

US 6 CO 9 CORRIDOR OPERATIONS STUDY ACCESS MANAGEMENT SUMMARY

Summit County, Town of Silverthorne, Town of Dillion

Prepared for
CDOT Region 3
1198 S Adams Ave
Silverthorne, CO
Contract Administrator:
Grant Anderson, PE Resident Engineer
303-512-5601

Michelle Hansen, PE
Michelle@stolfusandassocaites.com
Stolfus & Associates, Inc.
5690 DTC Blvd Suite 330W
Greenwood Village, CO 80111
303-221-2330



COLORADO
Department of Transportation

Table of Contents

INTRODUCTION	3
Project Background	3
Goals	3
Study Area	3
ACCESS MANAGEMENT – BENEFITS, PRINCIPLES & TECHNIQUES	3
Access Management Benefits	4
Guiding Principles	4
Techniques	5
EXISTING CONDITIONS	5
Land Use Characteristics	5
Local Planning	7
Local Land Use	7
Local Transportation	7
Highway Characteristics	9
Existing Access Inventory	10
TRAFFIC OPERATIONS	10
Existing Traffic Conditions	10
Future Traffic Conditions	10
Traffic Growth Methodology	10
2035 Level of Service Results	11
2045 Level of Service Results	11
Interchange Analysis	12
SUB AREA DEVELOPMENT	12
Existing Conditions	12
Local Planned Developments	12
Sub Area Options	12
ACCESS PLAN DEVELOPMENT & PLAN RECOMMENDATIONS	20
Methodology	20
Plan Recommendations	20
Alternative Options	23
Golden Eagle / Bald Eagle Road - Phased Alternatives	23

4 th Street Pedestrian Crossing Option	23
Lake Dillon Drive - Roundabout Analysis	23
Local Road Improvements	24
CONCLUDING STATEMENT	24

List of Figures

Figure 1: Study Area	3
Figure 2: Functional Intersection Area	4
Figure 3: Right-In/Right-Out Access with Raised Median	5
Figure 4: ¾ Movement Median Opening	5
Figure 5: Town of Silverthorne Districts Map	8
Figure 6: 2035 Level of Service Comparisons	11
Figure 7: 2045 Level of Service Comparisons	11

List of Tables

Table 1: Speed Limits	9
Table 2: Access Category	9
Table 3: Access Point Classification	10
Table 4: 2035 Intersection Performance	11
Table 5: 2045 Intersection Performance	11
Table 6: 2022 Traffic Volume	12
Table 7: 2045 Traffic Volume	12
Table 8: Sub Area Options 1-2	13
Table 9: Sub Area Options 4-5	17
Table 10: Access Plan Recommendations	20
Table 11: US 6 and Lake Dillon Dr Roundabout Analysis	23

List of Exhibits

Exhibit 1: Potential Land Use Redevelopment	6
Exhibit 2: Proposed Access Plan	21
Exhibit 3: Proposed Access Plan	22

INTRODUCTION

Project Background

In 2023, the Colorado Department of Transportation (CDOT) identified the need to take a data-driven approach to corridor operations and safety to identify efficiency improvements for United States Highway 6 (US 6) and Colorado State Highway 9 (CO 9) within the context of existing and proposed land uses and infrastructure. As part of the corridor operations study, access management was identified as a key component for evaluation to identify access management improvements and intersection configurations that support corridor operations and safety, as well as local access and circulation. This report summarizes the proposed access management plan for US 6 and CO 9 for CDOT and participating local agencies including the Town of Silverthorne, the Town of Dillon, and Summit County. Access recommendations are provided for the major public intersections along the corridor, including intersections that have full movement access and/or significant traffic volumes entering or exiting the corridor. The access improvements considered existing and future projected traffic volumes and roadway and land-use characteristics on the corridor. The appropriateness of additional access points, additional traffic signals, and/or access restrictions for existing full movement intersections was considered on a case-by-case basis considering local circulation opportunities and impact to traffic operations at adjacent intersections.

Goals

The access management plan was developed to achieve the following goals:

- Provide effective and efficient travel for traffic on US 6 CO 9.
- Improve safety and operations along the corridor for all users.
- Support mobility needs of existing and future land uses.

Study Area

The study area begins north of I-70 in the Town of Silverthorne and runs south to the Town of Dillon as illustrated in Figure 1. The limits of the project are along CO 9 between the I-70 interchange (MP 101.56) and Hamilton Creek Road (MP 103.980) and along US 6 between the I-70 Interchange (MP 208.66) and the Evergreen Drive / Lake Dillon Drive (MP 209.84) intersection, totaling approximately 3.63 miles of highway. Sub-areas along the corridor were identified for detailed analysis; including the I-70 Exit 205 interchange and the Stephens Way / Wildernest Road loop. These sub-areas were analyzed to examine how traffic, access and circulation along the loop interacts with highway and interchange operations. The focus of this report is on public access points.

