SH 83 Safety and Operations Analysis:
Bayou Gulch to El Paso County Line
MP 30.20 – MP 53.88
Project Code 23008

FINAL Technical Report

Prepared for:

COLORADO
Department of Transportation

DOUGLAS COUNTY
COLORADO

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INTRODUCTION

The Colorado Department of Transportation (CDOT) is conducting a comprehensive roadway safety and operational analysis of SH 83 between MP 30.20, East Palmer Divide Avenue, southern end and MP 53.88, Bayou Gulch Road, northern end. This project will ultimately identify priority packages that will address safety and resiliency needs in the SH 83 corridor. A more reliable SH 83 will reduce the congestion caused by frequent accidents and the resulting full or partial closures. The implemented improvements will be based on existing funds available and potential grant applications that CDOT will manage in coordination with Douglas County. This report's purpose is to document the process of analysis and to list the recommended improvements.

SH 83 is a unique transportation facility within the region and is a vital connection to adjoining destinations. As a regional arterial and also serving as a rural highway, it connects multiple communities, provides access to natural resources and agricultural areas of southeast Douglas County, and provides rural DRCOG region residents with timely access to health care, emergency services, schools, businesses, and the opportunities of the regional economy. This highway is also the only other significant route parallel to I-25, connecting Douglas and El Paso counties; and connecting the two largest Metropolitan Planning Organizations (MPO) in Colorado. Maintaining a safe, efficient, and all-weather operation is critical to the resiliency of the region's transportation system and the health of its residents, to preserve a high quality of life.

Figure 1 Project Location Map

Study Area

SH 83 is a corridor that connects the southeast Denver Metro communities to the northern communities of Colorado Springs. Our project limits are such that SH 83, on the northern end at Bayou Gulch Road, is also known as Parker Road, and goes south through Franktown and Douglas County, ending at the southern limit

of East Palmer Divide Avenue, also known as the County line that divides Douglas with El Paso County. See **Figure 1** for the project limits. Note that State Highway (SH) is interchangeable with CO 83; for the purposes of this report, SH 83 is used.

SH 83 is one of the top three most traveled north-south corridors in Douglas County. Travelers using the corridor navigate a facility that lacks features including passing lanes, many intersections without turn lanes, and inadequate or non-existent shoulders abutting non-recoverable slopes. The corridor also traverses some of the highest and windiest terrain in the southern front range and driving in winter weather events is challenged by blowing and drifting snow, lack of delineators or shoulder rumble strips, and none of the traveler aids including remote weather information stations (RWIS), cameras, or message signs that could make travel smarter. There are significant populations of elk and deer that cross the highway, especially at dusk or dawn to water in Cherry Creek or other smaller drainages that generally parallel the route.

Local and Regional Impact

Enhancing the safety and reliability of this critical link in the regional transportation system will increase opportunities for people and business to share in a vibrant economy. SH 83 is the primary access route for several municipalities in Douglas County and serves as a secondary travel route between the Denver Metropolitan Area and municipalities in Douglas County, Elbert County, and El Paso County. Other key impacts include:

- SH 83 benefits and crosses directly through Franktown, the Town of Parker, and the Town of Castle Rock's eastern boundary at Castle Oaks Drive.
- SH 83 further benefits several municipalities by providing secondary access from southern Colorado and City of Colorado Springs to the City and County Denver, City of Centennial, City of Aurora, Town of Elizabeth through the junction of SH 86, Town of Monument, by providing additional options and an alternative route to I-25.
- For smaller communities like Franktown, SH 83 is both a main street for local business and a critical connection to regional commerce, health care, schools, and employment.
- The vast open space amenities available in this part of the region are a tremendous asset for attracting employers and provide a benefit to employees' quality of life. Examples include:
    - Castlewood Canyon State Park
    - Hidden Mesa Open Space
    - Lincoln Mountain Open Space
    - Colorado Front Range Trail
    - Palmer Range Divide Trail

Previous Studies and Projects

Our analysis has been built upon the previous efforts related to our project limits. The following is a list of relevant projects and studies in order of most recent completion date:

- CDOT's Passing Zones Project. CDOT Headquarters Safety and Traffic Engineering Branch reviewed the corridor passing zones and made modifications in the spring of 2021.
- Douglas County's *Safety Assessment Report, SH 83A MP 28.10 to 30.27 Walker Rd. to El Paso/Douglas County Line* (DiExSys, July 2019). This study summarized the magnitude and nature of the safety issues within the study limits with recommendations on maximizing crash reduction.
- Douglas County's *Safety Assessment Report SH 83A MP 30.20-53.88 El Paso/Douglas County Line – North* (DiExSys, January 2019). This study summarized the magnitude and nature of the safety issues within the study limits with recommendations on maximizing crash reduction.
- Douglas County's *2030 Transportation Plan* (November 2009). The purpose of this plan was to define a long-range vision for a multi-modal transportation system that offers choices in how people travel within the County; there are some specific recommendations along SH 83 including widening (reference on page 47), transit (reference on page 67) and bicycle (reference on page 70) and implementation (reference on pages 83-86).
- CDOT's *SH 83-86 Corridor Optimization Plan* (September 2004) – The purpose of this plan was to develop specific corridor visions which are consistent and compatible with local plans and are supported by affected local governments and regional agencies.

