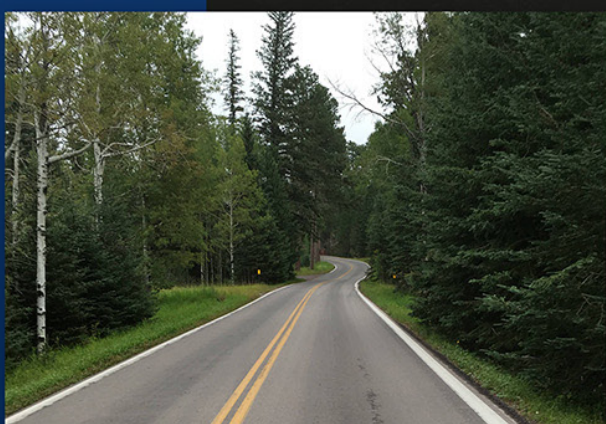
BLACK HILLS

CONTEXT SENSITIVE CORRIDORS STUDY

PHASE 1 & 2 REPORT



Black Hills CONTEXT SENSITIVE CORRIDORS STUDY

PHASE 1 AND 2 REPORT

Prepared for:

South Dakota Department of Transportation
700 E Broadway Ave
Becker Hansen Bldg
Pierre, SD 57501-2586

Prepared by:

Felsburg Holt & Ullevig
6300 S Syracuse Way, Suite 600
Centennial, CO 80111
303.721.1440

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I. INTRODUCTION

Topography in the Black Hills region is substantially different from other areas in the state. Within the Black Hills terrain is more severe than the rolling to flat terrain observed in eastern parts of the state. Additionally, functions many state routes support in the Black Hills region are substantially different than provided in other regions. While central and eastern state routes principally support the functions of moving people and goods between communities and between South Dakota and other areas of the country, select state routes identified in this study emphasize the drive/ride experience provided by the road. These routes have been identified as context sensitive corridors and reflect the following unique characteristics relative to other state routes:

- Scenic vistas and protected areas immediately adjacent to the route
- Geologic features such as tunnels and/or rock outcroppings along the route
- Multiple consecutive combinations of horizontal and/or vertical curves that make motorcycle, bicycle and auto drives interesting for travelers
- Narrow (less than 12 foot with minimal or no shoulders) travel lanes that reduce the road cross section and the level of impact to the surrounding geologic features, streams, and/or natural areas

Many of the context sensitive routes provide access to or traverse recreation areas such as Custer State Park, Mount Rushmore National Memorial, or Spearfish Canyon. These routes also host and support major events such as the annual Sturgis Motorcycle Rally. These popular sites and events also attract bicyclist and, in select cases, pedestrian travel that must share the road with motor vehicles including motorcycles, automobiles, recreational vehicles, vehicles towing trailers, tour buses as well as commercial vehicles. Associated with improving access to activity areas and accommodating mixed modes are requests for:

- Widening paved surfaces to provide more comfortable separation between motorized and non-motorized users
- Adding or expanding pullouts for parking
- Expanding cross sections to include passing zones or climbing lanes to reduce platooning behind slower vehicles
- Rural pedestrian crossing between parking and recreation areas

Accommodating many of these requests through improvements reflective of applying the SDDOT Design Guideline for mountainous conditions would result in widening the cross section or expanding a curve, which may result in the following:

- Substantial impacts to adjacent terrain, geologic features and/or streams.
- Elevated construction and/or ROW costs associated with removing rock faces.
- Perceived negative impact to the corridor user experience associated with flattening/expanding curve radii.

Each of these impacts is perceived as a challenge that needs to be addressed in balancing the context sensitive conditions with the need to provide a facility that accommodates the mix of users and activities. Addressing these challenges is the focus of the Context Sensitive Corridors study, which has a goal of identifying appropriate improvements, if there are any, that address needs within the corridors while retaining the connection and integration of routes to the surrounding environment.

Timing of the study and selection of corridors to include is driven in part by SDDOT's pavement management system recommended timing for major pavement work along selected routes. It is SDDOT practice to conduct a study of design and operational needs and to identify potential improvements five to eight years before action is needed based on roadway condition. It is thereby prudent to investigate what, if anything, can be done to upgrade these routes to get them closer to current design guidelines while complementing the context.

1.1 Study Area

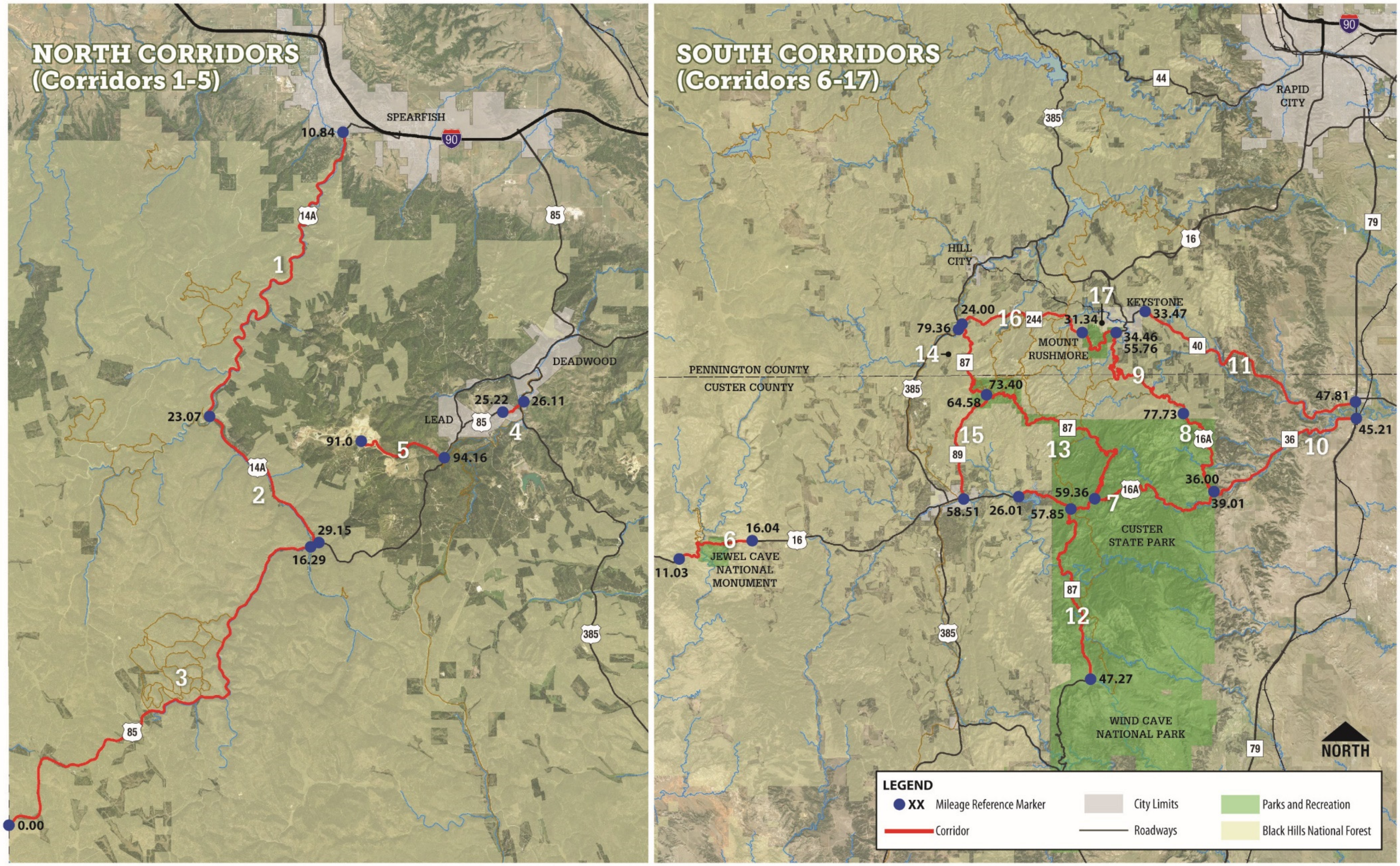
Context sensitive corridors included in the study are made up of a north and south group of routes in Custer (south area), Pennington (south area) and Lawrence (north area) Counties. Across the two geographic areas the SDDOT identified 17 state routes to be evaluated as part of the context sensitive corridors study. **Table 1** documents routes included and provides a description of each corridor starting and ending point. North and South area study corridors are displayed on **Figure 1**.

Except for portions of Corridor 4 (traveling between Lead and Deadwood) and Corridor 17 (Connecting Keystone to Mount Rushmore National Memorial, routes are two-lanes in rural areas. At higher activity venues (Mount Rushmore National Memorial) turn lanes and traffic signals have been added, but most intersections along the routes are stop controlled single lane approaches. Additional information on route geometrics and intersection control is included in **Section 3**.

Table 1. Context Sensitive Corridors

Corr #	Route	Beginning Point	Ending Point
North Corridors			
1	US 14A	South of Spearfish	Savoy
2	US 14A	Savoy	Cheyenne Crossing
3	US 85	Wyoming Border	Cheyenne Crossing
4	US 85	Lead	Deadwood
5	SD 473 (Terry Peak Road)	US 85	Terry Peak Ski Area
South Corridors			
6	US 16	West of Jewel Cave Monument	East of Jewel Cave Monument
7	US 16A	East of Custer	East End Custer State Park
8	US 16A	US 36	North Entrance Custer State Park
9	US 16A (Iron Mountain Road)	North Entrance Custer State Park	Keystone
10	SD 36	East Entrance Custer State Park	Hermosa
11	SD 40	Keystone	Hermosa
12	SD 87	US 16A	Highland Ridge Road
13	SD 87	Sylvan Lake Picnic Area	US 16A
14	SD 87 (Needles Highway)	US 385	Sylvan Lake Lodge
15	SD 89	Needles Highway	Custer
16	SD 244	US 385	Mount Rushmore National Memorial
17	SD 244	Mount Rushmore National Memorial	US 16A (Iron Mountain Road)