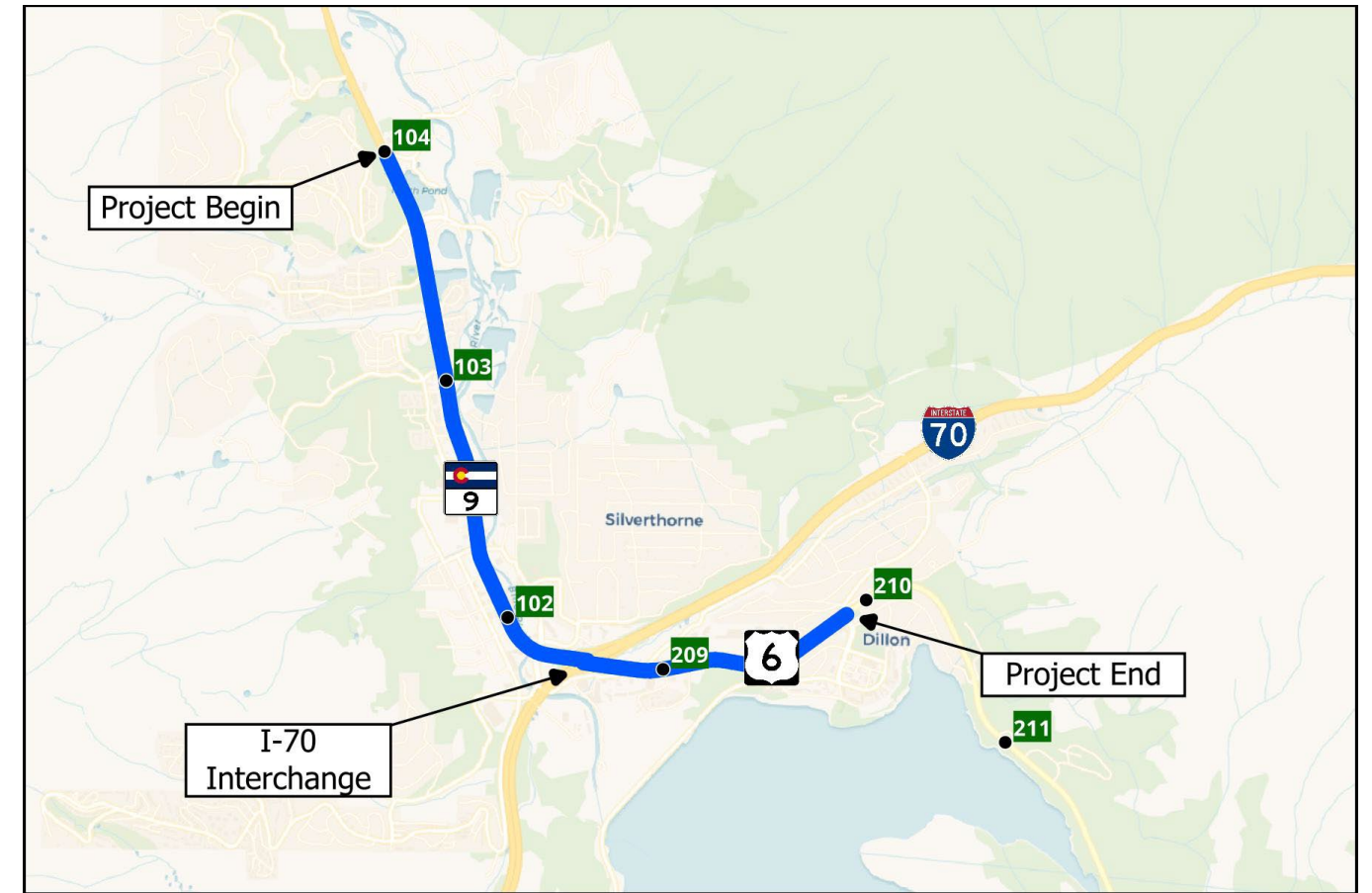


Figure 1: Study Area

ACCESS MANAGEMENT – BENEFITS, PRINCIPLES & TECHNIQUES

As defined by the *Access Management Manual, TRB, Second Edition 2014*, “Access management is the coordinated planning, regulation, and design of access between roadways and land development. It involves the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway.” Access management along Colorado State Highways is generally administered by CDOT on a case-by-case basis, as prescribed by the State Highway Access Code (SHAC). Developing an Access Management Plan for the entire corridor provides CDOT, Town of Silverthorne, Town of Dillon, and Summit County with the opportunity to develop a single transportation plan that considers multiple access points along a segment of highway as a network rather than as individual access points. Corridor specific issues such as intersection spacing, traffic movements, circulation, safety concerns, land use, topography, alternative access opportunities, and other local planning documents were considered while developing the Access Management Plan. The Access Management Plan presented is compatible with existing and future land uses and is meant to provide a blueprint for access improvements that can be implemented to improve safety and operations by reducing the number of potential conflict points along the corridor.

Access Management Benefits

Access management provides the means to balance good mobility along the highway with local access needs of businesses and residents. Implementation of access management principles and techniques on state and local transportation networks can provide the following long-term benefits for highway users, communities, and businesses:

- **Improve safety.**
 - Fewer decision points and potential for conflicts for motorists, cyclists, and pedestrians results in a reduced number of crashes.
 - Safe access to businesses and residences is provided.
- **Increased ability to accommodate traffic demands.**
 - Fewer locations where vehicles are entering and exiting the corridor results in smoother traffic flow on the highway.
 - Reduces congestion and travel times on the highway.
 - Improved operations on the highway also provides increased opportunities to reduce delays on the local street system.
 - Improved operations on the highway results in less air pollution.
- **Preserves property values and the economic viability of abutting development.**
 - A more efficient roadway system captures a broader market area.
 - A more predictable and consistent development environment is created.
- **Encourages use and development of local streets.**
 - Alternative local routes allow traffic to access local amenities conveniently without using the highway, thereby providing both convenient local access and circulation and reduced volumes on the highway.
- **Enhanced Corridor Appearance.**
 - Businesses are easily located.
 - Well-defined access points with suitable spacing provides more opportunities for streetscaping/landscaping.

Guiding Principles

Access management centers around limiting and consolidating access along major roadways and diverting access to private property on a supporting local street network and circulation system. The following guiding principles to access management were applied in the development of the Access Management Plan for US6-CO9:

1. Locate major intersections to favor through movements and to accommodate infrastructure for turning movements.
2. Maintain the integrity of the functional intersection area.
3. Minimize the number of locations where vehicles merge, split, or cross.
4. Remove turning vehicles from through traffic lanes.
5. Provide/utilize a supporting local street network for access and circulation.
6. Compliance with the SHAC

Functional intersection area was considered in evaluating access between major intersections. American Association of State Highway and Transportation Officials (AASHTO) A Policy on Geometric Design of Highways and Streets, 2011 and Access Management Manual, TRB, Second Edition 2014 indicates that separation of access points should not be less than the functional area of the intersection. The functional intersection area extends upstream and downstream from the physical intersection as shown in Figure 2.

The upstream distance is a combination of storage length, deceleration, and taper length. It also includes perception-reaction distance required for the speed of the segment. The downstream distance is measured as either acceleration length or decision sight distance. Decision sight distance was used for this corridor. Providing the necessary decision sight distance allows drivers to pass through an intersection before considering potential conflicts at the next intersection. The functional intersection area depends on the speed of the segment and the number of projected turning vehicles at the intersection. Ideally, no access points are located within the functional intersection area, however, at certain locations site-specific conditions may prevent the ability to achieve this goal.

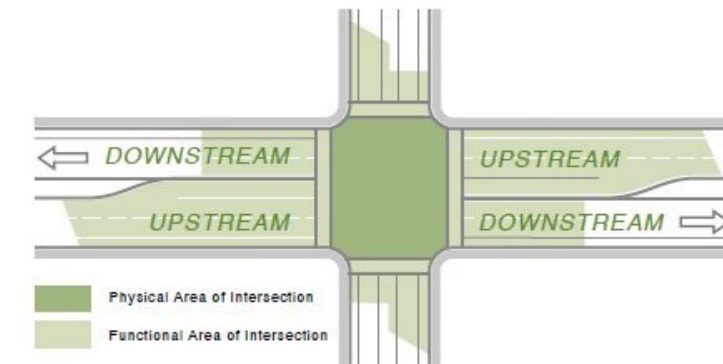


Figure 2: Functional Intersection Area¹

¹ Federal Highway Administration (FHWA) Access Management in the Vicinity of Intersections Technical Summary

Techniques

Access management techniques are used to achieve the guiding principles and realize the benefits of access management along US 6-CO 9. The following techniques were considered to address public road intersection access along US 6-CO 9:

Principles 1, 2, 6: Locate major intersections to favor through movements and to accommodate infrastructure for turning movements; maintain the integrity of the functional intersection area; and compliance with the SHAC

Technique: Identify appropriate spacing for traffic signals and to accommodate auxiliary lanes

Principle 3: Minimize the number of locations where vehicles merge, split, or cross

Technique: Install Medians and Islands

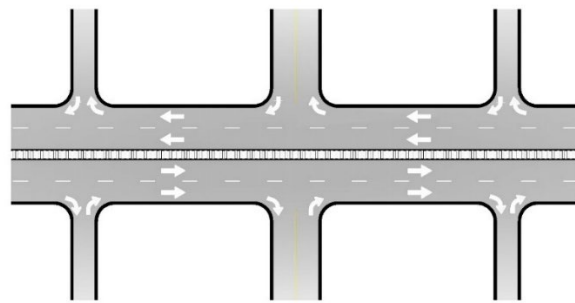


Figure 3: Right-In/Right-Out Access with Raised Median²

Figure 3 illustrates right-in/right-out access with raised median which eliminates left-turn movements between major intersections throughout a corridor.

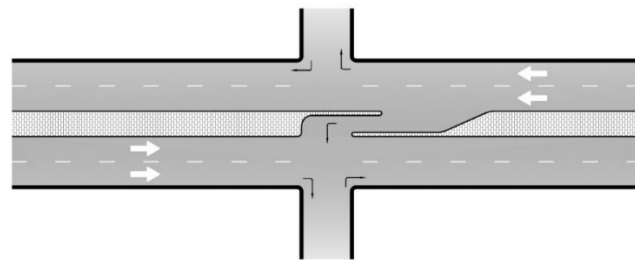


Figure 4: 3/4 Movement Median Opening²

Figure 4 illustrates a directional median opening, or a 3/4 movement, which limits left-turn movements to one direction at strategic locations where increased access is beneficial for safety or operational reasons.

Principle 4 & 6: Remove turning vehicles from through traffic lanes and compliance with the SHAC

Technique: Provide auxiliary lanes with appropriate storage, deceleration and acceleration for left and right turn movements based on traffic demand.

Other access management principles and techniques for private driveway access not considered in this plan should be applied in accordance with the SHAC as individual properties redevelop.

Principle 5: Provide/utilize a supporting local street network for access and circulation.

Technique: Establish street network connectivity and continuous parallel routes to the highway that provide alternatives for circulation due to restricted movements on the highway or for local trips that don't require the use of the highway at all.

EXISTING CONDITIONS

Land Use Characteristics

Land uses within the study area are mostly commercial and residential. Land use and transportation planning documents from the Town of Silverthorne, Town of Dillon and Summit County's master plans and various known future development plans were used to estimate the proportion of future traffic accessing the highway at various public street intersections. Exhibit 1 shows potential development that is planned in the Town of Silverthorne, Town of Dillon, and Summit County by local authorities. The map was developed with help from the local agencies to produce an understanding of future development plans in the study area and to help understand the future traffic flow and use of access on the highways at public intersections.

² Transportation Research Board (TRB) Access Management Manual, Second Edition



Exhibit 1: Potential Land Use Redevelopment

Local Planning

Town of Silverthorne: Town of Silverthorne 2022 Comprehensive Plan update includes potential land uses near CO 9 which include commercial use, business parks, town core, and destination commercial. Exhibit 1 shows potential land use in the Town of Silverthorne. See Figure 5 for the Town of Silverthorn's Districts Map.

