the east and north sides of the intersection. There are driveways within close proximity to the intersection on both roadways. Refer to Figure 37 for existing conditions.

It should be noted that improvements were made to this intersection between 2009 and 2010. The enhancements included a wider radius on the southeast corner, a raised median on the northbound approach, and the removal of the south crosswalk. Construction was complete July 2010.

### ISSUES PER THE APPLICATION

According to the application, the City of Montrose submitted this intersection due to the safety concerns due to the conflicts between vehicles in the northbound right-turn lane and vehicles turning in or out of the driveways. The two driveways of most concern are for QT Service Station and Montrose County Social Services. The City has observed that accidents continue to occur in the northbound right-turn lane.

### RECOMMENDED IMPROVEMENTS

Since the construction was completed less than one-year ago, complete accident data was not available and historical data cannot be used to analyze this intersection. The City provided three accident records pertaining to the northbound right-turn lane. This intersection should be monitored to determine if the conflict continues to exist in the future. It is recommended that access management techniques be applied.

**Ranking: 9**

**City: Montrose**

**County: Montrose**

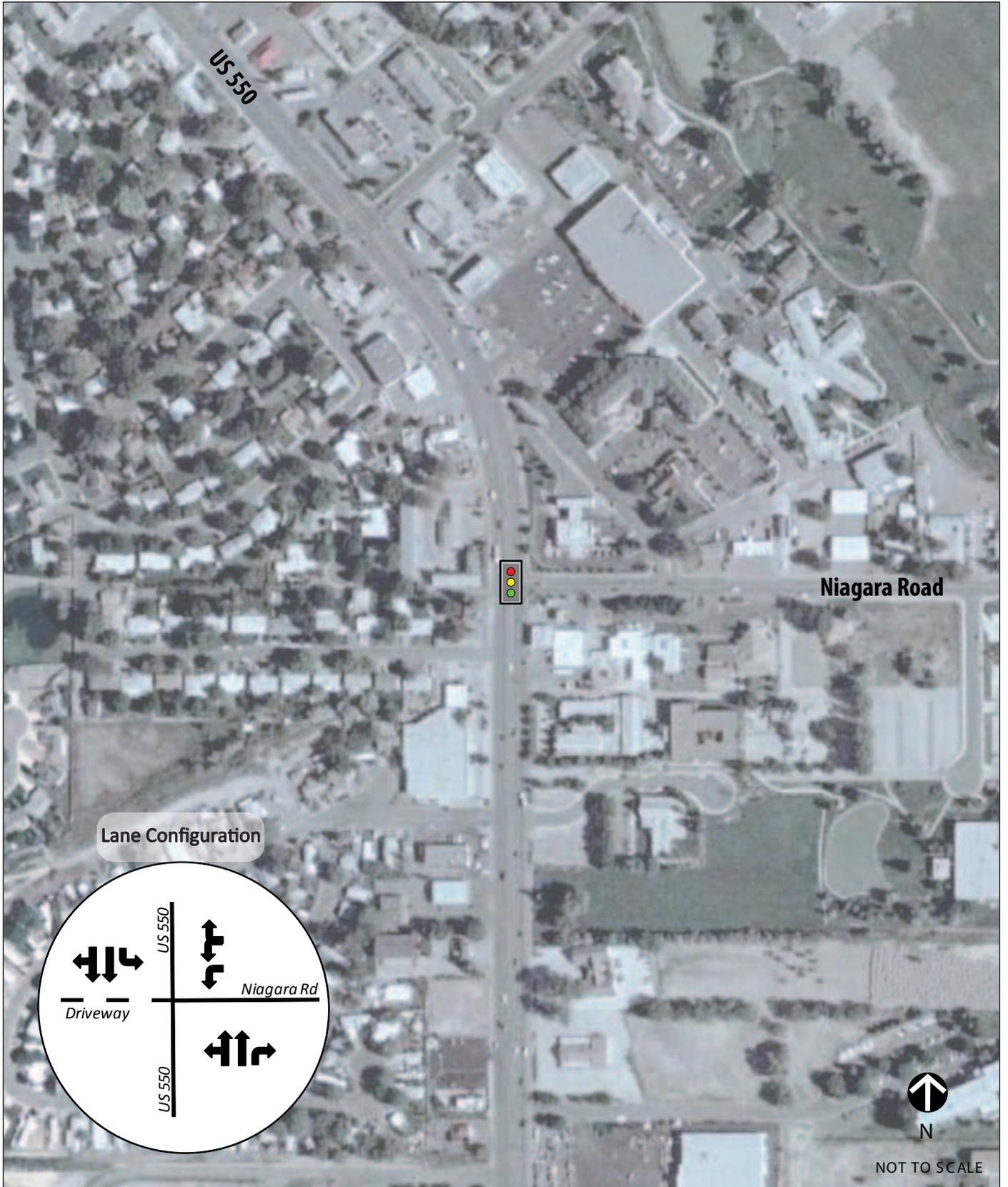
**ADT: 26,000 (Year 2010)**

**Heavy Vehicles: 5.6%**

**Classification: NRA**

**Milepost: 128.243**

**Accidents: Not Applicable**



Note: This figure aerial does not reflect recent northbound median and radius improvements

## US HIGHWAY 50 AND GUNNISON RIVER DRIVE

### EXISTING CONDITIONS

US Highway 50 an east-west regional route that travels across the entire state of Colorado. In Delta, this highway is Main Street and is orientated north-south, extending north to Grand Junction and south to Montrose and beyond. It provides access to many residential neighborhoods, local businesses, and other highways. At the studied intersection, the highway has two lanes per direction with a speed limit of 30 mph. Gunnison River Drive is a two-lane minor collector that provides access to businesses, the recreation center, Confluence Park, and Foster Farms.

Currently, this intersection is unsignalized with the minor approaches stop-controlled. The southbound approach has a right-turn deceleration and acceleration lane with painted channelization. Northbound has a left-turn deceleration lane. There are a few close intersections on both roadways. Union Pacific has railroad tracks across US Highway 50 approximately 400 feet south of Gunnison River Drive. Refer to Figure 38 for existing conditions.

It should be noted that this intersection is a part of the Delta Alternate Truck Route alignment. Currently, the construction plans and traffic study are being completed by the City. Construction is expected in 2012. The needs of this intersection will most likely change based on the projected traffic patterns and impacts of the alternate truck route. This study is evaluating the intersection based on the existing conditions and needs.

### ISSUES PER THE APPLICATION

According to the application, Delta County submitted this intersection due to the safety and operational concerns related to the difficulty in making eastbound left-turns. The County identified that the completing a left-turn from the eastbound approach is challenging because of the number of lanes on US Highway 50, commercial driveways near the intersection, visibility limitations, high traffic volumes, lack of gaps in traffic, and the distance required to enter northbound.

The County noted the Delta Alternate Truck Route is expected to relieve some of the truck traffic on US Highway 50 through the City and improve safety for 10 intersections through downtown Delta on Main Street.

### ANALYSIS

The traffic counts taken in 2005 indicate that 70 vehicles turn left from the eastbound approach and are unprotected. According to the traffic counts taken in 2005, the southbound left movement warrants a deceleration lane per the requirements of the CDOT Access Code because there are more than 10 vph. Currently, US Highway 50 has a median with guardrail, north of the intersection, that could be utilized as a left-turn deceleration lane for southbound or as a left-turn acceleration lane for eastbound. The available traffic counts do not warrant a signal with existing conditions.

**Ranking: 10**

**City: Delta**

**County: Delta**

**ADT: 12,000 (Year 2010)**

**Heavy Vehicles: 6.6%**

**Classification: NRA**

**Milepost: 70.766**

**Accidents: 2001 – 2008**

*Total – 9*

*Rear End – 6*

*Approach Turn – 2*

*Sideswipe – 1*

### **RECOMMENDED IMPROVEMENTS**

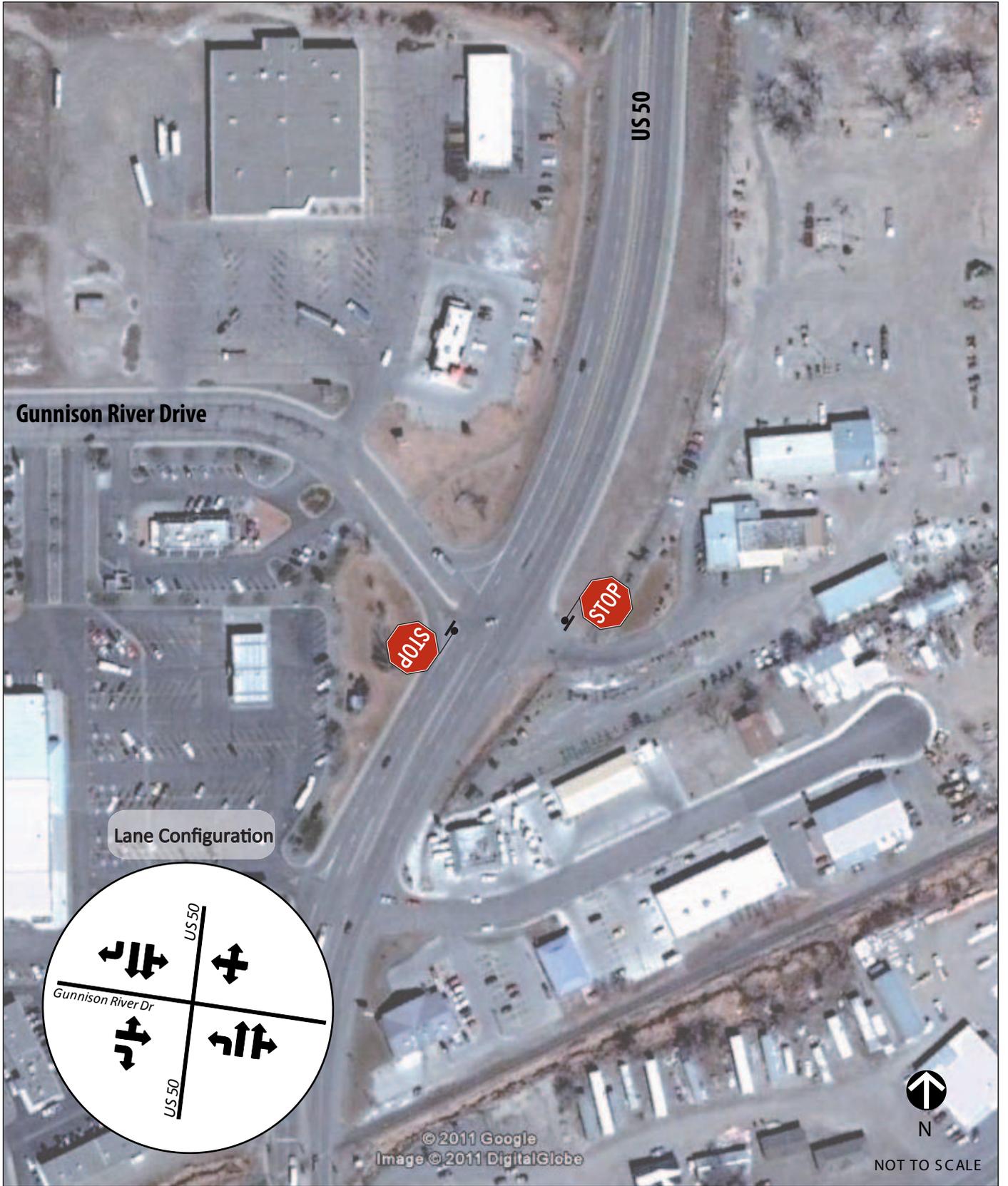
This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. Figure 39 illustrates the short-term recommendations.

#### **Short-Term Recommendations**

- Collect data to evaluate the sight distance issues that may exist with the curvature of US Highway 50.
- Collect current traffic counts to verify the need for a left-turn acceleration or deceleration lane on US Highway 50 and evaluate data for signal warrants. The future project should determine if there is a need for either:
  - A left-turn acceleration lane for eastbound turning vehicles, or
  - A southbound left-turn lane.

#### **Long-Term Recommendations**

- Monitor intersection during and after the construction of the Delta Alternate Truck Route to provide the warranted geometric and operational needs.





## STATE HIGHWAY 135 AND COUNTY ROAD 740 (CEMENT CREEK ROAD)

### EXISTING CONDITIONS

State Highway 135 is a two-lane highway that connects Gunnison to Crested Butte. Mainly the traffic comprises of commuters between the two towns and tourists (recreational, skiing, and festivals). County Road 740 (Cement Creek Road) is a two-lane local collector that serves as access to a residential neighborhood and recreational areas.

Cement Creek Road creates a T-intersection with State Highway 135 and is stop-controlled. Northbound has a right-turn deceleration lane and acceleration lane. Southbound has a left-turn deceleration lane. Cement Creek Road does not have separate turn lanes. Refer to Figure 40 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Gunnison County submitted this intersection due to the safety issues pertaining to the driving condition in the winter months, high volume of traffic, angle of minor approach, and absence of acceleration lane for vehicles turning left from Cement Creek Road.

It should be noted that the County previously hired an engineer to improve the grades at this intersection, but the improvements were not made because of the road closures needed to complete the work.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. Figure 41 and Figure 42 illustrate recommendations.

#### Short-Term Recommendations

- Provide a left-turn acceleration lane for vehicles turning from Cement Creek Road. Investigate if this can be completed by re-striping the existing painted median.

#### Long-Term Recommendations

- Re-align the Cement Creek Road to be at a perpendicular with State Highway 135 per the previously developed design plans.
- Provide the warranted turn lanes on all approaches.
- In the future, the private driveway should be aligned with Cement Creek Road if the property is redeveloped, the intersection is reconstructed, or if an access permit is requested.

**Ranking: 11**

**County: Gunnison**

**ADT: 6,200 (Year 2010)**

**Heavy Vehicles: 7.2%**

**Classification: RA**

**Milepost: 20.704**

**Accidents: 2004 – 2008**

*Total – 2*

*Broadside – 1*

*Rear End – 1*







## STATE HIGHWAY 135 AND COUNTY ROAD 738 (BRUSH CREEK ROAD)

### EXISTING CONDITIONS

State Highway 135 is a two-lane highway that connects Gunnison to Crested Butte. Mainly the traffic comprises of commuters between the two towns and tourists (recreational, skiing, and festivals). County Road 738 (Brush Creek Road) is a two-lane local collector that serves as access to a residential neighborhood, recreational areas, and the Crested Butte Country Club golf course.

Brush Creek Road creates a T-intersection with State Highway 135 and is stop-controlled. Northbound has a right-turn deceleration lane and acceleration lane. Southbound has a left-turn deceleration lane. Brush Creek Road does not have separate turn lanes. Refer to Figure 43 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Gunnison County submitted this intersection due to the safety issues pertaining to the driving conditions during winter months, the embankment, and the drainage. A permit was previously obtained to improve the grades and reduce the embankment; however, there are concerns that the lower elevation will make Brush Creek Road a snow trap.

### ANALYSIS

Improving the grades may lessen the safety concerns from winter conditions. The embankment limits the sight visibility of vehicles from Brush Creek Road and contributes to the formation of snow banks. The County states that together with CDOT the culvert is being maintained and the drainage issues have been reduced.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic counts (turning movement and hourly directional) to determine the turning lane and operational needs.
- Reduce the grades and lower the embankment at the intersection, with a design that minimizes the snow drifts on the roadways.
- Continue to maintain the drainage elements and determine if re-grading is needed.
- In the future, the private driveway should be aligned with Brush Creek Road if the property is redeveloped, the intersection is reconstructed, or if an access permit is requested.

**Ranking:** 12

**County:** Gunnison

**ADT:** 6,200 (Year 2010)

**Heavy Vehicles:** 7.2%

**Classification:** RA

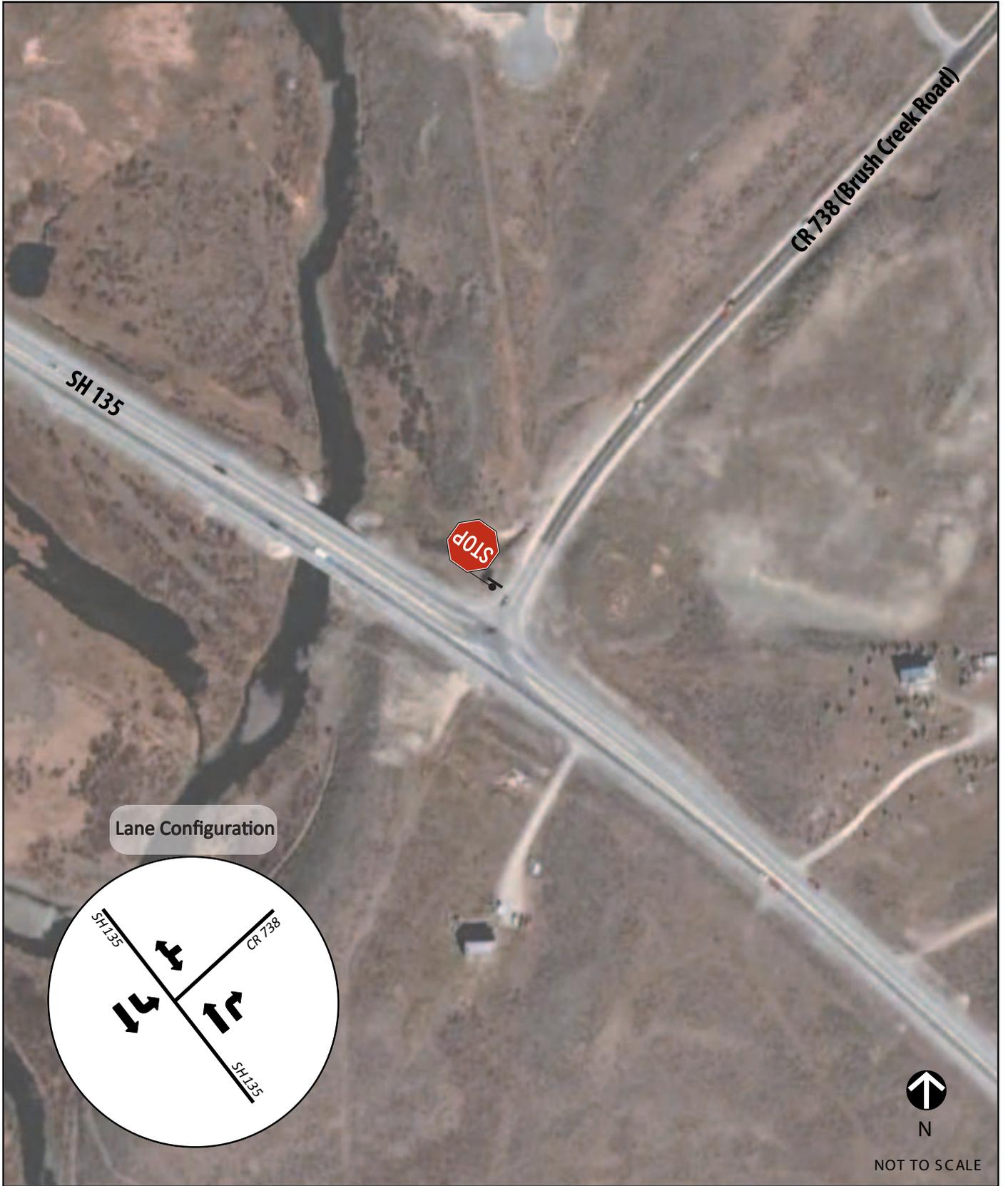
**Milepost:** 25.468

**Accidents:** 2004 – 2008

Total – 2

Broadside – 1

Rear End – 1



## US HIGHWAY 50 BUSINESS LOOP AND STATE HIGHWAY 348

### EXISTING CONDITIONS

US Highway 50 business Loop (50B) is a north-south arterial that travels through Olathe and is west of US Highway 50. It extends 1.5 miles with a cross section of one lane per direction and a speed limit of 30 mph within the study area. This highway provides access to Olathe's businesses, retail, residences, and local schools. State Highway 348 connects Delta to Olathe and provides access to agriculture areas. Olathe High School and Middle School is located on the northeast corner.

The intersection is unsignalized with a four-way stop. All approaches are one lane except the southbound that provides a channelized right-turn lane. There are minimal pedestrian features with a sidewalk on the west side of US Highway 50B. South of the intersection the sidewalk has a missing segment from the intersection to the food mart. There are no sidewalks on US Highway 50B or the other side of State Highway 348. There are curb ramps on the west corners. Refer to Figure 44 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the Town of Olathe was submitted for evaluation due to the safety and operational issues related to the congestion, importance of the intersection, location of and traffic from the schools, lack of turn lanes, absence of sidewalks, lack of warning devices, and multiple close driveways.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect vehicular, pedestrian, and bicycle traffic counts (turning movement and hourly directional) to determine the operational needs.
- Perform a Pedestrian Study to determine deficiencies and level-of-service (per the 2010 Highway Capacity Manual).
- Request a School-Zone Study be completed by CDOT.
- Verify that the proper signs are installed per the MUTCD, such as warning signs for the four-way stop and the school crossing.

**Ranking:** 13

**Town:** Olathe

**County:** Montrose

**ADT:** 2,300 (US 50B)  
3,700 (SH 348)  
(Year 2010)

**Heavy Vehicles:**  
4.8% (US 50B)  
6.4% (SH 348)

**Classification:**  
NRB (US 50B)  
NRA (SH 348)

**Milepost:** 16.832 (US 50B)  
0.931 (SH 348)

**Accidents:** 2007 – 2008  
Total – 2  
Rear End – 2



## US HIGHWAY 50 FRONTAGE ROAD AND COUNTY ROAD 17 (ANTELOPE CREEK ROAD)

### EXISTING CONDITIONS

US Highway 50 Frontage Road is located on the west end of Gunnison and extends 2.5 miles starting just south of New York Avenue and traveling west to its connection with US Highway 50 (near milepost 154). The Frontage Road is north of the highway and provides access to residential areas and local businesses. County Road 17 (Antelope Creek Road) is a local roadway that provides access to residential neighborhoods and recreational areas.

Antelope Creek Road creates a T-Intersection with the Frontage Road and is stop-controlled. There are no acceleration or deceleration lanes at this intersection. Refer to Figure 45 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Gunnison County submitted this intersection due to the safety and operational concerns related to the limited visibility, skew of the County Road, and lack of barrier between the Frontage Road and highway. The intersection is located on a hill which hinders a driver's visibility of other approaching vehicles. Antelope Creek Road curves and is a downhill into the intersection and is not perpendicular to the Frontage Road. There is currently no guardrail between the Frontage Road and US Highway 50. The County is concerned with vehicles traveling over the embankment on the highway.

### ANALYSIS

Historical data indicates that there have been no accidents at this location.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Apply access management techniques and review the spacing of the driveways.
- Examine the sight distance and evaluate the need to realign County Road 17 to be perpendicular with the frontage road.
- Improve grades on all approaches.

**Ranking: 14**

**County: Gunnison**

**ADT: 873**

**Classification: FR**

**Milepost: 156.302**

**Accidents: 2001-2008**

**Total – 0**

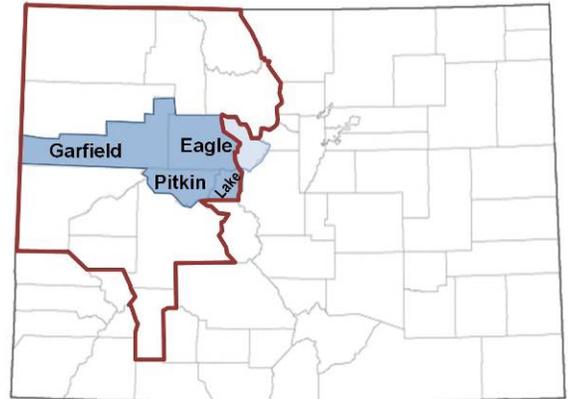


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## 5. TRANSPORTATION PLANNING REGION: INTERMOUNTAIN

The Intermountain TPR (#11) includes these Region 3 counties: Garfield, Eagle, Pitkin, and Lake. This TPR also includes Summit County which is located in Region 1 and not included in this study. Many cities/towns are located within these counties, such as Glenwood Springs, Carbondale, Basalt, Gypsum, Eagle, Rifle, Vail, and Leadville.

The following submitted intersections are located within the Intermountain TPR:



- Tier 1:**
- State Highway 82 and 23<sup>rd</sup> Street
  - State Highway 82 and 27<sup>th</sup> Street
  - State Highway 82 and Basalt Avenue
  - State Highway 82 and County Road 154/County Road 114 (Colorado Mountain College Road)
  - State Highway 82 and El Jebel Road
  - US Highway 6 and Valley Road
- Tier 2:**
- State Highway 82 and Baltic Avenue
  - State Highway 82 and Brush Creek Road
- Tier 3:**
- County Road 346 and County Road 315 (Mamm Creek Road)
  - State Highway 82 and County Road 113 (Cattle Creek Road)
  - State Highway 133 and Hendrick Drive/Sopris Avenue
  - State Highway 133 and Snowmass Drive/River Valley Ranch Road
  - US Highway 6 and Devereux Road
  - US Highway 6 and Hillcrest Drive
  - US Highway 6 and Oak Ridge Drive

## STATE HIGHWAY 82 AND COUNTY ROAD 154/COUNTY ROAD 114 (COLORADO MOUNTAIN COLLEGE)

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. At County Road 154/County Road 114, this four-lane divided highway is east-west and has a speed limit of 55 mph. County Road 154 is a local two-lane street that provides access to businesses and residential neighborhoods. County Road 114 is a local two-lane road that provides access to a small neighborhood, businesses, retail, ranches, and Colorado Mountain College. There is a frontage road located just north of the intersection that provides access to businesses and private homes. The Rio Grande Trail is parallel to State Highway 82 and is located just south of the highway.

This intersection is signalized with the mainline left-turns as protected only and the minor lefts as permitted only. There are pedestrian signal heads and push buttons on all corners and crosswalks across the highway. There is one curb ramp on the southeast corner and there are no sidewalks, just the Rio Grande trail. There is a bus stop on either side of State Highway 82, the eastbound stop is west of the intersection and the westbound stop is east of the intersection. Transit riders park in the dirt lot on the southeast corner and along the frontage road near the gas station. Refer to Figure 46 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Garfield County submitted this intersection for evaluation due to the concerns associated with the conflicts with adjacent accesses, high speed, highway curve and limited visibility, and substandard auxiliary lanes.

### ANALYSIS

The RFTA park-n-ride on the south side is about 30 feet from the intersection and is easily blocked by the queues on County Road 154 and the frontage road is approximately 150 feet north of State Highway 82. There are many other driveways on County Road 114 and on the frontage road near the intersection with the highway. The driveways are blocked at times if the queues on the minor streets are extensive.

The eastbound direction enters the intersection from a sweeping horizontal curve which limits the signal visibility, which is also hindered by the trees and vegetation along the roadway. There is an advanced signal head sign prior to the intersection on the side of the road and in the median. The acceleration and deceleration lanes on State Highway 82 were evaluated and Table 10 summarizes the existing and required lengths for each lane. The existing measurements were taken in the field and the required lengths are from the *CDOT Access Code*. All auxiliary lanes are substandard to the CDOT criteria.

**Ranking: 1**

**County: Garfield**

**ADT: 22,000 (Year 2010)**

**Heavy Vehicles: 3.7%**

**Classification: EX**

**Milepost: 6.655**

**Accidents: 2001 – 2008**

Total – 38  
Rear End – 24  
Broadside – 12  
Pedestrian – 2

### LOS (Delay):

AM Overall – B (16.1s)  
EB – A (9.7s)  
WB – B (17.7s)  
NB – C (32.9s)  
SB – C (32.8s)

PM Overall – D (40.2s)  
EB – A (7.0s)  
WB – B (14.4s)  
NB – F (>100s)  
SB – F (>100s)

TABLE 10: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 82 AND COUNTY ROAD 154/COUNTY ROAD 114								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	56	150	No	N/A	N/A	N/A
		Required	100+600	222		N/A	N/A	
	Right	Existing	120	230	No	170	200	No
		Required	600	222		960	222	
Westbound	Left	Existing	380	140	No	N/A	N/A	N/A
		Required	125+600	222		N/A	N/A	
	Right	Existing	210	125	No	110	140	No
		Required	600	222		960	222	

Source: Field Measurements, Google Earth Pro, and CDOT Access Code

Comparing the 2006 traffic volumes in the Garfield County *Traffic Impact and Needs Assessment* to the collected 2011 volumes indicated that volumes are similar. The biggest changes are the reductions in southbound left/through (AM only) and eastbound through and the increase in westbound through (PM only). The Synchro models indicated in the PM peak hour the minor approaches are failing due to the long queues and potential signal delay. If the mainline does not max-out on its green time, then these approaches can operate at LOS D.

Other observations:

- Buses are allowed to use the shoulder.
- Lots of gravel collecting on the trail on State Highway 82.



**Photo 7: State Highway 82 and County Road 154/County Road 114**

#### ***RECOMMENDED IMPROVEMENTS***

Figure 47 shows the short-term recommendations.

#### **Short-Term Recommendations**

- Remove vegetation on eastbound curve between the highway and the trail.
- Lengthen the eastbound left-turn lane storage.
- Construct sidewalks to the bus stops.
- Relocate the “Colorado Mountain College” directional sign west on State Highway 82 to improve visibility.
- Lengthen the other auxiliary lanes to conform to *CDOT Access Code*.
- Consider providing alternate location for the park-n-ride on the southeast corner to remove the close driveway to the highway.

Estimated Cost = \$2,500 (signs) + \$3,000 (trees) + \$50,000 (left-turn lane) + \$25,000 (sidewalks) + \$8,000 (striping) = \$88,500

### Long-Term Recommendations

- Further investigation and data collection of the entire area and adjacent accesses is needed to determine the feasibility of redesigning this intersection. Consider offset T-intersections, a roundabout, interchange, and re-design of county roads and the frontage road.
  - Off-Set T-intersections: The existing frontage road access that is 1,000 feet to the southeast of the intersection could be paired with the intersection at County Road 154/County Road 114 for an off-set T-intersection. This access would have to be signalized to provide protected movements. This would allow the southbound approach to be closed at its current location. Vehicles to and from County Road 114 will have an increased travel distance of 2,000 feet. This will reduce the number of conflict points that impact the signalized State Highway 82 intersection. There are some concerns with the downhill grades of County Road 114 to the frontage road and the storage space for vehicles at the new intersection.
  - Roundabout: A roundabout could reduce the number and severity of crashes at this intersection and reduce the delay experienced by the minor approaches. In-depth evaluation is needed to address the concerns related to the volume and speed differentials. There are concerns with the various driveways and frontage road accesses on both side streets.
  - Interchange: A grade-separated facility could be constructed to reduce the delay and intersection-related crashes. The highway traffic would be able to continuously flow and the minor road vehicles would have to merge.

Estimated cost: \$3,000,000





## STATE HIGHWAY 82 AND BASALT AVENUE

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. Through the Town of Basalt, this highway is east-west with a speed limit of 45 mph (55 mph north of the intersection) and extends five lanes wide with wide shoulders. Basalt Avenue is a local roadway that provides access to businesses, residential neighborhoods, and into the center of Basalt. It is the only connection between the two sides of Basalt.

This intersection is signalized with the mainline left-turns as protected only and the minor lefts as permitted only. There are pedestrian signal heads, push buttons, and crosswalks for all directions. Curb ramps are installed on the east corners. Sidewalks exist on the east side of Basalt Avenue and on both sides of State Highway 82, east of the intersection, ending at the bus stops. There are two bus stops on either side of State Highway 82, just east of the intersection, and a Roaring Fork Transportation Authority (RFTA) park-n-ride lot on the southeast corner. Refer to Figure 48 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the Town of Basalt submitted this intersection due to the safety concerns for pedestrians and bicyclists, as well as the operational issues associated with the close proximity to adjacent intersections.

Concerns for pedestrians and bicyclists stem from the pedestrian phase coinciding with turning vehicles for Basalt Avenue, safety for school children, and high volume of transit riders using the bus stops and parking lot. Conflicts typically occur during the peak hours, when the school children are crossing before and after school, and when the bus picks up and drops off passengers.

### ANALYSIS

Although the signalized intersection provides all the appropriate pedestrian features and the timing was observed to be adequate, the County reported that local pedestrian have concerns as they cross at this intersection due to the conflict with turning vehicles. The *Roundabout Feasibility Study* (2008) counted 41 pedestrians in the peak hour. Traffic counts from August 2008 show there were 25 pedestrians crossing State Highway 82 on the east crosswalk in the morning peak hour and 33 pedestrians in the evening peak hour. The data shows that there was a maximum of 16 pedestrians in one 15 minute period. In those same peak hours, there was 215 vehicles (AM) and 107 vehicles (PM) turning either left or right from Basalt Avenue and travel across the east crosswalk. Left-turning vehicles only have a permitted phase. Although right-turning vehicles can turn on red, they may be turning during the pedestrian phase and conflicting with pedestrians/bicyclists within the crosswalk. In peak hours, pedestrian traffic may reduce the capacity of the southbound left-turn movement, influence the experienced queues, reduce the right-turns on red, and impact the vehicular capacity of the intersection.

**Ranking: 2**

**Town: Basalt**

**County: Garfield**

**ADT: 19,000 (Year 2010)**

**Heavy Vehicles: 3.7%**

**Classification: EX**

**Milepost: 23.080**

**Accidents: 2001 – 2008**

Total – 45  
Rear End – 25  
Approach Turn – 7  
Broadside – 5  
Sideswipe – 4  
Pedestrian – 2  
Head On – 1  
Other – 1

Between 2001 and 2008 there were two reported accidents involving pedestrians. In the field it was observed that the east crosswalk is greatly used with a consistent flow of pedestrians and bicyclists. They were walking to and from the park-n-ride, shopping center, and residential areas.

North of the intersection there is a roundabout at Emma Road that is approximately 100 feet away and south of the intersection Cody Lane is 225 feet away. The roundabout does not have a directing pork chop on its northbound leg; however the alignment seems to direct vehicles in the correct direction. Due to the minimal distance between the roundabout and the studied intersection on State Highway 82, the southbound queues extended into and past the roundabout during peak periods.

RFTA has an important role for the commuter of the Roaring Fork Valley. At this intersection buses are allowed to use the right-turn lanes on State Highway 82 as “jump” lanes to travel through the intersection during the appropriate green phase. There is a sign on the northbound approach stating “No right-turn on red when RFTA buses are crossing intersection.” It was not observed if this creates conflicts.

A *Roundabout Feasibility Study* was completed in February 2008 by Ourston Roundabout Engineering, which indicated that further evaluation is needed to determine the feasibility of a roundabout at Basalt Avenue. This does not seem like a great solution for this intersection due to the location of the roundabout at Emma Road and the speed and volume differentials between the highway and Basalt Avenue. If a roundabout is desired, a more in-depth study is needed.