Ongoing Projects

The following projects are on-going and running parallel to this analysis:

- Douglas County's E Park Drive and Rafter Road Project. This project is a final design and construction project; it includes the addition of turn lanes at the closely spaced intersection of E. Park Drive (MP 51.63) and Rafter Road (MP 51.37).
- CDOT's Region 2 SH 83 and Palmer Divide Roundabout Project. This project is a final design and construction project; it includes a roundabout at SH 83 and East Palmer Divide Avenue (MP 30.24).
- CDOT's Access Control Plan (ACP). The ACP project limits were identified between MP 49.89 to MP 53.86. The ACP was necessary to prepare the corridor for planned traffic signals, restricted turning movements, property access for adjacent land development, existing and future residential accesses, and median locations.

Overall Process

The first step of this analysis was documenting the existing conditions of the corridor. This included analysis of safety conditions and operations as well as summarizing environmental resources. This was followed by documenting improvements that potentially address the identified areas of concern, and then prioritizing those recommendations based on various agreed to criteria. Ultimately, recommendations were provided that best addressed safety concerns in alignment with the screening criteria. This technical memo will address the methodology, assumptions, and results of this analysis.

Stakeholders

Prior to the start of the safety and operations analysis being conducted, a kickoff meeting was held to compile a wide-ranging list of stakeholders. Teams were formed as identified and the meeting frequency was set. Meetings provided project direction and reported back to the Executive Management Group regarding the outcomes and perspective of those involved. See **Table 1** for a summary of the identified stakeholder groups.

Table 1 Summary of Stakeholder Groups

Traffic Technical Working Group	
CDOT Region 1 Traffic and Access	Muller Traffic Engineering
Douglas County Traffic Engineering	Stanley Access Team
Consor Traffic Engineering	
Environmental Technical Working Group	
CDOT Region 1 Environmental	Consor Project Management
Douglas County Open Space	Pinyon Environmental Team
Design Team	
Consor Traffic and Roadway Engineering	Pinyon Environmental Team
Muller Traffic and Roadway Engineering	Stanley Access and Utilities
Access Team	
CDOT Access Manager	Stanley Access Engineer
CDOT Project Team Managers	Consor Project Team Manager
Douglas County	
Public Information Team	
CDOT Region Public Information Officer	Consor Public Outreach
CDOT Project Team Managers	
Project Management Team	
CDOT Project Team Managers	Consor Project Manager and Traffic Lead
Douglas County Project Team Managers	
Executive Management Group	
CDOT Region Traffic Engineer	CDOT Region Public Information Officer
CDOT Region Program Engineer	CDOT Project Program Managers
CDOT Assistant Deputy Director of Program Delivery	Consor Design Project Manager
Douglas Country Program Director	
Special Interest Groups	
Douglas County Schools	Bicycle Colorado
Colorado State Patrol	

The input and direction of each group was incorporated into the overall project process that will be expanded upon in subsequent sections.

PROJECT GOALS AND OBJECTIVES

Project Goals

The project goals for SH 83 between East Palmer Divide Avenue and Bayou Gulch Road are as follows:

- Gather and analyze existing conditions, focusing on safety, operations and future land development/growth
- Identify improvements that address safety
- Recommend prioritization of improvements
- Develop an access management plan (and support access control plan efforts on northern portion)

Objectives

The project team will achieve the project goals with the following objectives:

- Identify recommendations to address operational, maintenance and safety concerns, with a focus on safety and reducing crashes
- Incorporate projects that consider local, county, state and federal resource agencies, including CDOT Region 2 coordination to align recommended improvements with existing projects and efforts
- Include projects that incorporate the feedback that was received through public outreach and are sensitive to the needs of both local and state stakeholders
- Identify and support environmental concerns
- Thoughtful approach of prioritized recommendations
  Consideration to the previously performed DiExSys study, previous efforts and on-going projects, including development/growth

EXISTING CONDITIONS

This section provides an overview of the existing conditions and the safety and operations analysis performed including the environmental conditions that should be considered.

Roadway Characteristics

The 24-mile segment between East Palmer Divide Avenue and Bayou Gulch Road varies from two to four lanes, with narrow paved shoulders, numerous accesses, steep side slopes, and an abundance of wildlife. The posted speed limit varies from 55 to 65.

Data Collection

A comprehensive existing conditions ArcGIS map was used to display the corridor data. The map can be accessed using the link SH 83 Existing Conditions (Viewer) (arcgis.com).

The following information was collected:

- Mile markers
- Surrounding land uses and places of interest (locations of large businesses, parks, churches, schools, other defining location)
- Environmental resources
- Intersection identification (signalized, tee, full movement, driveway, other)
- Roadway characteristics/geometry (speed limits, number of lanes, shoulder widths, other)
- Traffic volumes (2020 and 2050 DRCOG traffic model volumes)
- Incidents/crash statistics (2015 – 2019)
- Traffic level of service (LOS) for intersections and arterials (2020 and 2050)
- Turning movement counts (July 2020)
- Access Control Plan (ACP) numbers with control recommendations (MP 50.00 to MP 53.30)
- Access Management Plan (AMP) numbers with control recommendations (MP 30.20 to MP 50.00)
- Social Pinpoint, project email, social media comments (public input), and local agency, CDOT and consultant input

The data collection findings were overlayed on an ArcGIS map to support with the analysis and technical discussions amongst the multiple working groups. Layers were grouped by type of data provided (Geometry, Environmental, Crash Information, etc.) and the map was shared with all agencies involved in the project.