Town of Dillon: Town of Dillon has a 2022 Town Core Master Plan with planned development near the interchange of I-70 and US Highway 6 which mostly consists of commercial and destination commercial use.

Local Land Use

The land use developments considered in the study included:

Town of Silverthorne:

- Element Hotel
- Green Village Redevelopment
- Smith Ranch
- Red Village Redevelopment
- Gateway Triangle Redevelopment
- Oxbow Redevelopment
- Fire Station at Golden Eagle Rd

Town of Dillon:

- Lakefront Hotel
- Town Core Redevelopment

Summit County:

- Lake Hill Workforce Housing Development
- USFS Employee Housing Development

Local Transportation

Town of Silverthorne: The Town of Silverthorne Transportation Master Plan (TMP) planned improvements that were investigated for operational and safety benefits as part of the study include:

- Variable Message Signage
- Diverging Diamond Interchange at I-70 Exit 205
- Town Core Complete Streets/Streetscape
- Signal at Ruby Ranch Road
- Double Northbound Left Turns on CO 9 to Wildernd Rd / Widen Wildernd Rd to 4 Lanes
- Stephen's Way Access Control
- Roundabout at Stephen's Way & Wildernd Rd
- Wildernd Rd Access Control
- Stephen's Way Widening to 4 Lanes
- Stephen's Way Alignment with Little Beaver Trail

Town of Dillon / Summit County: The Town of Dillon and Summit County planned improvements that were investigated for operational and safety benefits as part of the study include:

- Lake Dillon Drive Roundabout
- US 6 Sidewalk Connections
- US 6 Pedestrian and Bike Crossing at Little Beaver Trail

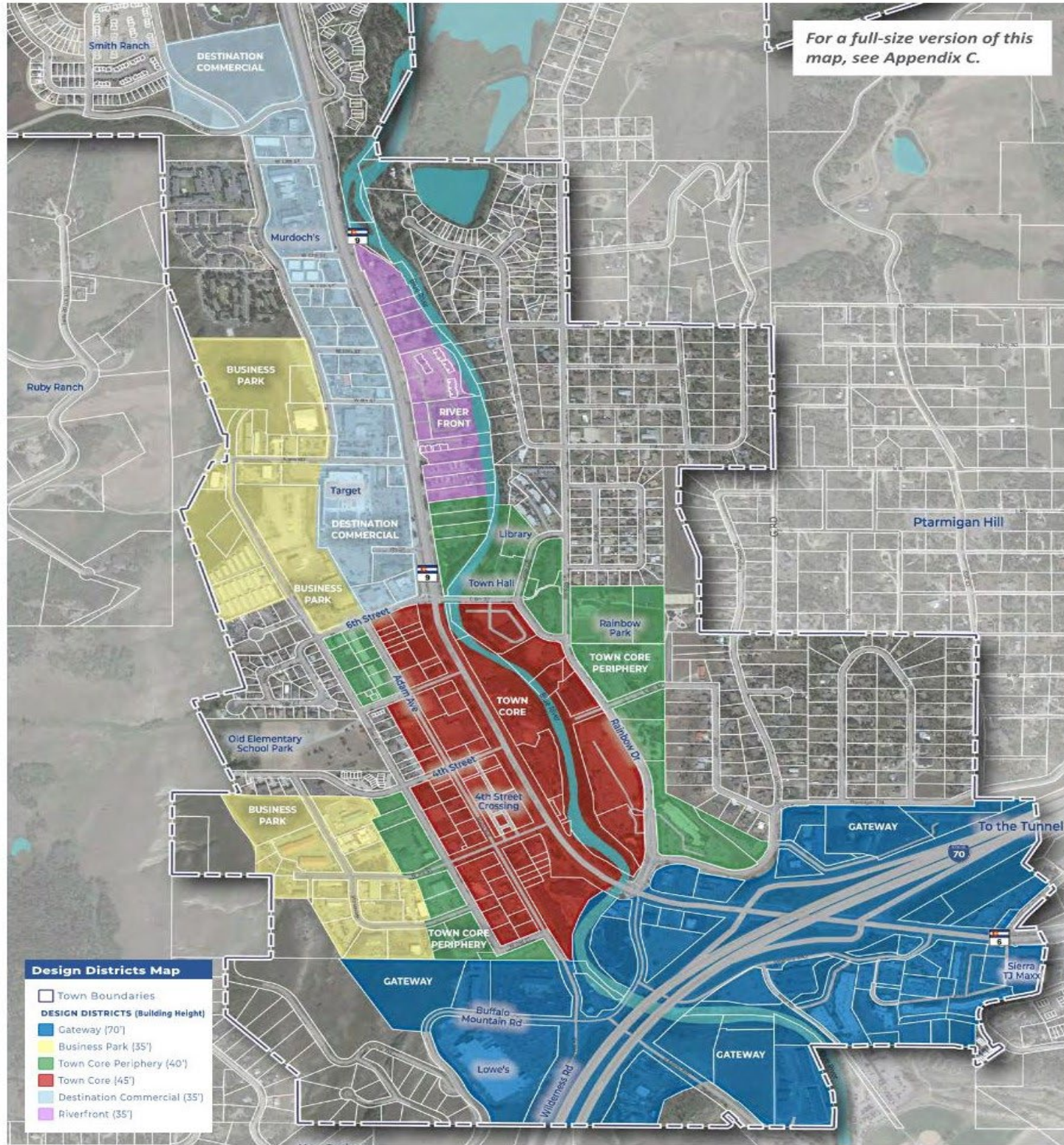


Figure 5: Town of Silverthorne Districts Map³

Highway Characteristics

The Annual Average Daily Traffic (AADT) of the corridors is 8,100 vehicles per day, and the 30th highest hour traffic used in the analysis for the corridor is 1,050 vehicles. The peak hours used in the analysis were Friday PM peak and Sunday midday peak. Refer to the Existing Traffic Conditions for further details. The peak hour traffic is approximately 13% of the total traffic on a typical day. About 0.5% of the vehicles in the corridor are classified as heavy vehicles, indicating that the corridor is not a common route for freight traffic. However, both US 6 and CO 9 are identified as detour routes for I-70 during closure events. US 6 provides an alternative route over Loveland Pass and CO 9 combined with US 40 and CO 13 provides an alternative route when Glenwood Canyon is closed.

US 6 and CO 9 is a four-lane highway through the entire study area, with 2 lanes traveling in both directions and left and right turn auxiliary lanes at key intersections. Generally, there is curb and gutter and raised median between 12th Street on CO9 and Dillon Ridge Road on US6. Outside of those limits, a mixture of curb and gutter and shoulders, and raised and painted medians exist. The study area consists of 10 signalized intersections including the I-70 interchange ramps, and 13 unsignalized intersections.

Speed limits along the corridor vary from 35 mph to 55 mph with the speed limit gradually increasing as the distance from the I-70 interchange increases in either direction. See Table 1.

Table 1: Speed Limits

Highway	Milepost Limits	Speed Limit (mph)	Limit Description
CO 9	103.44 -103.98	55	North of Hamilton Creek Rd
CO 9	102.76 -103.44	45	South of Hamilton Creek Rd to south of 9 th St
CO9/ US 6	101.56 – 102.76/ 208.66 – 209.40	35	South of 9 th St to east of Dillon Ridge Rd/E Anemone Trail
US 6	209.40 – 209.84	40	East of Dillon Ridge Rd/E Anemone Trail to west of Lake Dillon Dr

Currently the study corridor is classified as Minor Arterial and falls under the access categories of Non-Rural Principal Highway (NR-A) and Non-Rural Arterial (NR-B). Access category limits are summarized in Table 2.

Table 2: Access Category

Highway	SHAC Category	Milepost Limits	Limit Description
CO 9	NR-A	MP 103.979 to MP 103.050	Hamilton Creek Rd to Ruby Ranch Rd
CO 9	NR-B	MP 103.050 to MP 101.562	Ruby Ranch Rd to I-70 Interchange
US 6	NR-B	MP 208.659 to MP 209.442	I-70 Interchange to Dillon Dam Rd
US 6	NR-A	MP 209.442 to MP 209.844	Dillon Dam Rd to Lake Dillon Dr

Guidance from the SHAC for these classifications was considered in developing access management recommendations. A summary of the major characteristics of each classification follows.