Figure 1. Study Corridors



1.2 Study Process

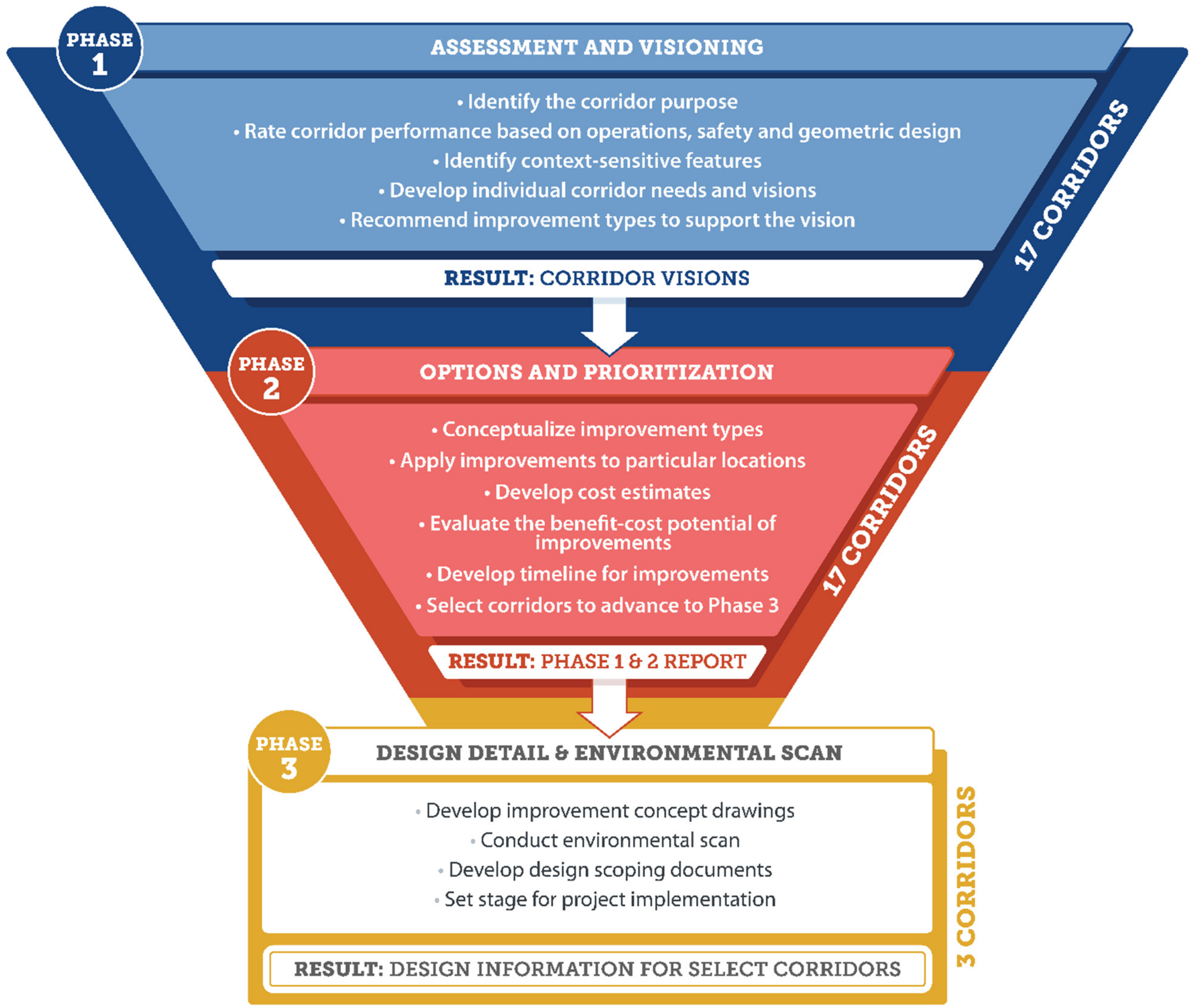
The study has been organized into a three phase overall program; each phase is outlined below and depicted graphically on **Figure 2**:

Phase 1: Analyze the existing and future no-build conditions and determine the future vision for all of the study corridors. Discover unique characteristics, physical design, safety and traffic conditions for each corridor; identify deficiencies and needs to be addressed through the planning process; define a range of project types for each corridor.

Phase 2: Determine the high-level feasible solutions needed to implement the future vision and develop a prioritized list of projects to begin implementing the preferred solutions. Investigate and prepare individual corridor improvement programs consistent with the context of the specific corridor.

Phase 3: Determine the details of the feasible solutions necessary to develop the scope document for up to three corridors identified in Phase 2. Select a group of three corridors to advance for more detailed design and environmental scan work.

Figure 2. Study Phases



1.3 Study Oversight

Central to creating the context sensitive plan was discussion and information sharing with state/federal agency, county, and appropriate local jurisdictions throughout plan development. Prior to initiating the work, the SDDOT identified and invited representatives from the following agencies to participate on the Study Advisory Team (SAT):

- United States Forest Service (USFS), including representatives from each of the Ranger Districts in the region. Districts invited to participate include Hell Canyon, Northern Hills, Mystic, and Black Hills National Forest
- United States National Park Service (USNPS) representatives from Jewel Cave and Mount Rushmore properties
- South Dakota Game, Fish and Parks representatives from Custer State Park
- Spearfish Canyon Association
- Federal Highway Administration

SDDOT representatives from the following divisions participated in the SAT:

- Administration
- Bridge Design
- Custer Area Office
- Project Development
- Rapid City Area Office
- Rapid City Region Office
- Road Design
- Transportation Inventory Management

The SAT's role was to oversee the major project milestones, provide technical input, and to monitor the progress of the planning process.

1.4 Report Content

The remainder of the Phase I and 2 report provides:

- Section 2 - An overview of the context sensitive corridors assessment process, including information needed to characterize corridor functions and needs, improvement concepts, identifying recommendations, and preparation of an implementation plan.
- Section 3 - Detail of the individual corridor purposes/functions and physical and traffic conditions.
- Section 4 - Potential corridor improvement concepts that address identified needs/deficiencies within the definition of supporting a context sensitive approach to evaluating each corridor.
- Section 5 - Selection process and results for corridors to advance to Phase 3.

The report text is supported by detailed information in the Appendices, listed as below. In particular, Appendices A-C provide important graphical reference information in support of the report body.

Appendix A. Corridor Characteristics

Appendix B. Improvements to Support Vision

Appendix C. Corridor Improvement Packages

Appendix D. Corridor Ratings Support Information

Appendix E. Corridor Cost Estimates

Appendix F. Benefit-Cost Ratio Calculations

2. CONTEXT-SENSITIVE PROCESS

Context Sensitive Solutions (CSS) principles were utilized as a framework for developing the study. As applied in numerous transportation infrastructure projects, Context Sensitive Solutions provides a method for planning, designing and constructing improvements to infrastructure that are consistent with the purpose and role fulfilled by a corridor.

Context Sensitive Solutions (CSS) operates with the following Core Principles (fhwa.dot/gov/planning/css):

- Strive towards a shared stakeholder vision to provide a basis for decisions
- Demonstrate a comprehensive understanding of contexts
- Foster continuing communication and collaboration to achieve consensus
- Exercise flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments

While the study represents a less formal implementation of CSS, these principles have guided the project team toward successful completion of Phases 1 and 2. Described as follows, stakeholder and public collaboration has supported the technical work and a series of steps were followed to reach outcomes in line with CSS principles.

2.1 Stakeholder and Public Collaboration

In addition to ongoing guidance from the SAT, efforts were made to obtain feedback from other interested groups. A broad list of potential stakeholders were contacted and meetings occurred with numerous representatives. In Phase 1, stakeholder input was received through the following efforts:

- Small group meetings with adjacent landowners/stakeholders with interest in individual or a range of corridors.
- Municipal representative meetings in which current issues and future development traffic impacts on the corridors were discussed. Entities included the Cities of Custer, Hermosa, Spearfish, Lead and Deadwood.
- Meetings with the Black Hills Council of Governments and Chambers of Commerce associated with the Cities of Spearfish, Lead and Deadwood were consulted, along with the School District encompassing the Lead and Deadwood area.
- Individual agency meetings with staff responsible for specific properties along one or more of the corridors including Custer State Park.

General public meetings in support of Phases 1 and 2 were held in both the north and south regions of the study area in August of 2018. Each of the meetings were broadcast live via YouTube. Participants had opportunity to provide comments on issues they experience within one or more corridors and their perception of corridor desired functions. In-person and people participating remotely (live or delayed through watching the recorded meeting) were provided with the opportunity to send comments and/or questions via email.

A website was established to provide current information and serve as a tool for public feedback throughout Phases 1 and 2 of the study.

2.2 Context Sensitive Analysis Steps

The context sensitive analysis approach employed across the study area corridors is displayed on **Figure 3** and outlined in the steps below:

Step 1: **Identify Corridor Purpose and Function** – From the inception of the study, the project team worked with SDDOT staff, stakeholders from the range of agencies directly affected by decisions in the corridors and public stakeholders to understand the transportation roles (functions) each corridor supports. By establishing this foundational understanding, the study has proceeded in a direction consistent with expectations of users and owners. Additionally, through reaching out to the range of constituents with the question of "what are the functions desired to be served by each route" and an understanding of potential conflicts between or within groups was established early. This early understanding allowed the team to efficiently resolve critical conflicts between corridors without expending resources going down a path not supported by critical stakeholders. Definition of the range of functions and/or purposes to be served are provided in sections to follow.

Step 2: Gather and Analyze Corridor Information – The purpose of this step is two-fold. First is to have consistent information to use in comparing activity in the corridors relative to the desired functions and purposes defined in Step 1. As there is potential for various perspectives regarding the purpose role served of each corridor, providing a data-driven review to confirm assumptions is critical to building support for decisions made later in the overall process. Second, while the SDDOT understands physical improvement to these corridors may need to be addressed differently than others in the state system, decisions on when action is needed will be based on traditional data analysis of elements such as pavement condition or crashes. Thus, a robust dataset of current and anticipated future conditions is critical to establishing action timing.

The project team also established a basic understanding of each corridor beyond the quantifiable data. Corridor "ride-alongs" with agency staff were conducted to extract meaningful information regarding performance, critical operations and maintenance needs and future improvement options.

Step 3: Identify Improvement Needs – Needs are defined in the corridors as conditions wherein:

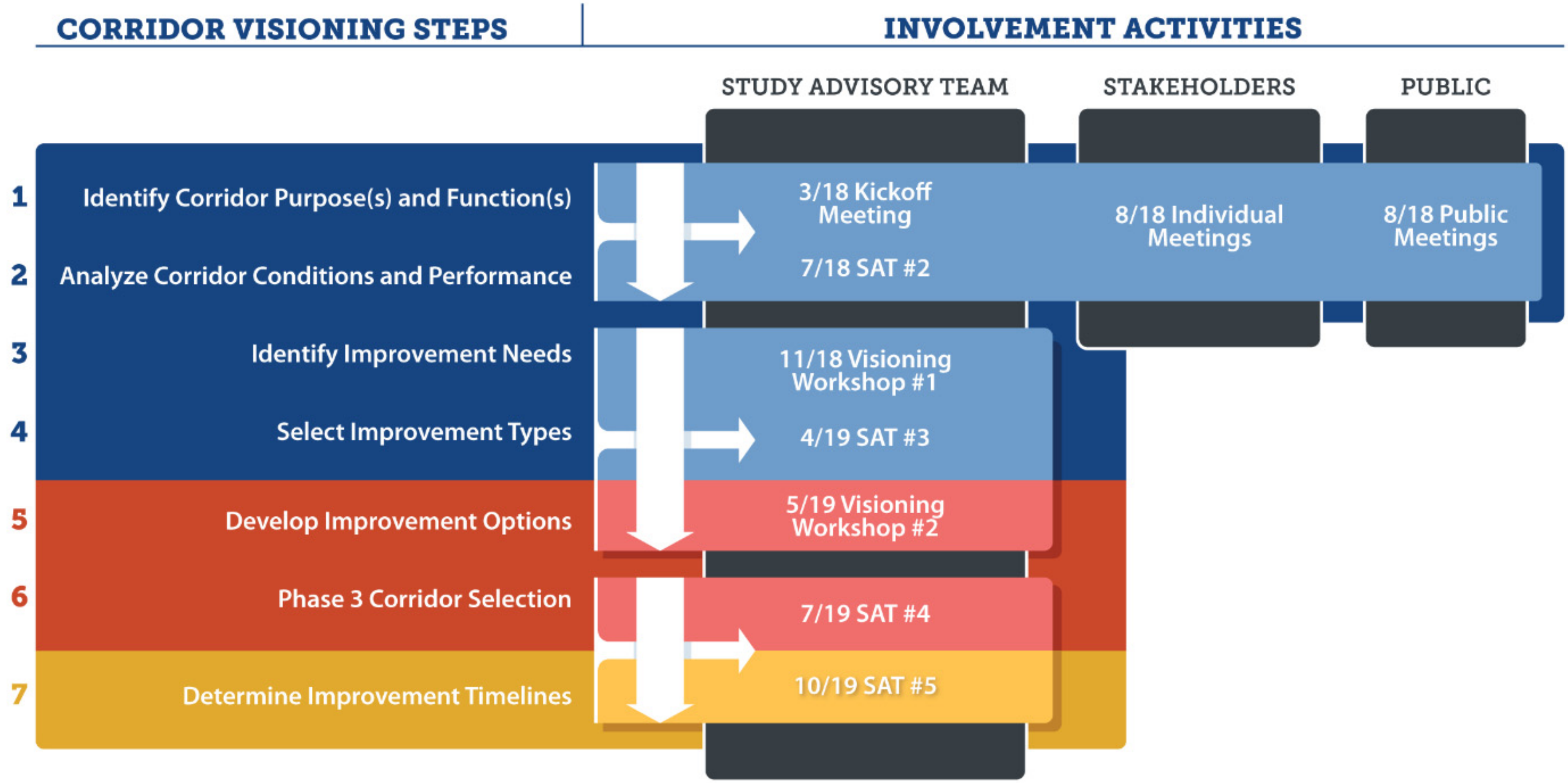
- Historic crash experience exceeds the expected level for observed conditions and a design solution shows potential to result in fewer crashes
- Current road design conditions do not meet accepted design criteria
- Critical infrastructure conditions are causing need for urgent action
- Traffic operations (Level of Service) are below acceptable thresholds based upon the current or future traffic volumes, cross section and traffic control
- Roadway design conditions observed by users contributed to unreported crashes or near-misses and/or are anticipated to be linked to ongoing safety concerns

Across the corridors, thresholds defined when action varied based on corridor function or purpose.

Step 4: Establish Improvement Types – An initial range of potential improvements within the corridors were developed to reflect needs defined across the range of corridors and sensitivity to the adjacent environment and key functions for each corridor. Improvement types were classified in one of the following categories:

- Design – Improvements to assist the corridor in achieving design standards given contextual boundaries
- Multimodal Operations – capacity improvements to address traffic congestion and/or non-motorized travel
- Safety – Safety mitigation motivated by the ability to reduce crashes
- ITS – Intelligent Transportation Systems deployments to reduce congestion, provide enhanced warning to drivers regarding conditions ahead, or to reduce crashes
- Aesthetics – Actions to complement existing features and increase visual appeal

Figure 3. Corridor Visioning Actions



Step 5: Develop Improvement Options for Each Corridor – While each corridor is categorized as a context sensitive corridor, the specific characteristics, constraints to changes and need for action is drastically different across the corridors. Some corridors carry relatively low traffic volume at lower speeds and serve a primary function of providing an interesting ride/drive for users. Within a corridor with these characteristics, the extent of changes from the current conditions would be limited to addressing segments experiencing higher crash rates and higher crash severity. Segments with narrower lanes or minimal shoulders not experiencing safety issues, would be allowed to remain as they are even if the design is inconsistent with the current design guidelines. Other corridors serve a commercial or commuter function where throughput is a higher priority than in corridors where the trip is the more important function. For commercial/commuter purpose corridors, improvements that bring a corridor more into compliance with design guidelines would be suggested and reviewed. Cost estimates were prepared for the recommended capital improvements to each corridor, and estimated safety benefits of these improvements were used to develop Benefit-Cost calculations.

Step 6: Phase 3 Corridor Selection – Through this step, two critical decisions were addressed. First, the range of options for addressing the unique needs in each corridor were screened to identify recommendations reflecting corridor goals and had costs in line with the level of operational or safety improvement impact. Second, identify three of the corridors to be advanced to Phase 3 where more detailed conceptual design of recommended improvements was completed and more detailed cost estimates would be prepared.

Step 7: Determine Improvement Timelines – Through this step, improvement timelines were developed for each corridor with higher Benefit-Cost improvements assigned an earlier priority. The improvement timelines provide starting point for implementing projects. Projects may be implemented as standalone efforts or combined with other needs to maximize project utility. For example, many of the routes have been identified in the SDDOT pavement management system for surface rehabilitation over the next eight years. Information regarding upcoming pavement need may be integrated with the needs assessment completed through Steps 1 through 6 to influence the timeline for recommended improvements.

2.3 Visioning Workshops

The collaborative corridor visioning process unfolded during two visioning workshops held during Phases 1 and 2. These workshops helped to facilitate proper identification of corridor purposes, needs and improvement types and led to the development of shared visions. Attendees consisted of the SAT members. At each meeting all 17 corridors were reviewed in detail to validate data-driven findings and ensure that the improvement types identified for each corridor can be implemented in context sensitive fashion. Each meeting resulted in adjustments to the improvements envisioned, and the end result presented in this report represents the shared vision arrived at through collaborative effort.

3. PURPOSE, PERFORMANCE AND NEEDS

A numeric rating system was developed to display key corridor conditions including:

Purpose – The corridors are assigned ratings based on their tendency to serve as Destination, Destination Access or Commuter/Commercial roadways. The rating system allows for recognition of multiple purposes served within the same corridor.

User Mix – Corridors were reviewed relative to the user type/vehicle mix observed in the corridor compared to the other 16 corridors in the study. The numeric rating allocated to a corridor reflected the deviation from the 17 corridor average for the particular user/vehicle type. Corridors with vehicle/user percentages higher than the average for the study corridors were assigned higher scores. Users include motorized and non-motorized.

Context – The nature and intensity of unique features "beyond the pavement" along the corridor are rated. The greater the number and/or quality of the features, the higher the score.

Traffic & Safety – Traffic conditions are rated based on Level of Service findings for current and projected Year 2050 traffic levels. Safety is rated based on relative magnitude of crash history compared with anticipated expected norms for roadways of similar type.

Road Design – Geometric features of the roadway are rated relative to conforming to established standards.

Each corridor was rated relative to the others. Ratings are described in more detail as follows and depicted on **Table 2. Appendix D** provides supporting information. Ratings are provided on a 1 to 5 scale, 1 generally indicating that the rated feature exerts high influence on the corridor and 5 indicating little or no influence.

3.1 Purpose

Each of the 17 corridors included in the study have been grouped as context sensitive corridors, however, within each common group there is a relatively broad range of functions supported by the routes. Understanding the function, or travel purposes, supported by a corridor is critical to defining needs and selecting appropriate improvements. A corridor for which the purpose is to provide access to one of the recreation venues may carry traffic levels similar to a corridor whose purpose is the experience of the drive through the corridor and reflect similar design characteristics, but the identified issues/needs between the routes could be different. Additionally, appropriate improvements for the corridors could also be different. Thus, an initial step in conducting the context sensitive corridors planning study was to define the purpose or purposes supported by each corridor.

To provide structure to defining the range of corridor purposes, an initial review of each corridor was conducted and from this step common themes were identified across corridors. The themes were used in the final characterization of each corridor to allow side-by-side comparison in subsequent steps of the overall review process. Themes of corridor purpose are:

Commuter/Commercial – The corridor provides connectivity between residential areas and employment areas or is intended to carry goods from one point in the region to another or through the region. Residential-to-work areas may be relatively close (within a community) or be separated by longer distances (from one community to another). Characteristics defining a commute/commercial corridor are:

- Vehicle throughput is of greater importance than providing access to adjacent property.
- Reducing travel time through the corridor is of high importance.
- Providing or maintaining a reliable travel time is of high importance.

- Providing lane widths and shoulders to better accommodate commercial vehicles is important.

Destination – The most basic definition of a destination corridor is the driver/passenger experience of the road is the reason for the trip. Curves, narrower lanes, slower speeds are not considered deficiencies, but rather are desirable characteristics of the adventure provided by the trip whether it is made by auto, motorcycle or bicycle.

Destination Access – Corridors supporting this purpose are hybrids in that they carry travelers between their accommodations location (hotel/campground/home) and the venue to be visited and they provide an effective level of adjacent access to key destinations. They are also routes that connect venues travelers may visit in a day trip. Thus, characteristics of these corridors are:

- Vehicle throughput and efficient access to/from adjacent property are more equally balanced.
- Reducing travel time through the corridor is of high importance.
- Providing or maintaining a reliable travel time is of high importance.

Each of the study corridors support a combination of the purposes identified above, which requires reviewing each corridor relative to the definitions and evaluating how closely a definition reflects the desired purpose. Across the purposes each corridor was reviewed and allocated a value from one to five reflecting how applicable the definition is to the desired purpose of the corridor. Value definitions are outlined below:

- 1 – Represents the primary function or purpose provided by the corridor.
- 3 – The particular purpose is supported by the corridor, however, it is a secondary purpose to another primary function.
- 5 – The purpose is a minor, or tertiary, function provided by the corridor.