The acceleration and deceleration lanes on State Highway 82 were evaluated and Table 11 summarizes the existing and required lengths for each lane. The only auxiliary lane to conform to the *CDOT Access Code* is the westbound right-turn acceleration lane. The eastbound right-turn lane is very close to meeting the criteria, but the taper length is slightly short.

TABLE 11: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 82 AND BASALT AVENUE								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	300	80	No	N/A	N/A	N/A
		Required	150+600	222		N/A	N/A	
	Right	Existing	600	160	No	870	640	No
		Required	600	222		960	222	
Westbound	Left	Existing	400	170	No	N/A	N/A	N/A
		Required	150+435	162		N/A	N/A	
	Right	Existing	400	170	No	635	375	Yes
		Required	435	162		550	162	

Source: Google Earth Pro and CDOT Access Code

Other observations:

- The pedestrian push button on the northeast corner is on the wrong side of the traffic signal pole.
- Pedestrians most likely cross this intersection to utilize the Rio Grande Trail on the south side of Basalt Avenue (observed trail marker leading to the Rio Grande Trail) and the Snowmass Trail to downtown Basalt on the north side.
- Signal heads are aligned properly and lane designation signs are installed on the mast arms.



Photo 8: State Highway 82 and Basalt Avenue

### **RECOMMENDED IMPROVEMENTS**

It should be noted that this intersection is a part of a RFTA project that plans to upgrade the transit facilities. Any improvements should be coordinated with RFTA. Figure 49 and Figure 50 show the recommendations.

### **Short-Term Recommendations**

- Remove and relocate the pedestrian push button on the northeast traffic signal pole to the correct side of the pole.
- Add a splitter island to the northbound leg of the roundabout at Emma Road and Basalt Avenue.
- Monitor the pedestrian volumes and accidents to determine if the westbound left-turn should become a protected only phase to eliminate the conflicts.

Estimated Cost = \$20,000 (splitter island)

### Long-Term Recommendations

- Construct a grade-separated pedestrian facility and remove pedestrian features at the intersection.
- Lengthen the acceleration and deceleration lanes to conform to *CDOT Access Code*.

Estimated Cost = \$300,000 (pedestrian facility) + \$200,000 (lanes) = \$500,000







## STATE HIGHWAY 82 AND 27<sup>TH</sup> STREET

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. Through Glenwood Springs, this highway is north-south with a speed limit of 35 mph and extends four lanes wide with a TWLTL and wide shoulders. 27<sup>th</sup> Street is a local roadway that provides access to businesses, residential neighborhoods, and the school district's bus barn. It also provides access to properties located west of the river. The Rio Grande Trail is parallel to State Highway 82 and is located just west of the highway.

This intersection is signalized with the mainline left-turns as protected+permitted and the minor lefts as permitted only. There are pedestrian signal heads on the east, west, and north sides of the intersection. Crosswalks are painted on the north and west sides. Push buttons are only installed for the north crosswalk. Curb ramps are installed on all corners, but the pork chop island on the northwest corner does not have ramps. Sidewalk exists on the north side of 27<sup>th</sup> Street west of the intersection. Refer to Figure 51 for existing conditions.

It should be noted that RFTA has plans to develop the southeast corner as a park-n-ride.

### ISSUES PER THE APPLICATION

According to the application, the City of Glenwood Springs submitted this intersection for evaluation due to the issues related to the high volumes, queuing, insufficient number of lanes, and narrow lanes on 27<sup>th</sup> Street, as well as the frequent conflict with trail users.

### ANALYSIS

The collected traffic data indicates that there are 466 vehicles in the AM peak hour and 377 vehicles in the PM peak hour that are utilizing the eastbound approach of 27<sup>th</sup> Street. The Synchro model indicates that the queues clear with the given green time. In the field it was observed that the queues on eastbound 27<sup>th</sup> Street sometimes extend past the bus barn driveway. The queues are impacted by the lack of a right-turn lane and the short left-turn storage length, which is limited by the left-turn pocket for the driveway. The right-turning vehicles are delayed if there is a through vehicle blocking the shared lane; however, they sometimes block the left-turning vehicles from reaching the designated lane. In the peak hours there are approximately 250-290 vehicles turning right onto south State Highway 82 and over 100 vehicles turning left. A right-turn lane is warranted per *CDOT Access Code*. In the field it was measured that west 27<sup>th</sup> Street is about 48 feet wide, which can accommodate four 12-foot lanes. The current lanes are between 13 and 16 feet wide, which is greater than the typical design of 12 feet. With striping changes, the lanes can either be widened, if desired, or narrowed to provide a new right-turn lane.

**Ranking: 3**

**City: Glenwood Springs**

**County: Garfield**

**ADT: 26,000 (Year 2010)**

**Heavy Vehicles: 3.9%**

**Classification: NRB**

**Milepost: 1.714**

**Accidents: 2001 – 2008**

Total – 49

Rear End – 27

Approach Turn – 12

Broadside – 5

Sideswipe – 3

Pedestrian – 1

Other – 1

**LOS (Delay):**

AM Overall – C (28.3s)

EB – C (30.6s)

WB – C (33.8s)

NB – C (24.2s)

SB – C (30.7s)

PM Overall – C (23.3s)

EB – B (16.6s)

WB – C (25.5s)

NB – C (21.6s)

SB – C (29.7s)

Analyzing the signal timing and volumes shows that only minor tweaks may slightly improve this intersection. Split phasing was evaluated and did not provide great benefits to this intersection and would require updating the coordination of the corridor.

In the PM peak hour there were 11 pedestrian crossing on the east side (trail) and 18 on the north crosswalk. In the AM peak hour there were 3 bicyclists traveling through this intersection. There are also a maximum of 427 vehicles turning either right or left from State Highway 82 onto west 27<sup>th</sup> Street, which may conflict with the pedestrian and bicycle traffic. In the field it was observed that northbound trail users and northbound left-turning drivers may not be able to see each other before reaching the crosswalk due to the separate grades. The trail is below the elevation of the roadway and there are trees and vegetation lining the trail, which all may contribute to lack of visibility between the trail users and left-turning vehicles. It was observed that eastbound right-turning vehicles stop on the crosswalk and block the trail access. They have an acceleration lane on the highway so they may not always come to a complete stop when they approach the trail and intersection. There are signs on 27<sup>th</sup> Street and on the trail to warn the users of the upcoming crossing.

The acceleration and deceleration lanes on State Highway 82 were evaluated and Table 12 summarizes the existing and required lengths for each lane. The existing measurements were taken from an aerial and the required lengths are from the *CDOT Access Code*. The northbound left-turn lane has a slightly short storage length, but a long taper. It is limited by the back-to-back left-turn lane for 29<sup>th</sup> Street. The storage length could be lengthened and the taper could be shortened if desired.

Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Northbound	Left*	Existing	330	225	No	N/A	N/A	N/A
		Required	375	120		N/A	N/A	
Southbound	Left	Existing	330	190	Yes	N/A	N/A	N/A
		Required	10	120		N/A	N/A	
	Right	Existing	400	135	Yes	230	210	Yes
		Required	50	120		150	120	

\*Limited by the back-to-back left-turn storage and taper for 29<sup>th</sup> Street.  
Source: Google Earth Pro, and *CDOT Access Code*

Other observations:

- Drainage elements (gutter pan and inlet) on the westbound approach are in poor condition.



**Photo 9: State Highway 82 and 27<sup>th</sup> Street**

#### ***RECOMMENDED IMPROVEMENTS***

It should be noted that this intersection is a part of a corridor design plan to upgrade the transit facilities. Any improvements should be coordinated with the RFTA project. Figure 51 illustrates the short-term recommendations.

#### **Short-Term Recommendations**

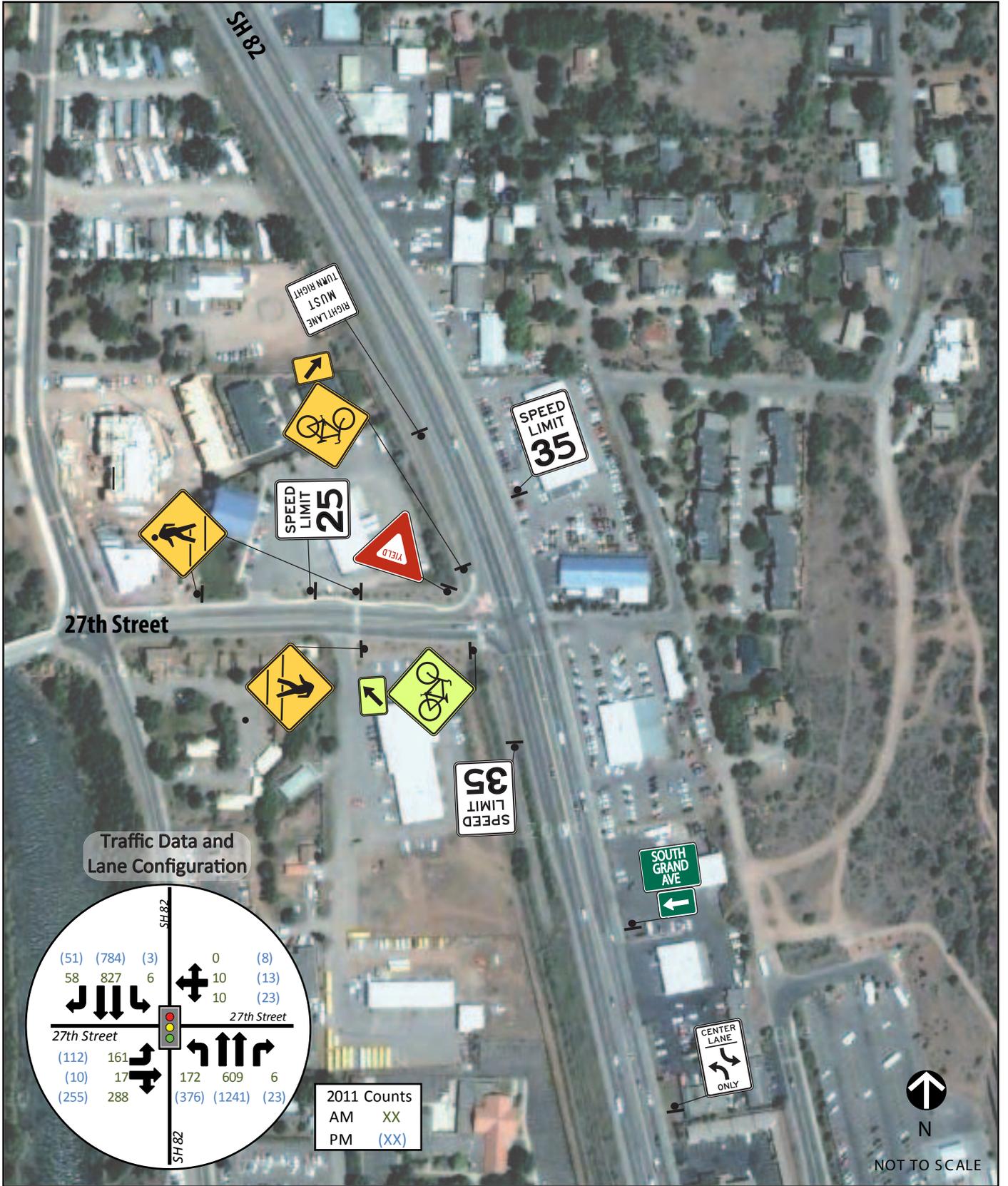
- Improve striping and signage on the south portion of the trail to inform upcoming intersection. Install either W3-1 (stop ahead – symbol) with W16-31AZ (XX miles ahead)”.
- Install W11-1 (Bicycle) and W16-2a (Distance) on the eastbound approach approximately 300 feet prior to the intersection.
- Install R10-15 (Turning Traffic Must Yield to Pedestrians) next to the northbound left-turn signal and prior to the southbound right turn lane.
- Re-stripe the left-turn lane at the bus barn driveway to be a TWLTL and extend eastbound left-turn lane for State Highway 82 back to the driveway.
- Re-stripe eastbound to provide one receiving lane, one left-turn lane, one through lane, and one right-turn lane. The width of the road can accommodate four 12-foot lanes.

Estimated Cost = \$2,00 (signs) + \$6,500 (striping) = \$7,500

### Long-Term Recommendations

- Construct a grade-separated facility tunnel.
- Re-stripe the northbound left-turn lane to increase the storage length and reduce the taper to meet the standards of the *CDOT Access Code*.
- Monitor the pedestrian volumes and accidents to determine if the northbound left-turn should become a protected only phase to eliminate the conflicts.

Estimated Cost = \$310,000





## STATE HIGHWAY 82 AND EL JEBEL ROAD

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. Through the Town of El Jebel, this highway is east-west with a speed limit of 45 mph and extends five lanes wide with wide shoulders. El Jebel Road is a local roadway that provides access to retail, businesses, residential neighborhoods, community center, and ball fields. It is the main connection between the two sides of El Jebel.

This signalized intersection currently operates with split phasing for the minor approaches due to the geometry that does not allow for left-turns to occur simultaneously and protected only left-turns on the highway. There are no pedestrian features at the signal because there is a pedestrian tunnel on the east side of the intersection. Sidewalks exist south of State Highway 82 on Valley Road leading to the community center and retail shopping area. There is a RFTA bus stop on El Jebel, just north of the intersection, and another one east of the intersection on State Highway 82. A trail has recently been constructed on Farve Lane. Refer to Figure 53 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Eagle County submitted this intersection for evaluation due to the concerns related to pedestrian conflicts on Valley Road, heavy traffic, impacts from close intersections, and inadequate storage lengths and queues on minor approaches.

### ANALYSIS

Pedestrians are able to easily and safely cross State Highway 82 with the existing tunnel; however, there are conflicts on either end of the tunnel. To the north pedestrians are directed into a parking lot of a shopping center and past the parking lot there are no sidewalks on El Jebel Road. On the south end the pedestrians are directed to a crosswalk across E. Valley Road or a sidewalk to the shopping center. The crosswalk is located at the confusing intersection with Valley Road and northbound vehicles have a stop sign, but the southbound vehicles turning from State Highway 82 do not have a stop sign.

There is a large volume of vehicles from and to the minor approaches and the turn lanes may be inadequate to accommodate the queues. The northbound approach has two left-turn lanes that are each 110 feet long and the volumes reach 100 vph; therefore, the turn lanes provide adequate storage according to the CDOT Access Code. The northbound right-turn has 100 feet of storage length with a high of 31 vph, which is sufficient. However, in the field it was observed that the experienced queues on this approach are a result of the northbound through movement blocking turning vehicles from getting to their designated turn lane. There is also a conflict with the close proximity to the intersection at Valley Road (about 150 feet), which has a stop sign on the northbound and eastbound approaches. The vehicles on this northbound approach are trying not to block the intersection of Valley

**Ranking: 4**

**Town: El Jebel**

**County: Eagle**

**ADT: 29,000 (Year 2010)**

**Heavy Vehicles: 4.2%**

**Classification: EX**

**Milepost: 19.044**

**Accidents: 2001 – 2008**

Total – 37  
Rear End – 21  
Broadside – 9  
Sideswipe – 2  
Overtaking Turn – 2  
Approach Turn – 1  
Overturning – 1

**LOS (Delay):**

AM Overall – C (23.9s)  
EB – B (13.5s)  
WB – B (12.6s)  
NB – D (51.6s)  
SB – D (54.2s)  
PM Overall – C (30.5s)  
EB – B (13.3s)  
WB – B (18.6s)  
NB – F (81.0s)  
SB – F (81.0s)

Road; however, they also do not want to miss the green phase at State Highway 82. The northbound stop sign helps create gaps for vehicles from Valley Road to get to State Highway 82.

Southbound El Jebel Road has two left-turn lanes with a total of 230 feet of storage, but the volumes show 351 vehicles in the morning peak hour and 144 vehicles in the evening peak hour. To accommodate the vehicles there needs to be a storage length of 350-400 feet, which is currently limited by the intersection at Farve Lane (about 230 feet). The southbound approach has shared through/right-turn lane and the right-turn volumes warrant a designated lane. A queue for the through or right-turning vehicles may hinder the left-turning vehicles from getting to their turn lanes. The queues may be worsened by the conflicts created at the close intersections with Farve Lane and Valley Road.

The acceleration and deceleration lanes on State Highway 82 were evaluated as well and Table 13 summarizes the existing and required lengths for each lane. The eastbound right-turn lane has a slightly short storage length, but a longer taper than required. These could be adjusted to match the *CDOT Access Code*. The eastbound left-turn lanes is substandard and should be lengthened.

TABLE 13: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 82 AND EL JEBEL ROAD								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	370	170	No	N/A	N/A	N/A
		Required	100+435	162		N/A	N/A	
	Right	Existing	335	300	No	650	700	Yes
		Required	435	162		550	162	
Westbound	Left	Existing	615	180	Yes	N/A	N/A	N/A
		Required	100+435	162		N/A	N/A	
	Right	Existing	510	215	Yes	1040	370	Yes
		Required	435	162		550	162	

Source: Google Earth Pro and *CDOT Access Code*

In the PM peak hour, EL Jebel Road has failing LOS on both approaches due to the queuing, limited storage lengths, and potential long signal delay. The queuing and blockage of turn lanes is illustrated in the SimTraffic simulations. When the mainline through movement does not max-out, then the minor approaches can operate at LOS D.

LSC Consultants completed a traffic study in March 2011 for the potential development for the area around the community center and ball fields. The developer would like to build a 79,500 sq ft recreation center, 33,000 sq ft ice rink, four indoor tennis courts, two soccer fields, 150-seat amphitheater, a BMX park, and a skate park. It was estimated that there will be 2,580 vehicle-trips during an average Saturday. In the peak hour it will have 199 vehicles entering the complex and 156 vehicles exiting. The majority of the traffic is expected to come from E. Valley Road and north El Jebel. The future LOS of the intersection on State Highway 82 will remain C in 2015 and

reduce to LOS D in 2035. There were no improvements recommended for the highway intersection or El Jebel Road.

Other observation:

- The right-most signal head for the northbound left-turn has a red ball instead of a red arrow.
- A local resident and business woman stated that the tunnel is highly used and liked by the locals. It is well-lit and has CCTV cameras (provided by and monitored by the local business).
- There are drainage issues on the minor streets with pooling water and collected gravel.
- The median on the northbound approach is beneficial to direct southbound vehicles from impeding on northbound vehicles.
- There are potential plans to develop the area in the southwest quadrant for a recreation center and park-n-ride.
- The bus stop island on the north side of El Jebel Road seems to be more of an obstacle than a helpful element. With worn pavement markings, this island looks as though it is in the middle of the through lane.



**Photo 10: State Highway 82 and El Jebel Road**

#### ***RECOMMENDED IMPROVEMENTS***

It should be noted that this intersection is a part of a RFTA project that plans to upgrade the transit facilities. Any improvements should be coordinated with RFTA. Figure 54 and Figure 55 illustrate the short-term and long-term recommendations, respectively.

### Short-Term Recommendations

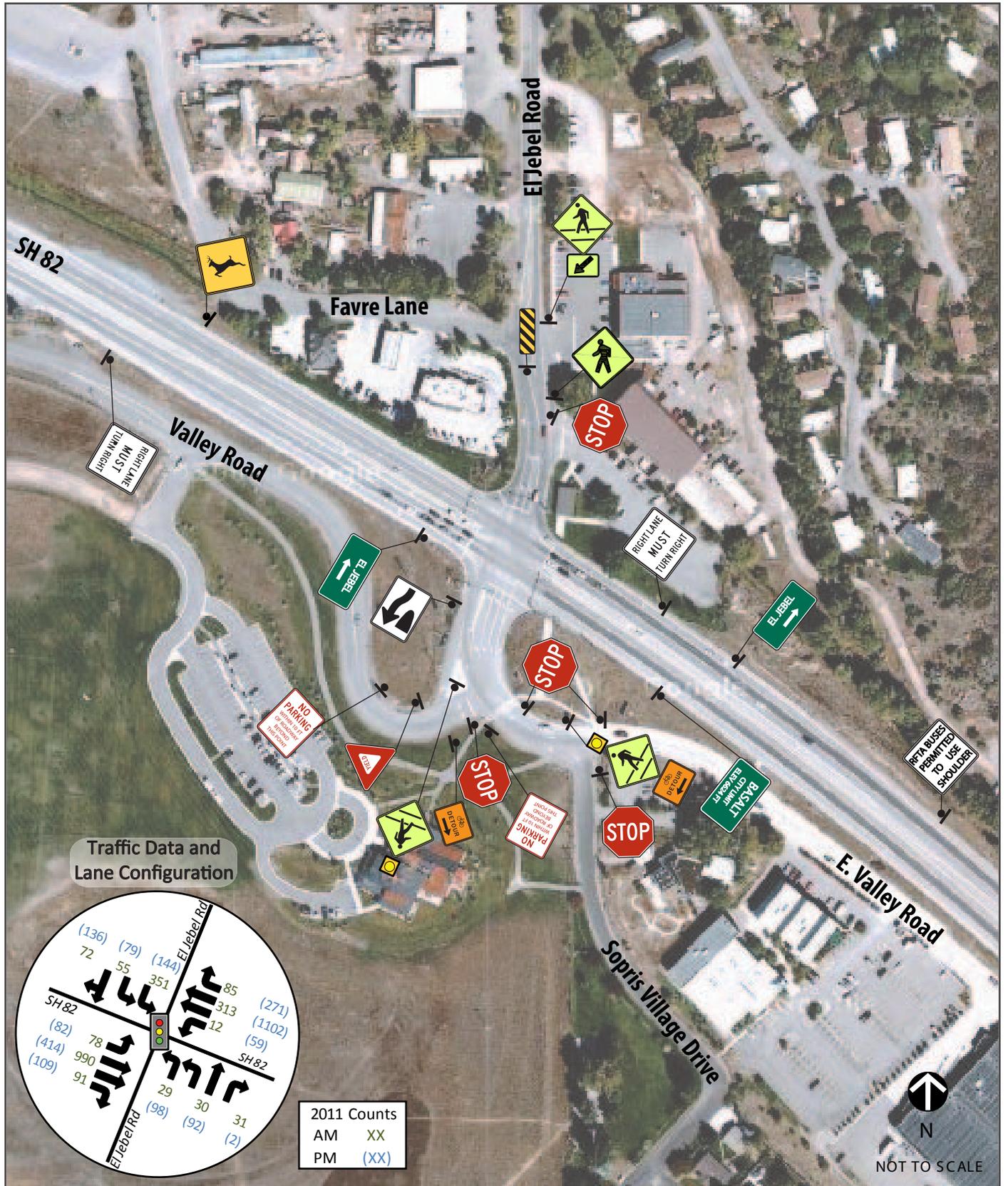
- Relocate the north El Jebel Road RFTA bus stop to a location farther north.
  - Remove the island at the bus stop and utilize pavement to accommodate lengthening turn lanes on El Jebel Road.
- Reduce the width of the shopping center driveway (northeast corner) and move as far north as possible.
  - Re-stripe parking lot to define spaces.
- Coordinate with RFTA for parking lot improvements at the northeast corner (currently designed) and relocation of bus stop.
- Modify Farve Lane to be either (1) a right-in-right-out or (2) right-out only access onto El Jebel Road.
  - Remove left-turn lane to Farve Lane.
  - Lengthen the southbound left-turn lanes to Farve Lane. This may require northbound lane on El Jebel Road to be realigned.

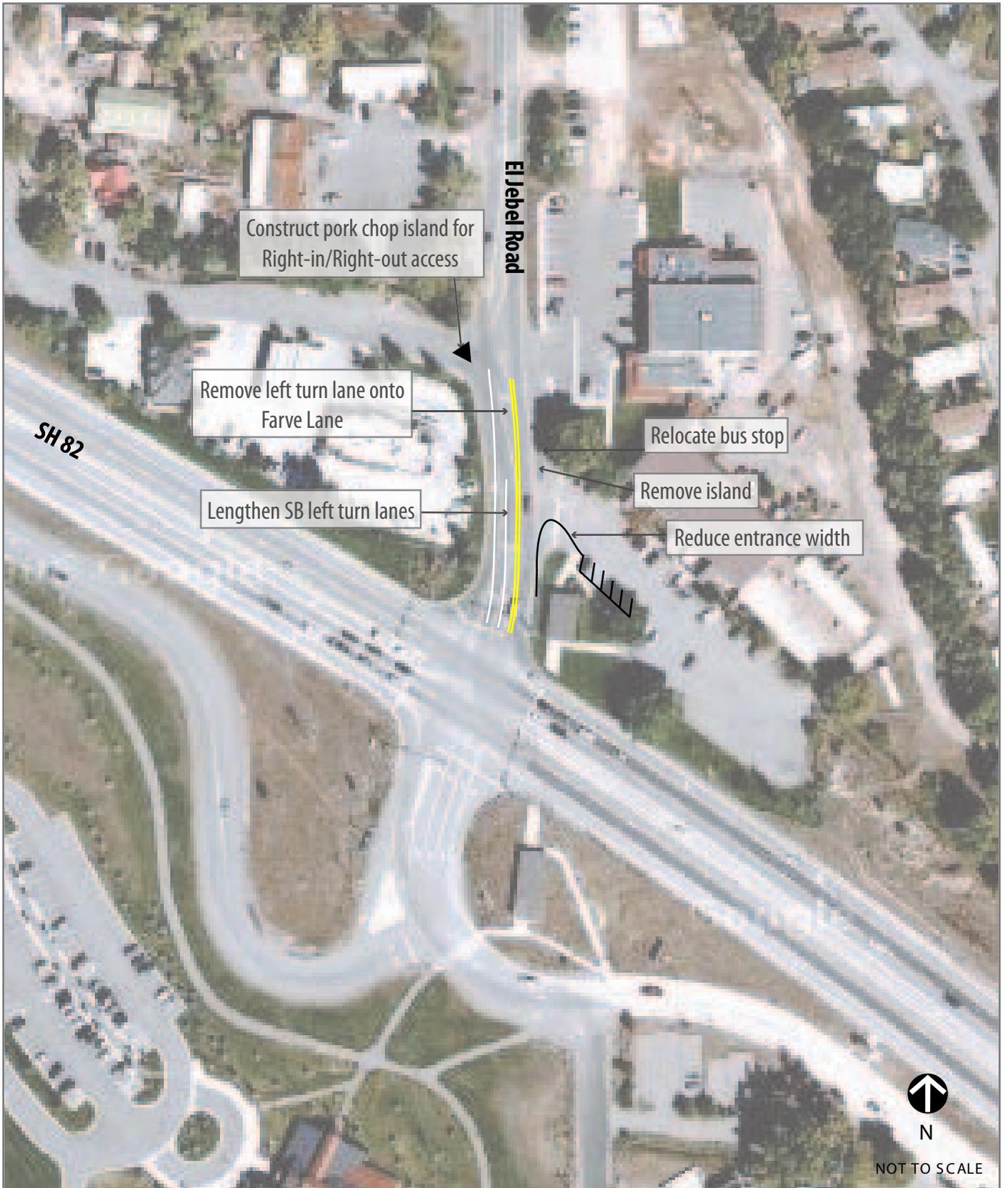
Estimated Cost = \$100,000

### Long-Term Recommendations

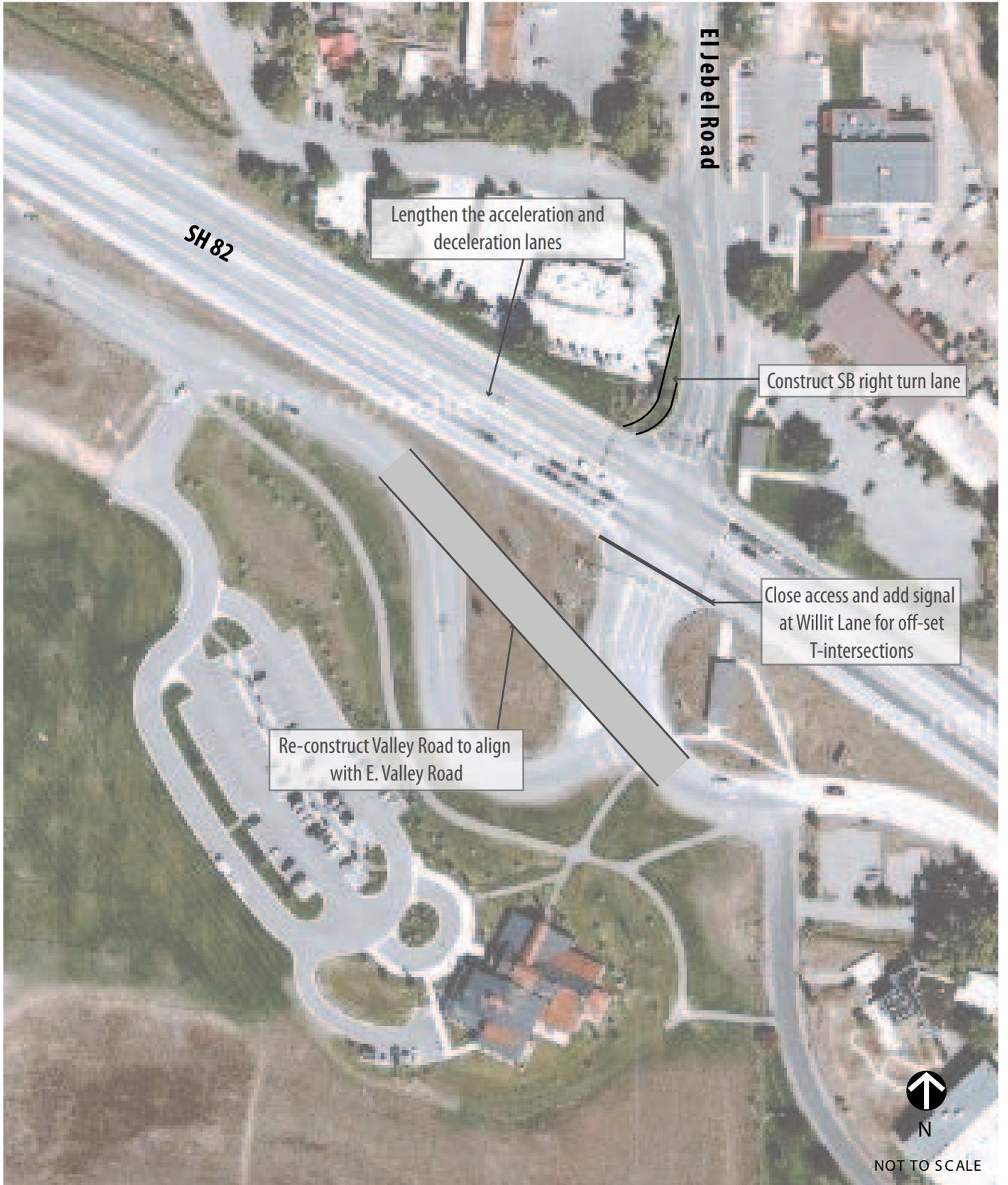
- Review signal timing and update if necessary.
- Construct a southbound right-turn lane.
- Close the northbound access at El Jebel Road to State Highway 82.
  - Construct a better alignment of Valley Road to connect to E. Valley Road.
  - Add a signal on State Highway 82 at Willits Lane to have a pair of offset T-intersections, if warranted.
  - Ensure that E. Valley Road can handle the increased traffic.
- Lengthen the acceleration and deceleration lanes to meet the standards of the *CDOT Access Code*.

Estimated Cost = \$100,000 (right-turn lane) + \$700,000 (Valley Road) + \$5,000 (striping) = \$805,000





Note: Coordinate with RFTA for parking lot improvements and relocation of bus stop



## STATE HIGHWAY 82 AND 23<sup>RD</sup> STREET/GRAND AVENUE

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. Through the Glenwood Springs, this highway is north-south with a speed limit of 35 mph and extends four lanes wide with a TWLTL. 23<sup>rd</sup> Street/Grand Avenue is a local roadway that provides access to businesses and residential neighborhoods. It also provides access to the 27<sup>th</sup> Street bridge. The Rio Grande Trail is parallel to State Highway 82 and is located just west of the highway.

This intersection is signalized with all the left-turns as protected+permitted. There are pedestrian signal heads and crosswalks for all directions. Push buttons are only installed for the north and south crosswalks. Curb ramps are installed on all corners. Sidewalk exists on both sides of 23<sup>rd</sup> Street/Grand Avenue and on the State Highway 82 (except on the west side, south of the intersection). Refer to Figure 56 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the City of Glenwood Springs submitted this intersection for evaluation due to the issues related to the angle of eastbound Grand Avenue and conflicts with trail users.

### ANALYSIS

Traffic data indicates that most of the eastbound vehicles are turning left at this intersection. There are technically two approach lanes (one left-turn, one shared through/right-turn); however, the skew limits the storage length and the ability for vehicles to reach their desired lane until they are within 40 feet of the intersection. The data does not indicate that a separate right-turn lane is warranted. The capacity of the Grand Avenue approach may be impacted by the skew and the steep upgrade into the intersection.

It looks as though the intersection has been reconstructed to improve the southbound right-turn lane, the trail crossing, and the width of the eastbound approach. On the south side of Grand Avenue, the improvements did not properly align the curb ramp and crosswalk with the trail. The curb ramp is offset by about five feet and there are no features that force trail users to use the crosswalk. In the field, it was observed that bicyclists and pedestrians traveling northbound on the trail travel over the curb instead of using the crosswalk. It was also an interesting discovery that the trail users are pushing the pedestrian call buttons for the east-to-west crosswalks, which impacts the timing and capacity of the intersection. There are no push buttons for the trail crossing, but there is a sign instructing trail users to "use ped signal". Since the east-to-west button is the only available button to push next to these signs, they push it and activate the pedestrian phase to cross the highway rather than the trail crossing.

It was observed that the 27<sup>th</sup> Street (westbound) left-turning queue did not always clear and some vehicles waited through three cycles until they cleared the intersection. It was observed that the left-turning vehicles only cleared

### Ranking: 5

**City:** Glenwood Springs

**County:** Garfield

**ADT:** 26,000 (Year 2010)

**Heavy Vehicles:** 3.9%

**Classification:** NRB

**Milepost:** 1.405

**Accidents: 2001 – 2008**

Total – 41  
Rear End – 20  
Broadside – 8  
Sideswipe – 4  
Approach Turn – 3  
Bicycle – 1  
Wild Animal – 1  
Other – 4

### LOS (Delay):

AM Overall – B (16.6s)  
EB – D (45.8s)  
WB – C (30.1s)  
NB – B (14.5s)  
SB – B (10.8s)  
PM Overall – B (14.1s)  
EB – D (36.4s)  
WB – C (26.2s)  
NB – B (13.2s)  
SB – A (7.2s)

if there was a vehicle waiting in the shared through/right-turn lane, otherwise, only two or three vehicles were able to clear in the given green time. In the field, a few vehicles would run the red light at the end of their phase to get onto State Highway 82. A review of the signal timing indicates that the allotted green times are adequate; therefore, the detection may be insufficient or working improperly.