- Category NR-A or Non-Rural Principal Highway applies to medium to high-speed sections with medium to high traffic volumes within suburban and urban areas. Direct access is subordinate to through traffic movements. Full movement intersections are spaced ½ mile apart. Exceptions to ½ mile spacing may be permitted if no reasonable alternative exists, the need for the intersection is justified, and minimum 35% signal progression efficiency is achieved. One access is granted per parcel if reasonable access cannot be obtained from the local street system. Locations of full movement intersections should serve as many properties and interests as possible. Three-quarter movements may be permitted if operations at adjacent full movement intersections are improved, and design standards are met.
- Category NR-B or Non-Rural Arterial applies to medium speed sections with medium to high traffic volumes within intercity, intracity, and intercommunity travel areas. This category allows more direct access to occur. Full movement intersections are spaced ½ mile apart. Exceptions to ½ mile spacing may be permitted if minimum 30% signal progression efficiency is achieved. One access is granted per parcel, if it does not create safety or operational problems. Three-quarter movements may be permitted if operations at adjacent full movement intersections are improved, and design standards are met.

An access id number and a reference point (milepost) will identify the location of each access point in the Access Management Plan exhibits. Note that mile points along CO 9 increase with travel from east to west and mile points along US 6 increase from west to east as shown in Table 1: Speed Limits. For the access table, the left and right sides of the roadway correspond to the direction of increasing milepost. The left and right side of the road will be reversed for the US 6 and CO 9 corridors.

³ Source: <https://www.silverthorne.org/home/showpublisheddocument/518/637902014680870000>

Existing Access Inventory

Within the study area, the Access Management Plan considered 40 existing local public road access points on US 6 and CO 9 including the on/off ramp intersections with I-70. Most of the public road access points are currently full movement. The access points are classified in Table 3.

Table 3: Access Point Classification

Access Type	# of Access Points
Public Road Unsignalized (PRU)	19
Public Road Signalized (PRS)	21

A complete inventory of existing access points is included in the Access Table and Matrix in Table 10.

TRAFFIC OPERATIONS

To measure traffic operations on the US 6/CO 9 corridor, a methodology was developed, and analyses were performed at each intersection from Hamilton Creek Rd to Lake Dillon Drive. For more information and details on the traffic methodology, see the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document. These analyses evaluated future traffic projections for the Interim (2035) and Future (2045) conditions. This allowed comparisons to be made between “No-Build” (i.e., without access management recommendations) conditions and conditions with the proposed access management plan.

Intersection performance was analyzed using the Highway Capacity Manual (6th Edition) Level of Service (LOS) performance rating, which measures the quality of traffic flow. An intersection is considered failing if it has a level of service (LOS) rating of “F” and a worst-case movement with a volume-to-capacity (v/c) ratio greater than 1.0. An intersection is considered near failure if it has a LOS rating of “F”, and a volume-to-capacity ratio less than 1. An intersection is acceptable if it has an LOS rating of A, B, C, or D and the v/c ratio is less than 1. These are the measures that have been used to determine whether intersections in the US 6/CO 9 corridor are functioning well enough to allow traffic to flow freely.

Existing Traffic Conditions

To provide a conservative analysis of how well the corridor is operating throughout the year, traffic conditions were evaluated for 4:00-5:00 PM on a Friday in July, and from 12:00-1:00 PM on a Sunday in July. July is the highest traffic month of the entire year. The corridor currently experiences congestion during the peak hours at this time of year. The intersection analysis shows that half of the unsignalized intersections have failing movements due to people being unable to make left turns onto or off CO 9. The signalized intersections are functioning fairly well in current conditions, with only 1 of the 13 signalized intersections failing, which was the Eastbound I-70 on/off ramp. However, there are significant queues during this time at many of the signalized intersections, especially the intersections near I-70. The queues can extend into nearby intersections. Level of Service results for the existing traffic conditions can be found the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

Future Traffic Conditions

Traffic Growth Methodology

When growing existing traffic volumes to reflect future conditions, several factors were accounted for to provide the most reasonable future traffic projections. The future traffic volumes first considered the growth reflected in CDOT’s statewide travel demand model for Year 2045. CDOT’s model estimates future traffic volumes based upon land use predictions from the State Demographer’s Office. After this traffic volume growth was added, the resulting forecasts were reviewed against locally planned development to identify any locations where the forecasted volumes didn’t adequately reflect locally planned development as described in the Local Planning Section. In these cases, the traffic forecasts resulting from the CDOT’s statewide regional travel demand model were manually adjusted to reflect traffic from planned developments. The final volumes used for the analyses can be found in the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

2035 Level of Service Results

The access management plan (AMP) showed significant improvements for the corridor in the ten-year (2035) projection. As seen in Table 4, the AMP improved the corridor from having nine (9) intersections failing in the No-Build scenario to having only one (1) intersection failing with the AMP. The AMP also showed eleven (11) of the twenty (20) intersections being acceptable in the year 2035 compared to only five (5) intersections being found acceptable in the No-Build scenario. The proposed AMP provides operational improvement to the corridor compared to operations under existing access configurations, however the Wilderrest Road and CO 9 intersection is still predicted to fail under 2035 traffic conditions. This intersection acts as a bottleneck along CO 9, meaning that traffic within the corridor will be backed up at this intersection. This could also lead to congestion at intersections up and down stream, as traffic queues at the intersection could interfere with other intersections' performance. The comparison between the AMP and the No-Build scenario can be found below in Figure 6.

Table 4: 2035 Intersection Performance

Corridor Scenario	# of Acceptable Intersections	# of Intersections Nearing Failure	# of Failing Intersections
No-Build	5	6	9
Access Management Plan	11	8	1