Table 2 documents the results of the corridor purpose assessment across all 17 corridors. As stated previously, all corridors support some level of functionality across each defined purpose, which is reflected in the analysis results by including a numerical value for each potential purpose. A summary of the assessment is provided as follows:

- Serving commuters and commercial goods movement are the primary purposes supported by Corridors 3, 4, 6, and 11. Within the group:
  - Corridor 3 (US 85) – Supports goods and personal travel movement between Wyoming and I-90 near Sturgis.
  - Corridor 4 (US 85) – Is the most urban of the corridors connecting Deadwood and Lead.
  - Corridor 6 (US 16) is an intermediate segment of a long US 16 corridor connecting Wyoming to destinations in Custer.
  - Corridor 11 (SD 40) – Connects Keystone and Hermosa which share work forces-and is a commercial vehicle route from SD 79 serving both communities.
- Being a destination is the primary function of Corridors 1, 8, 9, 13, 14, 16 and 17. This finding is supported by many of these corridors having names attached that promote them as travel venues similar to other recreational venues in the region. Routes with marketed names include:
  - Spearfish Canyon State/National Forest Service Scenic Byway
    - Corridors 1 and 2 (both US 14)
  - Norbeck National Scenic Byway
    - Corridors 8 and 9 (US 16): Iron Mountain Road
    - Corridor 13 (SD 87): Needles Highway
    - Corridors 7 (US 16A, 14 (SD 87), 16 and 17 (both SD 244)

Table 2. Corridor Performance Summary

	STUDY CORRIDORS																
	north					south											
CATEGORIES	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
PURPOSE																	
Commuter/Commercial	5	5	1	1	3	1	3	5	5	3	1	5	5	5	5	5	5
Destination	1	3	5	5	5	5	3	1	1	5	5	3	1	1	3	1	1
Destination Access	3	1	3	3	1	3	1	3	3	1	3	1	3	3	1	1	1
USER MIX																	
Cars	5	5	5	5	2	4	4	5	5	3	1	5	5	3	5	3	4
Motorcycles	3	1	4	5	5	5	5	1	1	5	5	5	4	5	4	5	5
Heavy Vehicles	5	5	4	1	5	1	5	5	5	5	5	5	3	5	5	5	3
Bus/RV	5	5	5	5	3	NA	1	5	5	3	5	5	5	5	5	1	2
Ped	1	4	5	1	3	5	1	3	1	5	5	2	1	2	3	3	1
Bicycle	1	3	4	4	4	4	3	3	2	5	5	5	2	3	3	2	3
CONTEXT																	
unique geologic features	1	1	3	5	5	5	3	5	1	5	5	3	1	1	3	1	1
unique viewsheds	1	1	3	5	5	1	1	3	1	5	3	3	1	1	3	1	1
Recreational Resources	1	3	3	5	3	1	1	5	1	5	5	1	1	3	5	1	1
Private Development	3	3	5	5	1	5	5	5	5	1	1	5	5	3	3	5	5
User Enjoyment	1	1	3	5	5	1	1	1	1	5	5	1	1	1	3	1	1
TRAFFIC/SAFETY CONDITIONS																	**
Current LOS	4	5	2	3	5	5	4	4	5	5	5	5	4	5	5	4	1
2050 LOS	4	4	2	1	4	5	3	4	4	5	5	4	4	4	5	2	1
Speed	3	3	5	2	4	4	3	2	1	5	5	2	1	1	3	4	2
Crash History	2	2	1	2	1	3	3	1	1	1	3	1	1	2	1	4	3
Crash History w/o Sturgis Weeks	3	3	1	2	1	3	3	2	2	1	3	3	3	4	3	4	4
ROAD DESIGN																	
Shoulder Width*	5	1	1	1	1	2	2	1	1	5	4	1	1	2	1	4	4
Lane Width	4	3	3	5	4	5	5	1	1	5	5	4	2	3	4	5	5
Horizontal Curve Density	5	5	4	4	5	2	4	2	1	4	3	5	2	1	2	3	5
Clear Zone*	2	1	3	1	4	2	2	1	1	5	5	2	1	1	2	4	5
Sight Distance	4	4	5	5	4	4	2	1	1	5	4	2	1	1	2	2	5
Access Spacing	2	1	2	4	2	4	4	4	4	2	1	4	4	4	3	4	4
Grade	4	2	4	1	2	2	5	2	1	5	1	2	1	1	4	5	4

Purpose rating scale

Primary		Secondary		Tertiary
1	2	3	4	5

User Mix rating scale

High presence				Below avg presence
1	2	3	4	5

Context rating scale

High presence				Low/no presence
1	2	3	4	5

Traffic/Safety Conditions rating scale

More concerns				Few concerns
Low speed				Higher speed
1	2	3	4	5

**Corridor 17 LOS rated for two-lane portion:

Road Design rating scale

More deficiencies				Few deficiencies
1	2	3	4	5

* Note: Drainage issues as a result of minimal shoulders and clear zone are rated as "1."

- Providing access to key recreational venues (Destination Access) in the region is the primary function of Corridors 2, 5, 7, 10, 12, and 15. Corridors 16 and 17, also listed among the Destination corridors, are unique relative to the other 15 as they represent a shared primary responsibility as Destination and Destination Access corridors. Venues (destinations) accessed directly from these corridors are:
  - Corridor 2 (US 14A): Serves as a connector into Corridor 1, which contains Bridal Veil Falls, the Devil's Bathtub and numerous designated picnic areas
  - Corridor 5 (SD 475): Is the access road to Terry Peak Recreation Area
  - Corridor 7 (US 16A): Access to and through Custer State Park
  - Corridor 10 (SD 36): Access to Custer State Park
  - Corridor 12 (SD 87): Access to and through Custer State Park
  - Corridor 15 (SD 89): Connects Custer State Park to hotels and other venues in Custer. Additionally, it supports commuter travel for park employees living in/around Custer.
  - Corridor 16 (SD 244): Access to Mount Rushmore National Memorial
  - Corridor 17 (SD 244): Access to Mount Rushmore National Memorial

3.2 Performance

3.2.1 User Mix

The percentage of each roadway user type is rated relative to the other corridors. Motorized user types include cars, motorcycles, heavy vehicles, and bus/RV's (a subset of heavy vehicles). These user types were quantified using weekday and weekend traffic count information categorized by vehicle type. **Table 3** depicts average motorized traffic percentages for weekday and weekend conditions in the month of June 2018.

Table 3. Motorized Users and High Percentage Corridors

User	Study-wide Average Percentage		Observed higher-frequency corridors
	Weekday	Weekend	
Cars	87	86	5, 6, 7, 10, 11, 14, 16, 17
Motorcycles	7	9	1, 2, 8, 9, 13, 15
Heavy Vehicles	6	5	3, 4, 6, 13, 17
Bus/RV (as a percentage of Heavy Vehicles	1	1	5, 7, 10, 16, 17

As shown in **Table 3**:

- Average motorcycle and heavy vehicle traffic combined reaches 13-14 percent of the traffic stream, a notably higher percentage than would likely be observed throughout South Dakota.
- Corridor 13, Needles Highway, shows higher heavy vehicle percentages even as destination corridor.
- Motorcycles observed with greater frequency along destination routes including Needles Highway, Iron Mountain Road and Spearfish Canyon.
- Bus/RV presence is elevated on destination access corridors such as 16 and 17, which show fewer motorcycles as a percentage.

Nonmotorized traffic includes bicyclists and pedestrians, both of which are difficult to accurately capture using traditional traffic counting methods. Alternative sources of information used included qualitative assessments of pedestrian activity and recorded corridor bicycle rides on the Strava® application. It is generally expected that destination corridors would accommodate more pedestrians and bicyclists with fewer along commuter/commercial oriented corridors. Exceptions to this trend include:

- Corridors 16 and 17 accessing Mount Rushmore National Memorial serve higher nonmotorized traffic levels as people tend to park/exit their cars to view features and select individuals walk from Keystone to the Memorial.
- Corridor 4 is characterized as a commuter/commercial corridor, while residences front the roadway making nonmotorized travel more common.

Other notable findings include:

- Corridor 1 through Spearfish Canyon is a highly popular nonmotorized corridor.
- Other notable nonmotorized corridors include Corridors 7, 8, 9, 12, 13 and 14.

Bicycle traffic levels were recorded during daytime hours at locations along Corridors 1, 9 13, and 16 as part of study data collection efforts. Corridors 1 (54 weekday/ 16 weekend bicyclists) and 13 (28/2 weekday/weekend bicyclists) showed the greatest use levels. Very few bicyclists were recorded along Corridor 9.

3.2.2 Context

Acknowledging the importance of features outside of the paved surface and right-of-way, ratings were developed to characterize the presence and intensity of unique features along each corridor. Each corridor's context was rated in five categories, listed as follows:

Unique geologic features – Many of the study corridors wind through rocky territory, contributing to the unique user experience, and the roadway alignment and section has been adjusted.

Unique viewsheds – Numerous locations along study corridors provide opportunities to stop and look at natural and built surroundings.

Recreational resources – Resources include trail access, rock climbing spots, river access and recreational oriented businesses.

Private development – The level of private development varies widely among the corridors. Types of development include residences, formalized campgrounds and commercial businesses.

User enjoyment – This qualitative measure represents the appeal of the corridor as a destination worthy of traveling, if only for the experience. Corridors with an established identity were rated highly in this category.

Consistent with their purpose, the ratings depict higher contextual presence for Destination Corridors 1, 8, 9, 13, 14, 16 and 17.

Corridors 2 and 6 also contain higher contextual influences while these corridors serve destination access or commuter/commercial purposes, highlighting some potential challenges in providing the desired function while preserving context.

3.2.3 Traffic/Safety Conditions

Traffic operations and safety conditions were assessed to identify needs to enhance traffic flow or reduce crashes.

Current and Future Level of Service (LOS) – The operational performance of each corridor was evaluated based on its ability to provide acceptable weekday and weekend LOS along its length as a two-lane highway corridors and application of Highway Capacity Manual criteria. The project team developed Year 2025 and 2050 forecasts to include future LOS conditions in the evaluation.

Current and future forecasted traffic volumes along the study corridors lie within typical capacity of two lane highways. LOS was found to be acceptable for the majority of cases and locations analyzed. Current LOS not meeting SDDOT criteria were found along Corridors 3, 4, and 17. Corridors 7 and 16 join this list based on year 2050 forecasts. These corridors emphasize functions beyond destination roles, highlighting the importance of acceptable operational performance. Weekday and weekend LOS were found to be similar, varying by a single grade in some cases.

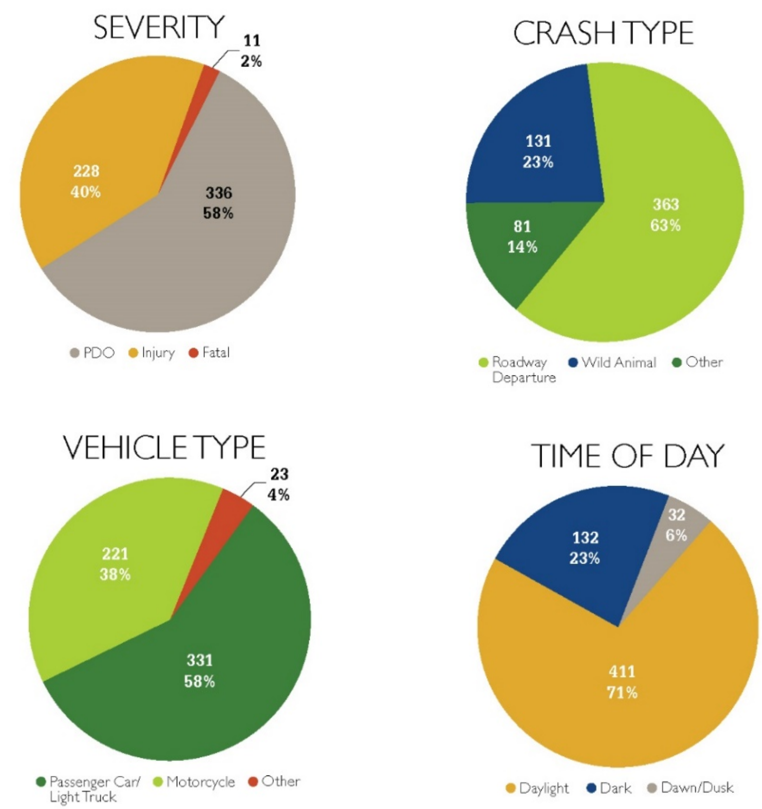
Traffic bottlenecks typically occur where roadways intersect, so 13 intersections along study corridors were evaluated. Intersection traffic operations are at LOS C or better for current and future conditions and all movements assessed with one exception. By 2025, the intersection of US Highway 385 with US 85 (Corridor 4) between Lead and Deadwood shows LOS D for the critical left turn movement.