Reviewing the storage lengths, the minor approaches are substandard, but are restricted by their geometry and/or closely spaced intersection. The mainline acceleration and deceleration lanes provide adequate storage lengths. The taper length for the northbound left-turn deceleration lane is substandard and will require removal of the median to be lengthened. The southbound right-turn deceleration lane is substandard, but is limited by the geometric and right-of-way constraints.

**TABLE 14: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 82 AND 23<sup>RD</sup> STREET**

Approach	Lane	Condition	Deceleration		
			Storage + Decel	Taper	Met?
Northbound	Left	Existing	75	25	No
		Required	25	120	
Southbound	Left	Existing	100	75	Yes
		Required	40	120	
	Right	Existing	100	65	No
		Required	300	120	

Source: Google Earth Pro and CDOT Access Code

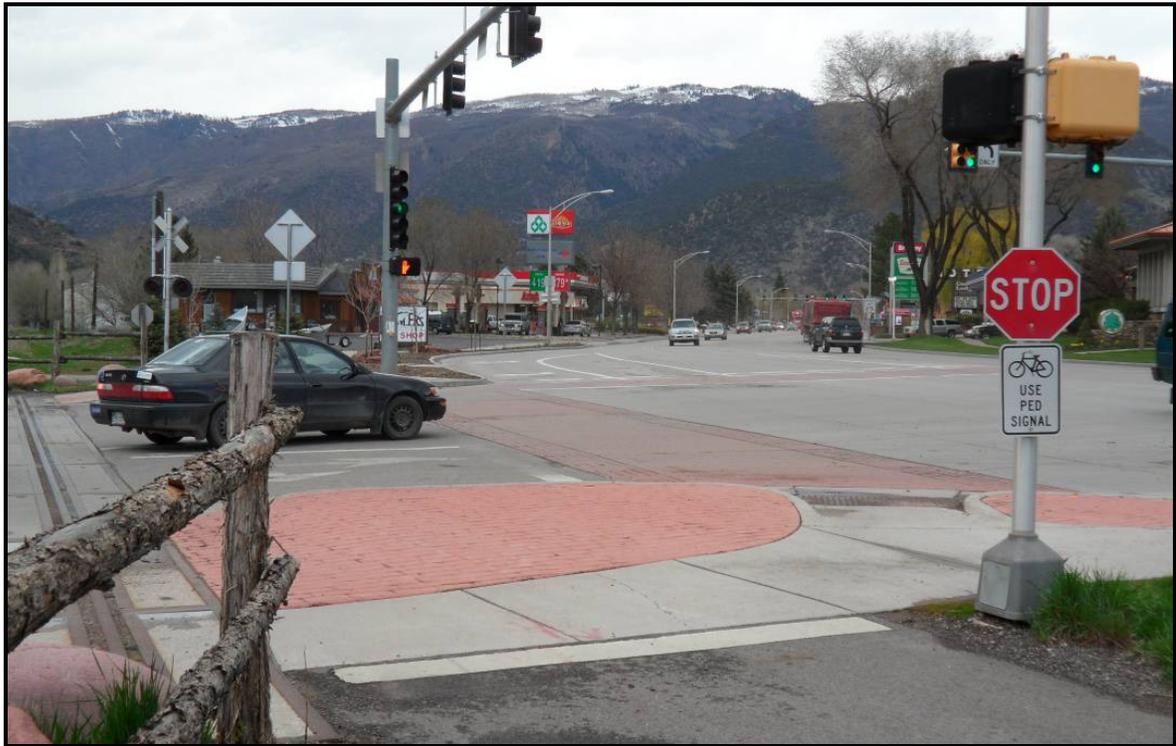


Photo 11: State Highway 82 and 23<sup>rd</sup> Street/Grand Avenue

### **RECOMMENDED IMPROVEMENTS**

The recommendations are illustrated in Figure 57 and Figure 58.

#### **Short-Term Recommendations**

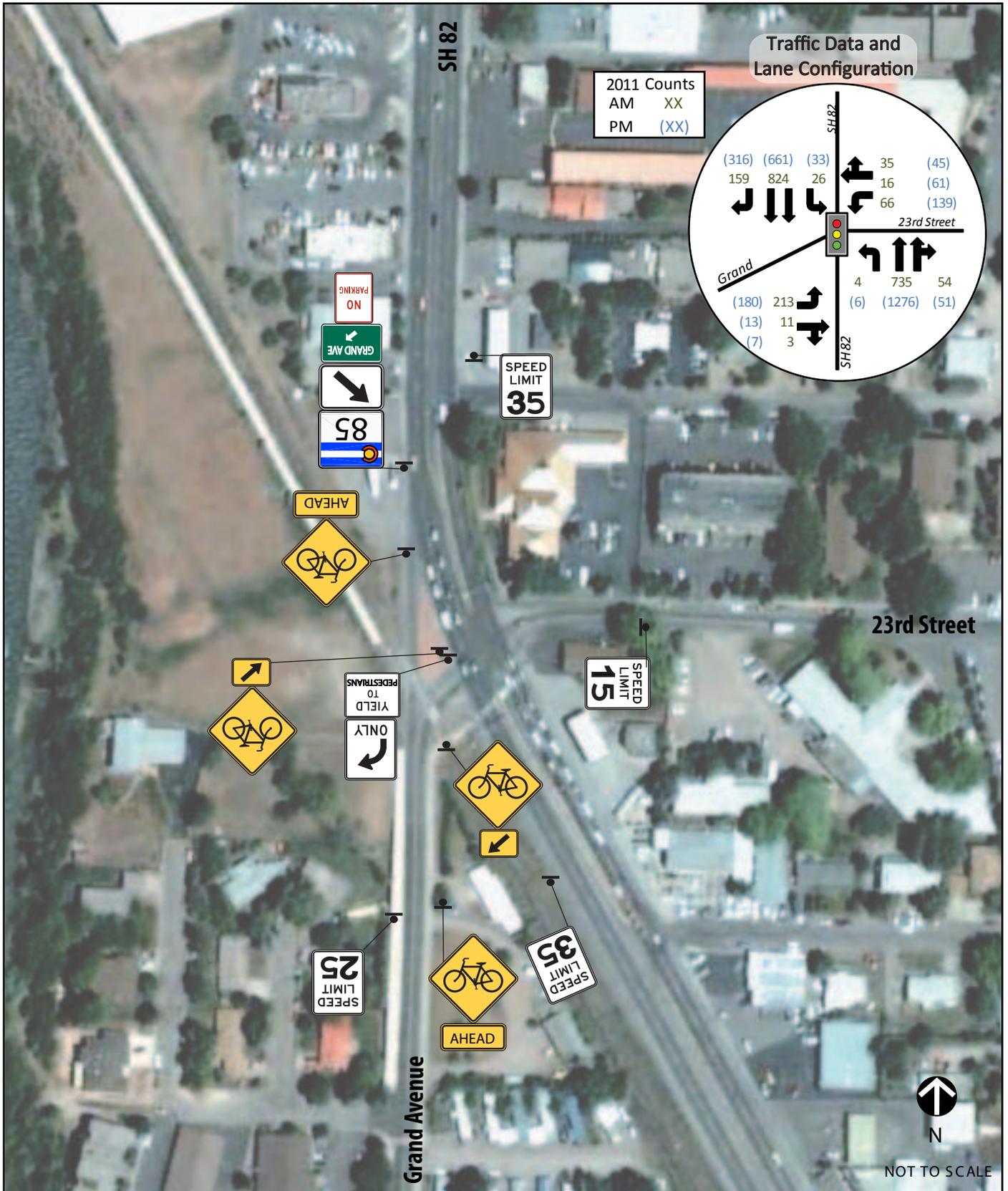
- Verify detection is working properly. Upgrade equipment if needed.
- Clarify the signage on the trail and at the intersection for trail users.
- Install a pedestrian push button on the existing poles for the west side crosswalk at the trail crossing.
- Extend the fence or add an obstacle to direct trail users to the curb ramp.
- Estimated Cost = \$500 (push button) + \$600 (signs) + \$1,000 (fence) = \$2,100

#### **Long-Term Recommendations**

- Move the pedestal pole on the southwest corner closer to State Highway 82. Install a sign pole for the trail signs and separate them from the pedestal pole with the east-to-west pedestrian push button.
- Re-align the south trail to align with the curb ramp.
  - Move the fence to direct trail users to the crosswalk.

- Re-align the sidewalk on the east side of Grand Avenue to connect with the trail prior to the intersection.
- Remove red-concrete area and design an eastbound right-turn lane.
- Change signage to reflect trail changes.
- Lengthen auxiliary lanes to meet the criteria of the *CDOT Access Code*.
- There is a street network that would provide access to State Highway 82 an option may be to close the eastbound approach of 23<sup>rd</sup> Street and creating a cul-de-sac. Evaluate the impacts to Grand Avenue, 27<sup>th</sup> Street, and the intersection on State Highway 82 and 27<sup>th</sup> Street.

Estimated Cost = \$5,000 (pedestal) + \$75,000 (trail) + \$75,000 (lanes) = \$155,000



Note: This figure aerial does not reflect recent improvements to the southbound right-turn movement



Note: This figure aerial does not reflect recent improvements to the southbound right-turn movement



Note: This figure aerial does not reflect recent improvements to the southbound right-turn movement

## STATE HIGHWAY 82 AND BRUSH CREEK ROAD

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. At the studied intersection, this highway is north-south with a speed limit of 50 mph and is divided by a grassy median with two lanes per direction. Brush Creek Road is a local two-lane roadway that provides access to residential neighborhoods on the west and a RFTA park-n-ride to the east. Brush Creek Road leads to the Town of Snowmass.

This intersection is signalized with the mainline left-turns as protected only, but do not operate simultaneously due to geometry and southbound mast arm design (northbound is protected and southbound is permitted). All the right-turns are channelized with pork chop islands with turn lanes on all approaches and acceleration lanes on the highway. There are crosswalks on all sides except the north side with pedestrian signal heads and push buttons. Sidewalks exist on the south side of Brush Creek Road and there is a pedestrian tunnel under State Highway 82. Refer to Figure 59 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Pitkin County submitted this intersection for evaluation due to the concerns related to high speeds, high peak hour volumes, and inability for mainline left-turn lanes to operate simultaneously. Provided traffic counts show that in July 2007 this portion of the highway had 20,400 to 20,900 vehicles per day.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. Figure 60 illustrates the recommendations.

- Reconstruct the southbound left-turn lane to align properly with the northbound left-turn lane.
- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection, and controller.

**Ranking: 6**

**County: Pitkin**

**ADT: 18,000 (Year 2010)**

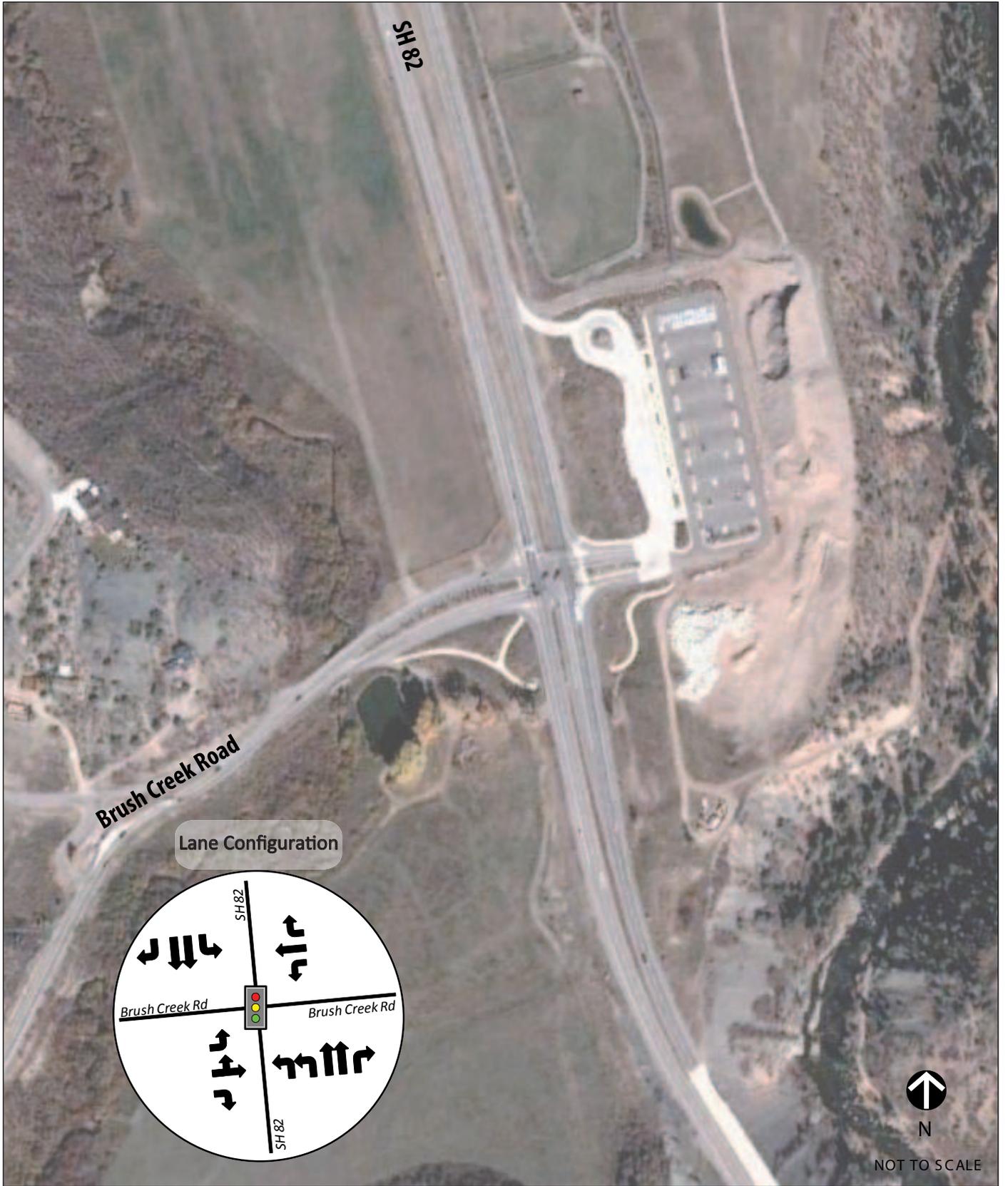
**Heavy Vehicles: 4.4%**

**Classification: EX**

**Milepost: 35.283**

**Accidents: 2001 – 2008**

*Total – 40*  
*Rear End – 25*  
*Broadside – 3*  
*Sideswipe – 3*  
*Approach Turn – 2*  
*Overtaking – 1*  
*Wild Animal – 1*  
*Other – 5*





## US HIGHWAY 6 AND VALLEY ROAD

### EXISTING CONDITIONS

US Highway 6 is a regional arterial that stretches across the state of Colorado and travels through the Town of Gypsum. It is utilized to get to many mountain towns, local connections, and as an alternate route to I-70. At the intersection of Valley Road, the highway travels east-west, is two lanes wide with wide shoulders, and has a speed limit of 35 mph. In Gypsum, it provides access to residential neighborhoods, businesses, Eagle Valley High School, Gypsum Elementary School, and national forest areas. Valley Road is a local street that provides access to the schools, residential neighborhoods, golf courses, and national forest areas.

The intersection is signalized with a span wire design. The westbound left-turn is protected+permitted phasing and the other approaches are permitted only. There are crosswalks on all approaches, except the east side, and pedestrian signal heads for the three crosswalks. A trail exists on the both sides of US Highway 6, east of the intersection, and sidewalks to the west. There are sidewalks on both sides on Valley Road south of the intersection, but only on the east side of the road north of the intersection. Pedestrian signal heads, push buttons, and crosswalks exist on the north, south, and east side of the intersection. There are curb ramps on all corners. Refer to Figure 61 for existing conditions.

It should be noted that the Town has preliminary design plans to add auxiliary lanes on US Highway 6 from Oak Ridge Drive to I-70, which includes upgrades at Valley Road.

### ISSUES PER THE APPLICATION

According to the application, the Town of Gypsum submitted this intersection for evaluation due to the issues pertaining to poor drainage, steep super elevation, small turning radii, high volume of vehicles and pedestrians, and accident frequency.

### ANALYSIS

The intersection drainage is poor due to the super elevation of the highway and lack of drainage features. There is a large drainage pan across the northbound approach causing slowing and a concrete ditch on the southeast corner. It seems that the drainage is inadequate as evident by the gravel sitting in the gutters, cross pan, and on the sidewalks. The condition of the pavement is poor with various cracks that may be a result of the drainage issues that create the freeze-thaw effect in the winter months. US Highway 6 has a large super elevation across the entire width of the roadway with improper drainage and run-off may create icy conditions. At the steepest point, the highway has a six percent super elevation just east of the intersection.

Other geometric issues are the small turning radii, narrow lanes on Valley Road, and inadequate turn lane storage lengths. It was observed that the southwest corner is inadequate for turning semi-trucks, as most of them turning right onto Valley Road had to turn from the eastbound through lane and then straddle the receiving lane and northbound left-turn lane. If vehicles were sitting in the northbound left-turn lane, semi-trucks making the eastbound right would have to wait or drive on the sidewalk. The sidewalk has tire tracks on them and the curbs are chipped from heavy vehicles. Valley Road is approximately 30 feet wide and has three lanes: one receiving

**Ranking: 7**

**Town: Gypsum**

**County: Eagle**

**ADT: 9,700 (Year 2010)**

**Heavy Vehicles: 9.7%**

**Classification: RA**

**Milepost: 142.608**

**Accidents: 2001 – 2008**

*Total – 13*

*Rear End – 7*

*Broadside – 3*

*Approach Turn – 1*

*Bicycle – 1*

*Other – 1*

lane, one left-turn lane, and one shared through/right-turn lane.. It was observed in the field that passenger vehicles also take the east-to-south turn at a wide angle and use the northbound left-turn lane if vehicles are not present in that lane. If a wide vehicle were in one of the northbound lanes, then it may block vehicles from traveling in the other lane.

Each approach provides the necessary lanes warranted by the 2011 traffic counts; however, the storage lengths do not accommodate the experienced volumes. Table 16 provides the existing measurements of the turn lane lengths and the required lengths per the CDOT Access Code. It can be seen that the eastbound right-turn lane and westbound left-turn lane are substandard and are not accommodating the peak hour volumes. Eastbound is limited by the unsignalized intersection at Eagle Street/Estes Lane (190 feet west) and by the width of US Highway 6. Westbound is limited by the signalized intersection of Oak Ridge Drive (435 feet to the east), but may be able to be slightly extended by utilizing the painted median. The northbound white lane line defining the left-turn lane can be extended, but is unnecessary with the storage provided by the two-way left-turn lane (TWLTL).

TABLE 15: ACCELERATION AND DECELERATION LANES FOR US HIGHWAY 6 AND VALLEY ROAD								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Meet ?	Accel	Taper	Meet ?
Eastbound	Left	Existing	35	70	N/A	N/A	N/A	N/A
		Required	N/A: Low volume			N/A	N/A	
	Right	Existing	55	135	No	175	130	Yes
		Required	70	120		150	120	
Westbound	Left	Existing	85	100	No	N/A	N/A	N/A
		Required	100+190	120		N/A	N/A	
Northbound	Left	Existing	110	TWLTL	Yes	N/A	N/A	N/A
		Required	70	80		N/A	N/A	

Source: Google Earth Pro and CDOT Access Code

This intersection is one of the busiest intersection in town due the high volume of vehicles traveling through the intersection to I-70, tourists visiting Gypsum and locations south on Valley Road, students and buses commuting to the school, and local residences driving around town. Figure 61 provides the turning movement counts gathered in April 2011. The greatest volumes are the through movements on US Highway 6, as well as the turning movements to and from the south side of Valley Road. In the evening peak hour there were 18 pedestrians using the north crosswalk and eight using the east crosswalk.

According to the application, the Eagle County Sheriff indicated that this intersection had 21 accidents in this past year; however, this recent data was not submitted. The accident data available was from 2001 to 2008, which showed a total of 13 accidents, with the majority being rear ends and on the eastbound approach. The available data did not indicate a high frequency of crashes at this location, but should be verified with more recent years.

Other observations:

- There are four luminaires at the intersection, one per traffic signal pole.
- Pedestrian walk and clearance time is shorter than required.
- There are a few driveways close to the intersection on the south side of US Highway 6, just west of the intersection.



**Photo 12: US Highway 6 and Valley Road**

### ***RECOMMENDED IMPROVEMENTS***

Recommendations are shown in Figure 62.

#### **Short-Term Recommendations**

- Reduce the width of the driveway on US Highway 6 into the restaurant and place as far from the intersection as possible.
- Improve drainage.
- Install signal detection, including advanced detection.
- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection, and controller.

- Reconstruct the radius on the southwest corner to accommodate larger semi-trucks. This may require right-of-way acquisition.
- Align the east crosswalk with the north pedestrian ramp or construct a directional ramp for this crosswalk.

Estimated Cost = \$10,000 (driveway) + \$25,000 (drainage) + \$300,000 (signal) + \$30,000 (radius) = \$365,000

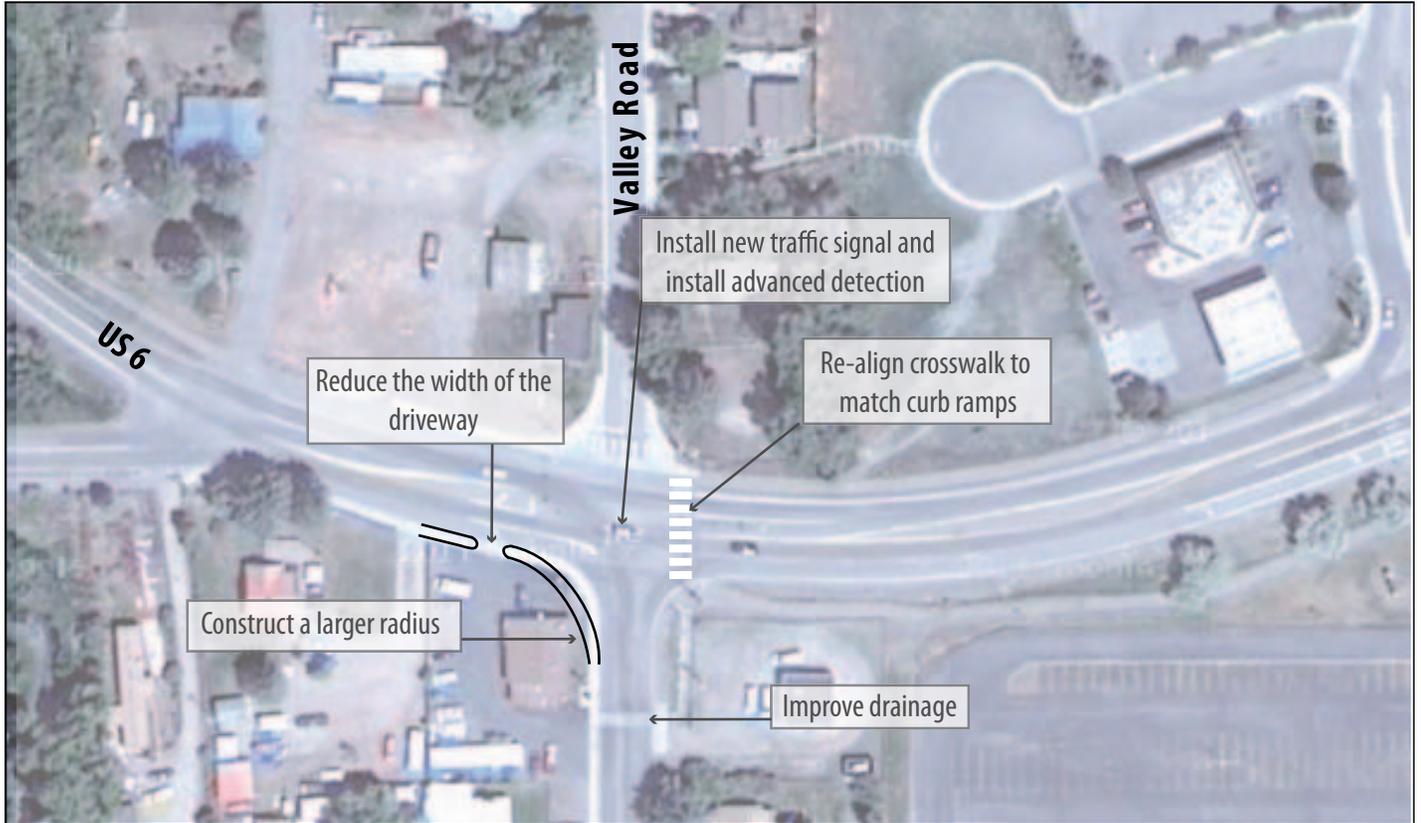
### Long-Term Recommendations

- Improve the super elevation and grades as planned.
- Widen Valley Road to provide wider lane widths.
- Lengthen westbound left turn lane length and the eastbound left turn at Oak Ridge Drive. Maximize the storage lengths with the available pavement (back-to-back left-turn lanes).
- Construct a proper sidewalk with curb and gutter on the north side of US Highway 6, east of the intersection. This should be a part of the super elevation project.
- Change Eagle Street to a right-in-right-out access to improve intersection spacing and lengthen turn lanes at Valley Road.

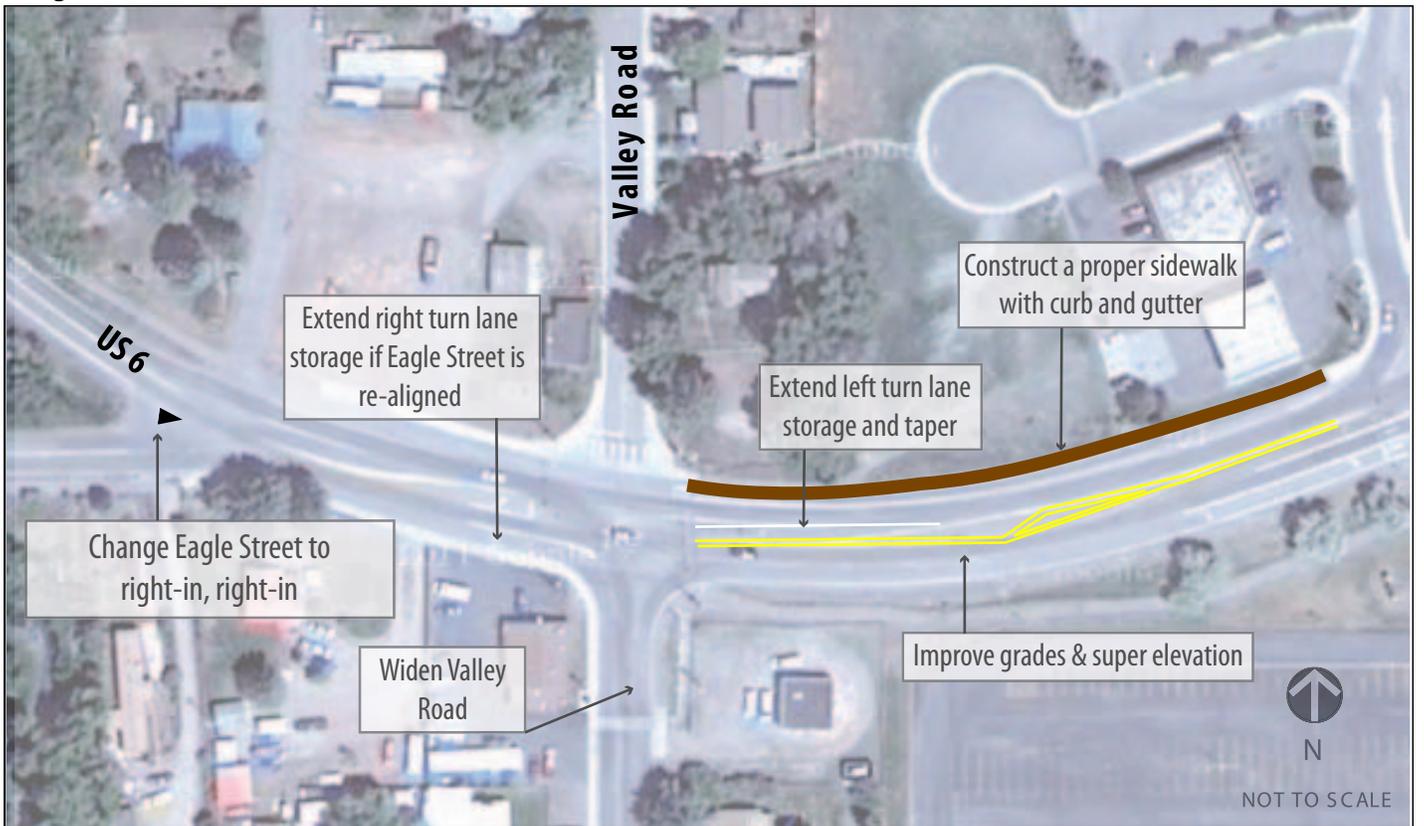
Estimated Cost = \$100,000 (super elevation) + \$100,000 (widening, right-of-way not included) + \$10,000 (Eagle Street) = \$210,000



Short-Term Recommendations



Long-Term Recommendations



## STATE HIGHWAY 82 AND COUNTY ROAD 113 (CATTLE CREEK ROAD)

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. At County Road 113 (also known as Cattle Creek Road), this four-lane divided highway is north-south with a speed limit of 65 mph. Cattle Creek Road is a local roadway that provides access to businesses, ranches, and residential neighborhoods to the east. The eastbound approach is a driveway to a private residence.

This intersection is unsignalized with the minor approaches stop-controlled. There are many closely spaced driveways and adjacent intersection on the east side. The frontage road and County Road 110 connect to Cattle Creek Road within 50 feet of the intersection and are stop-controlled as well. Refer to Figure 63 for existing conditions.

It should be noted that there are current plans to develop the property to the west of the intersection and a traffic impact study is in-progress.

### ISSUES PER THE APPLICATION

According to the application, Garfield County submitted this intersection for evaluation due to issues associated with high speeds, substandard auxiliary lane lengths, lack of left-turn acceleration lane, warranted signal, and queuing and blocking created by adjacent intersections.

### ANALYSIS

The *Traffic Impact and Needs Assessment* (2010) indicated that the grades increase by a consistent five percent from the highway and the turn lanes are insufficient. The study states that the intersection is “confusing” and causes issues due to the lack of pavement markings, wide pavement section of Cattle Creek Road, close proximity to adjacent intersections, minor street skews impacting sight distance from State Highway 82 turn lanes, and left-turning vehicles from Cattle Creek Road sit in median.

The County performed *Traffic Impact and Needs Assessment* for various intersections throughout the county and was completed in October 2010. The traffic counts in the study were taken May 2010. The capacity analysis shows that the intersection operates at LOS D and LOS F in the morning and evening peak hours, respectively. Accident data from CDOT indicates that the most frequent accidents are broadside and majority are from the southbound left-turn lane.

The existing acceleration and deceleration lanes were measured and compared to the requirements of the *CDOT Access Code*. Table 16 summarizes the evaluation of the auxiliary lanes at Cattle Creek Road.

**Ranking: 8**

**County: Garfield**

**ADT: 23,000 (Year 2010)**

**Heavy Vehicles: 4.0%**

**Classification: EX**

**Milepost: 7.870**

**Accidents: 2001 – 2008**

*Total – 7*

*Broadside – 3*

*Rear End – 1*

*Approach Turn – 1*

*Overtaking Turn – 1*

*Other – 1*

TABLE 16: ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 82 AND CATTLE CREEK ROAD								
Approach	Lane	Condition	Deceleration			Acceleration		
			Storage + Decel	Taper	Met?	Accel	Taper	Met?
Northbound	Right	Existing	200	220	No	215	165	No
		Required	700	300		1170	300	
Southbound	Left	Existing	135	245	No	N/A	N/A	N/A
		Required	50+700	300		1170	300	

Source: Google Earth Pro and CDOT Access Code

#### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. The long-term improvements should accommodate the proposed development for the property to the west.

#### Short-Term Recommendations

- Lengthen the acceleration and deceleration lanes to conform to the *CDOT Access Code*.
- Obtain recent traffic counts (turning movement and hourly directional) to verify signal warrants per the MUTCD.
  - If warrants are met, then install a new traffic signal.
- Implement access management techniques.
- Redesign the frontage road and local streets to improve spacing.



## US HIGHWAY 6 AND HILLCREST DRIVE

### EXISTING CONDITIONS

US Highway 6 is a regional arterial that stretches across the state of Colorado and travels through the Town of Edwards. It is utilized to get to many mountain towns, local connections, and as an alternate route to I-70. At the intersection of Hillcrest Drive, the highway travels east-west, is two lanes wide with wide shoulders, and has a speed limit of 50 mph. Hillcrest Drive is a local collector that is two lanes wide and provides access to residential neighborhoods, the water and sanitation treatment plant, and the Cordillera golf course.

Hillcrest Drive creates a T-intersection with US Highway 6 and is stop-controlled. Westbound has a right-turn deceleration lane and acceleration lane. Eastbound has a left-turn deceleration lane. Hillcrest Drive does not have separate turn lanes. Refer to Figure 64 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Eagle County submitted this intersection for evaluation due to the concerns associated with the alignment, high volumes, queuing, lack of a left-turn acceleration lane, dangerous left-turn onto the highway, and inadequate sight distance. The County stated that CDOT performed a preliminary warrant analysis and that the intersection met Warrant 3 (Peak Hour).

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic counts (turning movement and hourly directional) to further investigate the signal warrants (per the MUTCD) and determine the need for a left-turn acceleration lane (per the CDOT Access Code).
- Evaluate and mitigate the sight distance issues.
- Install a left-turn acceleration lane for vehicles turning from Hillcrest Drive. Evaluate use of the painted median, but ensure the CDOT design criteria are met.
- Install lighting at this intersection.