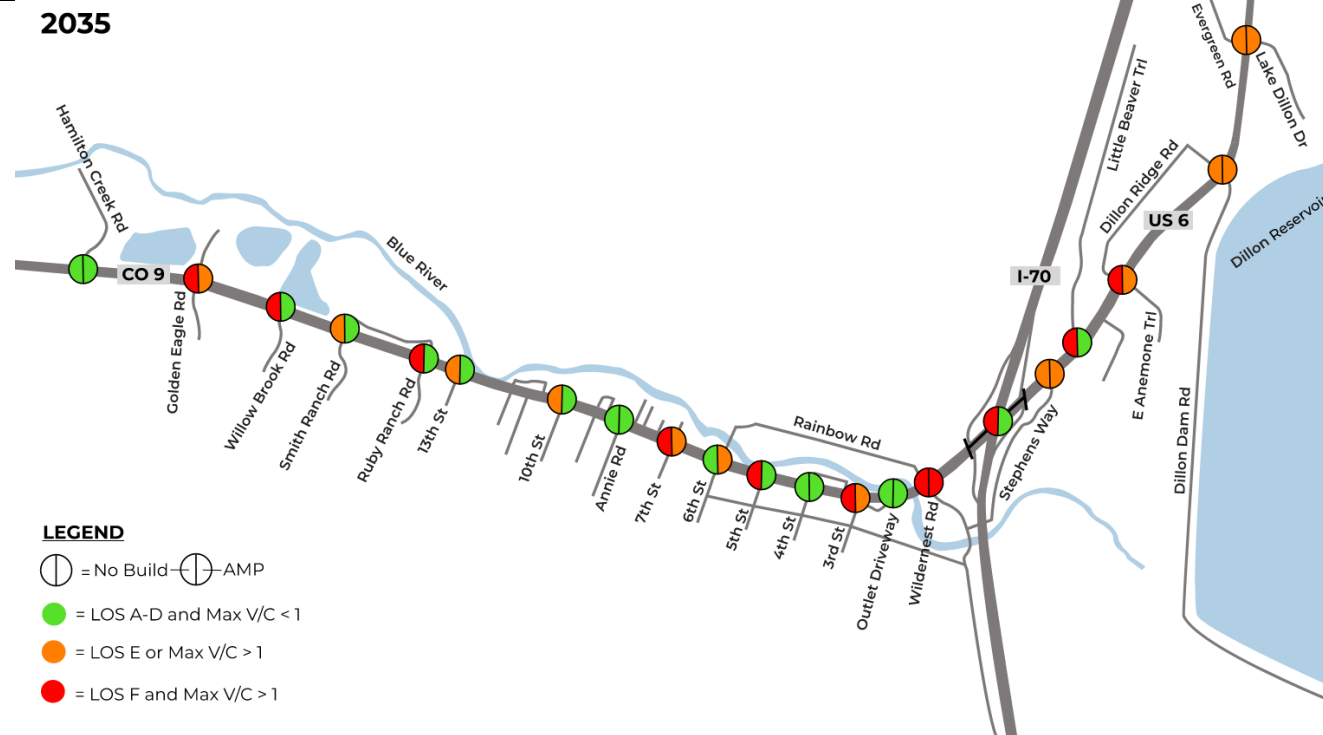


Figure 6: 2035 Level of Service Comparisons

2045 Level of Service Results

The AMP also shows improvements for the corridor in the twenty-year (2045) projection, however more intersections are predicted to fail. As seen in Table 5 below, the AMP improved the corridor from having eleven (11) intersections failing in the No-Build scenario to having four (4) intersections failing with the AMP. The AMP also results in ten (10) of the twenty (20) intersections being acceptable in the year 2045 compared to only five (5) intersections being acceptable in the No-Build scenario. Compared to the No-Build, the AMP shows improvement under the 20-year traffic projections; regardless, the corridor will deteriorate, and more intersections will reach failure over time. With more intersections failing, the bottlenecking problem will occur at more locations. The comparison between the AMP and the No-Build scenario in the year 2045 can be seen below in Figure 7.

Table 5: 2045 Intersection Performance

Corridor Scenario	# of Acceptable Intersections	# of Intersections Nearing Failure	# of Failing Intersections
No-Build	5	4	11
Access Management Plan	10	6	4



Figure 7: 2045 Level of Service Comparisons

Interchange Analysis

The interchange of I-70 and US 6 / CO 9 has a high volume of traffic, and previous studies, most notably the State Highway 9/ US Highway 6 Improvement Project at the Interstate 70 Silverthorne/Dillon Interchange Planning and Environmental Linkages Study (PEL) from 2012, has focused on improving traffic conditions at the I-70 Exit 205 interchange. To confirm potential solutions to be considered at the interchange, analyses were conducted using Federal Highway Administration’s Capacity Analysis for Planning of Junctions (CAP-X) tool to evaluate alternatives to improve current conditions, travel time and safety on the corridor. The analyses used 2022 traffic volumes for existing traffic conditions and 2045 traffic volumes for future traffic conditions for seasonal peak (July) conditions.

Two scenarios were evaluated in this analysis. The first scenario analyzed the current layout of the intersections with no changes. The second scenario added a right turn lane for the off ramps from I-70 onto US 6 CO 9. In this analysis different interchange alternatives were considered such as Single Point, Displaced Left Turn, Diverging Diamond, Diamond and Contraflow lefts. Table 6 and Table 7 summarize the results under existing and future traffic volume conditions.

Table 6: 2022 Traffic Volume

	No-Build Condition	No-Build Condition	Add 1 N-S Right Turn Lane	Add 1 N-S Right Turn Lane
Interchange Type	Friday V/C	Sunday V/C	Friday V/C	Sunday V/C
Diamond	1.17	0.90	0.94	0.73
Single Point	0.94	0.71	0.76	0.66
Diverging Diamond	0.94	0.71	0.86	0.69
Displaced Left Turn	0.90	0.67	0.71	0.62
Contraflow Left	1.13	1.06	0.91	0.89

Table 7: 2045 Traffic Volume

	No-Build Condition	No-Build Condition	Add 1 N-S Right Turn Lane	Add 1 N-S Right Turn Lane
Interchange Type	Friday V/C	Sunday V/C	Friday V/C	Sunday V/C
Diamond	1.82	1.36	1.45	1.09
Single Point	1.40	1.13	1.18	1.09
Diverging Diamond	1.41	1.15	1.41	1.15
Displaced Left Turn	1.34	1.09	1.11	1.01
Contraflow Left	1.61	1.44	1.17	1.20

Results show improvement in 2022 with added right turn lanes for all the options. However, single point, displaced left turns, and contraflow lefts require construction for improvement which is not feasible from an economical point of view as compared to the diamond and diverging diamond since reconstruction of the I-70 bridge over the highway is required for each option. Existing diamond and diverging diamond are preferred

options since reconstruction of the I-70 bridges is not required. In year 2045, all options improve with an additional right turn lane but are over capacity due to significantly high traffic volumes. The diamond and diverging diamond interchange were carried forward for additional analysis using microsimulation to better understand the traffic operational benefits of each interchange configuration. Refer to the US 6 CO 9 Corridor Operations Study – Microsimulation Analysis Memo for detailed results of the microsimulation analyses.

The initial design of the improved diamond added an additional right turn lane on both the eastbound and west off ramps to US 6 or CO 9. With existing traffic volumes, the microsimulation model showed negative results with increased bottlenecks and problematic weaving movements. The improved diamond design was then adjusted to include only modifications to the striping on the westbound off-ramp in order to provide more left turn storage than the existing configuration. As part of the I-70 Auxiliary Lanes project in 2023, the eastbound deceleration lane was extended allowing for more eastbound off ramp storage and avoiding queues extending onto I-70. Based on existing configuration after the auxiliary lanes project, no modifications were necessary on the eastbound off-ramp. Altogether, the improved diamond interchange includes adjustments to westbound off ramp striping to allow for more left turn storage.

SUB AREA DEVELOPMENT

Existing Conditions

The sub area, as defined in this study, consists of the segment between Wilderrest Road west of I-70 to the east to Dillon Ridge Road including the intersections at Stephens Way, Little Beaver Trail, and the I-70 interchange ramps. Stephens Way connects southwest to Wilderrest Road with access to several commercial properties while Little Beaver Trail is a northeast connection to both commercial and residential properties. Stephens Way is approximately 400 feet east of the I-70 eastbound interchange ramps and Little Beaver Trail is another 500 feet east of Stephens Way. Both intersections are signalized and allow movements in all directions. There are six signalized full movement intersections within 3300’, which greatly exceeds the ½ mile spacing required by the SHAC and recommended by industry guidance documents including the Access Management Manual and AASHTO Green Book. Based on field observations and traffic analysis results, the limited space between Stephen’s Way and Little Beaver, in particular, creates bottlenecks and delays due to high left turning volumes from US 6 to both local roadways.

Local Planned Developments

Based upon the Town of Silverthorne’s Transportation Master Plan developed in 2020, there are expected developments in the sub area segment. In response to this development, Stephens Way is planned to be relocated approximately 100 feet east of the existing Stephens Way intersection. In addition, Little Beaver Trail is planned to be relocated across from Stephen’s Way creating a single four-legged intersection.

Sub Area Options

To improve operations and safety in the sub area segment, three initial options were developed and evaluated using 2045 future traffic projections, including the Town’s option described above (Option 2). The options were developed to compare level of service and capacity improvements through testing methods such as separation, relocation, movement restriction, changes to lane configuration, and signalization of the two intersections. The adequacy of existing curve radii were confirmed using the SHAC, CDOT Roadway Design

Guide, and the American Association of State Highway and Transportation Officials (AASHTO) A Policy on Geometric Design of Highways and Streets, 2011.

Option 1 - Signalized ¾ Movements at Stephen’s Way and Little Beaver

Option 1 keeps Stephens Way and Little Beaver Trail at their current locations and maximizes left turn storage on US 6 by adding dual left turn lanes from US 6 to both Stephens Way and Little Beaver Trail. The option also modifies the existing signalized intersections by restricting the northbound and southbound left turns onto US 6, allowing continuous westbound and eastbound through movements at Stephen’s Way and Little Beaver Trail respectively. See the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

Option 2 - Relocate Stephen’s Way and Little Beaver

Option 2 relocates Stephens Way approximately 100 feet to the east, as planned by the Town of Silverthorne, and relocates Little Beaver Trail to the west to align with Stephens Way. This option was developed to increase spacing between the I-70 Interchange, minimize the total number of intersections, and eliminate the weaving movement between Stephens Way and Little Beaver Trail. The newly developed intersection of Stephens Way and Little Beaver trail is a full movement signalized intersection with dual eastbound and westbound left turns. The existing Little Beaver Trail access remains a signalized intersection but restricts northbound and southbound left turns onto US 6. See the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

Option 3 - Relocate Stephen’s Way east with signalized ¾ movements at Little Beaver

Option 3 relocates Stephens Way to the east while keeping the existing Little Beaver Trail intersection location. In this option, Stephens Way is a signalized full movement intersection and includes dual westbound left turn lanes. Little Beaver Trail remains signalized with movement adjustments and restrictions including dual eastbound left turn lanes and restricting the southbound and northbound left turns. See the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

Other Options Considered

Several other options to reduce the number of full movement intersections and/or restrict movements between Wildercrest Road and Dillon Ridge Drive were considered and eliminated due to either the inability to reroute traffic and/or physical constraints that made the option infeasible. An option to restrict movements at Wildercrest Road and Rainbow Drive was eliminated due to the inability to reroute the large volume of westbound/northbound left turns. An option to relocate Stephen’s Way across from Little Beaver Trail was eliminated due to the impacts to developed private property. Options that attempted to combine I-70 ramp movements with either Stephen’s Way on the south or Little Beaver on the north were also considered. The combination of the eastbound I-70 off ramp with Stephen’s Way was deemed infeasible due to grades and required clearances needed over Adams Avenue and the Blue River. The combination of the westbound on ramp with Little Beaver Trail was deemed infeasible due to access restrictions from I-70 and the interchange ramps and environmental impacts over Straight Creek.