Speed – Weekday travel time runs were completed for each corridor during tourist and non-tourist seasons in both directions to further evaluate operational performance. Corridor travel speed runs were completed by a test vehicle traveling at speeds resulting in roughly equal time passing and being passed by other vehicles. The average end-to-end travel speed observed across all 17 corridors 37 Miles Per Hour (mph), with the maximum recorded along Corridor 11 at 51 mph. Corridors 13 (Needles Highway) and 9 (Iron Mountain Road), experienced the slowest end-to-end average travel speed of 24 mph.

It was found that travel time/speeds do not vary notably between tourist (May) and non-tourist (June) seasons. In many cases the travel speed increased during June. Reduced speeds were generally noted at locations of roadway curvature, wildlife slowdowns or extended travel periods behind slower traffic. Higher travel speeds were observed along corridors 3, 10, and 11 – consistent with their primary/secondary purposes as commuter/commercial routes.

Crash History – A five-year history (2013-2017) of reported crashes along each corridor was extracted from data provided by the SDDOT. A total of 575 crashes were reported. Breakdowns of the overall data are provided on **Figure 4**. As shown, severe crashes comprise 42 percent of all crashes. Wild animal and roadway departure crashes comprise 77 percent. Motorcycles represent 13 percent of the traffic stream and are involved in 38 percent of the crashes. Crashes happen mostly during daylight hours.

Figure 4. Summary of Crash History



To identify locations with high potential for crash reduction, the data were further evaluated relative to similar types of roadways in Colorado to categorize safety concerns by Level of Service of Safety (LOSS). **Figure 5** and **Figure 6** depict safety performance plots for each corridor.

Figure 5. Corridor Safety Performance – Total Crashes

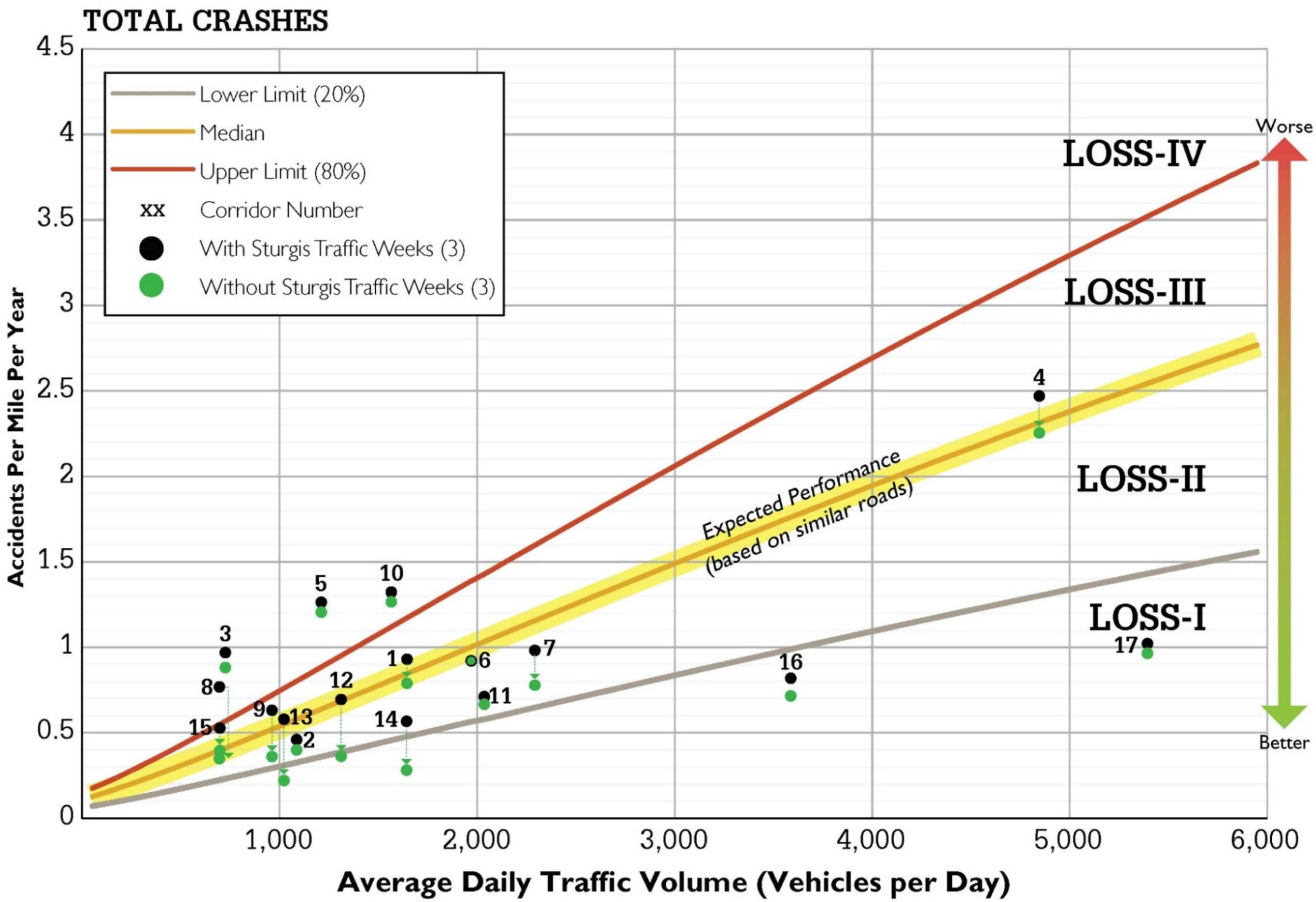
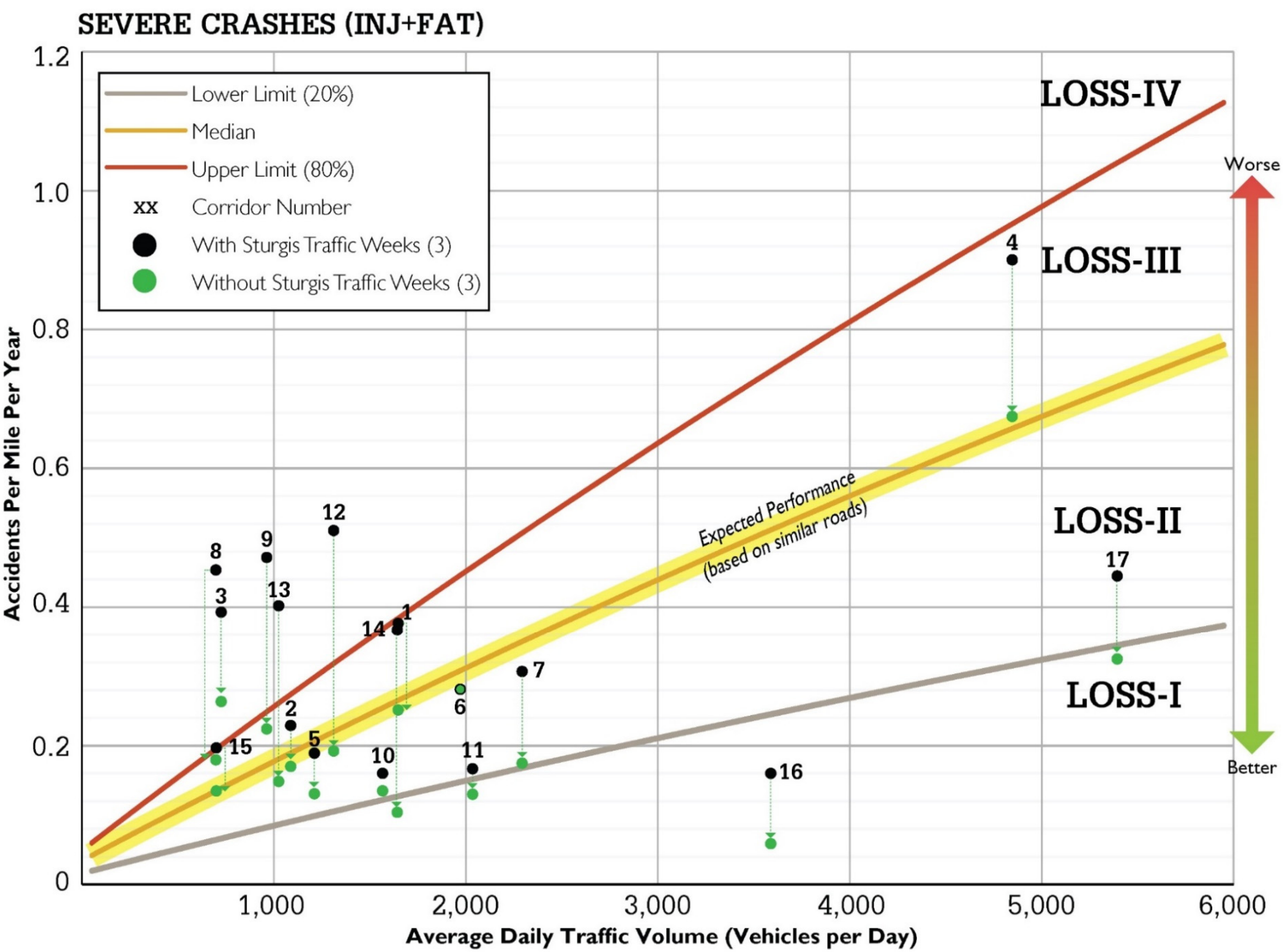


Figure 6. Corridor Safety Performance – Severe Crashes



As shown, the number of reported crashes per mile per year is plotted against traffic volume. The plotted points, when compared with the expected performance, yield a LOSS result for each corridor. Each LOSS Category provides an indicator of potential for crash reduction:

- LOSS IV – High potential for reduction
- LOSS III – Moderate to high potential for reduction
- LOSS II – Low to moderate potential for reduction
- LOSS I – Low potential for reduction

The LOSS analysis was performed for both total crashes and severe crashes only to reveal a range of potential safety improvement opportunities. In addition, the crash data were adjusted to remove the three-week time period in advance of, during and following the week of the annual Sturgis Motorcycle Rally to determine whether safety concerns persist.