**Ranking: 9**

**Town: Edwards**

**County: Eagle**

**ADT: 9,500 (Year 2010)**

**Heavy Vehicles: 4.1%**

**Classification: NRA**

**Milepost: 164.070**

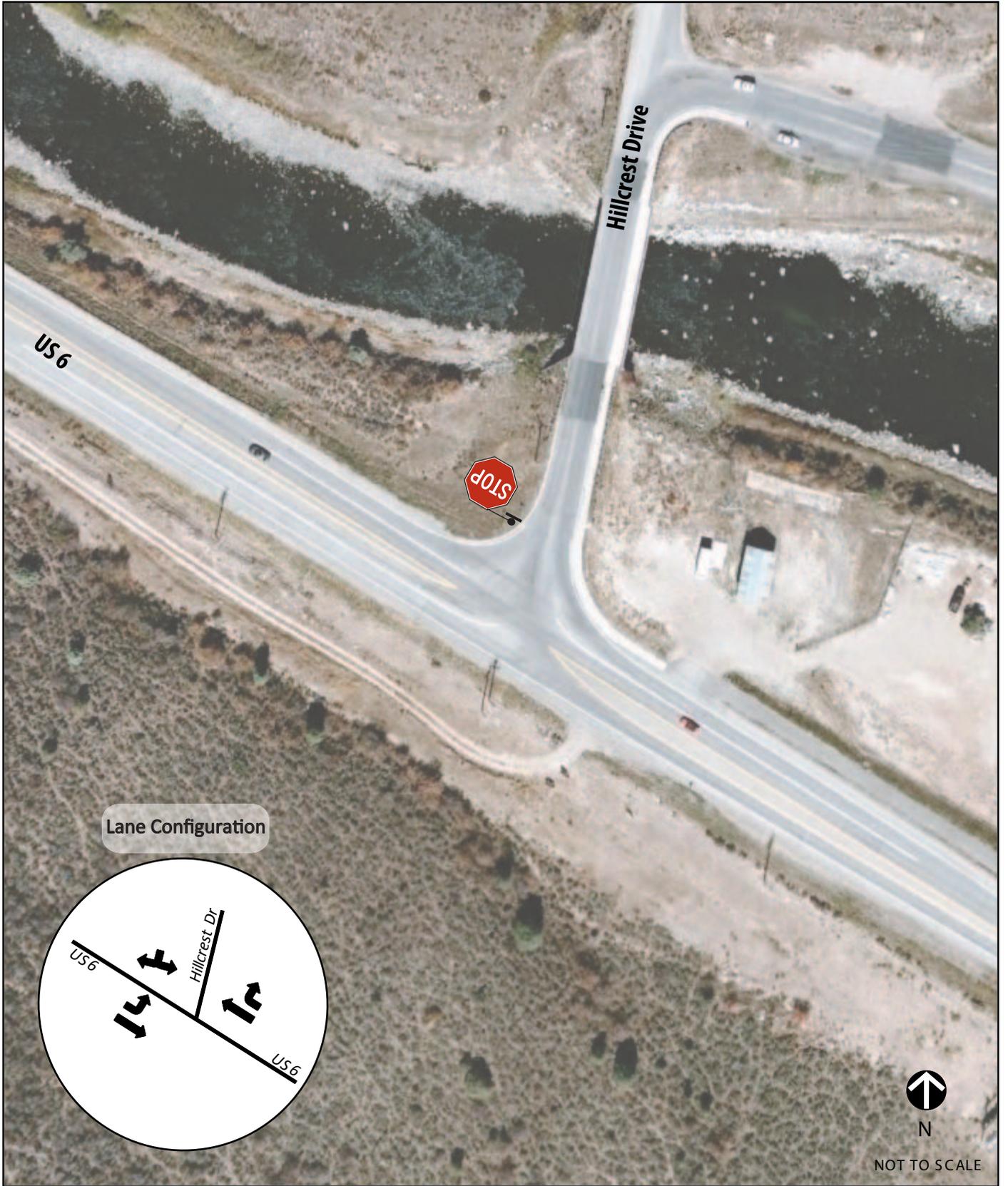
**Accidents: 2001 – 2008**

*Total – 10*

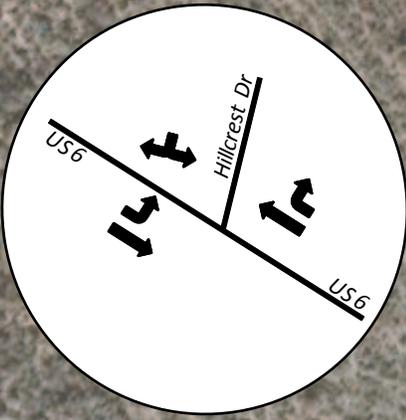
*Broadside – 5*

*Rear End – 1*

*Overtaking Turn – 1*



Lane Configuration



NOT TO SCALE

## US HIGHWAY 6 AND OAK RIDGE DRIVE

### EXISTING CONDITIONS

US Highway 6 is a regional arterial that stretches across the state of Colorado and travels through the Town of Gypsum. It is utilized to get to many mountain towns, local connections, and as an alternate route to I-70. At the intersection of Oak Ridge Drive, the highway travels east-west, is two lanes wide with wide shoulders, and has a speed limit of 35 mph. In Gypsum, it provides access to residential neighborhoods, businesses, Eagle Valley High School, and the Gypsum Elementary School. Oak Ridge Drive is a local street that is the high school driveway (northbound) and provides access to the shopping and grocery center to the north.

The intersection is signalized with a span wire design. The highway left-turns are protected+permitted phasing and the minor left-turns are permitted only. There are crosswalks on all approaches, except the east side, and pedestrian signal heads for the three crosswalks. A detached trail exists on the south side of US Highway 6, there is a sidewalk on the north side of the highway west of the intersection and on the north side of Oak Ridge Drive. This is a school-zone area during school hours. Refer to Figure 65 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the Town of Gypsum submitted this intersection for evaluation due to the concerns related to the alignment of Oak Ridge Drive, safety for school children, poor drainage, small radius on the southwest corner, and inefficiency of the current detection.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection (in-pavement), and controller.
- Review and update signal timing.
- Collect traffic counts (pedestrian, turning movement, and hourly directional) to determine operational needs and updates.
- Monitor pedestrian volumes and accidents. Evaluate the needs and pedestrian level-of-service (refer to the 2010 Highway Capacity Manual).
- Realign Oak Ridge Drive to match centerlines and provide a wider radius.

**Ranking:** 10

**Town:** Gypsum

**County:** Eagle

**ADT:** 9,700 (Year 2010)

**Heavy Vehicles:** 9.7%

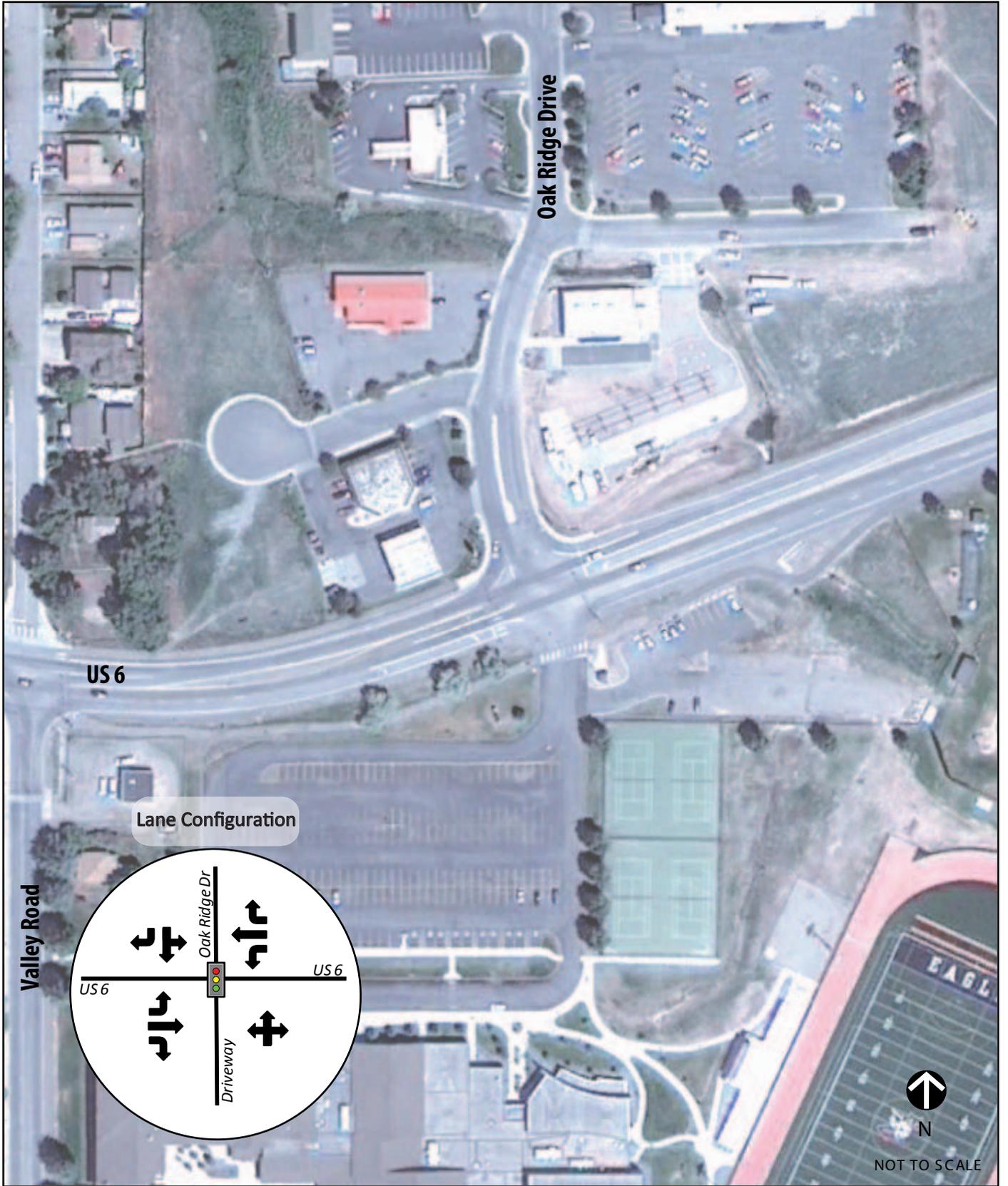
**Classification:** RA

**Milepost:** 142.717

**Accidents:** 2001 – 2008

Total – 5

Rear End – 5



## STATE HIGHWAY 82 AND BALTIC AVENUE

### EXISTING CONDITIONS

State Highway 82 is a principal arterial that travels through the Roaring Fork Valley connecting I-70 in Glenwood Springs to Aspen and on to Twin Lakes. At Baltic Avenue, this highway is northwest-southeast with a speed limit of 50 mph and extends five lanes wide. Baltic Avenue is a local roadway that provides access to businesses, office park, and residential neighborhoods to the east and the Aspen/Pitkin County Airport to the west.

This intersection is signalized with the mainline left-turns as protected only and the minor lefts as permitted only. There are left and right deceleration lanes and right-turn acceleration lane for west to north. The right-turn acceleration lane for east to south is a bus only lane. There are pedestrian signal heads and a crosswalk on the south side. Curb ramps are installed on the south corners. Sidewalks exist on the east side of Baltic Avenue to the park-n-ride and on both sides of State Highway 82, south of the intersection, ending at the bus stops. There are two highly utilized bus stops and bus pull-outs on either side of State Highway 82, just south of the intersection, and a Roaring Fork Transportation Authority (RFTA) park-n-ride lot west of the intersection. Refer to Figure 66 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Pitkin County submitted this intersection for evaluation due to the issues related to high speeds, high volume of traffic and multiple movements, unprotected turning movement conflicts with pedestrians, reduced levels-of-service in peak hours, and queuing on the minor street.

### ANALYSIS

The accident data from 2001 to 2008 does not reflect a pedestrian issue, but there are a series of rear end accidents on the highway approaches. Pitkin County conducted a *Roundabout Feasibility Study* in June 2010 to determine if a roundabout is a practicable design for the intersection of State Highway 82 and Baltic Avenue. The conceptual level report concluded that there is sufficient evidence that a roundabout should be further investigated for this location.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. It should be noted that an access management plan is currently being conducted for this area. Finalize this plan and implement recommendations from the plan.

- Collect traffic counts (turning movement) to determine need for additional left-turn lanes on Baltic Avenue, to optimize the signal timing, to further investigate a roundabout, and to develop the appropriate design.
- Review signal timing plan and update for pedestrian phasing as needed.
- Modify the local street network that impacts the highway intersection to reduce conflicts with queuing and blocking of Sage Way. Consider closing or changing Sage Way accesses to right-in-right-out.

**Ranking: 11**

**County: Pitkin**

**ADT: 18,000 (Year 2010)**

**Heavy Vehicles: 4.0%**

**Classification: EX**

**Milepost: 37.630**

**Accidents: 2001 – 2008**

*Total – 15*

*Rear End – 10*

*Broadside – 2*

*Overtaking – 1*

*Wild Animal – 1*

*Other – 1*





## US HIGHWAY 6 AND DEVEREUX ROAD

### EXISTING CONDITIONS

US Highway 6 is a regional arterial that stretches across the state of Colorado and travels through the City of Glenwood Springs. It is utilized to get to many mountain towns, local connections, and as an alternate route to I-70. At the intersection of Devereux Road, the highway travels east-west, is two lanes wide with minimal shoulders, and has a speed limit of 25 mph (eastbound) and 40 mph (westbound). In Glenwood Springs, it provides access to businesses, retail centers, residential areas, and leads into the center of the city. Devereux Road is a local street that provides access to businesses, CDOT offices, a hotel, and crosses over I-70 and the Colorado River. Offset by about 200 feet (to the west), is Transfer Trail which provides access to gravel pits, mining operations, residential neighborhoods, and recreational areas.

Devereux Road creates a T-intersection with US Highway 6 and is stop-controlled. Eastbound has a right-turn deceleration lane with painted channelization. Westbound has a left-turn deceleration lane. Devereux Road does not have separate turn lanes. Transfer Trail connects to US Highway 6 with a southbound approach. This access has a right-turn deceleration lane on the highway. There are sidewalks on the both sides of US Highway 6 that begin at Transfer Trail and extend into town. Devereux Road has a sidewalk on the west side from this intersection south for 250 feet. There are two bus stops with covered shelters near this intersection: one on the southeast corner and the other on the north side of US Highway 6 near Transfer Trail. Refer to Figure 68 for existing conditions.

**Ranking:** 12

**City:** Glenwood Springs

**County:** Garfield

**ADT:** 13,000 (Year 2010)

**Heavy Vehicles:** 6.4%

**Classification:** NRB

**Milepost:** 0

**Accidents:** 2001 – 2008

Total – 4

Broadside – 1

Wild Animal – 1

Other – 2

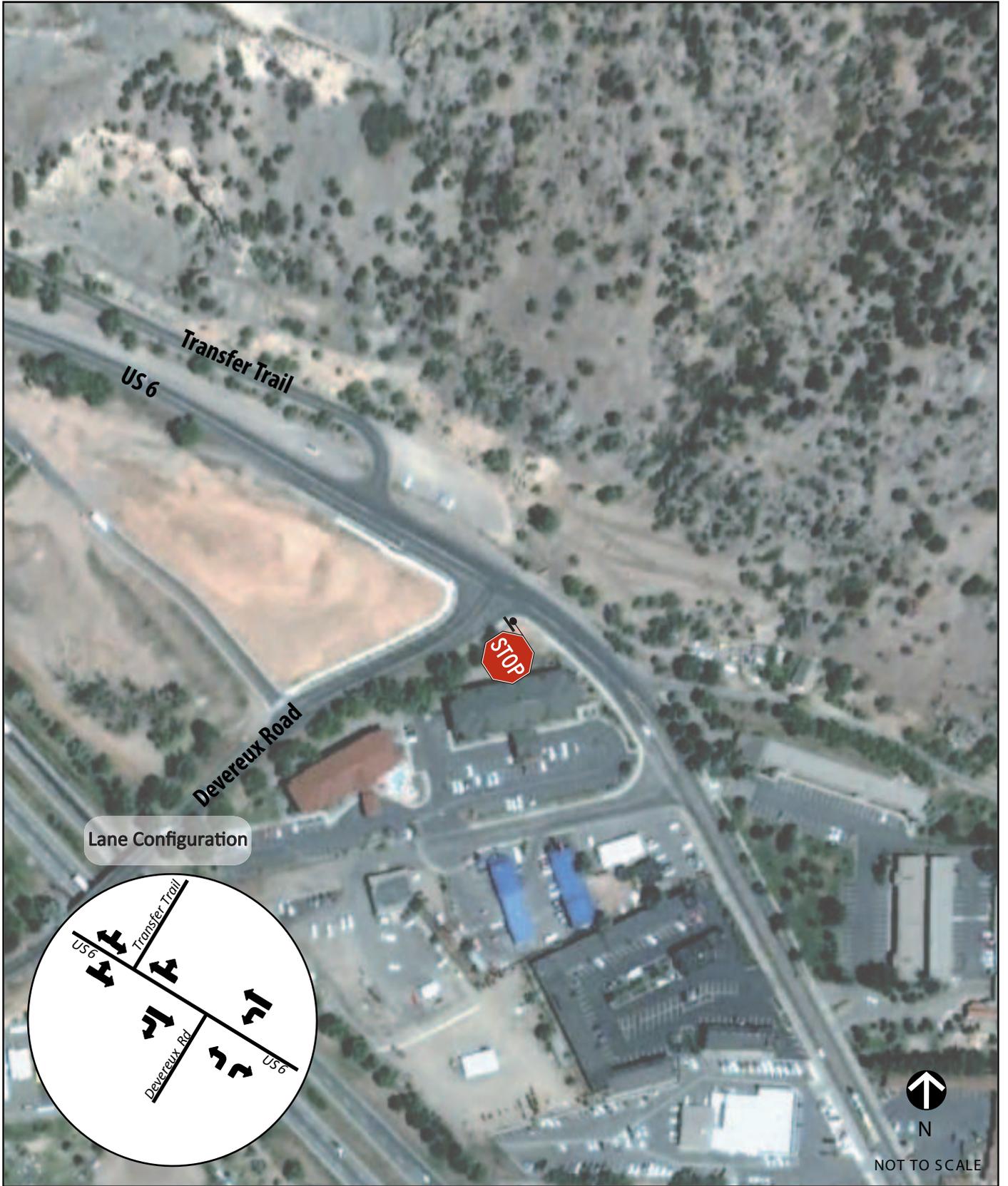
### ISSUES PER THE APPLICATION

According to the application, the City of Glenwood Springs submitted this intersection for evaluation due to the concerns associated with high number of tourists and locals using the trail, non-continuous sidewalks, extremely large radii, offset from Transfer Trail, buses stopping at stops, no channelization, and insufficient pedestrian and bicyclist facilities.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic counts (turning movement, hourly directional, and classification) to evaluate the signal warrants (in the MUTCD), develop appropriate intersection design, and determine truck usage.
- Conduct a Pedestrian and Bicyclist Study to determine the operational needs.
- Re-align Transfer Trail and Devereux Road to be one intersection.
- Monitor traffic volumes turning left onto Transfer Trail and construct a left-turn lane when warranted.



Note: Aerial does not show recent development in southwest corner and added turn lanes on US Highway 6

## STATE HIGHWAY 133 AND SNOWMASS DRIVE/RIVER VALLEY RANCH ROAD

### EXISTING CONDITIONS

State Highway 133 is a north-south regional highway that connects State Highway 82 (Carbondale) and State Highway 92 (Hotchkiss) and is the main arterial through Carbondale. It provides access to rural mountain towns, recreational areas, and rafting sites. Through Carbondale this highway provides one lane per direction. Snowmass Drive (westbound) is a local collector street that provides access to many residential roads, Roaring Fork High School, and local businesses. River Valley Ranch Road (eastbound) is a local street that provides access to a golf course and club, residential neighborhoods and local businesses.

This intersection is stop-controlled on the minor approaches. There are right and left-turn deceleration lanes for north- and southbound. On the north side of the intersection there is a school crossing with a painted crosswalk and signs. The middle and elementary schools are less than one-half mile north of the intersection. Refer to Figure 69 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the Town of Carbondale submitted this intersection due to the safety and operational issues associated with pedestrians, difficulty in making left-turns, and decreasing level-of-service. Due to the close proximity to the elementary and high school, this intersection has a high volume of pedestrians that are crossing State Highway 133. The Town employs a police officer during morning and afternoon peaks to assist pedestrians and cyclists as they cross the highway. The Town is also concerned that the width that pedestrians must cross and the lack of gaps in the traffic.

Local drivers have complained that there is a lack of gaps in the highway traffic to complete adequate turning movements at this location. A previous Corridor Feasibility Study (2002 – PBS&J) indicated that this intersection will meet signal warrants in 2025. According a more recent Traffic Impact Study (2009 – FHU), the 2008 analysis indicated that this intersection had an LOS of C and D for the morning and evening peak hours, respectively, and it was projected that the levels-of service would decrease to D and E by 2011. This second study recommended a signal be installed by 2029.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Request a School-Zone Study be completed by CDOT.
- Monitor the traffic volumes at this intersection to install a signal when warranted.
- Construct one westbound left-turn lane, one westbound right-turn lane, and one eastbound left-turn lane (warranted by 2008 volumes).

**Ranking:** 13

**Town:** Carbondale

**County:** Garfield

**ADT:** 8,200 (Year 2010)

**Heavy Vehicles:** 4.0%

**Classification:** NRB

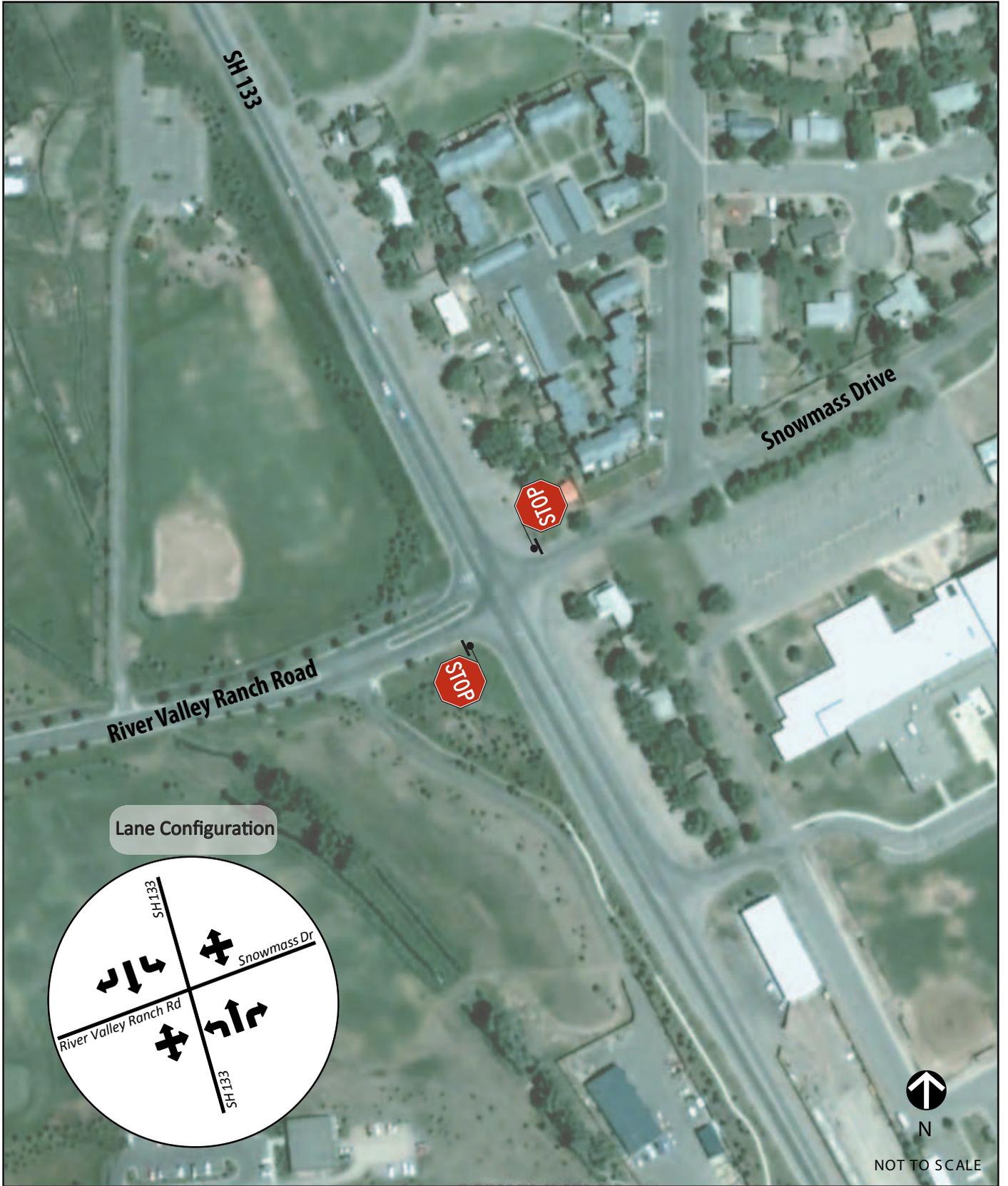
**Milepost:** 67.044

**Accidents:** 2001 – 2008

Total – 8

Broadside – 6

Rear End – 1



## STATE HIGHWAY 133 AND HENDRICK DRIVE/SOPRIS AVENUE

### EXISTING CONDITIONS

State Highway 133 is a north-south regional highway that connects State Highway 82 (Carbondale) and State Highway 92 (Hotchkiss) and is the main arterial through Carbondale. It provides access to rural mountain towns, recreational areas, and rafting sites. Through Carbondale this highway provides one lane per direction. Hendrick Drive/Sopris Avenue (eastbound) is a local collector street that provides access to residential neighborhoods and local businesses. Sopris Avenue is offset to the north from Hendrick Drive and the liquor store driveway aligns with Hendrick Drive.

This intersection is stop-controlled on the minor approaches. There is a right-turn deceleration lane for southbound and a left-turn deceleration lane for northbound. The middle and elementary schools are less than one-half mile south of the intersection. Refer to Figure 70 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the Town of Carbondale submitted this intersection due to the safety and operational issues associated with the lack of gaps in traffic to accommodate the high volume of pedestrians crossing the highway.

According to the Pedestrian Crosswalk Traffic Control Assessment (2007 – TurnKey) and the Corridor Feasibility Study (2002 – PBS&J), this intersection warrants a signal. CDOT has already developed construction bid plans (Federal Aid Project No. C133A-036) for this intersection, which includes installation of a traffic signal and upgrading the pedestrian features.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Install warranted signal and include pedestrian features, such as pedestrian signal heads, push buttons, and crosswalks.
- Re-align Sopris Avenue to line up with Hendrick Drive.
- Construct the required turn lanes per the *CDOT Access Code*.

**Ranking: 14**

**Town: Carbondale**

**County: Garfield**

**ADT: 8,200 (Year 2010)**

**Heavy Vehicles: 3.1%**

**Classification: NRB**

**Milepost: 67.494**

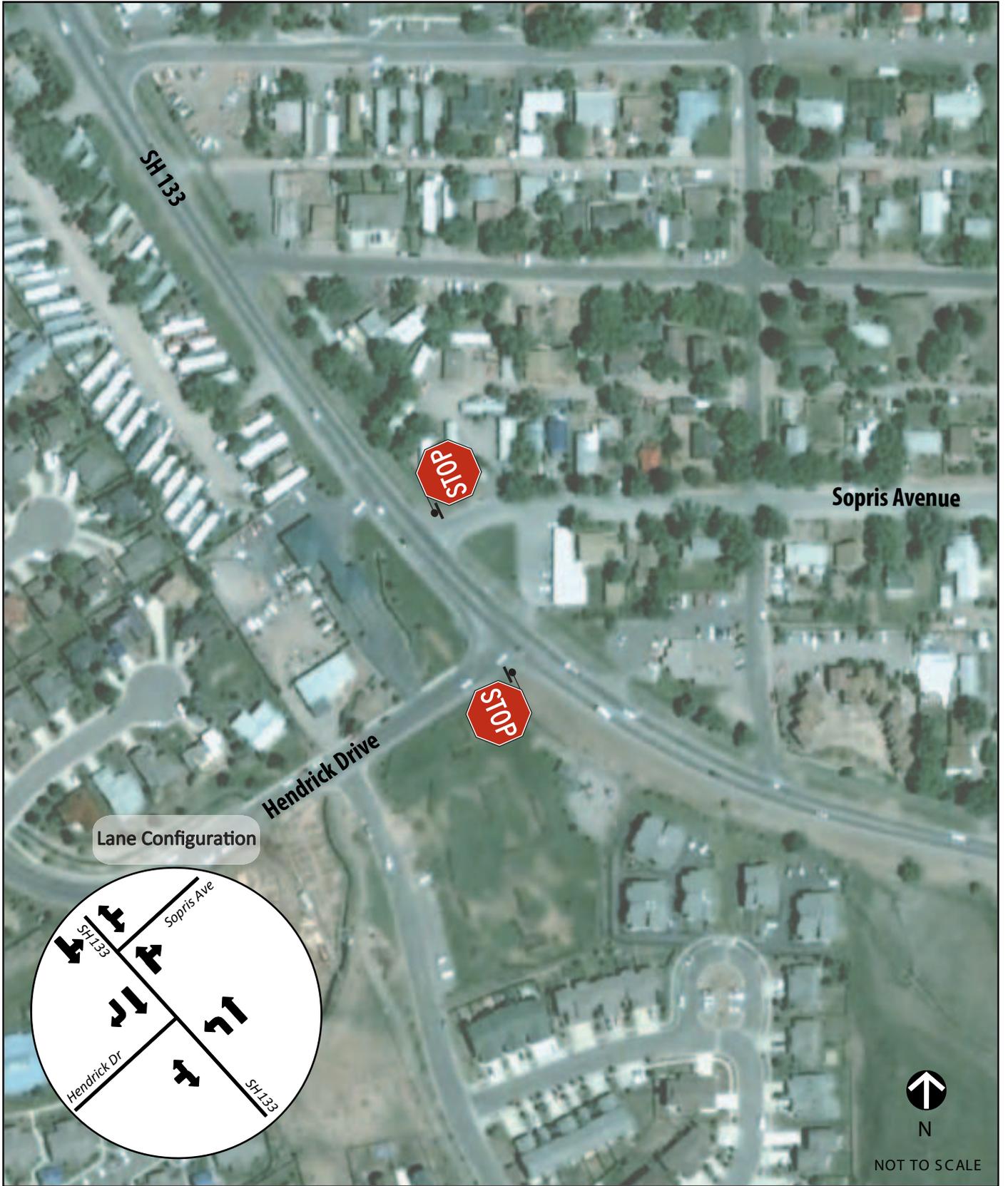
**Accidents: 2001 – 2008**

*Total – 3*

*Sideswipe – 1*

*Pedestrian – 1*

*Broadside – 1*



## COUNTY ROAD 346 AND COUNTY ROAD 315 (MAMM CREEK ROAD)

### EXISTING CONDITIONS

County Road 346 is a two-lane roadway that connects Rifle and Silt with access to local businesses. Mamm Creek Road is a two-lane roadway that provides access to recreational areas, ranches, residential areas, Garfield County Airport, and I-70. This intersection is unsignalized with County Road 346 stop-controlled and is about 300 feet south of an interchange with I-70. There are no auxiliary lanes on any of the approaches. Refer to Figure 71 for existing conditions.

Neither roadway is a highway, but the intersection is located within the I-70 right-of-way which is the reason it was included in this study.

It should be noted that Garfield County has preliminary plans to realign County Road 352, which is just south of this intersection.

### ISSUES PER THE APPLICATION

According to the application, Garfield County submitted this intersection for evaluation due to the issues associated with the closeness to the interchange, high percentage of heavy trucks, limited sight distance for northbound, offset of intersection, and future traffic growth.

### ANALYSIS

The County performed *Traffic Impact and Needs Assessment* for various intersections throughout the county and was completed in October 2010. This intersection was studied by the County due to the potential growth in the area due the energy industry and growth of the airport. Current conditions and traffic volumes indicate turn lanes are not warranted and operate at acceptable levels-of-service. The capacity analysis shows that the north- and southbound approaches are LOS D or worse in the peak hours.

The *Traffic Impact and Needs Assessment* (2010) indicated that this intersections sight distance is a concern due to the large embankment on the southeast corner and the County Road 346 approaches are skewed. There are parking areas on both the north quadrants of the intersection that are utilized as commuter parking areas and temporary staging for industry vehicles. The heavy truck volumes were 25 percent in the morning peak hour and 18 percent in the evening peak hour.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Continue to monitor this intersection for an increase in traffic volumes and changes in accidents. As traffic grows, collect data and evaluate the need for auxiliary lanes and operational upgrades.
- The skew does not appear to be causing any issues currently, however if operational or safety issues develop in the future due to the skew, the intersection should be realigned to address the geometric deficiencies.