Safety Evaluation

A comprehensive crash analysis was performed for the study corridor using data over a five-year period (2015 – 2019) to identify clusters and crash types. This analysis was intended as an update to the *Safety Assessment Report SH 83A MP 30.20-53.88 El Paso/Douglas County Line – North* (DiExSys, January 2019) report and provides additional recommendations, where warranted, by the observed crash patterns.

In general, crash patterns along the study segment south of the SH 86 intersection tended towards run-off-road crashes with the highest concentration of crashes in the vicinity of curves. There were also patterns that could be associated with vehicles slowing or stopping to turn at intersections or driveways where no auxiliary lanes are present. North of the SH 86 intersection, rear end crash patterns were more prominent and could be associated with the higher frequency of intersections and access points along the roadway.

The full safety review and summary of recommendations is provided in **Appendix A** with supporting detailed crash summary sheets provided in **Appendix B**.

Operational Evaluation

An operations analysis was performed for the study corridor using Highway Capacity Manual (HCM) Methodologies for the highway sections and Synchro Microsimulation Software Version 11, for the signalized intersections.

In summary, for the 2020 existing condition AM and PM peak periods, each intersection is operating at or better than LOS C. None of the 95th percentile queue estimates exceed capacity calculations, indicating that none of the signals are operating over capacity

The full operations analysis methodology and summary of output is provided in **Appendix C** with supporting turning movements counts provided in **Appendix D** and results from the HCM and Synchro analysis provided in **Appendix E**.

Environmental Conditions

Resources present in the corridor that require environmental clearances and/or permitting were identified and mapped based on readily available data. As the potential improvements were being developed, the team considered whether these resources would be impacted and the type of clearance/permitting that could be anticipated for implementing each improvement. This evaluation, found in **Appendix F**, enables CDOT and its partners to estimate cost and schedule needs for the environmental tasks. As a part of the evaluation, the team also included next steps for recommended short-term improvements. Smaller packages with no or limited environmental impact may not require field work and could be potentially cleared internally at CDOT, with or without consultant support. However, larger long-term packages may require field work and more extensive evaluation of impacts, mitigation measures, and coordination with federal agencies.

In addition to the environmental evaluation, a separate Wildlife Movement Technical Memorandum, **Appendix I**, was prepared to evaluate wildlife movement in the corridor. In summary, based on the documented carcasses and reported crash data, this corridor is known to have a high level of animal crossing activity. This memorandum notes the existing wildlife movement in the corridor and provides recommendations for mitigation measures considered in the overall recommendations of this corridor analysis.

Access Management Plan

The AMP is an important tool in advancing safety and operations along this highway and entails an output of map sheets and a table of existing and future access points along the corridor. An AMP was developed to document existing accesses; this was done in coordination with the efforts of the Access Control Plan, prepared by others for the northern portion of this corridor (Russellville Road north to Bayou Gulch). The AMP's purpose is to document existing conditions and pre-planned accesses; they do not need to be formally adopted by the state and local agencies.

In summary, the majority of the accesses that exist along the corridor are unsignalized with full movements allowed into and out of the property. Various recommendations are

proposed such as consideration to analyze further once areas are under redevelopment and/or restriction of movements due to analysis provided in other aspects of this project. Refer to **Appendix J** for the AMP.

PUBLIC ENGAGEMENT

In order to solicit and inform the public on this project; the project team developed a two-phase public engagement approach:

- Phase I informed the public on the project purpose and schedule, while providing an opportunity for input on issues and opportunities along the corridor.
- Phase II will inform the public on feedback we collected during Phase I, provide a summary of existing conditions and analysis completed, and present the recommended improvements to be implemented along the corridor. This information will be available on the project website.

Phase I was accomplished through the development of a project webpage posted on the Projects section of the CDOT website. The project overview, goals, objectives and location map were placed on the home page, along with links to a comment form, the project newsletter signup, and an interactive public input map created using the Social Pinpoint tool. To promote communication and solicit input, a postcard was mailed to residents and businesses near the corridor, followed by two social media posts on the CDOT Facebook page. Each outreach opportunity and associated metrics are summarized.