Key findings include:

- A majority (12 of the 17) corridors show LOSS III or IV in at least one of the scenarios analyzed.
- LOSS IV conditions exist along Corridor 3 for all crashes and for severe crashes, indicating actions in Corridor 3 could yield the greatest potential for crash reduction.
- LOSS I/II conditions (low/low-moderate potential for crash reduction) exist along Corridors 6, 7, 11, 16, and 17.
- LOSS IV findings (including crashes reported during the Sturgis weeks) occur along Corridors 5, 8, 9, 10, 12, 13 and 15.
- The removal of Sturgis weeks from the data shows clear differences in LOSS – reducing the potential for crash reduction along Corridors 1, 2, 4, 8, 9, 11, 12, 13, 14, 15 and 17.

Though the LOSS analysis provides a helpful screening-level review for higher crash frequencies, crash patterns can emerge at particular locations along corridors that show LOSS II or LOSS I results.

To further define potential improvement sites, crash locations and types were reviewed to identify particular patterns of crash types tied to locations that could be associated with roadway features. Locations showing higher concentrations are depicted on the Corridor Characteristics graphics in Appendix A. Common patterns are noted in gray shading by corridor in **Table 4** along with severity levels.

Table 4. Noted Crash Types/Severity by Corridor

	Crash Type Patterns			Severity		
	Roadway Departure	Wildlife	Motorcycle	Fatal	INJ	PDO
1				1	22	34
2				1	6	7
3				2	30	47
4				0	4	7
5				0	3	17
6				0[1]	7	16
7				1	20	43
8				1	12	9
9				0	26	9
10				0	5	36
11				1	39	11
12				2	25	10
13				1	28	12
14				0	11	6
15				0	6	10
16				1	5	24
17				0	7	10

[1]Fatal crash reported in 2018

3.2.4 Road Design

Corridor design performance was assessed to understand the nature and extent of consistency/deviation from the SDDOT Road Design Manual. This geometric evaluation does not provide a strict design manual criteria analysis given the unique nature of the context sensitive corridors and the commonality of design exceptions across the study corridors. The geometric ratings capture the prevailing conditions along each corridor rather than short individual segments that may change along its length.

The information in **Appendix D** provides detail regarding the rating criteria and the basis for rating each corridor as shown in **Table 2**. Road design rating categories and key findings include:

Shoulder Width – Given the constrained nature of the study corridors, narrow or no shoulders are a common condition observed. Corridors 1, 10 and 11, 16 and 17 provide the widest shoulders. Narrow shoulders along Corridors 3, 4 and 6 are at odds with their need to function as regional, higher speed connections.

Lane Width – Lane widths vary from less than 9.5 feet to 12 feet. Very narrow lanes are observed along Iron Mountain Road (Corridors 8 and 9) and Needles Highway (Corridor 13). Corridor 3 shows a geometric condition at odds with its function - lane width of 10-11 feet.

Horizontal Curve Density – The corridors were rated relative to each other based on the number of reduced advisory speed curves observed per mile. Particularly curvy roads include Corridors 9 and 14, closely followed by Corridors 6, 8, 13 and 15.

Clear Zone – Clear zone measures the presence of objects adjacent to the roadway that can cause safety concerns. Few corridors demonstrate sufficient clear zone, given the prevalence of rock outcroppings, slopes, etc. along the corridors. Corridors 5, 10, 11, 16 and 17 show relatively more open clear zones. The other scenic byway corridors show more obstructed conditions.

Sight Distance – Sight distance concerns were evaluated based on corridor field visits. Concerns are most prevalent within the Norbeck Byway corridors and portions of Corridors 12 and 15.

Access Spacing – Few issues are found within the corridors, given the lower development density context. Issues of note include portions of Spearfish Canyon (Corridors 1 and 2) and Corridor 3. Numerous residences front along Corridor 5, making this corridor unique among the study corridors.

Grade – Steep grades are present along many of the study corridors, and were found most extensively along Corridors 4, 9, 11, 13 and 14. Corridor 11 possesses a sustained vertical grade of up to 15 percent.

3.3 Needs

The following principles were used to compile a list of needs for each corridor, as shown in **Table 5**:

- The study team carried forward a context-sensitive approach, wherein the needs of a given corridor are identified to better equip that corridor to meet the characterized purpose and function. For example, destination corridors within the Norbeck Scenic Byway should emphasize safety while maintaining their unique character and de-emphasize throughput and end-to-end travel time. Therefore, needs for these corridors are focused on crash mitigation and user experience.
- The identification of needs is data-driven, relying on the performance information described in Sections 3.1 and 3.2 and supplemented by information received from the general public, study stakeholders and the SAT.
- The importance of reducing crashes was emphasized when identifying needs. For example, roadway design needs such as widened lanes or shoulders may emerge for a given location based on a pure geometric review in light of applicable standards, but without an accompanying safety concern the geometric need is de-emphasized.

Table 5. Summary of Corridor Needs

Corridor	Needs	Summary Statement
1	Speed reduction strategies	Scenic route balances visitor and resident traffic. Speed differentials, tight curves and nonmotorized activity along this scenic route need safety improvements.
	Pedestrian safety treatments at popular site(s)	
	Horizontal curve treatments to reduce crashes	
	Motorcycle safety treatments	
	Access management strategies to increase access spacing (north portion)	
2	Added shoulder width and center rumble strips	Recreation access oriented scenic corridor in need of improved condition. Urgent infrastructure work needed to stabilize roadway, and improved shoulder widths and spot curve treatments are needed to enhance functionality and safety.
	Roadside embankment slope stability/drainage improvements	
	Horizontal curve treatments to reduce crashes	
	Additional pullouts and parking improvements	
	Motorcycle safety treatments	
3	Additional pullouts alongside the roadway (to improve operations and safety)	National Highway System (NHS) route serves high speed commuter/commercial traffic. A corridor reconstruction effort increasing lane and shoulder widths and addressing horizontal curvature is needed to provide improved mobility and safety along this NHS regional route.
	Widened roadway section including lane and shoulder width	
	Horizontal curve treatments to reduce crashes	
	Motorcycle safety treatments	
	Speed management signage/devices	
	Added pavement surface friction	
	Roadside embankment slope stability/drainage improvements	
4	Pedestrian linkage along corridor	This urbanized corridor is highly constrained by rock walls and side slopes. Needs improved non-motorized connectivity and updated roadway section.
	Additional lane/shoulder width through corridor	
	Guardrail/roadside safety improvements	
	Improved aesthetics for transition between two communities	
	Modification to section to optimize shoulder and lane widths	
	Roadside safety improvements	

Corridor	Needs	Summary Statement
5	Additional pavement surface friction	Recreational access and residential character join to create unique context. Roadside improvements, pavement friction treatment, weather treatments and adjustments to pavement width are needed.
	Roadside drainage improvements	
	Weather sensing and communications devices	
	Speed mitigation through residential area	
	Add lane/shoulder width through residential area	
6	Speed reduction treatments to reinforce reduced speed zone	More constrained, curvy corridor segment within larger regional route. Enhance speed management, key intersection capacity and address spot curvature and wildlife crossing safety needs
	Signage/devices used to warn travelers of vertical curves	
	Additional turn lanes at Jewel Cave entry intersection	
	Wildlife crossing accommodation/safety measures	
	Horizontal curve safety improvements	
7	Horizontal curve safety improvements	Portion of Norbeck Byway that balances scenic route and State Park visitors with serving commuter traffic. Needs safety improvements for horizontal curves and nonmotorized treatments.
	Improvements (traffic control and/or turn lanes) at SD 87, Bismark Lake site, Wildlife Loop Road and US 16A intersections	
	Sight distance improvements	
	Pullout improvements/additions to accommodate scenery and speed differentials	
	Non-motorized safety improvements to areas of activity	
	Wildlife collision mitigation strategies	
8	Motorcycle safety improvements	Popular portion of Norbeck Byway. Needs geometric update to south portion and emphasis on aesthetics and motorcycle safety.
	Aesthetic treatments to reinforce corridor identity	
	Improved horizontal curvature, lane and shoulder width in south portion	
	Speed mitigation signage/devices	
	Roadside safety improvements	

Corridor	Needs	Summary Statement
9	Spot horizontal curve improvements to address crash risk, particularly to motorcycles	Iconic portion of Norbeck Byway-critical to maintain character. Emphasize spot improvements to address motorcycle needs.
	Aesthetic treatments to reinforce corridor identity	
	Motorcycle safety improvements	
	Signage/devices used to warn travelers of curves, unique conditions, clearance	
	Non-motorized safety improvements to areas of activity	
	Additional/improved pullouts along roadway	
10	Wildlife collision treatments	Higher speed travel corridor needs spot safety improvements and pavement treatments to enhance vehicular safety. Presence of wildlife collisions in need of treatment.
	Access management strategies in more developed portion (east)	
	Improved pavement safety condition	
	Spot horizontal curve safety improvements	
11	Access management strategies to increase access spacing	Commuter corridor needs spot treatments to enhance safety performance and driver awareness of roadway conditions.
	Steep vertical grade treatments for on road and roadside safety	
	Spot horizontal curve safety improvements	
	Signage/devices to improve traveler awareness of conditions	
	Additional pullouts to accommodate speed differentials	
12	Additional pullouts to address speed differentials and provide stop opportunities	Scenic destination access corridor with elevated severe crashes in need of targeted safety measures, particularly for motorcycles. Non-motorized activity locations and pullouts need safety improvements/additions.
	Spot horizonal curve safety improvements – geometry and signage/devices	
	Concentrated non-motorized activity locations could benefit from safety treatments	
	Motorcycle safety treatments	
13	Warning system for vehicles too large to pass through tunnel(s)	Iconic, narrow portion of Norbeck Byway needs spot curvature improvements, pullouts, parking/circulation space and motorcycle safety treatments.
	Motorcycle/Sturgis Rally safety measures	
	Appealing parking/stopping locations within west portion intensify need for driver information, pullout locations and pavement space for non-motorized users	

Corridor	Needs	Summary Statement
14	Switchback curves need added notification and geometric review	Portion of Norbeck Byway showing elevated severe crashes needs curve treatments, advance notification of unique geometric features and motorcycle safety measures.
	Rockfall protective measures needed	
	Motorcycle safety improvements	
	Pullout additions/enhancements needed to provide added refuge space	
15	Roadside treatments to enhance safety and drainage	South, more urbanized portion in need of roadside treatments and mid-corridor horizontal curvature needs improved signage/devices.
	Access locations in south portion need access management review	
	Vertical curvature improvements/added awareness in north portion	
16	Nonmotorized safety needs improvement at popular parking/pullout/view locations	Address demand and supply of parking at premium view locations in east portion while recognizing proximity to and objectives of National Memorial. Improve safety of horizontal curvature.
	Wildlife collision treatments to address patterns	
	Improve sight distance near accesses where limitations are causing hazard(s)	
	Horizontal curve safety improvements	
17	Bicycle/pedestrian travel options along corridor	High-traffic volume scenic connection to National Memorial needs additional functionality for bicycle and pedestrian travel. Need roadway capacity enhancements through two lane sections.
	Traffic operations improvements along two lane portions of corridor	
	Provide additional messaging devices/signage for National Memorial destination	
	Improve pullouts and parking	
	Improve pavement surface for safety/driver feedback	

In addition to the needs shown by corridor in **Table 6**, signing improvements are needed throughout all study corridors. In reviewing corridor conditions, it was found that horizontal curves are treated inconsistently regarding advisory speeds and type of signage. For example, some curves are delineated with chevrons while others of similar nature are not. Inconsistencies in sign condition and spacing are also noted.