**Ranking:** 15

**County:** Garfield

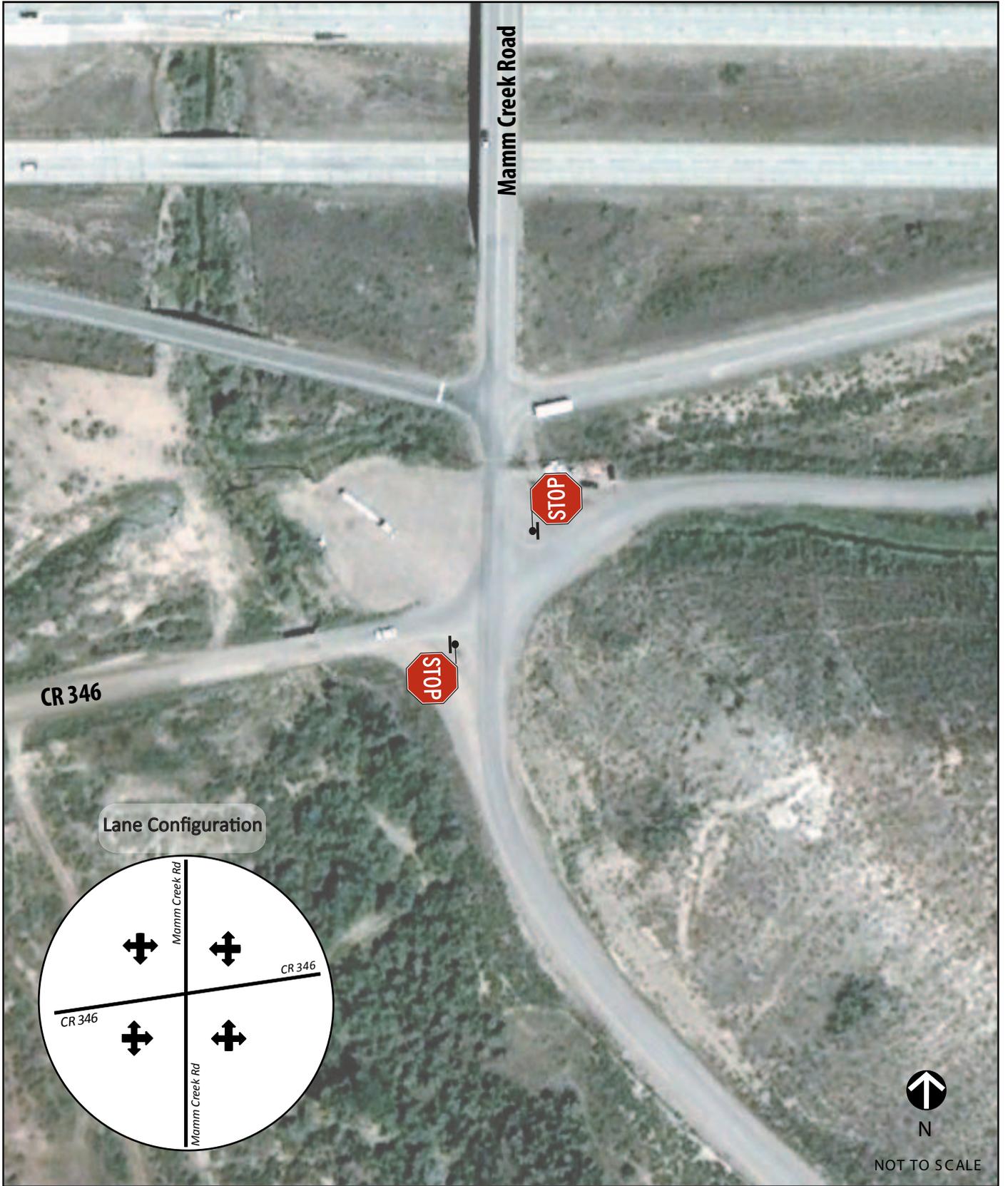
**Hourly:** AM – 239  
PM – 305  
(Year 2010)

**Heavy Vehicles:** 18-25%

**Classification:** N/A

**Milepost:** N/A

**Accidents:** 2001 – 2008  
Total – 3

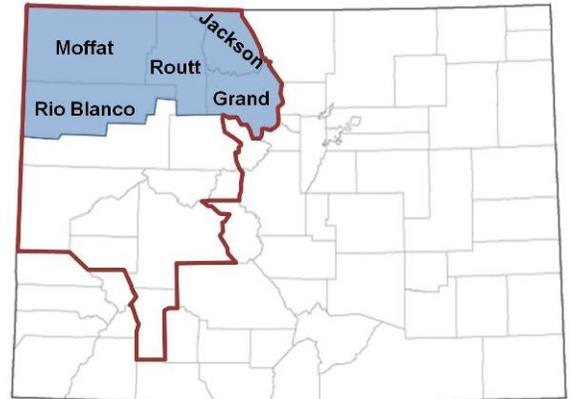


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## 6. TRANSPORTATION PLANNING REGION: NORTHWEST

The Northwest TPR (#12) includes these Region 3 counties: Moffat, Rio Blanco, Routt, Jackson, and Grand. Many cities/towns are located within these counties, such as Craig, Meeker, Steamboat Springs, Hayden, Kremmling, Yampa, Granby, and Walden.

The following submitted intersections are located within the Northwest TPR:



### Tier 1:

- State Highway 64 and County Road 5
- US Highway 40 and County Road 129 (Elk River Road)
- US Highway 40 and Downhill Drive/Riverside Drive
- US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)

### Tier 2:

- State Highway 9 and County Road 1
- US Highway 40 and County Road 42
- US Highway 40 and County Road 5
- US Highway 40 and County Road 54

### Tier 3:

- State Highway 131 and County Road 8/County Road 17/Main Street

## US HIGHWAY 40 AND DOWNHILL DRIVE/RIVERSIDE DRIVE

### EXISTING CONDITIONS

US Highway 40 is a regional arterial that is an active route from I-70 at Empire to the northwestern corner of Colorado. It is utilized for long distance trips, local connections, and as an alternate route to I-70. At the intersection of Downhill Drive/Riverside Drive, the highway travels east-west, is two lanes wide with a TWLTL and wide shoulders, and has a speed limit of 40 mph. Eastbound US Highway 40 is on a curve into this intersection. Riverside Drive (northbound) is a local roadway that provides access to a residential neighborhood. Downhill Drive (southbound) is a two-lane road that provides access to businesses and residential areas and has a downgrade to US Highway 40.

This intersection is unsignalized with the minor streets stop-controlled. There is one lane per direction, a TWLTL, and a right-turn deceleration and acceleration lane for eastbound. There is only a small section of sidewalk (280 feet) on the north side of US Highway 40 to the east, which does not connect to other pedestrian facilities. There is a bus stop with a shelter on the south side of US Highway 40, just east of the intersection. Crosswalks do not exist at this intersection. Refer to Figure 72 for existing conditions.

It should be noted that this intersection was a part of two recently completed corridor studies. Stolfus and Associates performed a *Needs Study* in 2008 and Jacobs completed a *NEPA Study* in 2010. Recommendations from these studies were considered.

### ISSUES PER THE APPLICATION

According to the application, Routt County submitted this intersection due to the safety and operational concerns that pertain to the lack of pedestrian and bicyclist facilities, difficulty turning left onto US Highway 40, crash frequency, roadway configuration and geometry, and visibility limitations due to bus stop shelter.

### ANALYSIS

Currently, there are no pedestrian or bicycle facilities, such as crosswalks or bike lanes, and the highway traffic travels at 40 mph. Pedestrians are crossing the highway to get to the bus stop, residential neighborhood, and local businesses. During the field visit, a pedestrian waited for a gap in traffic for a few minutes and then decided to run across the highway when a gap in both directions did not present itself. The width of the highway is roughly 185 feet with four lanes, which is a fairly long distance for pedestrians to cross. Neither the highway nor the minor roads have bike lanes; however, the County is planning to added bike lanes to Downhill Drive during the future highway improvement project. Downhill Drive is currently not wide enough to accommodate bike lanes and bicyclists do not have a shoulder to ride on. Riverside Road could be striped to have designated bike lanes if desired. US Highway 40 has a 10-foot shoulder on the north side and a 1-foot shoulder on the south side. Bicyclists are allowed to use the shoulder; however, the eastbound shoulder is

**Ranking: 1**

**City: Steamboat Springs**

**County: Routt**

**ADT: 12,000 (Year 2010)**

**Heavy Vehicles: 4.5%**

**Classification: NRB**

**Milepost: 130.285**

**Accidents: 2001 – 2008**

Total – 26  
Broadside – 11  
Rear End – 7  
Bicycle – 1  
Overturning – 1  
Sideswipe – 1  
Wild Animal – 1  
Other – 4

**LOS (Delay): Used the  
Projected 2011 Volumes**

AM

EB – A (0.7s)  
WB – A (0.1s)  
NB – C (19.2s)  
SB – F (77.8s)

PM

EB – A (1.0s)  
WB – A (0.4s)  
NB – B (14.9s)  
SB – F (64.0s)

narrow and would need to be widened to provide greater separation between vehicles and bicyclists, which would have to be designed to minimize conflicts with the continuous right-turn deceleration/acceleration lane.

Left-turns from Downhill Drive are hindered by the limited visibility of the oncoming eastbound vehicles, moderate speeds on the highway, and the high volumes during peak periods. According to the *AASHTO design Guide*, a stop-controlled intersection is recommended to have 390 feet of sight distance. The sight distance for drivers on Downhill Drive is inadequate to view the on-coming eastbound vehicles. The trees, embankment, and curve limit the driver's view. Volumes from the *2008 US 40 West Needs Study* were projected to 2011<sup>1</sup> to analyze the need for turn lanes and a signal.

According to the traffic volumes, a right-turn deceleration lane is warranted for the westbound approach. Currently, vehicles are using the wide shoulder to turn right onto Downhill Drive. The existing left-turn lanes are center turn lanes and provide adequate storage. Table 17 provides the existing and required auxiliary lane lengths. All of the deceleration and acceleration lanes meet the CDOT standard.

TABLE 17: ACCELERATION AND DECELERATION LANES FOR US HIGHWAY 40 AND DOWNHILL DRIVE								
Approach	Lane	Condition	Deceleration			Acceleration		
			Decel +Storage	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	TWLTL	TWLTL	Yes	N/A	N/A	N/A
		Required	100	144		N/A	N/A	
	Right	Existing	120	*	Yes	675	*	Yes
		Required	25	144		236	144	
Westbound	Left	Existing	TWLTL	TWLTL	Yes	N/A	N/A	N/A
		Required	50	144		N/A	N/A	

\*The lane is a continuous right-turn deceleration and acceleration lane that begins and ends at intersection (as known as a trap lane); therefore, there is not a taper.  
Source: Google Earth Pro and CDOT Access Code

Based on the traffic data from 2007, 2008, and 2011 (projected), a signal is warranted based on the MUTCD Warrant 3 (Peak Hour). Achieving Warrant 3 provides evidence that further investigation is needed to install signal to reduce delay and to enhance safety. It would be advised to collect hourly counts for vehicles and pedestrians on all approaches. According to the *2008 US 40 West Needs Study*, this unsignalized intersection operated at LOS F (64.8 seconds) and D (32.4 seconds), in the morning and evening, respectively. According to the NEPA Study conducted by Jacobs in August 2010, this intersection warrants a signal with the 2035 projections and will

<sup>1</sup> The volumes from the Study were from September 2007. According to the Census Bureau, Steamboat Springs had an average annual growth rate of 2.6 percent between 2000 and 2009. This growth rate was applied to the 2007 volumes to estimate the 2011 volumes.

need an additional through lane for westbound, one westbound right-turn lane, and separate right-turn, through, and left-turn lanes on the minor approaches.

Other observations:

- Minor approaches are skewed.
- There is no westbound right-turn lane.
- There are many commercial driveways on Downhill Drive near the intersection.



**Photo 13: US Highway 40 at Downhill Drive**

### ***RECOMMENDED IMPROVEMENTS***

Figure 73 and Figure 74 illustrates the short-term and long-term recommendations, respectively.

#### **Short-Term Recommendations**

- Stripe Downhill Drive to be three 11-foot lanes: one shared through/right-turn lane, one left-turn lane, and one receiving lane. Install appropriate signs.
- Construct a right-turn deceleration lane for westbound.
- Remove the trees on north side of US Highway 40, west of the intersection, which limit the view of Downhill Drive vehicles and oncoming eastbound vehicles. Or improving the embankment to improve sight distance.

Estimated Cost = \$1,600 (striping and signs) + \$125,000 (right-turn deceleration lane) + \$1,000 (trees) = \$127,600

### Long-Term Recommendations

- Monitor traffic volumes to further investigate the signal warrants.
  - Collect hourly directional counts to evaluate warrants.
  - Install traffic signal, when warranted per the MUTCD signal warrants. Should include pedestrian features.
- Construct bike lanes on Downhill Drive/Riverside Drive.
- Construct sidewalks on US Highway 40 and connect to bus stop and other sidewalks to the east.
- The skew does not appear to be causing any issues currently, however if operational or safety issues develop in the future due to the skew or a signal is installed, the minor approaches should be realigned. Realign Riverside Drive to match the centerline of Downhill Drive.

Estimated Cost = \$250,000 (5,000 ft pedestrian/bicycle paths)







## US HIGHWAY 40 AND COUNTY ROAD 129 (ELK RIVER ROAD)

### EXISTING CONDITIONS

US Highway 40 is a regional arterial that is an active route from I-70 at Empire to the northwestern corner of Colorado. It is utilized for long distance trips, local connections, and as an alternate route to I-70. At the intersection of County Road 129 (Elk River Road), the highway travels east-west, is two lanes wide with a TWLTL and wide shoulders (a total of 100 feet in width), and has a speed limit of 40 mph. The intersection is located in the middle of a nearly 90 degree curve on US Highway 40. The northbound approach of Elk River Road is a local roadway that provides access to local businesses, a gas station, shops, restaurants, and a bank. County Road 129 (southbound) is a two-lane road that provides access to the Steamboat Springs airport, business and industrial park, recreational properties, and rural residential areas. County Road 129 (Elk River Road) curves just north of the intersection and has a downhill grade from the airport.

This signalized intersection currently operates with split phasing for the minor approaches due to the geometry that does not allow for left-turns to occur simultaneously. The east- and westbound left-turns are permitted only. There are pedestrian signal heads on all directions and all corners with countdown signals for north- and southbound pedestrians. There are push buttons for the north- and southbound directions and some of these are not paired with the appropriate signage. There are no painted crosswalks or curb ramps on the pork chop islands. The four pork chops channelize the right-turn lanes which have free movement on the north- and southbound approaches. The east- and westbound channelized right-turn lanes have yield signs.

A paved trail travels on the south side of US Highway 40, extending from Shield Drive to Curve Court, and crosses Elk River Road. There are no sidewalks or trails on the north side of US Highway 40 or on County Road 129. There is a bus stop near this intersection on the westbound approach that does not have a shelter or any pedestrian facilities. Refer to Figure 75 for existing conditions.

It should be noted that this intersection was a part of two recently completed corridor studies. Stolfus and Associates performed a needs study in 2008 and Jacobs completed a *NEPA Study* in 2010. Recommendations from these studies were considered.

### ISSUES PER THE APPLICATION

According to the application, Routt County submitted this intersection due to the safety and operational concerns that pertain to pedestrian and bicyclist facilities, intersection level-of-service, split phasing, and queues.

### ANALYSIS

The pedestrians and bicyclists have long distances to walk, short clearance times, lack of curb ramps, and must cross channelized right-turn lanes. There are no sidewalks on the north side of the highway or on County Road 129. The existing sidewalk on the south side does not connect to other locations along the highway. The pork chop islands do not meet ADA requirements with the lack of curb ramps. The pork chop on the northeast corner is

**Ranking: 2**

**City: Steamboat Springs**

**County: Routt**

**ADT: 20,000 (Year 2010)**

**Heavy Vehicles: 3.2%**

**Classification: NRB**

**Milepost: 130.773**

**Accidents: 2001 – 2008**

*Total – 54*

*Rear End – 30*

*Broadside – 7*

*Approach Turn – 10*

*Sideswipe – 3*

*Other – 4*

**LOS (Delay): see Table 12**

small with minimal space to accommodate one pedestrian or bicyclist. Pedestrian utilizing the trail do not have push buttons and they cross approximately 20 feet behind the northbound stop bar. Currently, there are no bike lanes or bike detection.

It was observed that passengers from the bus stop on the northeast end of the intersection are dropped off on the side of the highway. One passenger chose to cross midblock instead of utilizing the pedestrian phasing of the intersection. Another passenger walked in the gravel shoulders along the highway and County Road 129.

According to the 2008 US 40 West Needs Study, this intersection operated at LOS D (39.8 seconds) and C (32.4 seconds), in the morning and evening, respectively. The study found that the accident frequency and severity (WHI) exceeds the statewide averages for similar locations. The study found that the public opinion is negative in regards to the quality of traffic flow at this location. The volumes from the US 40 West Needs Study were projected to 2011 traffic volumes by applying the growth factor from the 2010 Census data. These volumes and the current signal timing were input into Synchro for analysis purposes. Table 18 provides the capacity analysis conclusions for the intersection and its movements. It can be seen that many movements are at unacceptable levels-of-service with high delays in both the morning and evening peak hours. Majority of the failing operations are on the minor approaches; however, in the evening peak hour the westbound through movement operates at LOS E.

Approach/ Movement	AM Peak Hour		PM Peak	
	LOS	Delay (sec)	LOS	Delay (sec)
Overall	D	47.9	D	51.5
Northbound	E	62.9	D	50.7
Left/through	E	71.3	E	68.8
Right	A	0.0	A	0.0
Southbound	E	66.8	D	45.4
Left/through	F	83.9	D	54.9
Right	A	0.0	A	0.0
Eastbound	D	52.8	C	26.4
Left	B	17.3	D	36.4
Through	E	56.6	C	26.9
Right	A	6.5	A	6.0
Westbound	B	15.8	D	53.9
Left	D	40.8	B	19.9
Through	C	21.1	E	63.8
Right	A	3.0	A	8.5

Source: Fehr & Peers, 2011

The LOS and delays cannot be improved without removing the split phasing, which requires redesigning the intersection geometry. This type of phasing is creating inefficient traffic flow for this intersection and can greatly enhance the operations if it were removed. The yellow clearance time was reviewed and is adequate based on the ITE recommendations of four seconds for speeds between 35 and 50 mph.

According to the traffic model, the queues on the northbound and southbound approaches exceed the given capacity. In the morning peak hour, the eastbound direction experiences long queues and in the evening peak hour the queues are on the westbound directions. The model shows that these queues typically clear with the

allotted green time. In the field it was observed that the queues typically cleared, unless one or more vehicles were delayed in accelerating then the end of the queues on the minor approaches may not clear. During the afternoon, it was observed that queues quickly develop in all directions when the associated approach is red. The greatest observed queues were 14 vehicles for southbound, 3 vehicles for northbound, 11 vehicles for westbound, and five vehicles for eastbound (this was during the afternoon hours). As long as the queues seemed to be, they cleared during the provided green phases. These queues may be longer during the morning peak hour, as shown in the Synchro model.

The acceleration and deceleration lanes on US Highway 40 provide adequate storage and taper lengths. The westbound right-turn deceleration lane taper is interrupted by a driveway; however, the storage is adequate. Table 19 provides the existing and required lengths for the auxiliary lanes.

Approach	Lane	Condition	Deceleration			Acceleration		
			Decel +Storage	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	100	TWLTL	Yes	N/A	N/A	N/A
		Required	25	144		N/A	N/A	
	Right	Existing	260	*	Yes	450	*	Yes
		Required	50	144		236	144	
Westbound	Left	Existing	310	TWLTL	Yes	N/A	N/A	N/A
		Required	50	144		N/A	N/A	
	Right	Existing	200	*	Yes	600	290	Yes
		Required	200	144		236	144	

\*The lane is a continuous right-turn deceleration and acceleration lane that begins and ends at intersection (as known as a trap lane); therefore, there is not a taper.  
Source: Google Earth Pro, and CDOT Access Code

Other observations:

- There was some standing water on the roadway and in the pork chop gutter, especially on the northwest corner. Drainage may be inadequate.
- The visibility of the southbound right-turn vehicles is limited by the CDOT fence. Pedestrians are allowed to cross to this corner; however, they may not be seen by vehicles as they drive around the corner due to the fence that is very close to the edge of pavement.
- There is only one luminaire on the signal pole on the southwest corner.
- The eastbound right-turn lane's yield sign is not adequately facing the right-turn deceleration lane.

- The westbound right-turn lane is a yielded movement; however, it acts as a free movement by most drivers.



Photo 14: US Highway 40 and Elk River Road

### ***RECOMMENDED IMPROVEMENT***

#### **Short-Term Recommendations**

Figure 76 illustrates the short-term recommendations.

- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection, and controller.
  - Update pedestrian signal heads, push buttons, signs, and timing.
  - Remove the split phasing.
- Install a single left-turn lane for the northbound approach of Elk River Road and dual left-turn lanes for the southbound approach.
- Install one W3-3 sign (Signal Ahead – Symbol) on southbound approach per the requirements of the MUTCD.
- Install lane designation signs for all approaches.

- Monitor pedestrian/bicyclist volumes and accidents to determine the needs at the intersection and bus stops.

Estimated Cost = \$300,000 (signal) + \$500,000 (re-construction) + \$8,000 (signs) = \$808,000

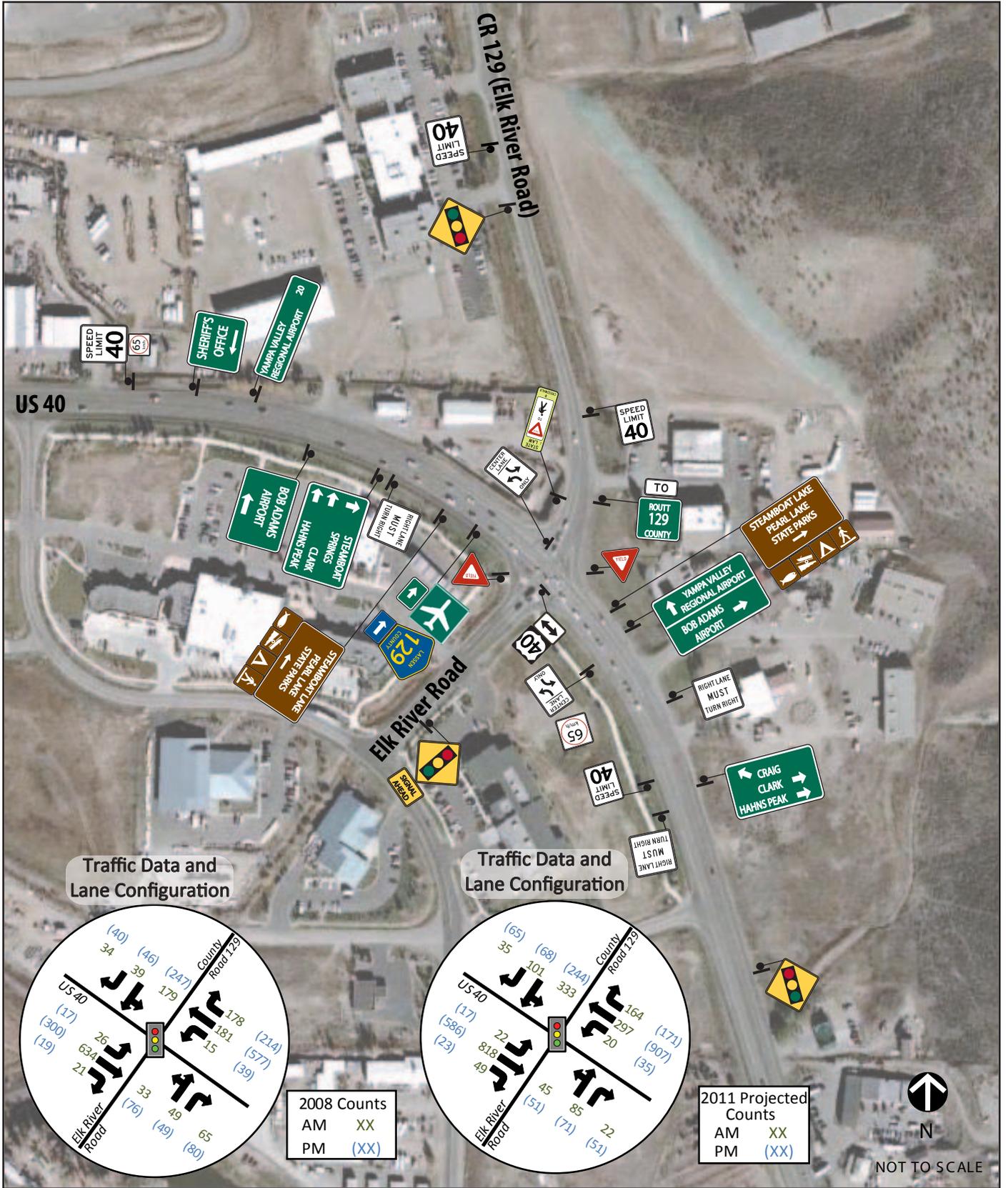
### Long-Term Recommendations

- Re-design the intersection. Implement one of the solutions provided in the *2008 US 40 West Needs Study*<sup>2</sup> (consider an interchange or roundabout)

Estimated Cost = \$3,000,000 (roundabout)

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<sup>2</sup> The *2008 US 40 West Needs Study* determined that the intersection at Elk River Road will need to be entirely redesign and reconstructed as a roundabout, interchange, or flyover to accommodate the future traffic demand. It identified some spot improvements that would enhance the intersection temporarily before the major long-term improvements would be implemented. The interim solution was to remain signalized with the addition of one northbound left-turn lane, one southbound left-turn lane, a new signal, and improve the lane alignment across US Highway 40. Eventually a second southbound left-turn lane will be needed. This will require signal and geometric upgrades.





## US HIGHWAY 40 AND COUNTY ROAD 42

### EXISTING CONDITIONS

US Highway 40 is a regional arterial that is an active route from I-70 at Empire to the northwestern corner of Colorado. It is utilized for long distance trips, local connections, and as an alternate route to I-70. At the intersection of County Road 42, the highway travels east-west, is three lanes wide with seven-foot shoulders, and has a speed limit of 50 mph. County Road 42 is a two-lane local road that provides access to residential areas. This T-intersection is currently unsignalized with County Road 42 being stop-controlled. US Highway 40 provides a right-turn deceleration lane and right-turn acceleration lane, along with a TWLTL. Refer to Figure 77 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Routt County submitted this intersection for evaluation due to the limited visibility, crash frequency, and queuing on the minor street. There is an embankment on the north side of US Highway 40 (east of the intersection) that blocks southbound drivers' view of oncoming westbound vehicles. According to the 2010 NEPA Study<sup>3</sup>, the crash severity and frequency at this location is higher than the statewide averages for similar intersections. The traffic flow on US Highway 40 is steady during peak hours with few gaps to allow left-turning vehicles from County Road 42 to get onto the highway. As these vehicles wait for an acceptable gap, a queue is formed and right-turning vehicles use the shoulder to bypass the growing queue. Left-turning vehicles from County Road 42 are also treating the highway TWLTL as an acceleration lane when a gap in both directions is not available.

### ANALYSIS

This intersection was not visited because it was not originally one of the top three in its TPR in the preliminary ranking. After the evaluation process this intersection moved up in the rankings, while the third ranked intersection (US Highway 40 and State Highway 13/County Road 7) dropped in rank. According to the *NEPA Study* conducted by Jacobs in August 2010, this intersection warrants a signal with future conditions, but in the short term an exclusive left-turn lane on County Road 42 is needed and the embankment needs to be modified. The *2008 US 40 West Needs Study* by Stolfus verifies the need to construct a left-turn lane on County Road 42 and suggested a traffic signal in the future.

**Ranking: 3**

**County: Routt**

**ADT: 12,000 (Year 2010)**

**Heavy Vehicles: 4.5%**

**Classification: NRA**

**Milepost: 128.340**

**Accidents: 2001 – 2008**

*Total – 9*

*Broadside – 7*

*Head On – 1*

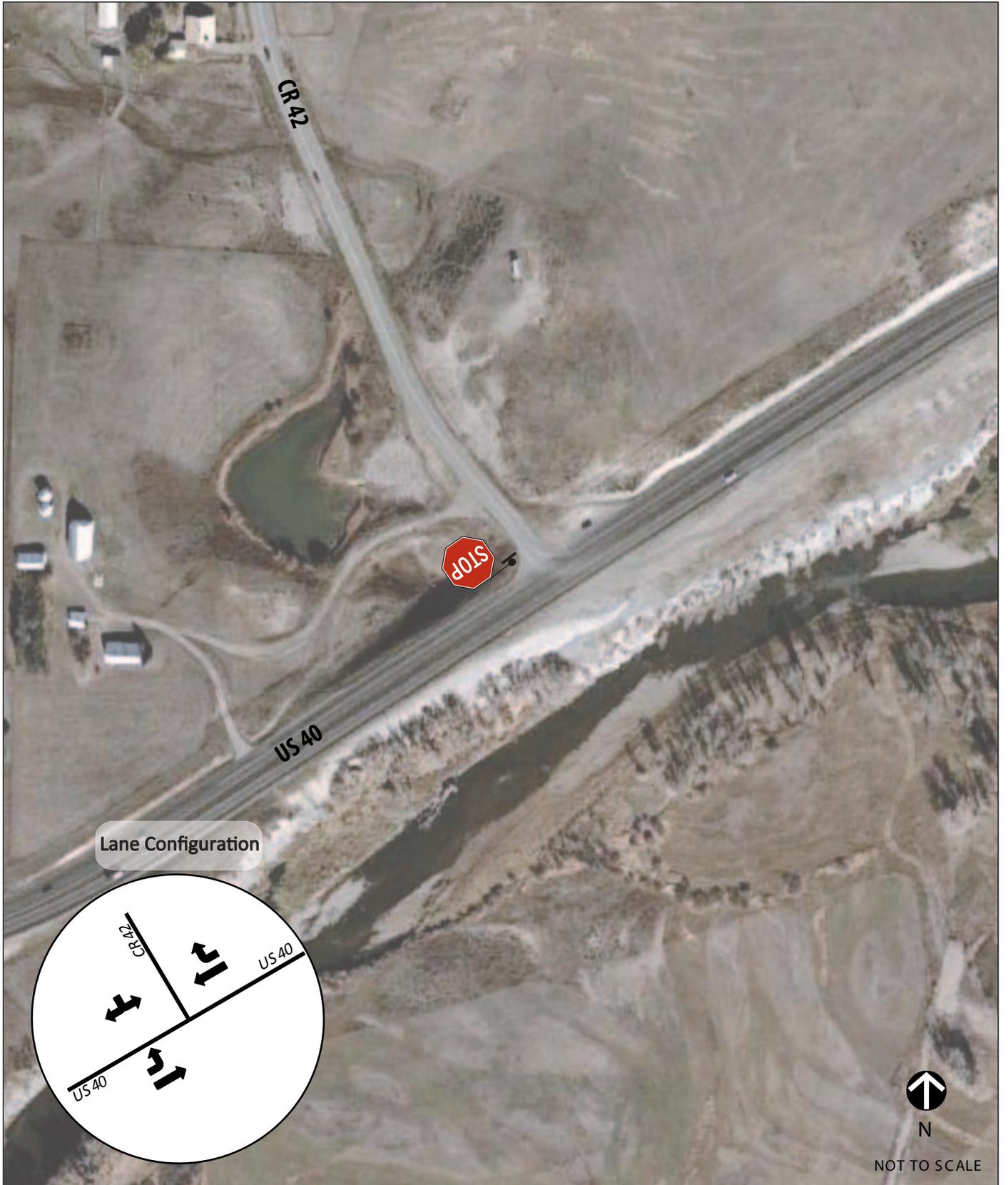
*Other – 1*

<sup>3</sup> "West Steamboat Springs US Highway 40 NEPA Study" was conducted in August 2010 by Jacobs.

### **RECOMMENDED IMPROVEMENTS**

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit. Figure 78 illustrates the recommendations for US Highway 40 and County Road 42.

- Verify that the appropriate signage is installed.
- Provide one left-turn lane and one right-turn lane on County Road 42. This may reduce the width of the receiving lane. Refer to the *2008 US 40 West Needs Study* (Figure 13) for a potential design.
- Reduce the embankment to provide adequate sight distance.
- Monitor the traffic volumes at this intersection to install a signal when warranted.





## STATE HIGHWAY 64 AND COUNTY ROAD 5

### EXISTING CONDITIONS

State Highway 64 is a two-lane east-west regional highway that connects the towns of Dinosaur and Meeker. It is widely used by large commercial trucks (17 percent during off peak hours) generated by the oil and gas industry. At the intersection, State Highway 64 is located between a mountain side and the White River. County Road 5 is a two-lane rural roadway that provides access to gas and oil companies, recreational areas, and agricultural/ranching land. It connects to State Highway 13 which leads to Rifle.

County Road 5 is an unsignalized T-intersection with State Highway 64, with County Road 5 being stop controlled. There are no acceleration or deceleration lanes on either roadway. There is a 165-foot bridge on County Road 5 over the White River, which is roughly 80 feet south of the intersection. There is good sight distance for all approaches. Refer to Figure 79 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, this intersection was submitted by Rio Blanco County due to the concerns related to the absence of acceleration and deceleration lanes, conflicts with slowing, turning or accelerating vehicles, queuing on both roadways, , the insufficient geometry needed for heavy vehicles, and projected increase in traffic.

### ANALYSIS

Currently, there are no acceleration or deceleration lanes on any of the approaches, which reduces the capacity of the intersection as turning vehicles create queues while they wait for gaps in traffic. This is especially an issue with large vehicles when they are turning at this intersection because they require a larger turning template, turn at slower speeds, and accelerate slowly. There were a few skid marks located on State Highway 64 in the westbound direction near the intersection with County Road 5.

According to the CDOT Access Code, a left-turn deceleration lane is warranted for the westbound approach based on the 2009 volumes<sup>4</sup>. Currently, the right-turn volume for the eastbound approach is below the auxiliary requirements; however, for safety purposes a designated right-turn lane may be desirable. A northbound left-turn lane and right-turn lane are warranted based on the 2009 volumes. Due to the high volume of northbound right-turn vehicles in the evening peak hour, a right-turn acceleration lane is warranted. A left-turn acceleration lane on State Highway 64 will improve safety and reduce the impacts of slow accelerating vehicles. This same configuration was recommended in the Rio Blanco County Road 5 Intersection Analysis Report and is currently in the design process, as provided in the 30 percent plan set. Table 20 provides the required deceleration/acceleration and taper lengths for auxiliary lanes on State Highway 64.

<sup>4</sup> Volumes from the Rio Blanco County Road 5 Intersection Analysis Report were utilized in the analysis. Volume included passenger cars and heavy vehicles. CDOT requires heavy vehicles to be converted to passenger car equivalents. Truck volumes were multiplied by three and added to the volume of passenger cars for analysis purposes.

**Ranking: 4**

**County: Rio Blanco**

**ADT: 1,100 (Year 2010)**

**Heavy Vehicles: 17.0%**

**Classification: RA**

**Milepost: 56.243**

**Accidents: 2001 – 2008**

Total – 3

Guardrail – 2

Other – 1

**LOS (Delay):**

AM

EB – A (0s)

WB – A (7.1s)

NB – A (9.1s)

PM

EB – A (0s)

WB – A (3.3s)

NB – A (9.5s)

**TABLE 20: REQUIRED ACCELERATION AND DECELERATION LANES FOR STATE HIGHWAY 64 AND COUNTY ROAD 5**

Approach	Lane	Deceleration		Acceleration	
		Decel +Storage	Taper	Accel	Taper
Eastbound	Right	226	144	236	144
Westbound	Left	226+225	144	N/A	N/A

Source: Google Earth Pro and *CDOT Access Code*

Although there was only one accident recorded from January 2001 to December 2008, there is potential of conflicts due to the geometry and vehicle composition. The turning radii at this intersection are insufficient for vehicles classified as WB 50 or larger. Repeatedly, semi-trucks were observed to utilize both lanes of State Highway 64 and County Road 5 as they turn from either the north- or eastbound approach. A truck pulling a trailer stopped on the bridge on County Road 5 to allow a semi-truck to complete its right-turn from State Highway 64. This semi-truck straddled both the eastbound lane and the receiving lane on State Highway 64 to make the turn and utilized some of the northbound lane to complete the turn. This made it impossible for the smaller truck to get over the bridge at the same time. The faded and missing portions of the northbound double yellow center line, near the intersection, suggest that many large vehicles have turned into the opposing lane in order to complete a turn from State Highway 64 due to the small turning radii. At a closer glance of the pavement, tire tracks could be seen that indicated large vehicles where making very wide turning from the eastbound direction onto County Road 5.