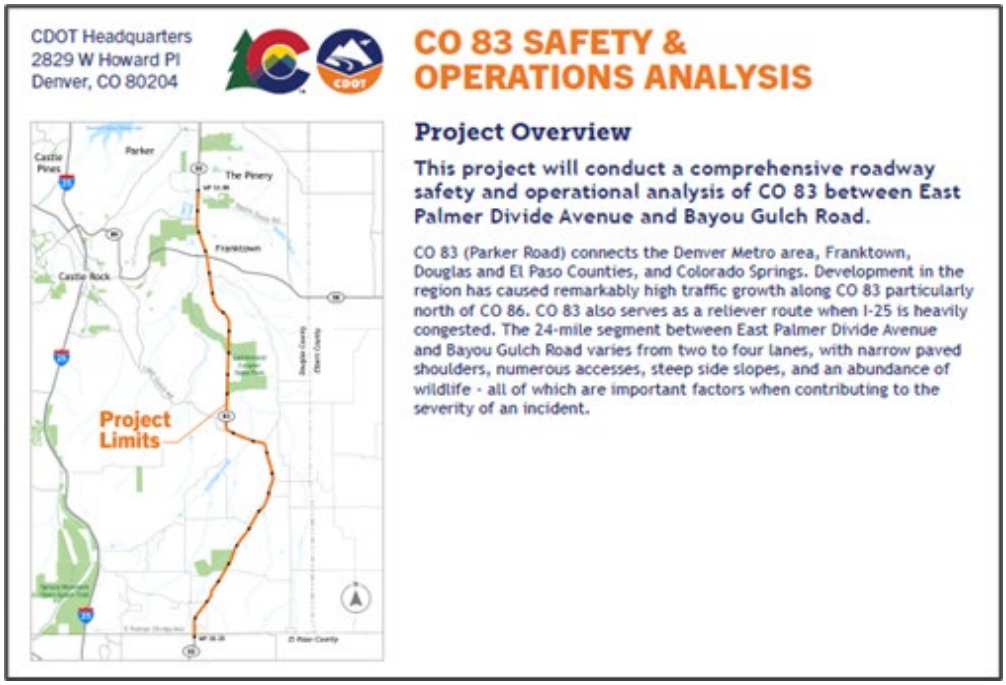
Website

The project webpage is located at www.codot.gov/projects/co83safetydesign. A total of 108 question or comment submissions were received and 153 people joined the email list via the links on the landing page during Phase I.

Postcard Mailers

Starting on September 10, 2021, a total of 8,092 mailers were sent to residents and businesses near the SH 83 corridor (16 U.S. Postal Service mailing routes). The mailer included a QR code linking to the project webpage and input map, which was scanned 146 times between September 17 and October 22, 2021, 80% of which were from iOS devices. The postcard mailer front and back are shown in **Figure 2**.

Figure 2 Postcard Mailer (Front and Back)



Social Media

Two posts were added to the CDOT Facebook page to notify the public of the project and promote the opportunity to provide input; refer to **Figure 3** and **Figure 4**.

Most comments were not about this specific project – many provided feedback about COTRIP's recent update at that time. A couple of overall suggestions for SH 83 were given, including the addition of a toll lane and bike facilities.

Figure 3 Facebook Post 1 – October 12, 2021

Impressions	20,246
Reach	19,434
Engagement	644
Reactions	10
Shares	12
Comments	9

Figure 4 Facebook Post 2 – October 14, 2021

Reactions	16
Shares	7
Comments	17

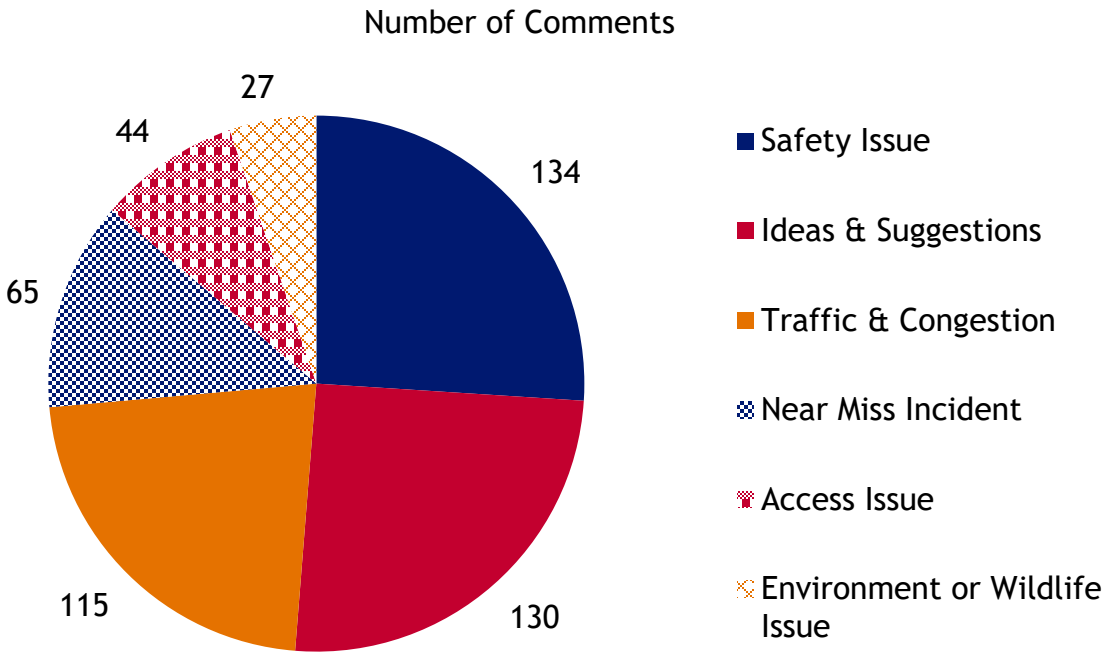
Interactive Public Input Map

The interactive map was available on the Social Pinpoint platform from September 14 to October 16, 2021. The map had 1,974 total visits, 781 unique users, and received 515 unique comments. The top comment topics included:

- Focus on completing the I-25 South Gap project
- Widen SH 83 to four lanes
- Do nothing to maintain rural characteristics
- Add turn lanes, acceleration/deceleration lanes
- Review passing/no passing zones
- Coordinate signal timing
- Add climbing lane near Castlewood Canyon
- Improve wildlife crossings
- Identify alternate route to the east
- Install a sound wall to reduce noise
- Increase enforcement

The full topics captured by the public comments can be shown in **Figure 5** highlighting that the main comments were on captured on safety.

Figure 5 Interactive Public Input Map Comment Category Breakdown



Next Steps

Phase II of public engagement is anticipated for early Spring 2022 after this report is finalized.

Community members who enrolled in the project newsletter will receive updates through the remainder of the project and will be directed to the project webpage for updated and supplemental information. Additionally, once materials become available, the team will work with CDOT's marketing team to continue the informative social media campaign, as appropriate.