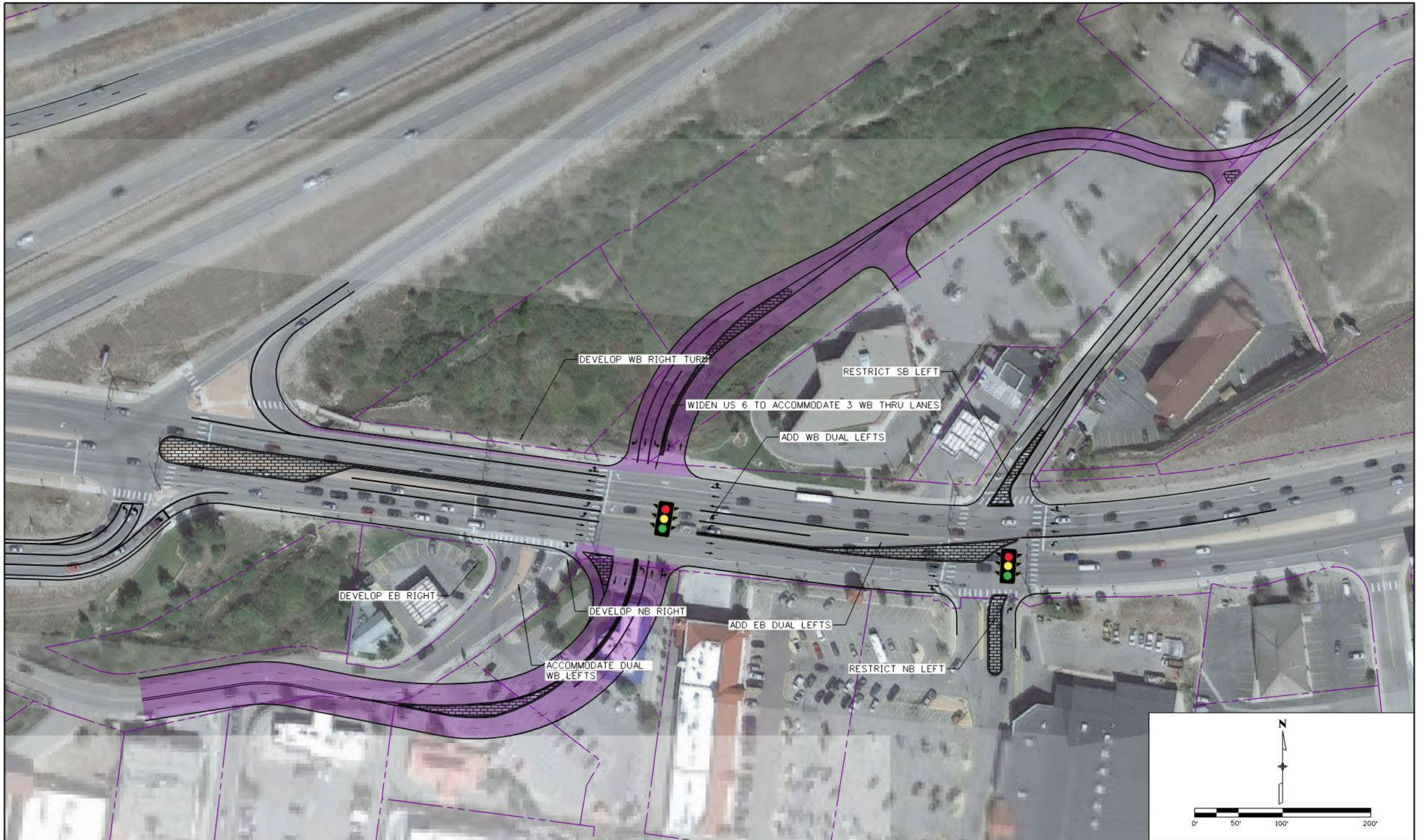
Options 1-2 Analysis

Once Options 1 through 3 were developed, they were analyzed using 2045 projected traffic volumes to evaluate the resulting level of service. While both options improve operations at the Little Beaver Trail intersection, they worsen operations at the critical Stephens Way intersection. Both options show individual movements as over-capacity, implying that queues may build for some movements during peak periods and potentially impact overall corridor capacity. Option 3 was removed from analysis due to weaving concerns and insufficient spacing between intersections, which caused queuing that significantly exceeded available storage lengths. Please refer to Table 8 for capacity and operational results of Options 1 and 2. Based on stakeholder input from the Project Leadership Team meetings, Options 1 and 2 were re-examined and revised to produce two additional options, Options 4 and 5.

Table 8: Sub Area Options 1-2

Option	Interse ction	Contro l Type	Friday 2045	Friday 2045	Friday 2045	Friday 2045	Sunday 2045	Sunday 2045	Sunday 2045	Sunday 2045
			No- Build	No- Build	Build	Build	No- Build	No- Build	Build	Build
			Interse ction Total	Interse ction Total	Interse ction Total	Interse ction Total	Interse ction Total	Interse ction Total	Interse ction Total	Interse ction Total
			Max v/c	LOS	Max v/c	LOS	Max v/c	LOS	Max v/c	LOS
1	US 6 & Stephe ns Way	Signaliz ed	>1	F	>1	F	>1	C	>1	E
2	US 6 & Stephe ns Way	Signaliz ed	>1	F	>1	F	>1	C	>1	E
1	US 6 & Little Beaver Trail	Signaliz ed	>1	F	>1	E	>1	D	0.940	C
2	US 6 & Little Beaver Trail	Signaliz ed	>1	F	>1	C	>1	D	0.810	A







Option 4 - Relocate Stephen's Way and Little Beaver with T-intersection for Commercial Access

Option 4 modifies Option 2 by closing the existing north access at Little Beaver Trail and creating a cul-de-sac at the existing gas station entrance. This option reduces the total number of accesses along US 6 while eliminating the weave movement between Stephen's Way and Little Beaver Trail. The newly formed intersection at relocated Stephens Way and Little Beaver Trail is signalized and includes dual eastbound and westbound left turns. This option maximizes the left turn storage space to accommodate the volume of future left turns projected onto Stephens Way and Little Beaver Trail. The existing Little Beaver Trail south access to the commercial center remains signalized as a three-legged t-intersection. See the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