According to the County Road 5 Intersection Analysis, it is expected that this intersection will increase traffic volumes by 150 percent over the next 20 years. This prediction will greatly increase the queuing and the need for acceleration and deceleration lanes at the studied intersection.

Other observations:

- The pavement is in fair condition for all approaches.
- The striping is in poor condition on County Road 5.
- There is a set of mail boxes located on the north side of State Highway 64 directly across from County Road 5.
- There was lots of gravel sitting on the edges of the bridge and building up on the guardrail.
- When a wide-load was traveling eastbound, a semi-truck traveling westbound drove on the edge of the pavement to have enough room to pass.



**Photo 15: State Highway 64 and County Road 5**

#### ***RECOMMENDED IMPROVEMENTS***

Short-term recommendations are shown in Figure 80 and long-term recommendations are shown in Figure 81.

#### **Short-term Recommendations**

- Add one W2-4 sign (T Symbol) on County Road 5 prior to the intersection.
- Add one W1-7 sign (Large Double Arrow) on US Highway 40 across from County Road 5.

Estimated Cost = \$600

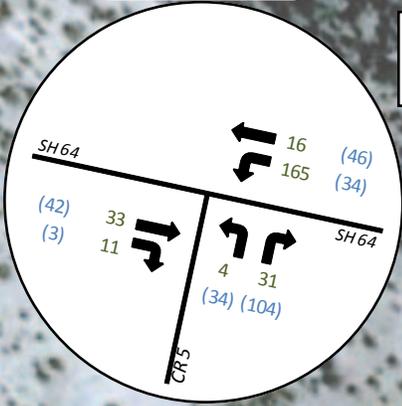
#### **Long-term Recommendations**

- Reconstruct intersection as planned in the *Intersection Analysis Report* and 30 percent plans
  - This includes one northbound left-turn lane, one northbound right-turn lane, one eastbound right-turn deceleration lane, one eastbound through lane, one westbound through lane, and one westbound left-turn deceleration lane.
  - Provide a right-turn acceleration lane for northbound to eastbound. Provide a left-turn acceleration lane for northbound to westbound.
  - Provide a wide receiving lane on County Road 5.
  - Widen bridge to accommodate lanes.
  - Increase radii to accommodate large turning vehicles.
- Add lighting to the intersection.

Estimated Cost = \$550,000 (improvements to State Highway 64, additional lanes and bridge widening not included)

Traffic Data and Lane Configuration

2009 Counts	
AM	XX
PM	(XX)







## US HIGHWAY 40 AND COUNTY ROAD 5

### EXISTING CONDITIONS

US Highway 40 is a regional arterial that is an active route from I-70 at Empire to the northwestern corner of Colorado. At the intersection of County Road 5, the highway travels north-south, has a two lane with wide shoulders, and a speed limit of 55 mph. It is utilized for long distance trips, local connections, and as an alternate route to I-70. County Road 5 travels west of the highway and provides access to the Fraser ball fields, Young Life Christian youth camp, gravel pits, and rural neighborhoods. The westbound approach is a private driveway.

US Highway 40 and County Road 5 is currently unsignalized with the minor approaches stop-controlled. The highway provides deceleration lanes for the left-turn and right-turn onto County Road 5 and an acceleration lane for the right-turns from County Road 5. The private drive does not have acceleration or deceleration lanes; however, they most likely utilized the 11-foot shoulder. There is a Union Pacific railroad 120 feet west of the intersection. Refer to Figure 82 for existing conditions.

**Ranking: 5**

**County: Grand**

**AADT: 9,700 (Year 2010)**

**Heavy Vehicles: 5.6%**

**Classification: RA**

**Milepost: 226.188**

**Accidents: 2001 – 2008**

*Total – 1*

*Overturning – 1*

### ISSUES PER THE APPLICATION

According to the application, Grand County submitted this intersection for evaluation due the safety and operational issues associated with high volume of vehicles turning from County Road 5, impacts from high heavy vehicle traffic, and the close at-grade railroad crossing. County Road 5 experiences a large quantity of travelers during holiday weekends and the summer months due to the many events that occur at the ball fields. During the peak travel periods, the traffic flow reaches unacceptable delays due partially to the large commercial trucks from the gravel pits that are slow to accelerate, as well as the trains. The gravel pits generate approximately 60 trucks per day and there are 28 to 30 daily trains.

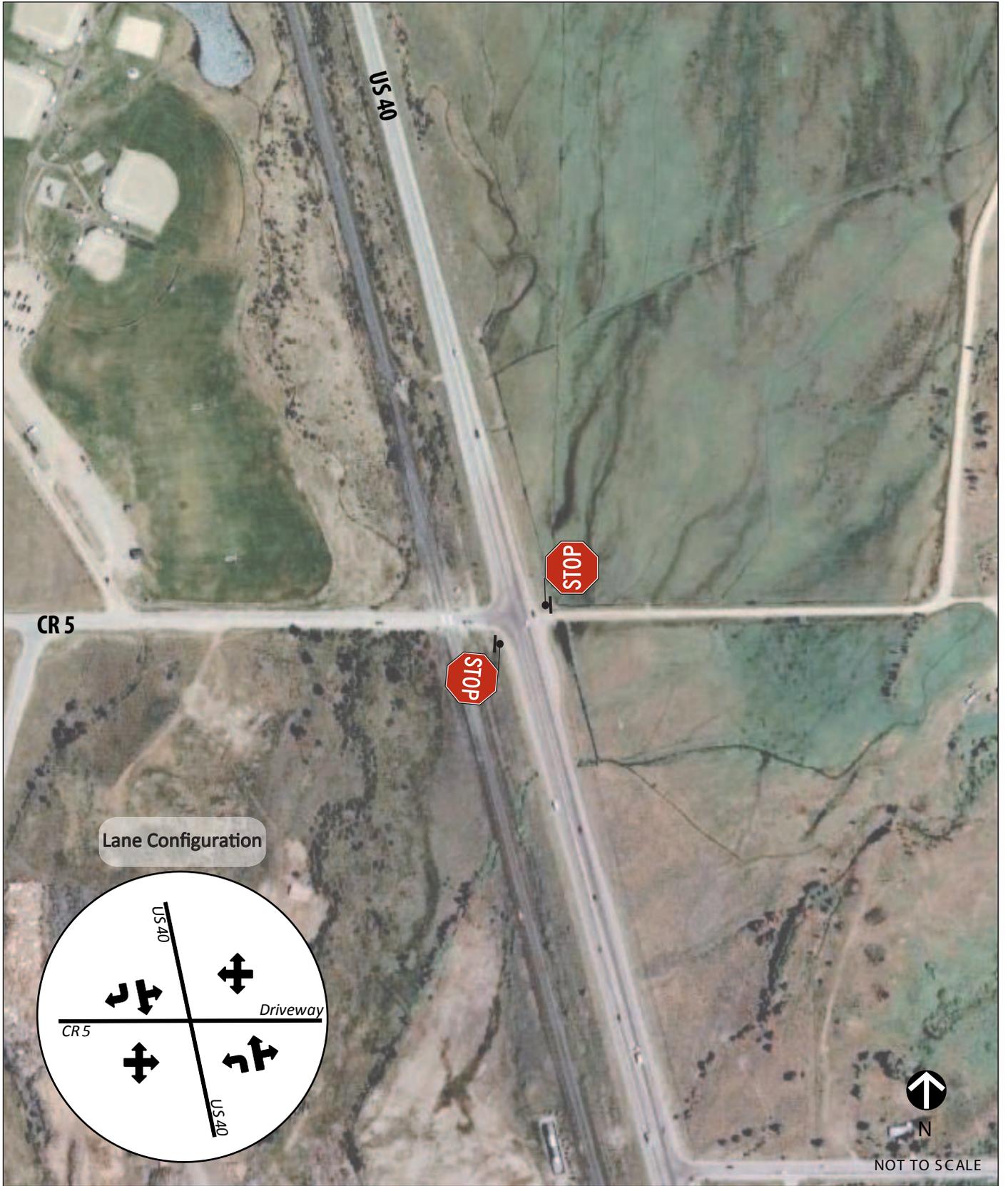
### ANALYSIS

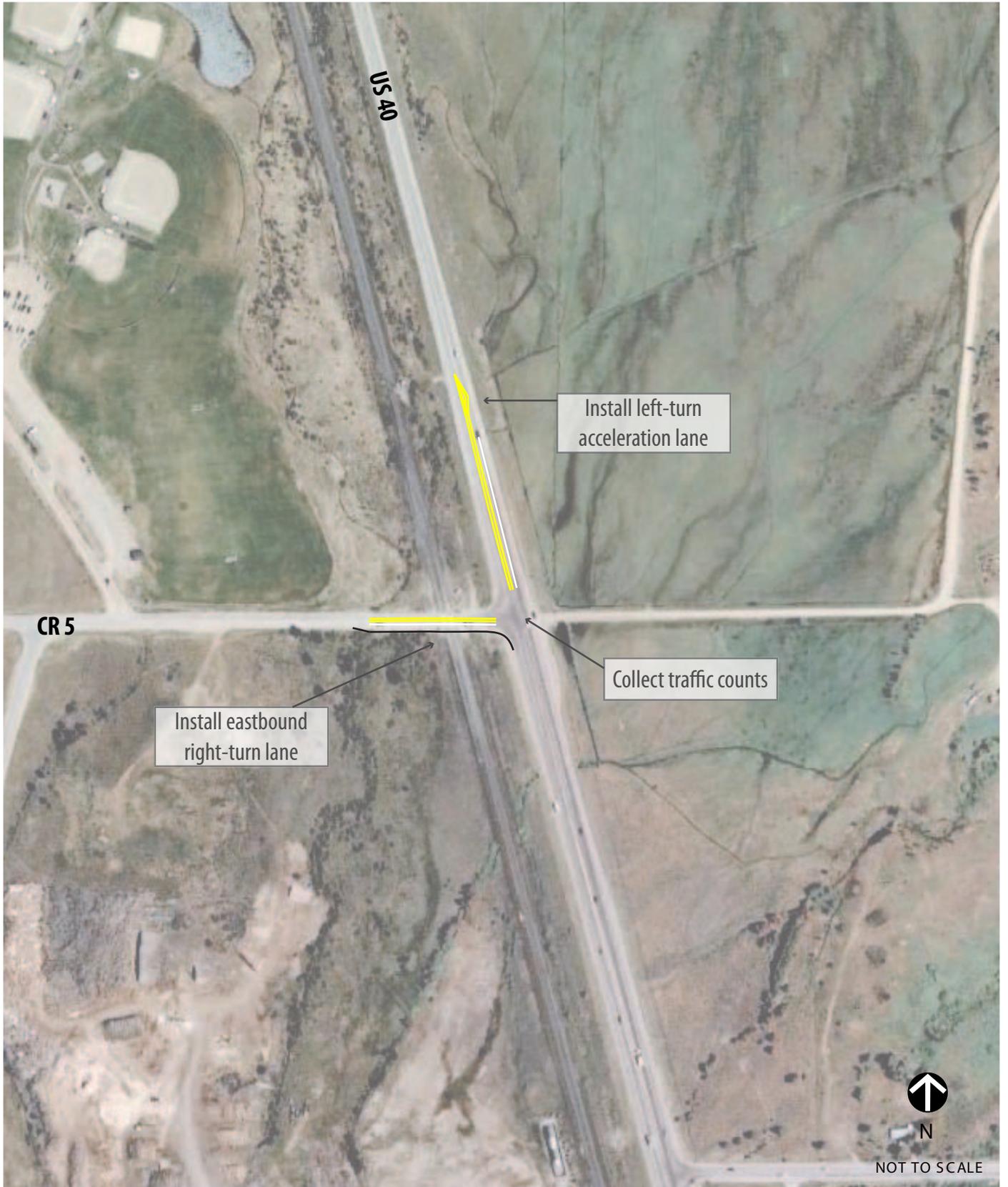
Since County Road 5 has one eastbound lane, queues are created as left-turning vehicles wait for long periods of time for a safe gap. Right-turning vehicles do not have the ability to pass the queue to utilize the acceleration lane and reduce the queue length. According to the County traffic data, there was an average ADT of 1,145 vehicles per day (vpd) in June 2005.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Collect traffic counts (turning movement and hourly directional) to evaluate the signal warrants (in the MUTCD) and necessary deceleration and acceleration lanes.
- Construct a left-turn acceleration lane for vehicles turning from County Road 5 to northbound US Highway 40.
- Construct a second lane on County Road 5 to separate turning movements.
- Consider constructing a grade-separated railroad crossing.





## US HIGHWAY 40 AND COUNTY ROAD 54

### EXISTING CONDITIONS

US Highway 40 is a regional arterial that is an active route from I-70 at Empire to the northwestern corner of Colorado. At the intersection of County Road 54, the highway travels east-west, is two-lanes wide with a TWLTL and varying shoulder width, and a speed limit of 65 mph. It is utilized for long distance trips, local connections, and as an alternate route to I-70. County Road 54 is a two-lane gravel road that provides access to residential areas.

This T-intersection is currently unsignalized with County Road 54 being stop-controlled. There is an absence of deceleration and acceleration lanes on all approaches. Both roadways are on decent grades and curves as they each wind through the mountainous terrain. Guardrail is installed on the south side of the highway. Refer to Figure 84 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Grand County submitted this intersection due to the safety concerns of left-turning vehicles from US Highway 40 onto County Road 54. Due to the limited sight distance around the curve and the high speeds, left-turning vehicles are stopping on the highway, which creates an unsafe situation for them and following vehicles. According to the County traffic data, there was an average ADT of 117 vpd in July 2005. There is a high volume of vehicles traveling between Granby and the YMCA and residential areas located east of the intersection.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Verify that the appropriate signage is installed.
- Collect traffic counts (turning movement) to evaluate the need for a westbound turn lane per the CDOT Access Code.
- Add a left-turn lane for the westbound approach. .

**Ranking: 6**

**County: Grand**

**AADT: 6,500 (Year 2010)**

**Heavy Vehicles: 4.3%**

**Classification: RA**

**Milepost: 217.970**

**Accidents: 2001 – 2008**

*Total – 1*

*Rear End – 1*





## US HIGHWAY 40 AND STATE HIGHWAY 13/COUNTY ROAD 7 (GREAT DIVIDE ROAD)

### EXISTING CONDITIONS

US Highway 40 is a regional arterial that is an active route from I-70 at Empire to the northwestern corner of Colorado. It is utilized for long distance trips, local connections, and as an alternate route to I-70. At the intersection of State Highway 13/County Road 7, the highway travels east-west and has a speed limit of 45 mph. West of the intersection the highway has two lanes, and east of the intersection the highway has two lanes per direction plus a TWLTL. State Highway 13 (northbound approach) is a two-lane roadway that connects Craig to Rifle. County Road 7 is a local roadway that currently provides access to residential neighborhoods, businesses, Moffat County High School, and the new Craig Memorial Hospital. Construction is in-progress for the Colorado Northwest Community College that will be located north on County Road 7. Parallel to and just north of US Highway 40, there is a Frontage Road that provides accesses to local businesses. There is a 10-foot buffer between the frontage road and highway on the west side and a 20-foot buffer on the east side. It extends from the access point that is one-quarter mile west of State Highway 13/County Road 7 intersection to Finley Lane (0.6 miles east of studied intersection).

This intersection is signalized with all left-turns operating as permitted only. Pedestrian features are not installed on the traffic signal and there are no crosswalks. There are no sidewalks near the intersection. The Frontage Road is stop-controlled. Refer to Figure 86 for existing conditions and Figure 87 provides the crash diagram.

It should be noted that this intersection was third in the preliminary rankings and it was visited; however, after the evaluation process this intersection dropped in ranks.

### ISSUES PER THE APPLICATION

According to the application, the City of Craig submitted this intersection due to the safety and operational concerns related to the conflicts with the driveways and Frontage Road and expected traffic increase.

### ANALYSIS

Just north of the intersection there is the Frontage Road and several undefined driveways. These create confusion and conflicts with those traveling on County Road 7. The driveways are wide and pavement markings are faded. Striping is faded and it is unclear if the southbound approach has one shared lane or two lanes with a designated right-turn lane. There is enough width to allow right turning vehicles to pass any queued left-turning and through vehicles. The wide pavement of County Road 7 and driveways encourages vehicles to park along the road. In the field it was observed that most vehicles go to the gas station and very few use the Frontage Road. According to the Traffic Impact Study (2007), there was a maximum of 12 vph on the eastbound approach of the frontage road and three vph on the westbound approach.

The *Traffic Impact Study* conducted in April 2007 for the development of the Memorial Hospital and Colorado Northwest Community College projected that the background traffic would increase by 5 percent in 2009 from the 2006 data. The development is expected to add 120 vehicles in the morning peak hour and 119 vehicles in the

**Ranking: 7**

**City: Craig**

**County: Moffat**

**ADT: 10,000 (Year 2009)**

**Heavy Vehicles: 6.6%**

**Classification: NRA**

**Milepost: 89.322**

**Accidents: 2001 – 2008**

Total – 11  
Rear End – 2  
Broadside – 2  
Approach Turn – 2  
Head On – 1  
Other – 4

evening peak hour. In 2026 it is estimated that the development will generate 382 vehicles in the morning and 381 in the evening. The City of Craig completed a city-wide Transportation Plan in 2009 and the traffic counts indicate that the traffic at this intersection has increased by 23 percent.

The 2009 left-turn volumes indicate that the north- and southbound approaches warrant the additional of a left-turn lane, with 51 vehicles turning left from northbound and 133 vehicles from the southbound in the morning peak hour. Southbound through has 48 vehicles in the morning hour warranting a right-turn lane. The *Traffic Impact Study* showed that the Frontage Road did not have an increase in traffic from 2006 to 2009. The capacity analysis of the study determined that the intersection did and will operate at acceptable levels-of-service with the existing and future conditions. The acceleration and deceleration lanes were measured and compared to the requirements in the *CDOT Access Code* and Table 21 provides this information. The eastbound left-turn deceleration lane has a slightly short storage length, but a longer taper than recommended. This could be altered by re-striping.

TABLE 21: ACCELERATION AND DECELERATION LANES FOR US HIGHWAY 40 AND STATE HIGHWAY 13/COUNTY ROAD 7								
Approach	Lane	Condition	Deceleration			Acceleration		
			Decel +Storage	Taper	Met?	Accel	Taper	Met?
Eastbound	Left	Existing	290	200	No	N/A	N/A	N/A
		Required	273+100	162		N/A	N/A	
	Right	Existing	275	400	Yes	450	*	Yes
		Required	273	162		388	162	
Westbound	Left	Existing	250	TWLTL	Yes	N/A	N/A	N/A
		Required	273+150	162		N/A	N/A	
	Right	Existing	280	220	Yes	N/A	N/A	N/A
		Required	273	162		N/A	N/A	

\*Lane ends at a driveway; therefore, there is not a taper.  
Source: Google Earth Pro and *CDOT Access Code*

Other observations:

- There is a pedestrian signal located approximately 525 feet north on County Road 7 that is at a trailhead, but is non-operational. The signal heads were off and the push buttons do not engage the pedestrian signal.
- There is a bus stop located at the gas station driveway.
- The northbound signal heads are not aligned above the centerline of the lanes.
- Drainage issues exist on County Road 7 along the driveways.
- The signal does not have any lane designation signs, which could better define the southbound approach.



**Photo 16: US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)**

### ***RECOMMENDED IMPROVEMENTS***

Recommendations are shown in Figure 88 and Figure 89.

#### **Short-Term Recommendations**

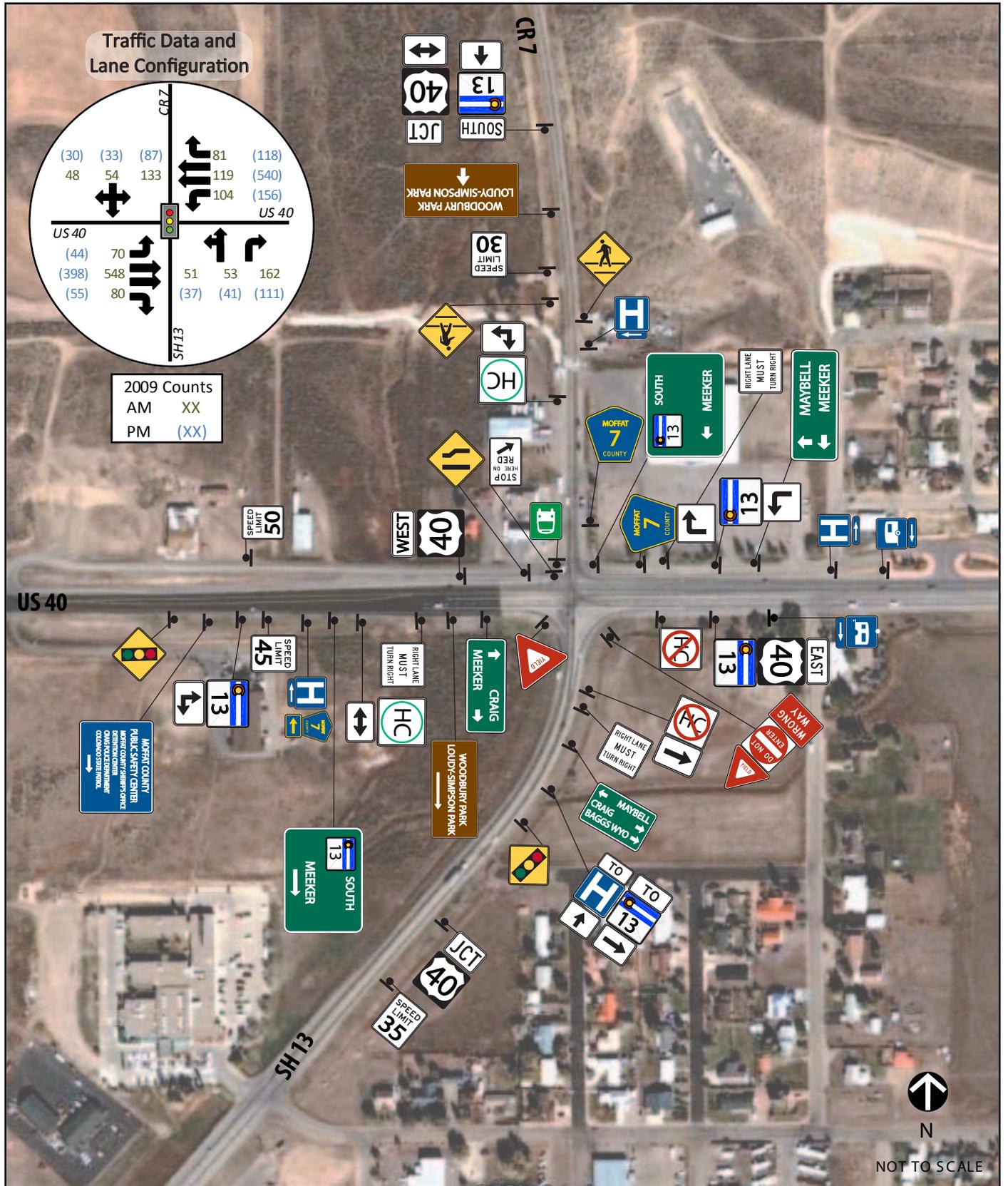
- Relocate the W3-3 sign (Signal Ahead) on the eastbound approach to the top of the hill.
- Install advanced detection.
- Prohibit the parking on County Road 7.
- Install lane designation signs on the mast arms.
- Fix the drainage issues on County Road 7 and at the driveways.
- Apply access management techniques for driveways and frontage roads.
- Remove the non-operable pedestrian signal on County Road 7 or upgrade and turn it on.

Estimated Cost = \$10,000 (detection) + \$3,600 (signs) + \$50,000 (drainage) + \$50,000 (access management)  
= \$113,600

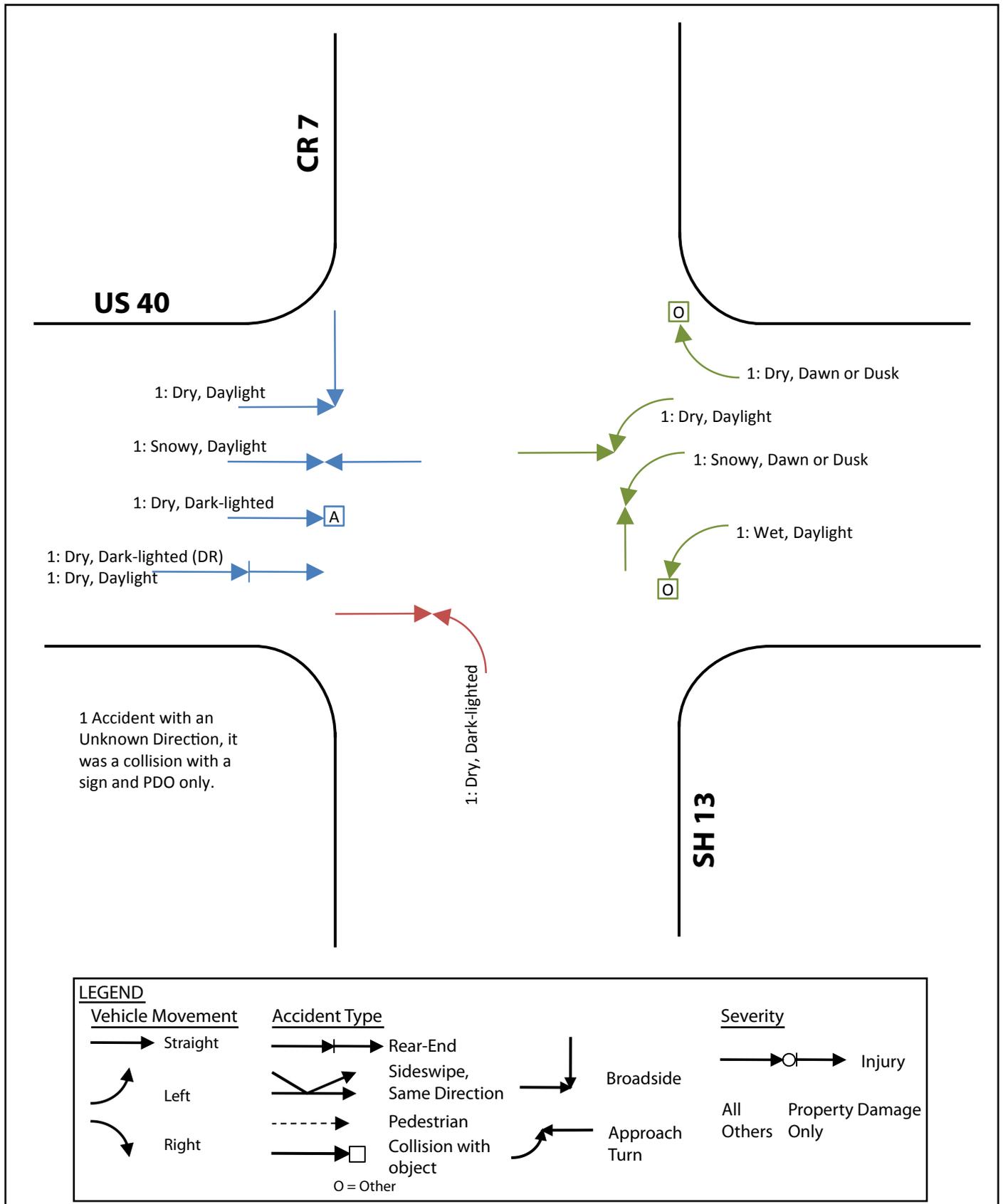
### Long-Term Recommendations

- Construct one northbound left-turn lane (use through lane and make the right a shared through/right) and one southbound left-turn lane. This will require re-design of the intersection and traffic signal.
- Install new traffic signal equipment to conform to CDOT standards and the MUTCD. This may include, but not limited to: poles, mast arms, signal heads, pedestrian features, detection, and controller.

Estimated Cost = \$150,000 (southbound turn lane) + \$20,000 (northbound turn lane) + \$300,000 = \$470,000



Note: This aerial is not up-to-date and does not include the recently constructed Memorial Hospital located north on County Road 7







## STATE HIGHWAY 131 AND COUNTY ROAD 8/COUNTY ROAD 17/MAIN STREET

### EXISTING CONDITIONS

State Highway 131 transverses north-south and extends from Steamboat Springs to Wolcott. This highway is used as a portion of alternate routes to I-70 during extended closures. In Yampa, State Highway 131 is a two-lane roadway with minimal shoulder width and a speed limit of 50 mph. County Road 8 (westbound) is a two-lane local road that provides access to recreational areas. County Road 17 (eastbound) is a two-lane local road that provides access to the Town of Yampa and recreational areas. Main Street is a two-lane road that is a fifth leg to the intersection and travels south into town.

This five-legged unsignalized intersection is stop-controlled on the minor roadways and does not have deceleration or acceleration lanes. Refer to Figure 90 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, the Town of Yampa submitted this intersection due to the safety concerns between high speed traffic from the highway and the pre-schoolers and elementary students on Main Street.

### ANALYSIS

South Route Elementary school and a recently constructed pre-school are located on Main Street, approximately 375 feet south of the intersection with State Highway 131 and the county roads. The issue appears to be when vehicles traveling southbound at 50 mph on State Highway 131 exit onto Main Street and do not immediately slow to the posted speed limit of 25 mph and then 15 mph near the schools. Main Street aligns perpendicular to County Road 17 and nearly parallel with the highway, which encourages southbound highway travelers to continue at the highway speed as they enter Town. There are no slowing techniques or devices on Main Street.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

### Short-Term Recommendations

- Verify that the appropriate signs are located on State Highway 131 and Main Street per the guidelines in the Manual on Uniform Traffic Control Devices (use the most recently accepted version).
- Implement traffic calming techniques on Main Street

**Ranking: 8**

**Town: Yampa**

**County: Routt**

**ADT: 1,800 (Year 2010)**

**Heavy Vehicles: 7.3%**

**Classification: NRA**

**Milepost: 42.655**

**Accidents: 2001 – 2008**

*Total – 1*

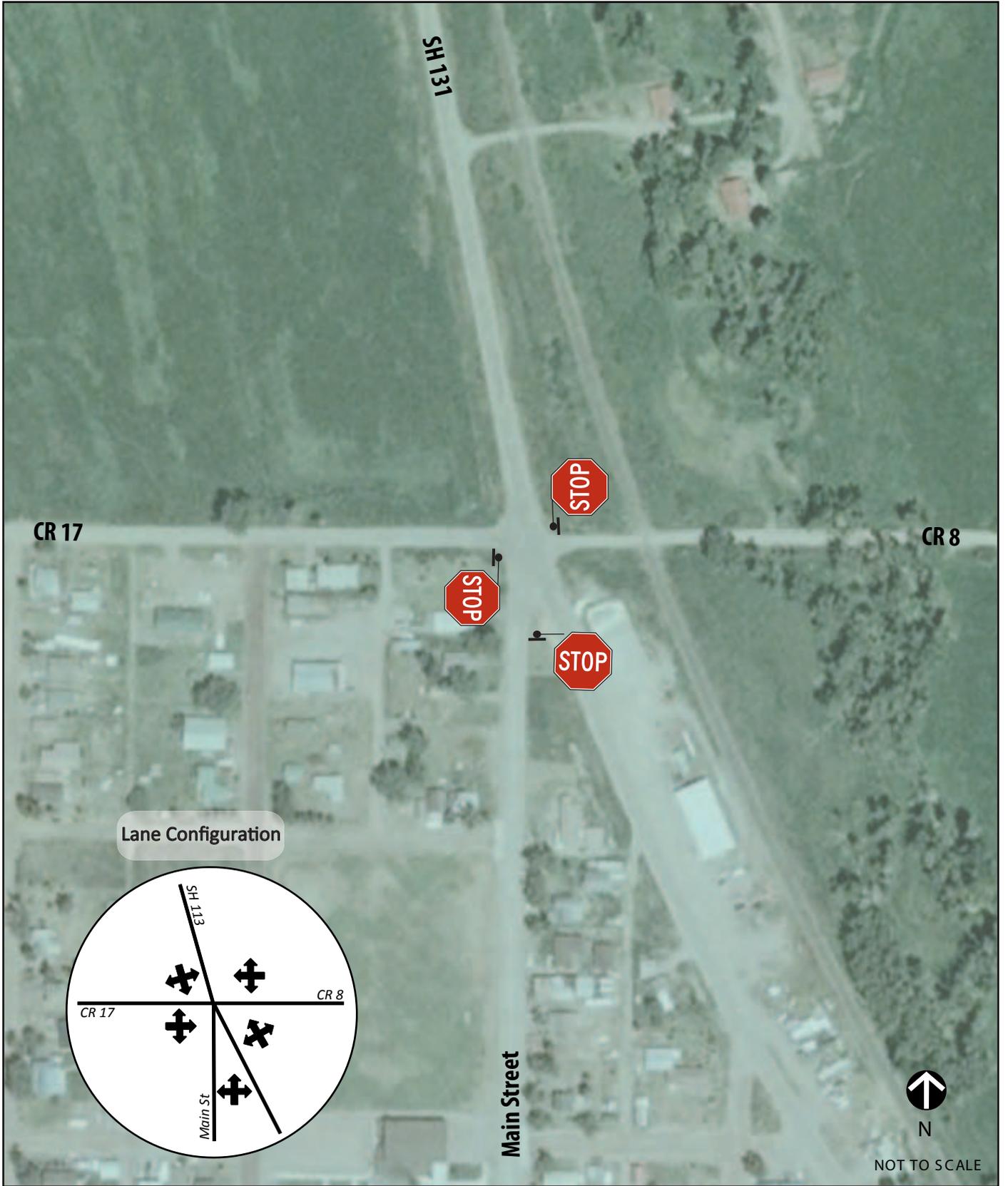
*Embankment – 1*

### Long-Term Recommendations

Consider one of the following options:

1. Remove Main Street entirely between State Highway 131 to 5<sup>th</sup> Street.
2. Change Main Street to be one-way in the northbound direction from 5<sup>th</sup> Street to State Highway 131.
3. Construct a cul-de-sac on Main Street (just south of State Highway 131) and prohibit access to/from State Highway 131.

These will all require proper restrictive devices and signage, as well as improvements to other local streets that will carry the redistributed traffic.