RECOMMENDATIONS AND SCREENING PROCESS

Recommendations

A list of issues was compiled along the corridor based on the analysis performed, inclusive of public comment. From this list, specific mitigation options are provided in order to address each of these issues. From here, the screening process, which is described in this section, was applied to the mitigation options. This is summarized in **Appendix G** and is referred to as the mitigation table herein.

Overall Screening Process

A screening process was developed to justify the validity of improvements listed in the mitigation table and to identify the priorities along the corridor. A two-step screening process (Level One and Level Two) was used where the scoring criteria were presented to the project teams for approval.

General categories of criteria were developed in conjunction with the technical working groups and approved by the Executive Management Group. The team identified factors for each criteria to allow for variable scoring. The initial high-level criteria were:

- Operational Effectiveness
- Land Use Consequence
- Economic Feasibility
- Environmental Feasibility

These 4 criteria were turned into 5 variable scoring measures for both Level One and Level Two screening criteria and were applied to each row of the mitigation table as shown in **Figure 6**.

Level One Screening Process

Following the application of criteria points to each recommendation within Level One, all criteria points were added for a cumulative total score, then ranked from high to low. High values indicate an improvement with the following outcome:

- Early Package – These are recommendations that can be bundled into a package that clearly address the goals and objectives of this project and is implementable with a relatively low cost
- Project In Progress – These are recommendations that are already captured by an existing project already underway
- Project For Future – These are recommendations that can be captured by a future planned project
- Recommendation moves to Level Two screening process

More information is provided in subsequent sections summarizing the results.

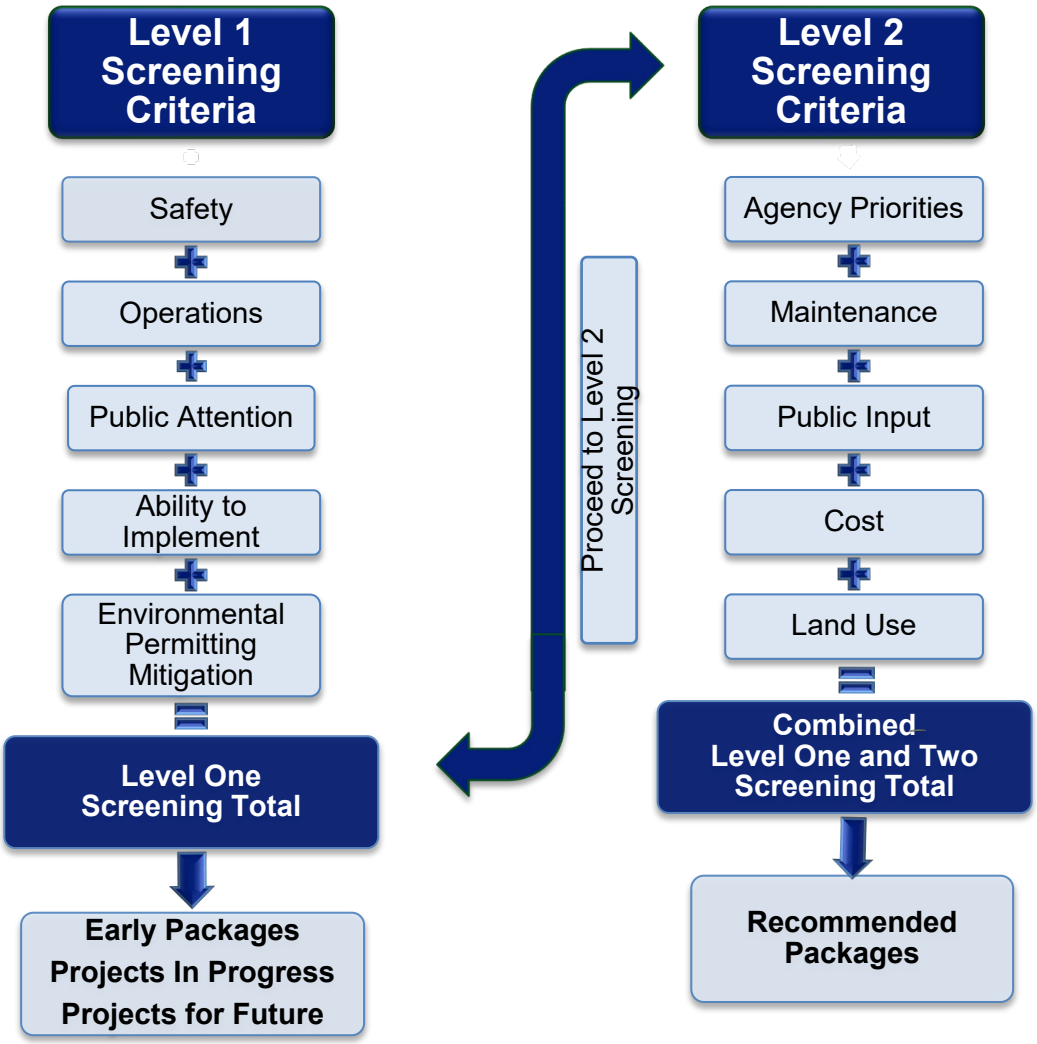
Level One Screening Process

Following the application of criteria points to each the remaining recommendations, all Level Two criteria points were added for a cumulative total score, then ranked from high

to low. High values indicate an improvement that are recommended to be project packages to be implemented.