Option 5 - Signalized ¾ Movement at Stephen's Way

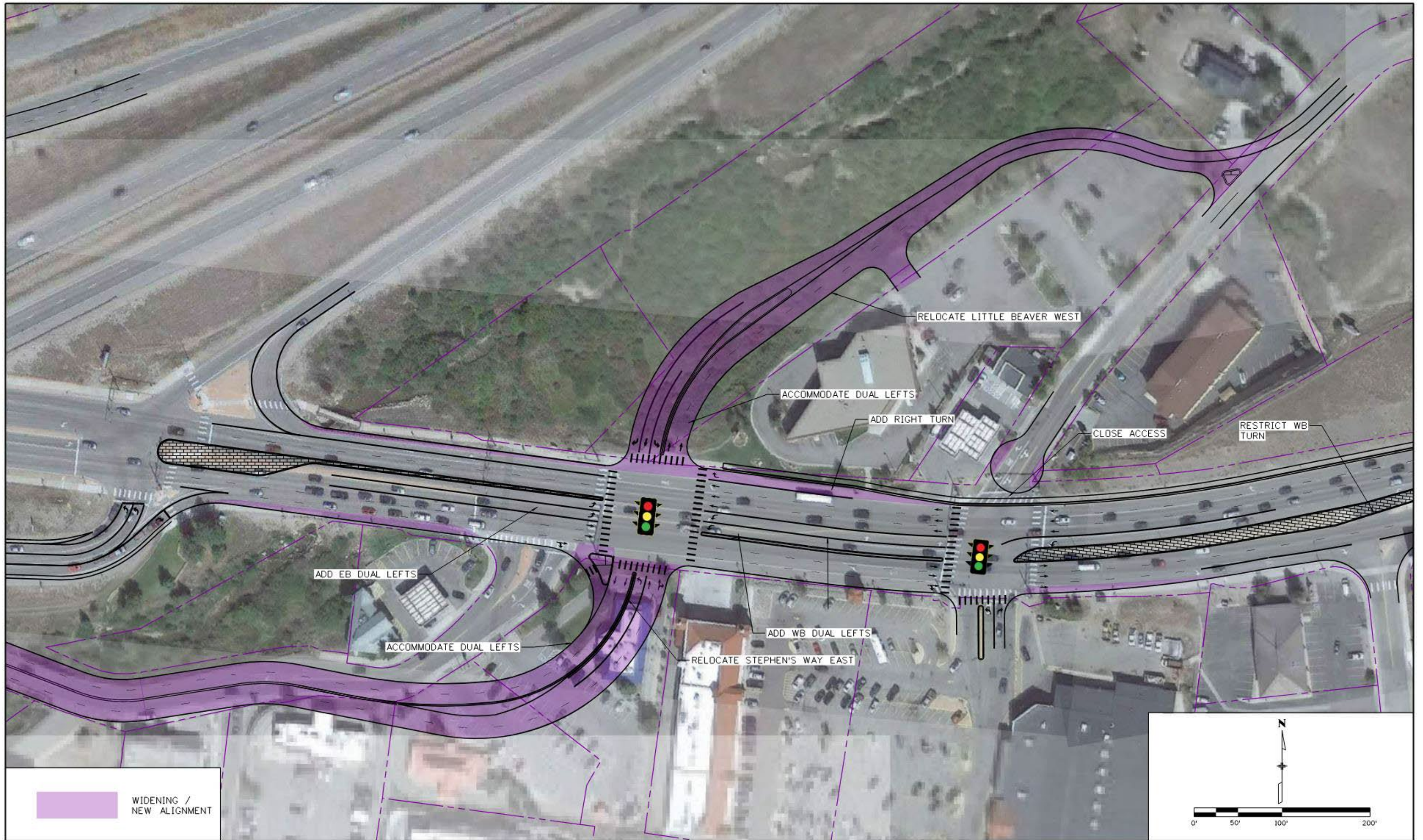
Option 5 revises Option 1 by keeping the intersection at Little Beaver Trail a full movement signalized intersection. This option keeps the existing locations of Stephens Way and Little Beaver Trail and includes dual left turns from US 6 to both Little Beaver Trail and Stephens Way. Both intersections are signalized, and the only restricted movement is the northbound left turn from Stephens Way to US 6. See the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

Options 4-5 Analysis

After completing analysis with options 4 and 5 using the forecasted traffic volumes, it was determined that level of service and capacity improved overall with both options. The greatest improvements were located at Little Beaver Trail for both Option 4 and 5 where the level of service and capacity improved. As with Options 1-2, individual movements will be over-capacity, implying that queues may build for some movements during peak periods and potentially impact overall corridor capacity. Capacity improved at Stephens Way using Option 4 while the level of service only improved slightly. For analysis results of Options 4 and 5, see Table 9: Sub Area Options 4-5 Option 4 ultimately provided the most capacity and operational benefit.

Table 9: Sub Area Options 4-5

			Friday 2045	Friday 2045	Friday 2045	Friday 2045	Sunday 2045	Sunday 2045	Sunday 2045	Sunday 2045
Option	Intersection	Control Type	No-Build	No-Build	Build	Build	No-Build	No-Build	Build	Build
			Intersection Total	Intersection Total	Intersection Total	Intersection Total	Intersection Total	Intersection Total	Intersection Total	Intersection Total
			Max v/c	LOS	Max v/c	LOS	Max v/c	LOS	Max v/c	LOS
4	US 6 & Stephens Way	Signalized	>1	F	>1	E	>1	C	0.890	C
5	US 6 & Stephens Way	Signalized	>1	F	>1	D	>1	C	>1	C
4	US 6 & Little Beaver Trail	Signalized	>1	F	>1	C	>1	D	0.840	C
5	US 6 & Little Beaver Trail	Signalized	>1	F	>1	D	>1	D	0.930	C



5690 DTC Boulevard, Suite 330W
 Greenwood Village, CO 80111
 Phone: 303-221-2330
 Fax: 303-221-2331
 www.stolfusandassociates.com

SUB AREA
 IMPROVED DIAMOND - OPTION 4



ACCESS PLAN DEVELOPMENT & PLAN RECOMMENDATIONS

Methodology

Access recommendations were evaluated only for major intersections along the corridor. Private property access points along the corridor were generally not considered except between Stephen's Way and Wilderndest Rd. The appropriateness of additional access points or traffic signals between full movement intersections or access restrictions for existing full movement intersections were considered on a case-by-case basis. Local circulation opportunities and impact to traffic operations at the nearest full movement intersections was also considered. Access solutions were developed by applying access management principles and techniques. Major full movement signalized intersections were determined based on traffic projections, town and county planning documents, intersection functional area and anticipated growth patterns. While access for individual parcels was not specifically analyzed, proposed improvements at public road intersections require access for each parcel in between major intersections to be limited to right-in/right-out. Access configurations, auxiliary lane needs and auxiliary lane lengths were defined for each full movement and ¾ movement intersection. For additional details regarding the access methodology, see the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

Plan Recommendations

Exhibit 2 and 3 on the following pages provide a visual representation of the proposed access management plan in terms location and level of access. Table 10 provides a summary of the proposed access management recommendations at each corridor location including proposed level of access, signalization and auxiliary lane improvements. In locations where dual turn lanes are recommended, additional improvements must be made to the adjacent local side streets to accommodate that second lane of turning traffic.

Table 10: Access Plan Recommendations

Access ID	Intersection	Existing Conditions	Proposed Conditions	Proposed Improvement
1	Hamilton Creek	Signalized Full Movement	Signalized Full Movement	No Changes
2,3	Bald Eagle Rd/ Golden Eagle Rd	Unsignalized Full Movement	Unsignalized Full Movement	Add EB Left Turn Accel Lane
4	Willowbrook Rd	Unsignalized Full Movement	3/4 Movement	Restrict EB Left Turn Extend NB Left Turn Lane Add SB Right Turn Decel Lane Add EB Right Turn Accel Lane
5,6	Smith Ranch Rd	Unsignalized Full Movement	3/4 Movement	Restrict EB, SB and WB Left Turns Extend NB Left Turn Lane
7,8	Ruby Ranch Rd	Unsignalized`	Signalized Full Movement	Signalize When Warranted Add Dual NB Left Turn Lanes Widen Ruby Ranch Road to accept dual left turns Add SB Right Turn Decel Lane
9	W 13th St.	Unsignalized Full Movement	Right-In/Right-Out	Restrict Left Turns
10,11	W 12th St.	Unsignalized Full Movement	Right-In/Right-Out	Restrict Left Turns
12	W 11th St.	Right-In/Right-Out	3/4 Movement	Restrict EB Left Turn Extend NB Left Turn Lane