4. IMPROVEMENTS

Understanding the corridor purposes, performance and needs, the project team undertook a series of actions to craft unique visions for each corridor. Visioning workshops with the SAT were used to test ideas and reach agreement regarding the appropriate application of improvements to the corridors. The basic steps followed were:

1. List the range of improvement types with potential applicability
2. Identify which improvement types should be considered as feasible applications for each corridor
3. Complete a vision for each corridor by applying improvements to locations
4. Develop improvement cost estimates
5. Group the improvements in logical packages for implementation.
6. Create benefit-cost ratios for each improvement package
7. Develop an improvement timeline for each corridor

4.1 Range of Improvements

Reducing crash rates and/or severity is a primary need identified across the range of context sensitive corridors. Thus, improvements focused on those demonstrating an ability to reduce crashes and/or severity across the range of modes present and primary (priority) functions defined in each corridor. In addition to using the SDDOT Road Design Manual as a source for defining key characteristics of possible improvements, the FHWA *Crash Modification Factors Clearinghouse* (www.cmfclearinghouse.com) was accessed to refine the range of appropriate countermeasures to address needs. The Crash Modification Factors Clearinghouse is a database of design concepts that research has demonstrated are successful in reducing current and/or historically observed crashes. Research sponsored by FHWA documented in the database addresses crashes by type and severity across a range of roadway design types and area types (urban or rural).

Table 6 provides a summary of the range of roadway improvements organized to address needs identified. The table documents for each improvement concept, a potential crash modification factor by crash type. **Table 6** is also provided in **Appendices B** and **C** for reference.

Organization of the information in **Table 6** is outlined below:

- Columns 1 and 2: Description of potential improvements. The range of concepts have been categorized as:
    - Design (D): Improvements or changes to the current conditions focused on lane width, shoulder width, vertical and horizontal curvature of the road, superelevation through a curve, ditch slopes, objects immediately outside the pavement area, and auxiliary lanes aiding entry or exit from the road.
    - Multimodal Operations (O): Improvements reducing platooning behind slower moving vehicles, intersection control changes impacting crashes, better accommodating mixed traffic (bicycles, pedestrians and the range of motor vehicles) along and across a road.
    - Safety (S): Actions/improvements that affect visibility, speed, traction in wet/snow/ice conditions, and feedback if vehicles stray from travel lanes.
    - Intelligent Transportation Systems (ITS): The range of vehicle detection and information feedback that influence driver behavior, such as speed management devices, advance warning devices, weather information systems, etc.
    - Aesthetic Enhancements (A): These improvements may not have a measurable effect on driver behavior that can be measured in crash reduction. However, such improvements are complementary to safety motivated

actions and consistent with the context sensitive nature of routes covered in the study.

Each improvement type is assigned a unique code that designates its category and unique identifier. There are a total of 35 improvement types eligible for consideration across the corridors.

- Column 3: Capital vs. Operations and Maintenance. Assessing the potential costs relative to benefits focused on those improvements that would require the SDDOT to establish a new capital project. Of the 48 improvement types (including subsets of improvement codes), 32 are Capital and 16 are Operations and Maintenance.
- Column 4: Description of the improvement type
- Column 5: Crash Modification Factor (CMF) is a value of the anticipated reduction in crash rates associated with implementation of the specific strategy. A value of 1.0 would have no measurable impact on crash conditions and the lower the factor, the greater the anticipated reduction in observed current condition crash rate. The CMF's shown in **Table 6** were developed in collaboration with SDDOT Staff using information from CMF Clearinghouse (www.cmfclearinghouse.com) and the Highway Safety Manual.

Table 6. Improvement Types and Crash Modification Factors

Improvement Type		C or O/M[1]	Description		CMF
DESIGN (D)					
D1	Improve or mitigate horizontal curvature	C	Increase radius, remove compound curve, provide retroreflective markers, add more specific warning signage		0.8
D2	Improve or mitigate vertical curvature	C	Flatten curve, provide retroreflective markers, provide recovery area, add advance and specific signage		0.49
D3	Widen or reduce shoulder width	C	Increase width of shoulder, reduce width of shoulder to increase lane width	Widen from 0 - 2'	0.89
				Widen from 0-4'	0.81
				Widen from 0-6'	0.73
				Widen from 0-8'	0.77
D4	Widen or reduce width of travel lanes	C	Increase lane width, increase lane width by reducing shoulder width, reduce lane width to increase shoulder width	Widen from 9-12'	0.74
				Widen from 10-12'	0.83
				Widen from 11-12'	0.96
D5	Improve sight distance	C	Flatten hillsides around curves, remove and replace/relocate trees, add advanced warning signage		0.63
D6	Adjust curve superelevation	C	Increase superelevation to improve maneuverability around curves or improve drainage runoff of pavement		0.85
	Improve curve superelevation (as safety countermeasure)	C	Improve maneuverability around curves		0.85
D7	Add pullouts	C	Provide more pulloff locations along roadway		0.78
	Improve pullouts	C	Lengthen, widen, more signage/advance warning		
D8	Add parking	C	Provide more spaces in existing parking lots or add more parking lots along roadway		0.78
	Improve parking	C	Add parking spaces, reconfigure parking, increase parking space sizes		0.78
D9	Add drainage ditch	O&M	Keep water and debris off roads, minimize icing		N/A
	Improve erosion control/slope stabilization	O&M	Stabilize slopes, remove dead fallen trees, slide creek over		N/A
	Relocate or identify drainage structures in clear zone	O&M	Add shoulder to place drainage outside clear zone, move drainage outside clear zone		N/A

	Improvement Type	C or O/M[1]	Description		CMF
MULTIMODAL OPERATIONS (O)					
O1	Add passing lanes	C	Add passing lanes to allow cars to pass vehicles uphill and slow-moving vehicles, improve capacity along roadway and reduce congestion		0.65
O2	Increase passing zones	O&M	Add more areas to allow vehicles to pass other vehicles and reduce congestion		0.65
O3	Add more travel or turn lanes	C	Add lanes to improve capacity and reduce congestion to improve safety	Turn Lanes	N/A
				Travel Lanes	0.85
O4	Implement Access Management techniques	C	Adjust driveways, combine accesses, advance signage, reduce access points		0.7
O5	Change intersection traffic control	C	Review stop controlled, signal, roundabouts and other intersection improvements to reduce crashes	STOP signs to signal	0.56
				TWSC to AWSC	0.52
				STOP signs to roundabout	0.42
O6	Improve bike and/or pedestrian facilities	O&M	Widen pathways, add advance or informational signing, add crosswalks, provide shuttle service, add access to existing regional trails		N/A
	Add bike and/or pedestrian facilities	C	Provide bike lanes as appropriate, provide adjacent (barrier-separated trails)	Shared	0.68
				Separate	0.41
				Crosswalks	0.6

Improvement Type		C or O/M[1]	Description	CMF
SAFETY (S)				
S1	Add speed reduction signs and step down speeds in 10 MPH increments	O&M	Identify locations, speeds along roadway need to be reduced and provide appropriate signs per MUTCD, install traffic calming improvements	0.96 0.84
S1	Signing improvements/additions	O&M	Could include rockfall warning static signs, conduct sign audit, change posted speed to more closely reflect design speed, etc.	0.96 0.84
S2	Add or improve guardrail or improve clear zone	C	Flatten slopes to meet clear zone criteria, or add guardrail where flattening is not possible, add rubrail for motorcycles	0.78
S2	Reevaluate existing guardrail installations	O&M	Where slopes can be flattened to meet criteria or rock face locations, remove guardrail and flatten to reduce physical impact crashes, especially dangerous for motorcycles	0.78
S2	Improve pavement drop offs (material lacks hold)	O&M	Improve roadside slopes or add guardrail	0.777
S2	Removal of dead/dying trees	O&M	Fires and beetle kill has resulted in several fallen trees or dying trees, remove to improve aesthetics of view along the roadway that add to the journey	N/A
S3	Motorcycle-specific safety improvements	C	Provide motorcycle-specific sign/device alerts, improve roadway and roadside design for motorcycle forgiveness to prevent falls and crashes	0.7
S3	Sturgis Rally strategies	O&M	Roadway sweeping, temporary transverse rumble strips as ideas, VMS signs during rally	N/A
S4	Add center rumble strips	O&M	Inform drivers when vehicles are crossing the centerline to reduce head-on crashes	0.86 0.79
S4	Add edgeline rumble strips	O&M	Inform drivers when vehicles are running off the road to reduce offroad crashes, use wave-shaped rumble strips	0.85
S4	Provide transverse rumble strips	O&M	Inform drivers of stopping, slowing or sharp curve conditions and high pedestrian crossing locations to reduce crashes	0.66
S5	Provide high friction pavement treatment	C	Improve drivers ability to navigate roadway during adverse weather conditions (may not be good for motorcycles)	0.653
S6	Traffic Calming	C	Implement speed management techniques along roadway, including visual treatments, chicanes, narrowing, etc.	0.94
S7	Modify pavement markings	O&M	Provide reflectors or improve retroreflectivity	0.968
S8	Wildlife collision treatments	C	Construct wildlife fencing with gaps.	0.6
S9	Rockfall mitigation measures	C	Provide wider shoulder for rockfall collection, improve signage, conduct analysis and physical mitigation to prevent rockfall (hexagonal mesh, rockfall netting), evaluate geologic slide areas and potential mitigation, remove rock where feasible	N/A

Improvement Type		C or O/M[1]	Description	CMF
ITS STRATEGIES (I)				
I1	Dynamic Message Signs	C	Provide important crash, weather, debris, tunnels, pigtail bridges, animals, and other information to drivers as needed	0.93
I2	Dynamic Speed Display Signs	C	Adjust and inform drivers of speeds for roadway based on changing conditions, add speed radar signs	0.93
I3	Road Weather Information Systems (RWIS)	C	Collect weather information and communicate information to drivers vehicle website, apps, social media, etc.	0.93
I4	Advance warning signs (vehicle size, curves etc.)	C	Improve notifications to drivers regarding steep grades, sharp curves, tunnels, pulloffs, etc. Provide physical infrastructure to inform oversize vehicle drivers of roadway limitations and provide a means to turn vehicle around	0.93
I5	Cameras (video)	C	SDDOT has been working with GF&P to put cameras on trails, may be able to share with them.	0.93
I6	Traffic sensors (volumes, speed, etc.)	C	Collect information at key locations to inform drivers and use for analysis	0.93
I7	Communications improvements	C	Install equipment or use current devices to communicate between devices and with drivers. Use social media, apps and other means to convey information to drivers, improve cellular coverage	0.93
I8	Positive closure control devices	C	Provide remote closure mechanism to close roads safely during critical events	1
AESTHETIC ENHANCEMENTS (A)				
A1	Guardrail/roadside signage visual treatments	O&M	Consider types of cable barrier. Self-weathering steel has a good look to it. High-tension guardrail has issues with deflection, etc.	N/A
A2	Streetscape beautification	C	Use of materials native to the hills. Enhance the experience of these visitors traveling the roadways.	N/A
A3	Interpretive sites/locations	C	Add more sites that have very interesting information for all ages to add to the experience of traveling these highways for Mount Rushmore, pigtail bridges, scenic byways, etc.	N/A

4.2 Improvement Visions

A primary driver for completing the study is the corridor environment makes it difficult for the SDDOT to apply design manual guidelines without creating unacceptable impacts on either the corridor primary purpose or the surrounding environment. The potential for impacts, however, does not remove the responsibility to address travel safety and maintain the roadways in a state of good repair. Emphasized in selection of actions is the requirement for each of the recommended corridor improvements to cost effectively address a widely accepted need. In the case of the 17 corridors, cost effectiveness is measured both in the cost of implementing the proposal and in the physical and social impacts to the road and surrounding area. Unique to these corridors is sensitivity to impacts to the current road design, because for destination corridors, the adventure/experience of the trip is a primary reason the road is there.