More information is provided in subsequent sections summarizing the results.

Figure 6 Screening Criteria



Mitigation Table Inputs and Outputs

Table 2 defines the inputs and outputs that are shown within the mitigation table.

Table 2 Mitigation Table Summary

Column Name	Column Description
Reference Name	Identifies early action packages, items that need further study (outside this scope of work), items covered by other projects already planned, items to be covered during development (ACP or AMP recommendations), or those that were moved to the second level of screening
Cross Reference	Reserved column to help identify improvements that could be incorporated into multiple packages
Access Number(s)	The number of each access as it relates to the Access Control Plan and Access Management Plan
Existing Type of Intersection	The traffic control such as signalized, side street, driveway, or other (such as business reference).
Access Control	The type of access identified in the Access Control Plan database and the proposed recommendation (if any modification based on our analysis)
Level of Service in 2020	The worst LOS for the segment, corridor, or spot location using the existing conditions 2020 DRCOG traffic model and traffic counts from July 2021.
Level of Service in 2050	The worst LOS for the segment, corridor or spot location using the DRCOG 2050 traffic model and projected traffic counts.
Safety or Operational Concern to Mitigate	The existing issue of concern. Some locations included several concerns, and each were listed as a separate row in the mitigation table.
Mitigation Options (Improvements)	The improvements identified to address each concern. Some locations included several recommendations for the same location, and each was listed as a separate row in the mitigation table.
Source	The source identified where the improvement suggestions came from.
Number of Public Comments	The number of public comments, including number of “likes” on a particular comment, from the interactive public input map (Social Pinpoint), emails, or Facebook comments.
Begin Mile Marker	The start of the spot or corridor improvement location.
End Mile Marker	The end of the spot or corridor improvement location.
Count / Type	The crash count from the CDOT accident data base and breakdown

Column Name	Column Description
	into the following crash categories: property damage, injury, fatal.
Severe / Total Level of Service of Safety	The LOSS is based on the CDOT accident database and relevant roadway characteristics which yield an expected accident rate, reported for both severe crashes and total number of crashes.
Environmental Resources	Identifies whether the following resources may be anticipated at the location of the proposed improvement based on our initial project area survey: waters of the US, parks and recreation trails, Preble's meadow jumping mouse (PMJM) habitat, high wildlife vehicle collisions (WVC), and cultural resources (historic, archeological and/or paleontological).
Level One Screening	The Level One Screening is a ranking system used to prioritize the list of improvements based on Safety, Operations, Public Attention, Ability to Implement, and Environmental Permitting Mitigation.
Level Two Screening	The Level Two Screening is a ranking system used to prioritize the list of improvements based on Agency Priorities, Maintenance, Public Input, Cost and Land Use.

Level One Screening Criteria

Criteria developed for the Level One Screening were given points to weigh their importance. The Level One Screening was scored using points shown in **Table 3** and applied to each row in the mitigation table.

Table 3 Level One Screening Criteria and Scoring

Safety: Derived from the "Severe / Total LOSS" column in the mitigation table.	
Measurement	Points
LOSS I - indicates low potential for crash reduction	5
LOSS II - indicates low to moderate potential for crash reduction	10
LOSS III - indicates moderate to high potential for crash reduction	20
LOSS IV - indicates high potential for crash reduction	50
Operations: Derived from the "Worst 2020 Approach LOS (AM/PM)" column in the mitigation table.	
Measurement	Points
LOS A - indicates no congestion	0
LOS B - indicates minimal congestion	5
LOS C - indicates some congestion	10
LOS D - indicates congestion with delay	20
LOS E - indicates congestion and delay	40
LOS F - indicates roadway or intersection is over capacity	60
Public Attention: Derived from the "Number of Public Comments" column in the mitigation table.	
Measurement	Points
No – no public comments received	1
Yes - public comments received	5
Ability to Implement: Derived from engineering judgement by the project team on whether the package can be combined with other packages, if it would be a standalone package, or not a package at all but noted.	
Measurement	Points
Not a package - a study or idea that will not be a package	1
Standalone package - a project that does not benefit by being combined	25
Combine into one package - a package that could	35

potentially include at least one other line item improvement	
Environmental Permitting Mitigation: Based on existing environmental resources located in the project area and the anticipated permitting required for the package.	
Measurement	Points
Categorical Exclusion (substantial permitting) or Environmental Assessment	1
Categorical Exclusion (non-substantial permitting)	5
Categorical Exclusion (internal – no permitting)	10

Level Two Screening Criteria

The Level Two Screening criteria were also given points as shown in **Table 4** and applied to each row or improvement identified in the mitigation table.