13	W 10th St.	Unsignalized Full Movement	Right-In/Right-Out	Restrict Left Turns
14	W 9th St.	Right-In/Right-Out	Right-In/Right-Out	Restrict Left Turns
15,16	Annie Rd	Signalized Full Movement	Signalized Full Movement	Extend NB Left Turn Lane
17,18	W 7 th St.	Unsignalized Full Movement	Right-In/Right-Out	Restrict Left Turns
19,20	W 6 th St.	Signalized Full Movement	Signalized Full Movement	Extend SB Left Turn Lane Add SB Right Turn Lane
21,22	W 5th St.	Unsignalized Full Movement	Right-In/Right-Out	Restrict Left Turns
23,24	W 4th St.	Signalized Full Movement	Signalized Full Movement	*No Changes
25	W 3rd St.	Unsignalized Full Movement	3/4 Movement	Restrict EB Left Turn Extend NB Left Turn Lane Remove median landscaping to improve sight distance north of 3 rd Street
26	Private Access	¾ Movements	Right-In/Right-Out	Restrict Left Turns
27,28	Wilderndest Rd.	Signalized Full Movement	Signalized Full Movement	NB Dual Left Turn Lanes Widen Wilderndest Road to accept dual left turns Add SB Right Turn Lane Add Free NB Right Lane Extend SB Left Turn Lane
	Private Properties Between Wilderndest Rd and I-70	Right-In/Right-Out	Close Access	Close access with redevelopment and provide access via local roadways
29,30	I-70 WB Ramps	Signalized Full Movement	Signalized Full Movement	Extend WB Left Turn Lane
31,32	I-70 EB Ramps	Signalized Full Movement	Signalized Full Movement	No Changes
33,34	Stephens Way/Little Beaver Trail	Signalized 3-Legged Full Movement	Signalized 4-Legged Full Movement	Shift Stephen's Way east approximately 100' Realign Little Beaver Trail to align with Stephens Way Add Dual EB & WB Left Turn Lanes Widen Stephen's Way and Little Beaver Trail to accept dual left turns Add WB Right Turn Lane
35,36	Existing Little Beaver Trail	Signalized Full Movement	Signalized 3-Legged Full Movement	Close North Access
37	W Anemone	¾ Movement	Right-In/Right-Out	Restrict WB Left Turn
38,39	E Anemone Trail/Dillon Ridge Rd.	Signalized Full Movement	Signalized Full Movement	Add Dual SB Left Turn Lanes Widen Dillon Ridge Road to accept dual left turns Separate NB & SB Left Turns from thru movements and eliminate split phasing
40,41	Dillon Dam Rd.	Signalized Full Movement	Signalized Full Movement	Extend WB Left Turn Lane Extend EB Right Turn Lane
42,43	Lake Dillon Dr.	Signalized Full Movement	*Signalized Full Movement	Extend EB Left Turn

*Refer to Alternative Options Section



Exhibit 2: Proposed Access Plan



Exhibit 3: Proposed Access Plan

Alternative Options

At a few locations within the corridor alternative options or phased alternatives were identified for flexibility or to provide options if safety or operational issues develop.

Golden Eagle / Bald Eagle Road - Phased Alternatives

If safety or operational issues arise at this location in the future, an alternative options has been identified. The following alternative is provided for the Golden Eagle / Bald Eagle Road and Hamilton Creek intersections:

- Golden Eagle/Bald Eagle Rd:**
 -Phase 2 develops the Golden Eagle / Bald Eagle intersection into an unsignalized channelized T intersection which restricts the southbound and westbound left turns and provides an eastbound left turn acceleration lane. In addition, modifications to striping at Hamilton Creek Road to extend the westbound left turn lane are included since vehicles from Bald Eagle Rd will reroute to Hamilton Creek for left turn movements. See the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document.

4th Street Pedestrian Crossing Option

The Town of Silverthorne has identified 4th St as a critical pedestrian crossing location that serves the downtown core, parking garages, and performing arts center. Two alternatives were analyzed to minimize traffic disruption on CO 9, while also accommodating pedestrian crossing movements. Alternative 1 would have 4th St remain as a full movement signalized intersection. While right turn movement volumes are anticipated to just reach SHAC limits to require right turn deceleration lanes, the project team decided to deliberately forego right turn deceleration lanes at 4th St to minimize the pedestrian crossing distance. A southbound right turn deceleration lane was added to 6th Street to mitigate some of the right turn movements downtown.

Alternative 2 is a signalized ¾ movement on the east side and right-in right-out on the west side with a signalized pedestrian crossing with pedestrian refuge on the south side of the intersection. A right-in/right out on both side of the highway was considered with a signalized pedestrian crossing, but the southbound left turn lane was deemed critical to the performing arts complex on the east side by the PLT. Conceptual layouts of both alternatives can be found in the *US 6 - CO 9 Corridor Operations Study - Access Management Summary Appendices* document. It was found that the impacts at nearby intersections were minimal with the additional movement restrictions. 6th St approaches failing level of service in the year 2045 regardless, but no other intersections operations were impacted negatively, indicating that the addition of a pedestrian crossing could be a viable option for the 4th St intersection, if desired by the Town of Silverthorne.

Lake Dillon Drive - Roundabout Analysis

Lake Dillon Drive is a signalized intersection today and per the access management plan will remain signalized with expected auxiliary lane improvements needed over the next 20 years. As an alternative, the Town of Dillon and Summit County have been considering a roundabout at this location. Per the proposed highway construction plans on US 6 near the Town of Dillon (Project No: - 221412.01) by Mead & Hunt LLS, a proposed roundabout at the intersection of Lake Dillon Dr. and US 6 with two-lanes on the eastbound and westbound approach on US 6 and single lane northbound and southbound approaches. Using the proposed roundabout design, an HCS roundabout analysis was conducted with 2045 traffic volumes which showed the intersection functioning at LOS D on the eastbound and northbound approach and LOS F on the westbound and

southbound approach. Following these results another analysis was done with the same 2045 volumes, but a bypass right turn lane was added on the EB and SB approach producing better results on both approaches as shown in Table 11. The level of services were calculated utilizing the 2045 traffic demand forecasted in the US – CO 9 Corridor Operations Study. Mead & Hunt may have used a different methodology for projecting future traffic volumes, which may indicate a different result. Prior to implementing a roundabout at this location, a traffic study should be submitted to CDOT for review and approval. Level of service at the Lake Dillon Drive intersection is expected to deteriorate by 2045 with either a traffic signal or roundabout. Either option is acceptable if a traffic study and roundabout layout is approved through the CDOT Access Permit process.

Table 11: US 6 and Lake Dillon Dr Roundabout Analysis

Approach	As Designed by Dillon		With Capacity Improvements	
	Approach Delay, s/veh	LOS	Approach Delay, s/veh	LOS
EB	27.7	D	7.9	A
WB	59.	F	59.7	F
NB	29.1	D	29.1	D
SB	361.6	F	64	F

Local Road Improvements

As part of the study, the Wilderdest Road/Stephen's Way loop was evaluated. It was confirmed that the loop provides a critical alternative route to the US 6 and CO 9 corridor under I-70 by reducing demand on the highway and providing resiliency during incidents that impact the highway under I-70. The Town of Silverthorne's plan to provide four lanes of traffic on both Wilderdest Road and Stephen's Way improves operations on the highway. In addition, the Town's plans for a roundabout at the intersection of Wilderdest Road and Stephen's Way operates acceptably, although will have some geometric challenges and physical constraints given the proximity of the I-70 bridges and bridge over the Blue River. Controlling access on both of these roadways, as proposed in the Town's Master Plan, will benefit the system from both a safety and operational perspective.

While not specifically analyzed, the project team also identified the intersection of Rainbow Drive and Tanglewood Lane as problematic due to the proximity of Tanglewood to SH 9. Intersection functional area along Rainbow Drive cannot be provided creating operational and safety concerns. The AMP recommends restricting movements at Tanglewood to a right-in/right-out. Investigating future alternative routes from Tanglewood to Rainbow Drive to provide full movement access further northwest of the existing Tanglewood Ln intersection is recommended.

Double lefts required at the following intersections will require widening the local roadway to access double lefts: Wilderdest Road, Stephen's Way, Little Beaver Trail, Dillon Ridge Road, and Ruby Ranch Road. In addition,

the results of the analysis support the implementation of the following local Master Plan Improvements in Silverthorne, Dillon and Summit County:

- Multimodal connections on US 6
- Option 4 – Realignment of Little Beaver Trail with Stephen's Way
- 4 lanes on Wilderdest Road and Stephen's Way
- Roundabout at Wilderdest Road/Stephen's Way intersection
- Access control on Wilderdest Road and Stephen's Way
- Adams Avenue Extension

CONCLUDING STATEMENT

The goals of the US 6 and CO 9 access management plan are to provide recommendations to create effective and efficient travel, improve safety and operations, and support mobility of existing and future land uses along the corridor. Access management principles and techniques were utilized to develop access recommendations based on existing and future projected traffic volumes and local planned development.

In addition to the recommendations at major intersections along US 6 and CO 9, improvements to the I-70 interchange were investigated. The AMP provides recommendations at 10 signalized and 13 unsignalized intersections based on local planned developments while using access management strategies providing overall operational and safety improvements throughout the entire corridor.