## STATE HIGHWAY 9 AND COUNTY ROAD 1

### EXISTING CONDITIONS

State Highway 9 is a north-south regional highway that provides access between Kremmling and I-70. At the studied location, the highway is two lanes wide with gravel shoulders and has a speed limit of 55 mph. County Road 1 is a two-lane gravel roadway that primarily accommodates logging trucks, rafting trips, and recreational vehicles. It provides a direct route from the area to Glenwood Springs and becomes a bypass route when I-70 is closed due to adverse weather.

This T-intersection is currently unsignalized with County Road 1 being stop-controlled. There is an absence of deceleration and acceleration lanes on all approaches. State Highway 9 has steep upgrade in the southbound direction, just north of the intersection. Refer to Figure 91 for existing conditions.

### ISSUES PER THE APPLICATION

According to the application, Grand County submitted this intersection for evaluation due to the limited sight distance, high volume of heavy vehicles, and absence of acceleration and deceleration lanes. Without acceleration and deceleration lanes, the turning traffic may impede highway traffic, create queues, and decrease capacity. According to the submitted information and cursory evaluation, the need for acceleration and deceleration lanes is justified because of the high volume of heavy vehicles, slow acceleration of heavy vehicles, highway speed is greater than 45 mph, and the visibility is limited due to the embankment and vertical curve.

### ANALYSIS

State Highway 9 cuts through a hill and is on a curve just north of the intersection, which reduces the sight distance for vehicles turning from County Road 1. The cut bank hinders ability for vehicles on County Road 1 to be able to judge the speed and distance of oncoming southbound vehicles. Heavy vehicles that travel to and from the county road create slow conditions as they turn or accelerate. The County 2010 traffic count data indicates that the ADT for County Road 1 ranges from 126 to 892 vehicles during the months of June through August, with an average of 543 vpd. In the winter months, the peak day had 1,142 vehicles.

### RECOMMENDED IMPROVEMENTS

This intersection was not visited and recommendations are preliminary based on available data. Other improvements may be discovered with further investigation and a site visit.

- Cut back the existing hill embankment to improve sight distance.
- Collect traffic counts (turning movement) to verify the need for auxiliary lanes per the guidelines of the *CDOT Access Code*.
  - If warranted, construct on State Highway 9: one southbound right-turn deceleration lane, one northbound left-turn deceleration lane, one right-turn acceleration lane (for eastbound right-turning vehicles), and one left-turn acceleration lane (for eastbound left-turning vehicles).

**Ranking: 9**

**County: Grand**

**AADT: 3,500 (Year 2010)**

**Heavy Vehicles: 10.7%**

**Classification: RA**

**Milepost: 217.970**

**Accidents: 2001 – 2008**

*Total – 2*

*Broadside – 1*

*Other – 1*

- The skew does not appear to be causing any issues currently, however if operational or safety issues develop in the future due to the skew, the intersection should be realigned to address the geometric deficiencies. Realign County Road 1 to the south of the intersection if the skew creates an issue.



**APPENDIX A:  
DETAILED RANKING SPREADSHEET**

Submitted by: County/City	County	Intersection	Location				Contact Information	Application Information				
			Highway Designation	Application MM		CDOT MM		Contact, Title, Email, Phone, Address	Information Submitted	Application Safety and Operational Issues	Application Mitigation Ideas	
				From	To	From						To
City of Fruita	Mesa	US Highway 6 and 17 Road/Coulson St	NRB	20.00	-	19.955	20.000	Ken Haley City Engineer khaley@fruita.org 970-858-8377 325 E. Aspen Ave. Fruita, CO 81521	ROW maps	Close Proximity to the Union Pacific RR crossing (120'). Inadequate accel/decel lanes on US 6. South leg of road intersects US 6 at skewed angle (38 degrees) resulting in a offset alignment. Currently a major truck route to the I-70 Interchange and serving as 1 of the 3 accesses to the industrial zoned properties South of US 6, intersection traffic volume is projected to significantly increase	Install lights and gates for the RR crossing (South of US6). Realign 17 Road and signalize the intersection as recommended by traffic studies.	
		US Highway 6 and 20 Road	RA	23.00	24.00	23.657	23.860	Ken Haley	Road Photos	Intersection in close proximity to RR crossing that is approx. 120' S of the HWY intersection. Intersection is off set, unsignalized and contains inadequate accel lanes for left turns onto US 6 with a 55 MPH speed limit (the North leg of 20 Road intersects US 6 at a skewed angle and the South leg is offset and intersects perpendicular).	Realign and signalize 20 Road. Signalization would help improve safety of left turns onto US6.	
		State Highway 340 and Kingsview Road	RA	2.00	-	1.839	2.000	Ken Haley		Local street intersection without accel/decel lanes; SH340 has a 55 MPH speed limit and an 8% downhill grade resulting in concerns for turning traffic (especially left turns onto SH340 during peak AM hours). Intersection stop-controlled at minor approaches. Kingsview Road is the only access to residential subdivision, a City-owned open space park, and heavy recreationally -used BLM properties.	Construction plans have been completed for accel/decel lanes on SH340.	
Grand Junction	Mesa	State Highway 340 and Redlands Parkway	NRA	9.53	-	9.526	9.612	Jody Kliska Transportation Engr jodyk@gjcity.org 970 244-1591 333 West Avenue Building D Grand Junction, CO 81501	Accident Data	Riverfront Trail System extends along East side of intersection; channelization does not meet ADA standards. There are changing grades and a lack of signal options. Pedestrians and cyclists prohibited from reaching pedestrian push buttons and utilizing signal controls due to lack of curb ramps. Trail runs into accel lanes. No trail or sidewalks on Western side. No sidewalks or bike lanes west of intersection. Trail crosses 2 channelized right-turn lanes that are free-flowing into accel lanes. Accel lanes do not meet requisite length. Signalized intersection is in a hole, there are 45 MPH speed limits with no advance detection. No WB left turn phasing.	Reconstruct intersection to meet standards. Eliminate the accel lanes, accommodate the ped/bike usage of Trail System, install advance detection, consider WB LT phasing.	
Mesa County	Mesa	US Highway 141B and E Road	NRA	161.40	-	161.361	1613.482	James Nall Traffic Engr james.nall@mesacounty.us 970-254-4151 750 Main St Grand Junction, CO 81502	Traffic Information(AADT, etc.)	Deep cross pans which run parallel to SH141 on both sides of E Road intersection contribute to broadside accidents. Increasing sediment in and around the gutter pans may affect vehicles' stopping ability. Signal equipment is out dated with inappropriate alignment and does not all meet CDOT standards. Electric utility wire rests on mast arm directly above EB approach. Both sides of SH141 have narrow sidewalks with virtually none along E Road. Pavement markings in poor condition.	Eliminate gutter pans. Improve side street radius. Eliminate/relocate/mitigate commercial ac	
		Interstate 70 (Business Loop) and 30 Road	EX	9.40	9.60	9.501	9.570	James Nall	Construction Plans; Aerial Photo; Accident Data; Volumes/Timings	Intersection has higher than national average of rear-end accidents and an inefficiency of the protected lefts. Due to the inefficiency of the protected only phasing for NB left-turning vehicles, traffic turning left from Frontage Road onto I-70 WB is currently cutting through a shopping center parking lot. The EB right-turn lane is a channelized free movement with a receiving lane, but currently operating as a yield lane. Installed W4-6 signs not visible to traffic and view is obstructed for the signalized intersection by the RR bridge. Both right-trun accel lanes on I-70B do not meet CDOT length requirements but are limited by adjacent intersections. The SB right-turn lane is a trap lane and causes confusion.	Yellow clearance time checks for rear end type accidents. Advanced dilemma zone detection may help rear end accident pattern.	
Palisade	Mesa	US Highway 6 and Elberta Avenue	RA	43.00	-	42.706	42.957	Tim Sarmo - Town Administrator tsarmo@townofpalisade.org (970) 464-5602 PO Box 128 Palisade, CO 81526	Aerial	Traffic from multiple directions from both frontage roads and Highway 6 creating conflicts. No left turn lanes. No bike lanes. Difficult pedestrian crossing. Confusing and conflicting traffic flow from multiple points. Closely space intersections.	Request for a roundabout	
		US Highway 6 and Iowa Avenue	EX	43.00	-	42.957	43.000	Tim Sarmo		Traffic flow form multiple directions. No left turn lanes. No bike lanes. Difficult pedestrian crossing. Heavy truck traffic. Closely spaced intersections..	Request for a roundabout	
		US Highway 6 and 37.1 Road	RA	43.00	-	42.464	42.706	Tim Sarmo		Traffic flow from multiple directions. No left turn lanes. No bike lanes. Difficult pedestrian crossing.	Request for a roundabout	

Submitted by: County/ City	County	Intersection	Location				Contact Information	Application Information				
			Highway Designation	Application MM		CDOT MM		Contact, Title, Email, Phone, Address	Information Submitted	Application Safety and Operational Issues	Application Mitigation Ideas	
				From	To	From						To
Delta County	Delta	State Highway 133 and Samuel Wade Road/Bethlehem Road	RA	8.10	-	7.822	8.000	Bob Kalenak - County Engineer bkalenak@deltacounty.com 970-874-2035 501 Palmer St Delta, CO 81416-1796	Aerial Photo	Problem is left turn movement on Samuel Wade Road onto SH 133 WB or going straight onto Pitkin Road. Numerous accidents. Slight curve on SH 133. High truck traffic.	Reduce speed limit through intersection. Signal at intersection or redesign of SH 133 layout to pull curvature out of roadway design.	
		US Highway 50 and Gunnison River Drive	NRA	69.90	-	70.766	70.770	Bob Kalenak		LT movement on Gunnison River Dr to US 50 NB is risky. Block views of NB vehicles. Significant distance required to enter NB lane. Confusing environment making safe judgement a challenge. LT movement LOS reduced at high volume periods.	City of Delta has Truck Route Plan to include intersection (not submitted with application)	
		State Highway 65 and State Highway 92	NRB	NA	NA	3.814	4.000	Bob Kalenak		SH 92 high speed roadway. Railroad crossing 90' from intersection. LT movement from SH 65 onto SH 92 very dangerous at most times, undoable at rush hour. Vehicle storage for LT movement back up significantly. Inadequate from intersection to railroad crossings - vehicles sit on tracks. Back up issues on SH 65 due to LT movement problems blocking accel lane to SH 92. Blocking of intersection due to railroad crossing. SH 92 EB has a turn lane at intersection that obscures oncoming traffic from viewpoint of vehicles at SH 65 intersection.	Signalize intersection. Redesign layout to include dedicated lane for LT movement onto SH 92. Total intersection redesign including railroad crossing concerns.	
City of Gunnison	Gunnison	US Highway 50 and 10th Street	NRB	156.80	-	156.873	156.943	Ken Bradford Public Works Director tex@cityofgunnison-co.gov 970-641-8322 PO Box 239 Gunnison, CO 81230	Aerial	Intersection has 5 legs. Highway section is very wide and makes it difficult for LT movement from 10th Street. Sight distances are fair, but geometric design and approach angles are strange. LT movements from 10th street are prohibited, but difficult to enforce. Streetlight is located one block to the southwest of the 10th Street intersection which is problematic for optimal signalized separation.	NA	
		State Highway 135 and Spencer Avenue	NRB	0.75	-	0.740	0.922	Steve Westbay Community Development Director swestbay@cityofgunnison-co.gov 970-641-8152		Turn movements on EB and WB Spencer Avenue are restricted. Intersection is busy pedestrian crossing. Sidewalk crossing are substandard and create safety issues. Site distances are fair but geometric design precludes safe turning movements. Several large utilities located near the intersection make the design of functional pedestrian ways and turn movements difficult.	NA	
Gunnison County	Gunnison	State Highway 135 and County Road 740 (Cement Creek Road)	RA	20.70	-	20.704	21.000	Marlene Crosby PW Director mcrosby@gunnisoncounty.org 970-641-0044 811 Rio Grande, Gunnison Co 81230	ADT provided. Traffic Counts can be made available	High winds blowing west to east and icy, snowy roads. Not a perpendicular intersection. No acceleration lane for traffic turning southbound, required to merge with other highway traffic in a short distance.	No Suggestions	
		State Highway 135 and County Road 738 (Brush Creek Road)	RA	25.50	-	25.468	25.518	Marlene Crosby	See above	Problems occur during winter when the intersection is icy. Culvert with CDOT ROW freezes solid and all of the water hits the intersection.	Installation of a light. Open to suggestions.	
		US Highway 50 Frontage Road and County Road 17 (Antelope Creek Road)	FR	155.5 (From Hwy)	-	155.302 (From Hwy)	155.34 (From Hwy)	Marlene Crosby	See above	Not a 90 degree intersection and has a steep approach and is on a curve. Antelope Creek Road accesses onto the frontage road at the top of a steep hill limiting visibility. Three private access immediately past the intersection. No barrier to keep sliding vehicles from going over embankment onto US 50.	No Suggestions	
City of Montrose	Montrose	US Highway 550 and Niagara Road	NRA	128.00	-	128.243	128.418	Kerwin Jensen - Community Development Director kjensen@ci.montrose.co.us (970) 240-1478 P.O. Box 790 Montrose, CO 81402	Accident Data	NBRT lane and driveways near the intersection contribute to crashes for NB traffic attempting to turn EB onto Niagara Road.	Improve the right-hand turn lane by directing NB traffic in the right lane prior to the Q&T driveway to turn right into Q&T.	
		US Highway 50 and San Juan Avenue/Grand Avenue	NRA	91.88	91.92	91.878	91.916	Kerwin Jensen	Traffic Counts and Traffic Studies	High number of RE crashes that occur as WB drivers on San Juan Ave attempt to turn north on US 50. Skewed intersection.	Create a RT from San Juan Ave onto N Townsend Ave closer to a 90 degree angle. Narrowing the existing roadway on San Juan to one right turn lane by extending curb and gutter into the lane or widening the sidewalk to a bulb-out.	
		US Highway 550 and 12th Street/Columbia Way	NRA	128.24	128.91	128.418	128.445	Kerwin Jensen	Construction Plans; Photos; Aerial Photo/ROW Map	Four-pole spanwire traffic signal. Poor visibility of traffic signal and intersection. Center lines of South 12th Street on the east and local street Columbia Way on the west do not align causing intersection to be skewed.	Upgrade traffic signal to mast-arm signal with LED signals to improve visibility of intersection and signal. Possibly move South 12th Street to better align with center line of Columbia Way. Columbia Way residential neighborhood requests a protected left turn west onto Columbia Way from Townsend Avenue.	
Montrose County	Montrose	State Highway 90 and Chipeta Road	NRB	-	-	89.304	89.343	Spencer Ryland - Staff Engineer sryland@montrosecounty.net 970-252-7006 949 North 2nd Street Montrose, CO 81401	Aerial	Left turn lane faces into oncoming EB traffic on highway 90. EB 90 traffic merges with EB free-right traffic from Chipeta Rd. Numerous commercial and city park access driveways close to a major intersection.	Eliminate LT onto Chipeta Rd from Hwy 90	
		State Highway 348 and 5700 Road	RA	-	-	12.918	14.401	Spencer Ryland		West leg of intersection (SH 348) has vertical and horizontal alignment that creates inadequate entering sight distance. 5700 Rd legs are offset. Store located on northwest corner. HWY 348 does not meet CDOT geometric standards.	realign and reconstruct west leg of SH 348 and north leg of 5700 Rd	

Submitted by: County/City	County	Intersection	Location				Contact Information	Application Information				
			Highway Designation	Application MM		CDOT MM		Contact, Title, Email, Phone, Address	Information Submitted	Application Safety and Operational Issues	Application Mitigation Ideas	
				From	To	From						To
Town of Olathe	Montrose	US Highway 50B and State Highway 348	NRB	-	-	0.000	0.936	Scott A. Harold Town Administrator sharold@ci.olathe.co.us 970-323-5601 PO Box 789 Olathe, CO 81425	Cost Estimate; Accident Data <sup>A</sup> ; Counts (CDOT); Photos	Delays due to no turn lanes at this intersection. One Sidewalk connects from this intersection to Main Street North. Pedestrian traffic uses shoulder of road. No warning light at stop sign. Only School Zone lights during peak times.	Widening roadway, adding turn lanes, add curb and gutters, reduce parking on highway ROW, and installing sidewalks to direct pedestrian and bicycle traffic off of highway	
Eagle County	Eagle	State Highway 82 and El Jebel Road	EX	16.02	-	19.044	19.058	Greg Schroeder Sr Project Engineer greg.schroeder@eaglecounty.us 970-328-3567 PO Box 850, Eagle, CO 81631	Access Permits	Turn lanes on the N. side into Favre Lane (private road) do not allow full lane capacity for SB lanes onto SH82. South side (Valley Road) has a poor alignment at where Valley Road west connects. This makes it difficult for pedestrians due to the geometry. Lane lengths are not long enough for the peak queues. Traffic often backs up into adjacent intersections. This occurs on both north and south sides of the intersection. Close proximity of sidestreets (Valley Road on S., Farve Ln. & Driveways on the N.) cause blockages during peak times.	On the north side, creation of a one way loop for Farve Lane/Gillespie, change the location of the RFTA bus stop dropoff on north side, realign frontages on south side, SB right turn only lane onto SH 82.	
		US Highway 6 and Hillcrest Drive	NRA	164.00	-	164.070	164.460	Greg Schroeder	2010 Traffic Count Summary; Aerial	Intersection is not perpendicular to US 6, queuing issues over the bridge and back to Lake Creek Village Road, no LT accel lane onto US 6. Significant SB delays. SB left turn is dangerous. Not adequate sight distance for left turn onto EB US 6.	Install traffic signal and construct a LT accel lane on US 6	
Town of Basalt	Eagle	State Highway 82 and Basalt Avenue	EX	23.08	-	23.080	23.091	Larry Thompson Town Engineer 970-927-4701 101 Midland Ave, Basalt, CO 81621	Traffic Study; Accident Data; ROW maps; Counts	Ped/bike safety concerns crossing intersection due to vehicles turning from Basalt Ave onto SH82 and a high volume of peds crossing, notably school children and transit riders using the bus stops. During peak hours, SH82 SB queues extend into the Emma Road roundabout (100' S of intersection). The WB/RT accel lane is the only auxiliary lane meeting the CDOT Access Code. Intersection NE corner ped button is on wrong side of pole.	Grade-separated ped crossing, either an overpass or underpass. Possibility of a roundabout at intersection.	
Town of Gypsum	Eagle	US Highway 6 and Valley Road	RA	142.60	-	142.608	142.659	Ross Morgan Engineering Technician Ross@townofgypsum.com 970-524-1751 PO Box 130 Gypsum, CO 81637	Master Traffic Study	Poor drainage and steep (6%) super elevated highway causes safety concerns with ice at intersection. High volume of vehicles traveling to I-70 and schools located on intersection cause concern regarding pedestrians. Turning radii are too sharp; trucks hit structures.	Redesign intersection with a 3% cross slope, improved sight lines, clearly delineated ped cross walks, improved turning radii, and better drainage. Decrease the slope leading the US6 on Valley Rd for a more moderate approach.	
		US Highway 6 and Oak Ridge Drive	RA	142.70	-	142.717	142.883	Ross Morgan		Concern regarding intersection alignment, notably with school children crossing intersection while drivers turn onto US6 from Oak Ridge Drive. Poor drainage and a Northerly facing road expose winter driving safety hazards. Sharp intersection angles create problems for school busses turning right from US6. The West end of intersection requires improvement. Pole mounted signal lights do not perform well. Peak hours of concern regarding high traffic volume, student drivers, pedestrians, and school buses, are 7:00-8:00 AM and 3:00-4:00 PM.	Widen US6 WB lanes at intersection and increase intersection radius for turning vehicles. Realign intersection to match centerlines and improve striping. Incorporate additional crosswalks.	
City of Glenwood Springs	Garfield	State Highway 82 and 27th Street	NRB	-	-	1.714	1.917	Mike McDill City Engineer mike.mcdill@cogs.us (970) 384-6413 101 West 8th Street Glenwood Springs, CO 81601	Accident Data	Cycle time too short for the high traffic volume at intersection. Conflict between peds on the RFTA Trail (parallel to SH82) and intersection traffic cause safety concerns. Queuing issues at intersection. An insufficient number of turn lanes on 27th street can cause the increasing amount of traffic to backup through 3 major driveways and next intersection. Lanes on 27th Street are too narrow. The WB approach has poor drainage and pavement conditions.	Request a double turn lane and/or a grade separated trail crossing at intersection.	
		US Highway 6 and Devereux Road	NRB	-	-	0.000	0.072	Mike McDill		Ped and bicycle crossing issues at Intersection due to large radii and no channelization, as well as discontinuous sidewalks. Insufficient ped and bike facilities. Bus stops on both sides of US6 located too close to intersection. Large asphalt area is problematic for drivers due to unclear and short lived RT striping. "Tee" intersection (200' W of studied intersection) turning traffic conflict with traffic at US6 and Devereux Road. There is insufficient side road traffic control.	Design one signalized intersection with proper turn lanes and optimally located bus stops. Improve connectivity of sidewalks	
		State Highway 82 and 23rd Street	NRB	-	-	1.405	1.469	Mike McDill		EB angle of 23rd street at intersection causes conflicts between crossing trail users (trail parallels SH82 and crosses intersection) and turning vehicles.	Open to Suggestions	

Submitted by: County/ City	County	Intersection	Location				Contact Information	Application Information				
			Highway Designation	Application MM		CDOT MM		Contact, Title, Email, Phone, Address	Information Submitted	Application Safety and Operational Issues	Application Mitigation Ideas	
				From	To	From						To
Garfield County	Garfield	State Highway 82 and County Road 113 (Cattle Creek Road)	EX	7.90	-	7.911	8.000	Betsy Suerth Garfield County Project Engineer bsuerth@garfield-county.com 970-945-8212 x 1600 108 8th St #401 Glenwood Springs, CO 81601	Traffic Impact and Needs Assessment	65 MPH speedzone. EB and WB turn pockets to CR 113 are substandard length, storage and taper. No EB accel lane and WB accel lane is substandard length and taper. Intersection meets peak hour signal warrants during AM and PM peaks. Short turn lanes on mainline do not enable adequate decel or storage. Adjacent intersections East of intersection create queuing and blocking problems.	Lengthen turn lanes to CDOT standards. Add EB accel lane for LT vehicles. Provide beller advance warning along SH82 for the intersection. Signalize intersection.	
		State Highway 82 and County Road 154/County Road 114 (CMC Road)	EX	6.50	-	6.655	6.760	Betsy Suerth	Counts	55 MPH speedzone. EB approach in curve and limits the signal's visibility. EB and WB LT pockets and accel lanes are substandard length, storage, and taper. Short turn lanes on mainline do not enable adequate queueing storage. Sidestreet approaches have short storage lengths. Adjacent accesses (N and S) create queueing and blocking problems.	Lengthen turn lanes (accel/decel) to CDOT standards. Provide better advance warning along SH82 for the intersection, including signaling or flashing beacon on signal controller.	
		County Road 346 and Mamm Creek Road	FR	-	-			Betsy Suerth	Road Photos	Intersection has a blind corner for Mamm Creek NB traffic. Skewed approaches for CR346. Increasing traffic volume.	Realign intersection to remove skewed approaches for CR346 and remove blind NB approach. Add future turn lanes on Mamm Creek.	
Town of Carbondale	Garfield	State Highway 133 and Hendrick Drive	NRB	67.50	-	67.494	67.550	Larry Ballenger Public Works Director larryb@sopris.net 970-963-1307 511 Colorado Avenue Carbondale, CO 81623	Pedestrian Crosswalk Traffic Control Assessment	Turnkey Consulting concluded a school crossing signal is warranted based on CDOT standards as well as additional intersection improvements. Safety concerns for peds crossing intersection.	Signalization of Hendrick Drive and realign Sopris Avenue.	
		State Highway 133 and Snowmass Drive	NRB	66.80	-	67.044	67.204	Larry Ballenger	CDOT State Hwy Access Docs; Accident Data; Corridor Feasability Study; Carbondale Elementary School Redevelopment; Access Management Plan	Pedestrian safety is a concern due to an increasing amount of school children crossing as well as the crossing length. Unsignalized approaches cause difficulty completing adequate turning movements at peak hours. Police serve as crossing guards resulting in added strain on the police department. Long queue lengths.	Signalize intersection and review intersection to determine how to alleviate peak traffic concerns during the school year.	
Pitkin County	Pitkin	State Highway 82 and Baltic Avenue	EX	37.60	-	37.630	37.810	Brian Pettet Director of Public Works brian.pettet@co.pitkin.co.us 970-920-5390 76 Service Center Rd Aspen, CO 81611	Roundabout report	Safety concerns regarding peds due to high speeds, multiple traffic movements, pedestrian mix, and that they are unprotected from turning vehicles. LOS significantly reduced during peak hours. Stacking traffic existing through other intersections.	Dual LT from Baltic to SH 82, timing optimization, grade-separated ped crossing Explore possible roundabout	
		State Highway 82 and Brush Creek Road	EX	35.40	-	35.28.	35.414	Brian Pettet	Traffic Count	High speed and high traffic volume during peak hours. Opposing LT from SH82 unable to execute simultaneously. LOS significantly reduced during peak travel.	Expand intersection to allow simultaneous LT from SH82.	
Grand County	Grand	US Highway 40 and County Road 5	RA	226.00	-	226.188	226.470	Alan Green Safety Coordinator agreen@co.grand.co.us 970-877-2123 PO Box 9, Granby, CO 80446	Road and Bridge Priority	High volume traffic affects vehicles exiting CR5. Traffic flow is impeded on US40 when vehicles enter WB lanes. Wait times are exasperated due to the following: holidays, weekends, heavy truck high volume, a RR crossing (115' from US40) with 28-30 trains crossing each day, Fraser ball fields near intersection, a youth camp near intersection.	Realign WB lanes on US40. Readjust lane markings to allow for an accel lane. Re-striping current lane markings and install new signage.	
		US Highway 40 and County Road 54	RA	218.00	-	2107.970	218.000	Ken Haynes Road & Bridge Superintendent khaynes@co.grand.co.us 970-887-2123 467 E. Topaz Ave PO Box 9 Granby, CO 80446	Aerial	US40 traffic is stopped by LT vehicles at intersection. Existing safety concerns over WB LT vehicles which turn from a downhill, single lane on US40. Winter road conditions increase concern regarding LT vehicles on WB US40 at intersection which has a 65 MPH speedlimit. Intersection serves as only access point for Homestead Hills Subdivision. High traffic volume due to Snow Mountain Ranch/YMCA (1 MI North) and the Winter Park Subdivision (1.5 MI East). Steep grade and curves in road warrant further safety concern.	Widen the road to accommodate for a full LT lane and re-adjust striping to allow for a WBLT lane. Install signage indicating a turn lane, lane shift, etc.	
		State Highway 9 and County Road 1	RA	137.00	-	136.608	137.000	Ken Haynes	Traffic Counts	Limited site distance (N/S) when exiting from CR1 to US9, concerns regarding oversize/slow accel vehicles. Site distance is limited due to typography, including a rise(S) and a cut bank and curve (N). 55 MPH speedzone at intersection, oversize vehicles cannot safely accelerate to highway speeds without the risk of impeding US9 traffic. Difficult to accel onto US9 in adverse winter conditions, CR1 is used as bypass route when I-70 closes due to incimate weather . No accel/decel lanes on US9 at intersection. CR1 is used as a cut across route for vehicles traveling to Glenwood Springs.	Widen US9 at this intersection and lower the road alignment allowing for accel/decel lanes in addition to a better line of sight. Remove dirt from the east side of US9 at intersection and widen the highway to accommodate for accel/decel lanes. This would also improve line of sight for drivers. Request expansion on the east side of US9 due to an existing BLM historical site on opposing side.	
City of Craig	Moffat	US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)	NRA	89.00	-	89.322	89.441	Jim Ferree City Manager jferree@ci.craig.co.us 970-826-2023 300 West 4th Craig, CO 81625	Traffic Volumes/ Crashes; Memorial Hospital CO NW College TIA	High urban development in area surrounding intersection. LT lanes required on the North and South approaches due growth. Modifications to signal will also be required if improvements are made.	Incorporate LT lanes on N/S sides of intersection with associated LT arrows added to the signal light configuration. Close Frontage Road on NE corner of intersection or limit RT movements to RT in and out only.	

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			Highway Designation	Application MM		CDOT MM		Contact, Title, Email, Phone, Address	Information Submitted	Application Safety and Operational Issues	Application Mitigation Ideas	
				From	To	From						To
Rio Blanco County	Rio Blanco	State Highway 64 and County Road 5	RA	54.40	-	56.243	56.440	R. Van Pilaud County Engineer VPilaud@co.rio-blanco.co.us 970-878-9611 (Office); 970-756-4221 (Cell) Rio Blanco County Road and Bridge Department, 570 Second Street Meeker, CO 81641	Plans, Draft Traffic Report	One lane for all intersection approaches, an increasing traffic volume, and a high number of heavy vehicles cause concern. Queuing occurs on SH64 and CR5 while vehicles are turning. No accel/decel lanes or subsequent turning lanes. With increasing traffic volumes, the lack of designated turning lanes (esp. WB SH64) will cause queuing on both SH64 and at the minor approach, resulting in reduced Levels of Service. Intersection radii do not accommodate WB50 or larger vehicles, causing safety concerns as truck turning movements impact opposing directions of travel.	Dedicated LT and RT lands and corresponding decel lanes should be provided for each approach. An accel lane on EB SH64 and SB CR5 should also be provided.	
Routt County	Routt	US Highway 40 and Downhill Drive/Riverside Drive	NRB	130.22	-	130.285	130.482	Heather McLaughlin Senior Engineer hmclaughlin@co.routt.co.us 970-879-0537 136 6th Street, Box 773598 Steamboat Springs, CO 80477-3598	US40 NEPA corridor Safety Report	No crosswalk/traffic control or sidewalks for peds crossing from residential area (N of US40) to access bus stop. LT onto US40 difficult during peak hours. Concern regarding bikes because they must share narrow travel lanes with vehicles through intersection on Downhill Drive. High crash volume at intersection. At industrial area access, lane widths are narrow and inbound trucks cross into outbound LT lane. Intersections are offset (100'). No auxiliary RT lane from US40 onto Downhill Drive. Bus stop location blocks visibility from Riverside Drive.	NEPA study mitigation measures. Bike lanes/4' shoulder on Downhill Drive planned.	
		US Highway 40 and County Road 129 (Elk River Road)	NRB	130.64	-	130.773	130.826	Heather McLaughlin	Count Data	Pedestrians have long cross distance and no existing sidewalks on North side. No sidewalks or cross walks for peds to access from the core trial South of US40 to the businesses North of US40. Current island refuges and timing not adequate. No bike lane on US40 or CR129; no bike detection to trigger crossing signal. Split phase signal to accommodate movements (based on geometry of side streets) is not efficient during peak hours, long queues on both roads. LOS was F/F. Conflicts for LT vehicles on US40 due to island configuration/narrow lanes on Shield Drive.	Refer to NEPA study for mitigation measures. Bike lanes/4' shoulder planned on CR129 between US40 and airport. Reconfigure the intersection to allow protective/permissive phasing to reduce accidents.	
		US Highway 40 and County Road 42	NRA	128.33	-	128.340	128.776	Heather McLaughlin	Needs Study	Existing embankment North of US40 and RT vehicles blocks the sight oncoming US40 WB vehicles for CR42 LT motorists onto US40. High crash volume. No signal causes delays for LT vehicles entering US40 during peak AM hour; one outbound lane causes RT vehicles delay (RT vehicles use shoulder to bypass LT queue in single approach lane on CR42).	Refer to NEPA study for mitigation measures. Construction of an exclusive SB LT lane on CR42 and recommends an engineering study. CDOT Safety Study recommends laying back the embankment to provide additional sight distance on US40 east fo CR42 along with advance intersection warning signs.	
Town of Yampa	Routt	State Highway 131 and County Road 8/County Road 17/Main Street	NRA	42.75	-	42.660	43.000	Janet L. Ray Town Clerk jray@townofyampa.com 970-638-4511 P.O. Box 224 Yampa, CO 80483	Parcel Info; AADT; Road Alignment; Photos	Due to the 50 MPH speed limit on SH131, concern for crossing school children. Traffic moving from SH131 onto Main Street does not slow down for turns. No signal lights or warning signs on SH131, concern regarding multiple schools around/on intersection.	Install decel lane on SB lane approaching CR17, CR8, and Main Street. Traffic around schools still needs to be slowed down, possible stop signs.	