Table 4 Level Two Screening Criteria and Scoring

Agency Priorities Ranking: Agency ranking column was given a high, medium and low ranking based on engineering judgment and the following criteria.	
Measurement	Points
Low – Improvements that had less agency support, were too costly, or did not have all criteria filled out in Level One Screening.	1
Medium – Less impactful preventative measures, for example improvements include passing lanes, shoulders, access control, clear zone and wildlife.	5
High – Preventative measures, for example, improvements include turn lanes, signals, or other improvements recommended in the safety assessment.	10
Maintenance Ranking: Based on potential of improvement to resolve existing maintenance issue(s) on the corridor. These criteria could be subjective.	
Measurement	Points
No – These were locations that did not have apparent maintenance improvements.	1
Yes – This could improve maintenance concerns such as potholes, erosion, run-off-the road crashes, and guardrail hazards.	5
Public Input Ranking: Derived from the "Number of Public Comments" column in the mitigation table.	
Measurement	Points
None – no comments received	0
1-9 comments received	1
10-19 comments received	10
20 or more comments	20
Cost Ranking: A high-level cost estimate was applied to each location based on the type of improvement.	
Measurement	Points
Over $1,000,000	1
$250,000 to $1,000,000	10

Under $250,000	35
Land Use Impacts Ranking: This is related to scale of construction and environmental permitting needs.	
Measurement	Points
Yes – Improvements require capital construction or commercial development; therefore, substantial environmental permitting is also anticipated.	1
No – Improvements are minor and no environmental permitting or non-substantial environmental permitting is anticipated.	10

SCREENING RESULTS

Level One Screening Results

Following the collection of the existing information and application of the Level One Screening, each row or improvement received a cumulative score. The mitigation table was sorted from highest to lowest score, looking for a natural breaking point or cutoff. The following were possible outcomes.

Early Packages

Some improvement types were identified as "low hanging fruit" that could be implemented relatively quickly – these were identified as early packages shown **Table 5**. The design team is working with CDOT to advance these modifications in 2022.

Table 5 Early Packages

Location (MP)	ID	Project Name	Improvements	Cost*
30.50 to 53.88	Early 1	Corridor Signing Improvements	Signing improvements	$600,000
50.76 to 52.60	Early 2	Signal Timing Modifications	Improve signal timing at existing signals	$50,000
43.08 to 45.90	Early 3	Corridor Striping Modifications	Striping updates	$15,000

*Cost includes Final Design and Construction/Implementation, if needed

Project in Progress

Several recommendations were identified as already being addressed in other concurrent projects. These were eliminated from further screening evaluation.

Projects for Future

Several recommendations were identified as recommending further analysis or that will be captured as part of future efforts. Locations with recommendations that were beyond the scope of this analysis, was compiled for the Region to consider in the future. For example, due to the high volume of traffic at the SH 83 and SH 86 intersection a separate study is being prepared by CDOT to analyze options to improve capacity and safety. Other projects that fit this definition include those that will be done as part of development type projects and monitored by either CDOT and/or Douglas County.

Wildlife mitigation measures were evaluated as a part of the screening process and eliminated in Level One due to the high cost associated with providing the improvements. As the recommended packages proceed into design, CDOT will continue coordination to add wildlife crossing features into projects as applicable. Included is a full list of recommended wildlife crossing mitigation measures.

Recommendations Move to Level Two

The remaining rows with larger totals were recommended to move to Level Two Screening for further consideration. To ensure that any anomalies were not indiscriminately eliminated, each row was reviewed using engineering judgement by the project team and adjusted, as necessary.

Level Two Screening Results

The criteria were applied to each row or improvement, similar to the Level One process. The Level Two Screening scores were also sorted from highest to lowest and reviewed by the project team. This criteria was somewhat subjective and the team applied engineering judgement to each improvement to ensure that the ranking system met the project goals and objectives.

For example, engineering judgement was used to remove the Bayou Gulch NB Turn Lane Modifications package. While this scored well, implementation of this proposal would have resulted in the removal of a dedicated right-turn lane, removal of a pedestrian refuge island and subsequently may have caused other types of operational and safety issues. It also may not have resolved the congestion issue due to the possible internal school circulation issues that contribute to the congestion in this area.

RECOMMENDED PACKAGES

Following the review of Level One and Level Two Screening scores, a combined total score was calculated. The combined total score for rows or improvements were utilized to develop a list of packages for the SH 83 corridor.

The packages list, shown in **Table 6** was developed using the combined total score, location of improvement on the corridor and engineering judgment. **Appendix H** is a summary of the packages that highlight safety, operational, and environmental considerations. Below is a brief narrative of each recommended project package.

Package A – Corridor Wide Centerline Rumble Strip Improvements

Due to the high safety benefit a corridor wide rumble strip package was recommended. Package A includes adding a centerline rumble strip for the entire corridor to prevent head on crashes and vehicles crossing the centerline.

Package B – Bayou Gulch Southbound Left Turn Lane Modifications

Feedback from Douglas County Schools reported that southbound left-turning traffic backs up into through traffic during school ingress and egress times. To address this concern, Package B recommends extending the southbound left turn lane north of Bayou Gulch Road 300 feet. To maximize the safety and operational benefits, this package is not recommended to be implemented until internal school circulation issues are addressed at Ponderosa High School.

Package C – Hidden Mesa Improvements

Local residents noted difficulty entering and exiting the entrance at Hidden Mesa Drive. Package C recommends the addition of left and right turn lanes, acceleration and deceleration lanes, wider shoulders and rumble strips. The Hidden Mesa Drive entrance is on the west side of SH 83 and is approximately the same limits as package D. As funding allows, this package could be optimized by combining with adjacent improvements.

Package D – Lost Lake Drive Improvements

Located in the same stretch along SH 83 as Package C, the Lost Lake Drive access also experiences similar issues with finding gaps in the traffic stream to enter and exist Lost Lake Drive. Package D recommends adding left and right turn lanes, acceleration and deceleration lanes, widening shoulders and adding rumble strips for the Lost Lake Drive intersection. As funding allows, this package could be optimized by combining with adjacent improvements.

Package E – North Shoulder Improvements

The highest-ranking rows or improvements in the mitigation table occur between mileposts (MP) 50.50 and 53.88. Many of the concerns could be addressed by widening shoulders and adding rumble strips. After reviewing the existing conditions and optimizing the safety benefit, Package E was added to the recommended packages list between MP 51.50 to MP 53.50.

While the entire corridor would benefit from wider shoulders, this improvement was determined to be too costly for this project. Therefore, this improvement was limited to a smaller section as shown in Package E. If separate funding became available, the rest of the corridor could benefit from a corridor wide shoulder improvement project.

Package F – North Rumble Strip Improvements

Package F adds a centerline rumble strip to a focused area in the north section of SH 83 between MP 50.75 and MP 53.88 to prevent head on crashes and vehicles crossing the centerline. This improvement type scored well and is relatively inexpensive and

therefore could be implemented corridor wide (with Package A), in an identified targeted area or combined with other packages.

Package G – South Franktown Improvements

The top two highest ranking spot improvements are to extend the northbound left-turn lane at S. Kelty Road and to extend the southbound left-turn lane at Franktown Elementary School. Package G will combine improvements to address both the identified concerns, including adding a two-way left turn lane, acceleration and deceleration lanes, widening shoulders, and centerline and shoulder rumble strips. These improvements should be coordinated with planned development in the area and may also help address a northbound crash pattern. To maximize the safety benefits of Package G, additional coordination should be completed with Franktown Elementary School to recommend improvements to the internal school drop off and pickup circulation.

Package H – Shoulder Improvements

While wider shoulders would be an added safety benefit for the entire SH 83 corridor, Package H focuses on widening shoulders in one area that has a high number of run-off-road crashes between MP 45.31 and MP 50.75. The horizontal geometry in this section is challenging due to the existing reverse curves and steep existing embankments.

Package I – Prairie Canyon Ranch Improvements

Public feedback reported concerns about left turning vehicles queueing in the through lanes, particularly at the access to Prairie Canyon Ranch. Package I focuses on improving access to and from Prairie Canyon Ranch with the addition of turn lanes.

Package J – Gillian Road Improvements

The next ranking intersection improvement is at Gillian Road. Given the proximity to Cherry Valley Elementary School and recommended improvements for that location, the design team recommended combining all improvements into one package. The recommendations include adding left and right turn lanes, acceleration and deceleration lanes, widening shoulders, and centerline and shoulder rumble strips.

Package K – Passing Lane Improvements

The segment of SH 83 between MP 35.00 and MP 36.00 has limited shoulder widths with several crashes involving passing maneuvers. Public feedback included concerns regarding illegal passing in this area. Package K adds passing lanes in each direction on SH 83, shoulder and centerline rumble strips and improved shoulder width. These measures are intended to curve the frequency of crashes and prevent head on crashes and illegal passing.

Package L – South Shoulder Improvements

Package L focuses on improving shoulder widths and adding rumble strips on both sides of SH 83 between MP 32.15 and MP 32.61 to prevent run-off-road crashes.

Centerline rumble strips are also proposed to prevent head on crashes and centerline crossing.

Package M – Lorraine Road Improvements

This process was followed to determine the rest of the packages. **Table 6** is a summary of all package recommendations and conceptual cost estimates (design + construction) for consideration.

Table 6 Summary of Recommended Packages

Location (MP)	ID	Project Name	Improvements	Cost*
30.50-53.50	A	Centerline Rumble Strips	Centerline Rumble Strips	$1,500,000
53.86	B	Bayou Gulch SB Turn Lane Modifications	SB Left Turn Lane Extension	$540,000
52.07	C	Hidden Mesa Improvements	Accel/Decel/Turn Lanes, Shoulders, & Rumble Strips	$1,980,000
51.95	D	Lost Lake Drive Improvements	Accel/Decel/Turn Lanes, Shoulders, & Rumble Strips	$1,750,000
51.50-53.50	E	North Shoulder Improvements	Shoulders & Rumble Strips	$4,980,000
50.75-53.88	F	North Rumble Strip Improvements	Rumble Strips	$195,000
50.25-50.68	G	South Franktown Improvements	TWLTL/Accel/Decel Lanes, Shoulders & Rumble Strips	$4,130,000
45.31-50.75	H	Shoulder Improvements	Shoulders & Rumble Strips	$12,840,000
43.80	I	Prairie Canyon Ranch Improvements	Turn Lanes	$1,850,000
37.82-38.08	J	Gillian Road Improvements	Accel/Decel/Turn Lanes, Shoulders, & Rumble Strips	$5,840,000
35.00-36.00	K	Passing Lane Improvements	Passing Lane & Shoulders	$9,500,000
32.15-	L	South Shoulder	Shoulders & Rumble Strips	$1,750,000

Location (MP)	ID	Project Name	Improvements	Cost*
32.61		Improvements		
31.90	M	Lorraine Road Improvements	Accel/Decel/Turn Lanes, Shoulders, & Rumble Strips	$4,340,000

*Cost includes Final Design and Construction/Implementation and use 2022 dollars; inflation and market volatility should be considered for planning purposes

APPENDICES

Appendix A – Safety Assessment Report

Appendix B – Detailed Crash Summary Sheets

Appendix C – Operational Analysis

Appendix D – Turning Movement Counts

Appendix E – HCS Analysis and Synchro Evaluation Results

Appendix F – Environmental Report

Appendix G – Mitigation Table

Appendix H – Package Summary Sheets

Appendix I – Wildlife Movement Technical Memorandum

Appendix J – Access Management Plan