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			From	To	PDO	INJ	FAT	Total	Weighted total	Number of Years	Weighted/Year Factor	Score	Year	Vol	Note Ref #	Year	Vol	Note Ref #	Score	Past HV%	2010 HV%	Score	
City of Fruita	Mesa	US Highway 6 and 17 Road/Coulson St	1/1/2001	12/31/2008	5	0	0	5	2.5	8	0.312606984	0	2009	4,600	5	2010	5,600	5	1	8.9%	8.9%	2	
		US Highway 6 and 20 Road	1/1/2001	12/31/2008	9	3	0	12	19.5	8	2.438334474	1	2009	13,400	6	2010	15,000	6	2	5.6%	5.6%	2	
		State Highway 340 and Kingsview Road	1/1/2001	12/31/2008	2	0	0	2	1	8	0.125042794	0	2009	8,000	7	2010	8,200	7	2	2.6%	2.6%	1	
Grand Junction	Mesa	State Highway 340 and Redlands Parkway	1/1/2001	12/31/2008	13	1	0	14	11.5	8	1.437992126	1	2009	12,500	14	2010	12,000	14	2	2.9%	2.9%	1	
Mesa County	Mesa	US Highway 141B and E Road	1/1/2001	12/31/2008	40	14	1	55	100	8	12.50427936	4	2009	17,700	23	2010	18,000	23	3	5.2%	5.2%	2	
		Interstate 70 (Business Loop) and 30 Road	1/1/2001	12/31/2008	115	23	2	140	192.5	8	24.07073776	6	2009	19,100	15	2010	19,000	15	3	3.8%	3.8%	1	
Palisade	Mesa	US Highway 6 and Elberta Avenue	1/1/2001	12/31/2008	6	2	0	8	13	8	1.625556316	1	2009	6,800	19	2010	6,300	19	1	2.3%	1.7%	1	
		US Highway 6 and Iowa Avenue	1/1/2001	12/31/2008	0	0	0	0	0	8	0	0	0	2009	6,800	19	2010	6,300	19	1	2.3%	1.7%	1
		US Highway 6 and 37.1 Road	1/1/2001	12/31/2008	4	2	0	6	12	8	1.500513523	1	2009	6,800	19	2010	6,300	19	1	2.3%		1	

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Delta County	Delta	State Highway 133 and Samuel Wade Road/Bethlehem Road	1/1/2001	12/31/2008	6	2	0	8	13	8	1.625556316	1	2009	2,900	12	2010	2,900	12	1	8.3%	8.3%	2
		US Highway 50 and Gunnison River Drive	1/1/2001	12/31/2008	7	2	0	9	13.5	8	1.688077713	1	2009	12,500	13	2010	12,000	13	2	6.6%	6.6%	2
		State Highway 65 and State Highway 92	1/1/2001	12/31/2008	10	8	0	18	45	8	5.62692571	2				2010	13,000	30	2		6.0%	2
City of Gunnison	Gunnison	US Highway 50 and 10th Street	1/1/2004	12/31/2008	20	1	0	21	15	5	3.00164294	2	2009	7,900	10	2010	8,100	10	2	6.0%	6.0%	2
		State Highway 135 and Spencer Avenue	1/1/2004	12/31/2008	15	2	0	17	17.5	5	3.501916758	2	2009	8,000	11	2010	8,100	11	2	6.5%	6.5%	2
Gunnison County	Gunnison	State Highway 135 and County Road 740 (Cement Creek Road)	1/1/2004	12/31/2008	2	0	0	2	1	5	0.200109529	0	2009	6,300	46	2010	6,200	46	1	2.0%	9.2%	2
		State Highway 135 and County Road 738 (Brush Creek Road)	1/1/2004	12/31/2008	2	0	0	2	1	5	0.200109529	0	2009	6,300	46	2010	6,200	46	1	2.0%	7.2%	2
		US Highway 50 Frontage Road and County Road 17 (Antelope Creek Road)	1/1/2001	12/31/2008	0	0	0	0	0	8	0	0	2008	1,163		2009	873		1	2.0%	2.0%	1
City of Montrose	Montrose	US Highway 550 and Niagara Road	1/1/2010	12/31/2010	0	0	0	0	0	1	0	0	2009	25,800	31	2010	26,000	31	3	5.6%	5.6%	2
		US Highway 50 and San Juan Avenue/Grand Avenue	1/1/2001	12/31/2008	84	21	0	105	147	8	18.38129065	5	2009	16,400		2010	22,000		3	5.1%	6.1%	2
		US Highway 550 and 12th Street/Columbia Way	1/1/2001	12/31/2008	33	10	0	43	66.5	8	8.315345772	3	2009	25,400	33	2010	27,000	33	3	4.1%	4.1%	1
Montrose County	Montrose	State Highway 90 and Chipeta Road	1/1/2001	12/31/2008	8	2	0	10	14	8	1.75059911	1	2009	13,500	16	2010	13,000	16	2	3.4%	3.4%	1
		State Highway 348 and 5700 Road	1/1/2001	12/31/2008	5	1	0	6	7.5	8	0.937820952	1	2009	1,200	18	2010	1,200	18	1	7.3%	7.3%	2

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			From	To	PDO	INJ	FAT	Total	Weighted total	Number of Years	Weighted/Year Factor	Score	Year	Vol	Note Ref #	Year	Vol	Note Ref #	Score	Past HV%	2010 HV%	Score
Town of Olathe	Montrose	US Highway 50B and State Highway 348	1/1/2004	12/31/2008	2	0	0	2	1	5	0.200109529	0	2009	2,500	48	2010	4,000	48	1		4.8%	1
Eagle County	Eagle	State Highway 82 and El Jebel Road	1/1/2001	12/31/2008	24	13	0	37	77	8	9.628295104	3	2009	21,400	2	2010	22,000	2	3	2.0%	4.2%	1
		US Highway 6 and Hillcrest Drive	1/1/2001	12/31/2008	5	5	0	10	27.5	8	3.438676823	2	2009	10,500	34	2010	9,500	34	2	2.0%	4.1%	1
Town of Basalt	Eagle	State Highway 82 and Basalt Avenue	1/1/2001	12/31/2008	33	12	0	45	76.5	8	9.565773708	3	2009	17,100	4	2010	19,000	4	3	2.0%	3.7%	1
Town of Gypsum	Eagle	US Highway 6 and Valley Road	1/1/2001	12/31/2008	10	3	0	13	20	8	2.500855871	1	2006	9,600	35	2010	9,700	35	2	2.0%	9.7%	2
		US Highway 6 and Oak Ridge Drive	1/1/2001	12/31/2008	5	0	0	5	2.5	8	0.312606984	0	2006	9,600	35	2010	9,700	35	2	2.0%	9.7%	2
City of Glenwood Springs	Garfield	State Highway 82 and 27th Street	1/1/2001	12/31/2008	41	8	0	49	60.5	8	7.565089011	3	2009	25,900	8	2010	26,000	8	3	3.9%	3.9%	1
		US Highway 6 and Devereux Road	1/1/2001	12/31/2008	4	0	0	4	2	8	0.250085587	0	2009	12,200	9	2010	13,000	9	2	6.4%	6.4%	2
		State Highway 82 and 23rd Street	1/1/2001	12/31/2008	36	5	0	41	43	8	5.376840123	2	2009	25,900	8	2010	26,000	8	3	3.9%	3.9%	1

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Garfield County	Garfield	State Highway 82 and County Road 113 (Cattle Creek Road)	1/1/2001	12/31/2008	5	2	0	7	12.5	8	1.56303492	1	2009	22,400	27	2010	23,000	27	3	4.0%	4.0%	1
		State Highway 82 and County Road 154/County Road 114 (CMC Road)	1/1/2001	12/31/2008	20	18	0	38	100	8	12.50427936	4	2006	22,400	27	2010	23,000	27	3	2.0%	3.7%	1
		County Road 346 and Mamm Creek Road	1/1/2001	12/31/2008	3	0	0	3	1.5	8	0.18756419	0							0	2.0%	2.0%	1
Town of Carbondale	Garfield	State Highway 133 and Hendrick Drive	1/1/2001	12/31/2008	2	1	0	3	6	8	0.750256761	0	2009	8,100	29	2010	8,200	29	2	2.0%	3.1%	1
		State Highway 133 and Snowmass Drive	1/1/2001	12/31/2008	4	4	0	8	22	8	2.750941458	1	2009	8,100	29	2010	8,200	29	2	4.0%	4.0%	1
Pitkin County	Pitkin	State Highway 82 and Baltic Avenue	1/1/2001	12/31/2008	14	1	0	15	12	8	1.500513523	1	2009	17,800	24	2010	18,000	24	3	4.0%	4.0%	1
		State Highway 82 and Brush Creek Road	1/1/2001	12/31/2008	29	10	1	40	74.5	8	9.315688121	3	2007	14,500	38	2010	14,000	38	2	2.0%	4.4%	1
Grand County	Grand	US Highway 40 and County Road 5	1/1/2001	12/31/2008	1	0	0	1	0.5	8	0.062521397	0	2009	9,600	39	2010	9,700	39	2	2.6%	5.6%	2
		US Highway 40 and County Road 54	1/1/2001	12/31/2008	0	1	0	1	5	8	0.625213968	1	2009	8,100	40	2010	6,500	40	1	3.1%	4.3%	1
		State Highway 9 and County Road 1	1/1/2001	12/31/2008	2	0	0	2	1	8	0.125042794	0	2009	3,500	41	2010	3,500	41	1	4.6%	10.7%	3
City of Craig	Moffat	US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)	1/1/2001	12/31/2008	11	0	0	11	5.5	8	0.687735365	0	2009	9,500		2010	10,000	42	2	3.4%	6.6%	2

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Rio Blanco County	Rio Blanco	State Highway 64 and County Road 5	1/1/2001	12/31/2008	3	0	0	3	1.5	8	0.18756419	0	2009	1,200	28	2010	1,100	28	1	17.0%	17.0%	4
Routt County	Routt	US Highway 40 and Downhill Drive/Riverside Drive	1/1/2001	12/31/2008	14	12	0	26	67	8	8.377867169	3	2009	8,199	3	2010	12,000	43	2	2.0%	4.5%	1
		US Highway 40 and County Road 129 (Elk River Road)	1/1/2001	12/31/2008	54	0	0	54	27	8	3.376155426	2	2008	18,719	25	2010	20,000	44	3	2.0%	3.2%	1
		US Highway 40 and County Road 42	1/1/2001	12/31/2008	5	4	0	9	22.5	8	2.813462855	1	2009	7,515	26	2010	12,000	43	2	2.0%	4.5%	1
Town of Yampa	Routt	State Highway 131 and County Road 8/County Road 17/Main Street	1/1/2001	12/31/2008	1	0	0	1	0.5	8	0.062521397	0	2009	1,600	21	2010	1,800	21	1	8.9%	7.3%	2

Submitted by: County/City	County	Intersection	Benefit to Cost										Cost				Recommendations from the Study	
			Percent Reduced per Severity			Accident Reduction Factor				Calculated B/C	Score	Cost Est.	PE (25%)	Construct (85%)	Score	Short-Term	Long-Term	
			PDO	INJ	FAT	PDO	INJ	FAT	~ARF									
City of Fruita	Mesa	US Highway 6 and 17 Road/Coulson St	1	0	0	35	35	35	35	0.79	0	\$950,000	\$237,500	\$712,500	2		Once development begins, utilize the existing traffic study to upgrade the intersection. Realign 17 Road, signalize, install railroad gates and signal, and provide the necessary deceleration and acceleration lanes.	
		US Highway 6 and 20 Road	4	1	0	35	35	35	35	6.91	1	\$950,000	\$237,500	\$712,500	2		Collect traffic counts to determine adequate requirements for accel lanes and analyze signal warrants. Consider realigning 20 Road to remove the offset. Install the proper RR gates and signal.	
		State Highway 340 and Kingsview Road	0	0	0	30	30	30	0	0	0	\$250,000	\$62,500	\$187,500	5		Collect traffic counts (turning movement) to determine if the requirements for acceleration and deceleration lanes on State Highway 340 are met per the CDOT Access Code. Evaluate the sight distance for each approach based on the guidelines of the AASHTO. Modify the grading. Redesign the intersection if necessary.	
Grand Junction	Mesa	State Highway 340 and Redlands Parkway	2	0	0	32	32	32	32	2.25	0	\$321,200	\$80,300	\$240,900	4	Construct ADA compliant curb ramps on the trail and on the pork chop islands. Install trail crossing signs at free right-turn lanes. Add crosswalks to free right-turn lanes. Change the westbound left-turn lane to have protected+permitted phasing and new signal head. Extend the eastbound and southbound left-turn lanes on the highway to conform to CDOT Access Code.	Install new traffic signal equipment. Add a four-foot median on State Highway 340. Construct dual left turn lanes for the eastbound approach. Extend the southbound right-turn lane to conform to CDOT Access Code.	
Mesa County	Mesa	US Highway 141B and E Road	13	4	0	32	32	32	32	46.74	2	\$580,000	\$145,000	\$435,000	3	Install new traffic signal to meet standards. Fix drainage and remove cross pans.	Apply access management techniques to E Road. Lengthen the accel/decel lanes on the highway to meet CDOT standards.	
		Interstate 70 (Business Loop) and 30 Road	45	9	1	39	39	39	39	357.82	4	\$200,500	\$50,125	\$150,375	5	Re-orient existing W4-6 signage. Evaluate the signal timing for North Ave and 30 Road. Update signal timing to reflect traffic volumens and operational needs. Extend median on 30 road. Update detection loops and install advanced detection. Lengthen WB left-turn lane. Provide a 3/4 movement for the shopping center driveway.	Apply access management techniques. Provide signal interconnection to the signal at North Ave. After 29 Road is open, consider a corridor signal coordination and timing plan, and reevaluate the traffic patterns and operational needs.	
Palisade	Mesa	US Highway 6 and Elberta Avenue	3	1	0	48	48	48	48	3.08	0	\$1,000,000	\$250,000	\$750,000	2		Collect traffic, pedestrian, and bicycle counts to determine the operational needs for each. Consider closing the west side access of the north frontage road to 37 3/10 Road.	
		US Highway 6 and Iowa Avenue	0	0	0	48	48	48	0	0	0	\$1,000,000	\$250,000	\$750,000	2		Collect traffic, pedestrian, and bicycle counts (turning movement and hourly directional) to determine the operational needs for each and evaluate different intersection designs. Consider changing the north frontage road to one-way in the eastbound direction and make the access at 37.1 Road a right-in-right-out or close the frontage road access to Iowa Avenue. Consider making the south frontage road access a right-in-right-out.	
		US Highway 6 and 37.1 Road	1	0	0	48	48	48	48	0.93	0	\$1,000,000	\$250,000	\$750,000	2		Collect traffic, pedestrian, and bicycle counts (turning movement and hourly directional) to determine the operational needs for each and evaluate different intersection designs. Construct left-turn lanes on the east- and westbound approaches if volumes meet the criteria of the CDOT Access Code. Close the frontage road access to 37.1 Road. Realign the minor approaches to have matching centerlines.	

Submitted by: County/City	County	Intersection	Benefit to Cost									Cost				Recommendations from the Study	
			Percent Reduced per Severity			Accident Reduction Factor				Calculated B/C	Score	Cost Est.	PE (25%)	Construct (85%)	Score	Short-Term	Long-Term
			PDO	INJ	FAT	PDO	INJ	FAT	~ARF								
Delta County	Delta	State Highway 133 and Samuel Wade Road/Bethlehem Road	3	1	0	20	20	20	20	8.53	1	\$150,000	\$37,500	\$112,500	5	Clear some trees on NE corner.	Construct a LT accel lane for vehicles turning south from Samuel Wade Road. Collect traffic counts to determine if a signal is warranted.
		US Highway 50 and Gunnison River Drive	2	1	0	26	26	26	26	2.62	0	\$300,000	\$75,000	\$225,000	4	Collect data to evaluate the sight distance issues with the curvature of US50. Provide a LT accel or decel lane on US50 and evaluate data for signal warrants.	Monitor intersection during and after the construction of the Delta Alternate Truck Route to provide the proper geometric and operational needs.
		State Highway 65 and State Highway 92	3	2	0	26	26	26	26	62.63	2	\$150,000	\$37,500	\$112,500	5		Collect traffic counts (turning movement and hourly directional) to determine the turning lane and operational needs. Provide a left-turn acceleration lane on State Highway 92 for vehicles turning east from State Highway 65. There is two options for this improvement: (1) Utilize inside eastbound lane and force eastbound to taper to one lane prior to the intersection, or (2) construct the new lane in the median with consideration of tapering eastbound lanes to one lane prior to the merging location of the new left acceleration. Further investigation is needed to determine use of the median. There must continue to be a four-foot separation between both directions per the CDOT design standards.
City of Gunnison	Gunnison	US Highway 50 and 10th Street	5	0	0	50	50	50	50	29.16	2	\$300,000	\$75,000	\$225,000	4		Either close northbound 10th Street access and create a cul-de-sac or construct a splitter island to create a right-in-right-out access. Either extend the median to close the southbound 10th Street access or make 10th Street one-way in the northbound direction.
		State Highway 135 and Spencer Avenue	8	1	0	18	18	18	18	25.86	2	\$267,200	\$66,800	\$200,400	4	Improve the drainage and cross pans. Install curb ramps on the east side of the intersection per the ADA design standard. Reconstruct southeast curb ramp and sidewalk to comply with ADA standards. Install street name signs to all mast arms. Re-stripe the crosswalks and add one to the east side of the intersection. Install a longer mast arm for the northbound approach. Align the signal heads appropriately. Move the left-turn only sign to the northbound mast arm. Add and continue the bike lanes.	Construct new sidewalks on US Highway 135 with curb and gutter and elevated above the roadway. The design should provide a wide shoulder to accommodate bicyclists. Construct a sidewalk on the east side of US Highway 135, to the north, to connect to the bus stop. Construct sidewalks on the south side of Spencer Avenue. Lengthen the northbound acceleration lane to conform to CDOT Access Code. Widen the eastbound approach to reduce the offset with the westbound approach. This may include adding a similar median as currently exists on the westbound approach.
Gunnison County	Gunnison	State Highway 135 and County Road 740 (Cement Creek Road)	1	0	0	50	50	50	50	1.14	0	\$400,000	\$100,000	\$300,000	4	Provide a left-turn acceleration lane for vehicles turning from Cement Creek Road. Investigate if this can be completed by re-stripping the existing painted median.	Re-align the Cement Creek Road to be at a perpendicular with State Highway 135 per the previously developed design plans. Provide the warranted turn lanes on all approaches. In the future, the private driveway should be aligned with Brush Creek Road if the property is developed, the intersection is redesigned, or if an access permit is requested.
		State Highway 135 and County Road 738 (Brush Creek Road)	1	0	0	25	25	25	25	0.57	0	\$400,000	\$100,000	\$300,000	4	Collect traffic counts to determine the turning lane and operational needs. Reduce the grades and lower the embankment at the intersection, with a design that minimizes the snow drifts on the roadways. Continue to maintain the drainage elements and determine if re-grading is needed.	In the future, the private driveway should be aligned with Brush Creek Road if the property is developed, the intersection is redesigned, or if an access permit is requested.
		US Highway 50 Frontage Road and County Road 17 (Antelope Creek Road)	0	0	0	35	35	35	0	0	0	\$50,000	\$12,500	\$37,500	5		Apply access management techniques and review the spacing of the driveways. Examine the sight distance and evaluate the need to realign County Road 17 to be perpendicular with the frontage road. Improve grades on all approaches.
City of Montrose	Montrose	US Highway 550 and Niagara Road	0	0	0	20	20	20	0	0	0	\$50,000	\$12,500	\$37,500	5	N/A	
		US Highway 50 and San Juan Avenue/Grand Avenue	12	3	0	75	75	75	75	4181.77	5	\$153,000	\$38,250	\$114,750	5	Remove landscaping on the southeast corner which limits the visibility between westbound right-turning vehicles and northbound through vehicles. Narrow the westbound right-turn lane to 16 feet by painting a median between the through and the right lanes. Lengthen the southbound left-turn deceleration lane by 266 feet by re-stripping.	Construct a northbound right-turn acceleration lane for vehicles turning right from San Juan Avenue. Allow westbound right-turns to be free flowing.
		US Highway 550 and 12th Street/Columbia Way	11	3	0	32	32	32	32	36.01	2	\$741,900	\$185,475	\$556,425	3	Add second span wire to all four directions to stabilize the signal heads. Add signage on mast arm for lane designation for the EB and WB approaches. Add specialized signs to warn drivers of the skew. Change to split phasing for the EB and WB approaches.	Install new traffic signal equipment to conform to CDOT standards and the MUTCD. Re-align 12th Street to match the centerline of Columbia Way by moving 12th Street to the north. Align the sidewalks on the north side of the minor streets. Provide one left-turn lane, one through lane, and one right-turn lane for the westbound approach. Increase the curb radii on all corners.
Montrose County	Montrose	State Highway 90 and Chipeta Road	2	1	0	29	29	29	29	13.39	1	\$77,000	\$19,250	\$57,750	5	Improve the striping to better define the lanes. Apply access management principles. Collect traffic data to further investigate geometric and traffic control improvements.	With the appropriate data, consider evaluating the following options: 1. Improved alignment and continue as a T-intersection; 2. Florida-T configuration; 3. Roundabout; 4. Signalized Intersection; 5. Removal of the westbound left-turn lane; 6. Chipeta Road may need to become a right-in-right-out.
		State Highway 348 and 5700 Road	2	0	0	20	20	20	20	5.45	1	\$200,000	\$50,000	\$150,000	5		Collect traffic counts to determine if the requirements for acceleration and deceleration lanes on State Highway 340 are met per the CDOT Access Code. Evaluate the sight distance for each approach based on the guidelines of the AASHTO. Realign the 5700 Road approaches.

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			Percent Reduced per Severity			Accident Reduction Factor				Calculated B/C	Score	Cost Est.	PE (25%)	Construct (85%)	Score	Short-Term	Long-Term	
			PDO	INJ	FAT	PDO	INJ	FAT	~ARF									
Town of Olathe	Montrose	US Highway 50B and State Highway 348	0	0	0	35	35	35	0	0	0	0	\$500,000	\$125,000	\$375,000	4	Collect vehicular, pedestrian, and bicycle traffic counts to determine the operational needs. Perform a Pedestrian Study to determine deficiencies and level-of-service (per the 2010 Highway Capacity Manual). Request a School-Zone Study be completed by CDOT. Verify that the proper signs are installed per the MUTCD.	
Eagle County	Eagle	State Highway 82 and El Jebel Road	8	4	0	32	32	32	32	24.95	1	\$905,000	\$226,250	\$678,750	3	Relocate the north El Jebel Road RFTA bus stop to a location farther north. Remove the island at the bus stop and utilize pavement to accommodate lengthening turn lanes on El Jebel Road. Reduce the width of the shopping center driveway (northeast corner). Re-stripe parking lot to define spaces. Modify Farve Lane to be either (1) a right-in-right-out or (2) right-out only access onto El Jebel Road. Remove left-turn lane to Farve Lane. Lengthen the southbound left-turn lanes to Farve Lane.	Construct a southbound right-turn lane. Close the northbound access at El Jebel Road to State Highway 82. Construct a better alignment of Valley Road to connect to E. Valley Road. Add a signal on State Highway 82 at Willits Lane to have a pair of offset T-intersections, if warranted. Lengthen the acceleration and deceleration lanes to meet the standards of the CDOT Access Code.	
		US Highway 6 and Hillcrest Drive	3	3	0	20	20	20	20	18.3	1	\$100,000	\$25,000	\$75,000	5	Collect traffic counts to further investigate the signal warrants and determine the need for a left-turn acceleration lane. Evaluate and mitigate the sight distance issues. Install a left-turn acceleration lane for vehicles turning from Hillcrest Drive. Evaluate use of the painted median, but ensure the CDOT design criteria are met. Install lighting at this intersection.		
Town of Basalt	Eagle	State Highway 82 and Basalt Avenue	7	3	0	22	22	22	22	43.96	2	\$520,000	\$130,000	\$390,000	4	Remove and relocate the pedestrian push button on the northeast traffic signal pole to the correct side of the pole. Add a splitter island to the northbound leg of the roundabout at Emma Road and Basalt Avenue.	Construct a grade-separated ped facility and remove ped features at intersection. Lengthen the accel/decel lanes to meet the CDOT Access Code.	
Town of Gypsum	Eagle	US Highway 6 and Valley Road	3	1	0	32	32	32	32	7.79	1	\$575,000	\$143,750	\$431,250	3	Reduce the width of the driveway on US Highway 6. Improve drainage. Install signal detection, including advanced detection. Install new traffic signal equipment to conform to CDOT standards and the MUTCD. Reconstruct the radius on the southwest corner to accommodate larger semi-trucks. Align the east crosswalk with the north pedestrian ramp or construct a directional ramp for this crosswalk.	Improve the super elevation and grades as planned. Widen Valley Road to provide wider lane widths. Lengthen westbound left turn lane length and the eastbound left turn at Oak Ridge Drive. Maximize the storage lengths with the available pavement (back-to-back left-turn lanes). Construct a proper sidewalk with curb and gutter on the north side of US Highway 6, east of the intersection. Change Eagle Street to a right-in-right-out access to improve intersection spacing and lengthen turn lanes at Valley Road.	
		US Highway 6 and Oak Ridge Drive	2	0	0	32	32	32	32	2.27	0	\$300,000	\$75,000	\$225,000	4	Install new traffic signal equipment to conform to CDOT standards and the MUTCD. Review and update signal timing. Collect traffic counts to determine operational needs and updates. Conduct a Pedestrian Study and evaluate the needs and pedestrian level-of-service (refer to the 2010 Highway Capacity Manual). Realign Oak Ridge Drive to match centerlines and provide a wider radius.		
City of Glenwood Springs	Garfield	State Highway 82 and 27th Street	12	2	0	29	29	29	29	36.93	2	\$317,500	\$79,375	\$238,125	4	Improve striping and signage on the south portion of the trail to inform upcoming intersection. Install stop ahead sign on trail. Install Bicycle trail crossing sign on EB. Install turning Traffic Must Yield to Pedestrians sign for SB right and NB left. Re-stripe the left-turn lane at the bus barn driveway to be a TWLTL and extend eastbound left-turn lane for State Highway 82 back to the driveway. Perform a Pedestrian Study to determine deficiencies and level-of-service (per the 2010 Highway Capacity Manual). Re-stripe eastbound to provide one receiving lane, one left-turn lane, one through lane, and one right-turn lane.	Consider constructing a grade-separated facility tunnel.	
		US Highway 6 and Devereux Road	1	0	0	25	25	25	25	0.63	0	\$300,000	\$75,000	\$225,000	4	Collect traffic counts to evaluate the signal warrants, develop appropriate intersection design, and determine truck usage. Conduct a Pedestrian and Bicyclist Study to determine the operational needs. Re-align Transfer Trail and Devereux Road to be one intersection.		
		State Highway 82 and 23rd Street	15	2	0	24	24	24	24	39.82	2	\$155,000	\$38,750	\$116,250	5	Verify detection is working properly. Upgrade equipment if needed. Clarify the signage on the trail and at the intersection for trail users. Install a pedestrian push button on the existing poles for the west side crosswalk at the trail crossing. Extend the fence or add an obstacle to direct trail users to the curb ramp.	Move the pedestal pole on the southwest corner closer to State Highway 82. Install a sign pole for the trail signs and separate them from the pedestal pole with the east-to-west pedestrian push button. Re-align the south trail to align with the curb ramp. Move the fence to direct trail users to the crosswalk. Re-align the sidewalk on the east side of Grand Avenue to connect with the trail prior to the intersection. Remove red-concrete area and design an eastbound right-turn lane. Change signage to reflect trail changes.	

Submitted by: County/City	County	Intersection	Benefit to Cost										Cost				Recommendations from the Study	
			Percent Reduced per Severity			Accident Reduction Factor				Calculated B/C	Score	Cost Est.	PE (25%)	Construct (85%)	Score	Short-Term	Long-Term	
			PDO	INJ	FAT	PDO	INJ	FAT	~ARF									
Garfield County	Garfield	State Highway 82 and County Road 113 (Cattle Creek Road)	1	0	0	40	40	40	40	22.08	1	\$88,500	\$22,125	\$66,375	5		Lengthen the acceleration and deceleration lanes to conform to the CDOT Access Code. Obtain recent traffic counts to verify signal warrants per the MUTCD. If warrants are met, then install a new traffic signal. Implement access management techniques. Redesign the frontage road and local streets to improve spacing.	
		State Highway 82 and County Road 154/County Road 114 (CMC Road)	3	2	0	40	40	40	40	188.28	4	\$62,500	\$15,625	\$46,875	5	Remove vegetation on eastbound curve between the highway and the trail. Lengthen the eastbound left-turn lane storage. Construct sidewalks to the bus stops. Relocate the "Colorado Mountain College" directional sign. Lengthen the other auxiliary lanes to conform to CDOT Access Code. Consider providing alternate location for the park-n-ride on the southeast corner to remove the close driveway to the highway.	Further investigation and data collection of the entire area and adjacent accesses is needed to determine the feasibility of redesigning this intersection. Consider offset T-intersections, a roundabout, interchange, and re-design of county roads and the frontage road.	
		County Road 346 and Mamm Creek Road	1	0	0	33	33	33	33	31.41	2	\$10,000	\$2,500	\$7,500	5		Continue to monitor this intersection for an increase in traffic volumes and changes in accidents. As traffic grows, collect data and evaluate the need for auxiliary lanes and operational upgrades.	
Town of Carbondale	Garfield	State Highway 133 and Hendrick Drive	1	0	0	20	20	20	20	1.95	0	\$100,000	\$25,000	\$75,000	5		Install warranted signal and include pedestrian features. Re-align Sopris Avenue to line up with Hendrick Drive. Construct the required turn lanes per the CDOT Access Code.	
		State Highway 133 and Snowmass Drive	1	1	0	20	20	20	20	4.7	0	\$300,000	\$75,000	\$225,000	4		Request a School-Zone Study be completed by CDOT. Monitor the traffic volumes at this intersection to install a signal when warranted. Construct one westbound left-turn lane, one westbound right-turn lane, and one eastbound left-turn lane (warranted by 2008 volumes).	
Pitkin County	Pitkin	State Highway 82 and Baltic Avenue	7	0	0	48	48	48	48	4.23	0	\$1,000,000	\$250,000	\$750,000	2		Collect traffic counts to determine need for additional left-turn lanes on Baltic Avenue, to optimize the signal timing, to further investigate a roundabout, and to develop the appropriate design. Modify the local street network that impacts the highway intersection to reduce conflicts with queuing and blocking of Sage Way. Consider closing or changing Sage Way accesses to right-in-right-out.	
		State Highway 82 and Brush Creek Road	1	0	0	40	40	40	40	6.39	1	\$310,000	\$77,500	\$232,500	4	Reconstruct the southbound left-turn lane to align properly with the northbound left-turn lane. Install new traffic signal equipment to conform to CDOT standards and the MUTCD.		
Grand County	Grand	US Highway 40 and County Road 5	0	0	0	30	30	30	0	0	0	\$10,000	\$2,500	\$7,500	5		Collect traffic counts to evaluate the signal warrants (in the MUTCD) and necessary deceleration and acceleration lanes. Construct a left-turn acceleration lane for vehicles turning from County Road 5 to northbound US Highway 40. Construct a second lane on County Road 5 to separate turning movements. Consider constructing a grade-separated railroad crossing.	
		US Highway 40 and County Road 54	0	1	0	44	44	44	44	9.64	1	\$50,000	\$12,500	\$37,500	5		Verify that the appropriate signage is installed. Collect traffic counts to evaluate the need for a westbound turn lane per the CDOT Access Code. Add a left-turn lane for the westbound approach.	
		State Highway 9 and County Road 1	1	0	0	50	50	50	50	1.29	0	\$500,000	\$125,000	\$375,000	4	Further investigate the environmental impacts and requirements to remove a portion of the hill. Construct on US9: one SB RT decel lane, one NB LT decel lane, one RT accel lane (for EB RT vehicles), one LT accel (for EB LT vehicles). Consider realignment of the highway south of intersection.	Cut back the existing hill embankment to improve sight distance. Collect traffic counts (turning movement) to verify the need for auxiliary lanes per the guidelines of the CDOT Access Code. If warranted, construct on State Highway 9: one southbound right-turn deceleration lane, one northbound left-turn deceleration lane, one right-turn acceleration lane (for eastbound right-turning vehicles), and one left-turn acceleration lane (for eastbound left-turning vehicles).	
City of Craig	Moffat	US Highway 40 and State Highway 13/County Road 7 (Great Divide Road)	5	0	0	32	32	32	32	0.0535	0	\$583,600	\$145,900	\$437,700	3	Relocate the Signal Ahead on the eastbound approach to the top of the hill. Install advanced detection. Prohibit the parking on County Road 7. Install lane designation signs on the mast arms. Fix the drainage issues on County Road 7 and at the driveways. Apply access management techniques for driveways and frontage roads. Remove the non-operable pedestrian signal on County Road 7 or upgrade and turn it on.	Construct one NB LT lane and one SB LT lane. This will require re-design of intersection and signal. Install new traffic signal equipment to conform to CDOT standards.	

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			Percent Reduced per Severity			Accident Reduction Factor				Calculated B/C	Score	Cost Est.	PE (25%)	Construct (85%)	Score	Short-Term	Long-Term	
			PDO	INJ	FAT	PDO	INJ	FAT	~ARF									
Rio Blanco County	Rio Blanco	State Highway 64 and County Road 5	1	0	0	44	44	44	44	0.57	0	\$550,000	\$137,500	\$412,500	3	Add one T Symbol sign on County Road 5 prior to the intersection. Add one Large Double Arrow sign on US Highway 40 across from County Road 5.	Reconstruct intersection as planned in the Intersection Analysis Report and 30 percent plans. This includes one northbound left-turn lane, one northbound right-turn lane, one eastbound right-turn deceleration lane, one eastbound through lane, one westbound through lane, and one westbound left-turn deceleration lane. Provide a wide receiving lane on County Road 5. Widen bridge to accommodate lanes. Provide a right-turn acceleration lane for northbound to eastbound. Provide a left-turn acceleration lane for northbound to westbound. Increase radii to accommodate large turning vehicles. Add lighting at and approaching the intersection.	
Routt County	Routt	US Highway 40 and Downhill Drive/Riverside Drive	3	2	0	20	20	20	20	653.85	5	\$377,600	\$94,400	\$283,200	4	Re-stripe Downhill Drive to be one shared through/right-turn lane, one left-turn lane, and one receiving lane. Install appropriate signs. Construct a right-turn deceleration lane for westbound. Remove the trees on north side of US Highway 40, west of the intersection and improve the embankment.	Monitor traffic volumes to further investigate the signal warrants. Collect hourly directional counts to evaluate warrants. Install traffic signal, when warranted per the MUTCD signal warrants. Should include pedestrian features. Construct bike lanes on Downhill Drive/Riverside Drive. Construct sidewalks on US Highway 40 and connect to bus stop and other sidewalks to the east.	
		US Highway 40 and County Road 129 (Elk River Road)	7	0	0	35	35	35	35	5.46	1	\$808,000	\$202,000	\$606,000	3	Install new traffic signal equipment. Update pedestrian signal heads, push buttons, signs, and timing. Remove the split phasing. Install a single left-turn lane for the northbound approach of Elk River Road and dual left-turn lanes for the southbound approach. Install one Signal Ahead sign on the SB approach. Install lane designation signs for all approaches. Perform a Pedestrian/Bicyclist Study to determine the needs at the intersection and bus stops.	Re-design the intersection. Implement one of the solutions provided in the 2008 US 40 West Needs Study (consider an interchange or roundabout).	
		US Highway 40 and County Road 42	1	1	0	30	30	30	30	97.78	3	\$75,000	\$18,750	\$56,250	5		Verify that the appropriate signage is installed. Re-stripe County Road 42 to provide a left and right-turn lane. Refer to the 2008 US 40 West Needs Study for a potential design. Reduce the embankment to provide adequate sight distance. Monitor the traffic volumes at this intersection to install a signal when warranted.	
Town of Yampa	Routt	State Highway 131 and County Road 8/County Road 17/Main Street	0	0	0	30	30	30	0	0	0	\$300,000	\$75,000	\$225,000	4	Verify that the appropriate signs are located on State Highway 131 and Main Street. Implement traffic calming techniques on Main Street.	Consider one of the following options: 1. Remove Main Street entirely between State Highway 131 to 5th Street. 2. Change Main Street to be one-way in the northbound direction from 5th Street to State Highway 131. 3. Construct a cul-de-sac on Main Street (just south of State Highway 131) and prohibit access to/from State Highway 131. These will all require proper restrictive devices and signage, as well as improvements to other local streets that will carry the redistributed traffic.	

**APPENDIX B:  
ACCIDENT DATA SUMMARY**