The uniqueness of the context sensitive corridor purposes and functions, relative to others in the state, influences application of improvements in the following ways:

- Establishing a threshold for determining whether action is needed. For most state routes, a lane width of less than 12 feet or a missing segment of paved shoulder would warrant review for improvement. In the context sensitive corridors, a higher level of deviation from the desired design as defined in the SDDOT Design Manual would be permitted to retain corridor character. Meeting the threshold of need for action in a context sensitive corridor requires an observed elevated crash rate combined with the narrower lane or missing shoulder included in this example.
- Defining the improvement area. As it is desirable in most of the study corridors to maintain the current design conditions, the defined extent of an improvement area was held to a minimum to address the issue. If through a corridor, for example, a disconnected series of curves was in need of improvement, the context sensitive improvements were limited to the curved segments, whereas in other parts of the state improving tangent segments connecting the identified curves may also be addressed.
- Types of improvements. Across the range of context sensitive corridors there are few congested corridor segments or intersections. Additionally, there are very few segments where enhanced access management through consolidation is identified as a corridor need. The primary deficiencies for the corridors are tight curves, deficient superelevation, and/or a lack of sufficient paved shoulders, which contribute to higher crash rates and elevated severity. Thus, the predominant type of improvements are those focused on reducing run-off-the-road and head-on crashes, rather than those increasing throughput and reducing travel time.

The application of improvements to the study corridors is depicted in **Appendix B**. Each improvement is envisioned as location specific or corridor wide. The information contained within these depictions, in concert with the corridor purposes identified in **Table 2**, comprises the Vision for each of the 17 study corridors.

4.3 Cost Estimates

The project team developed planning level generalized cost estimates for the improvements envisioned for each corridor. The team reviewed the improvement types with respect to the limits and locations as presented to quantify the materials needed to implement these improvements. Unit costs were developed in collaboration with SDDOT staff, using The SDDOT pay items and representative unit costs. The costs of some improvements were estimated based on past projects such as ITS improvements.

Of note, some improvements require more detailed information in support of cost estimates, so costs were not developed for Phase 1 and 2 for traffic calming (S6), Access Management (O4), and intersection traffic control improvements (O5).

The costs were divided between capital improvements and operations and maintenance improvements and only capital costs items were factored into the benefit cost analysis and totaled in the cost tabulations provided in **Appendix E**. **Table 7** provides a summary of estimated capital costs to implement the vision by corridor.

Table 7. Estimated Vision Capital Cost by Corridor

Corridor	Estimated Capital Cost ($Million)
1	$1.4
2	$1.9
3	$18.5
4	$1.1
5	$1.0
6	$2.5
7	$3.3
8	$3.6
9	$4.0
10	$5.7
11	$1.3
12	$2.3
13	$2.2
14	$0.7
15	$0.9
16	$3.0
17	$1.4
TOTAL	**$54.8**

4.4 Capital Improvement Packages

The capital improvements envisioned for each corridor were grouped into discrete packages based on location and improvement type. **Appendix C** depicts the recommended packages.

4.5 Safety Benefit-Cost Analysis

Proposed safety improvements for each corridor were recommended based on the frequency, type, and clustering of recorded crashes. To determine the anticipated effectiveness (benefits) of the proposed improvements, it was necessary to develop a system to estimate the safety benefit of each improvement. Through coordination with the SAT, the consultant team developed a benefit-cost ratio (BCR) analysis approach to estimate the anticipated effects of proposed safety improvements. While it is possible that some proposed capital improvements could also result in improved travel time or congestion relief, these benefits are not quantified as these categories are not the primary driver of project needs.

The primary purpose of calculating BCRs for safety improvements was to determine the economic return of the proposed safety improvements and provide a preliminary prioritization tool for implementing improvements. The BCR calculates the total benefit and total costs anticipated from the proposed capital improvements in a single unit of measurement (dollars) and compares them as a ratio. A BCR greater than one indicates that the total benefits of safety improvements are more valuable than the total cost of implementing them. The BCR analysis considers the accrual of benefits and costs over numerous years.

The U.S. Department of Transportation (USDOT) *Benefit-Cost Analysis Guidance for Discretionary Grant Programs* (December 2018) was used as a basis for developing a methodology to calculate BCRs on each corridor. Some adjustments were made to this guidance in order to fine tune the approach the Black Hills and SDDOT areas. The following methodology was used to conduct BCR analyses on each of the study corridors:

Improvement Packages

The BCR analysis process focused only on capital improvement projects. Proposed improvements that could be combined during a single construction project were grouped together to create improvement packages. Packages were defined by the consultant team using engineering judgement.

Crash modification factors (CMFs) were assigned to each improvement package to estimate its effectiveness in reducing crash frequency. CMFs are values applied to current condition crash rates to reflect the observed rates with the treatment. When a CMF takes a value less than one, it indicates that the roadway treatment is expected to reduce crash frequency, whereas a CMF greater than one is expected to increase crash frequency. CMFs were taken from the *Highway Safety Manual* (2010), which is published by the American Association of State Highway Transportation Officials (AASHTO), and www.cmfclearinghouse.org. CMFs for improvement packages with multiple countermeasures were calculated using the product of the best CMF from each improvement category (Design, Multimodal Operations, Safety, ITS Strategies, Aesthetic Enhancements).

Evaluation Period

The evaluation period for the BCR analysis was selected to account for the long lifespan of proposed improvement projects during which safety benefits could be accrued. USDOT guidance recommends that evaluation periods match the expected lifespan of the improvement or end at least 20 years after completion of the project. Since the longest expected lifespan of the proposed safety improvement projects is 40 years, the evaluation period was set at 40 years.

Improvement Costs

The total cost of the proposed improvement packages is a function of the replacement/construction cost of the improvement and its life cycle. All improvement packages were assumed to be implemented in Year One of the analysis and replaced as needed over the 40-year analysis period. Lifespans for the proposed capital improvement projects were assumed as follows:

- High Friction Surface Treatment 10 years
- Signing Improvements 12 years
- Grading/Other Roadway Geometry 40 years

After calculating the total cost for construction and replacement of recommended improvement packages, an adjustment was made to account for the time value of money. Per the USDOT guidance, "This concept reflects the principle that benefits and costs that occur sooner in time are more highly valued than those that occur in the more distant future, and that there is thus a cost associated with diverting the resources needed for an investment from other productive uses. This process, known as discounting, will result in future streams of benefits and costs being expressed in the same present value terms."[1] Per the SAT, an annual rate of 4 percent was used to discount the replacements occurring after Year One to their Net Present Value (NPV).

Improvement Benefits

Safety benefits related to the proposed improvement packages would manifest in the form of reduced crash frequency over the evaluation period. Anticipated reduced crashes during the analysis period were calculated as the difference in crashes without improvements versus with improvements.

[1] U.S. Department of Transportation. *Benefit-Cost Analysis Guidance for Discretionary Grant Programs*. Washington, DC. December 2018. Page 9.

The most recent five-year crash history was used to determine an annual crash frequency without any improvements, expressed in crashes per year by severity (PDO, Injury, and Fatality). Since traffic volumes are expected to increase over time, the crash frequency would also be expected to increase. To account for this, the observed crash frequency was increased proportional to the expected traffic growth on the corridor for each year of the analysis period.

The five-year crash history was also used as a basis for determining crash frequency with proposed improvements. Each crash record was evaluated individually to determine which improvement packages would affect the probability of their occurrence. Appropriate CMFs were applied to current crash rates and applied to traffic levels to estimate improved condition crashes by severity. This anticipated annual crash improvement was increased proportional to the expected traffic growth on the corridor for each year of the analysis period.

The difference in crash frequencies between no improvement and improvement scenarios was calculated for each year to determine the safety benefit. Using this difference, the monetary value of the annual crash reductions was calculated using the following assumptions:

- $ 18,000.00 per PDO crash reduced
- $387,000.00 per injury/fatal crash reduced

As with the improvement costs, the monetary value of annual crash reductions was discounted at a rate of 4 percent per year to the NPV, resulting in the total safety benefit for all proposed improvements on the corridor. The monetary safety benefit of each improvement package was calculated by determining the crash reductions of each package as a proportion of total crash reductions and multiplying by the total safety benefit (in dollars).

At the end of the 40-year evaluation period, some improvements packages would have years of useful service life remaining. Consistent with USDOT guidance, the monetary value of improvement packages with remaining service life was calculated assuming the asset depreciates linearly over its service life. The remaining residual value was discounted to the NPV. The residual value of the package was then added to the safety benefit to determine the total improvement benefit.

BCR Results

The BCR of each corridor and improvement package were calculated using the following equation:

$$BCR = \frac{NPV\ Safety\ Benefits + NPV\ Residual\ Value}{NPV\ Capital\ Costs}$$

Table 8 shows a summary of calculated BCRs for each corridor and improvement package within the study area. Definitions of projects included in each improvement package can be found in **Appendix C**. A summary of BCR calculations for each corridor can be found in **Appendix F**.

There are three capital improvement types for which BCRs were not calculated. These include 04 – Access Management, 53 – Motorcycle/Sturgis Rally Improvements, and 56 – Traffic Calming. These were excluded from BCR calculations because the Phase 1 and 2 preliminary level of detail does not allow for adequate definition to calculate reliable BCRs. These improvement types are included in the Appendix B/C graphics.

4.6 Corridor Improvement Timelines

The packages identified were ordered by priority for implementation based on their benefit-cost ratios (ordered by highest to lowest). The **Appendix C** graphics provide this listing by priority.

Table 8. Capital Improvement Benefit-Cost Ratios

Corridor	Improvement Packages: A	B	C	D	E	F	G	H	I	J	K	TOTAL
1		0.06 : 1	3.73 : 1	7.82 : 1	8.07 : 1	8.96 : 1	7.94 : 1	0.35 : 1	3.93 : 1	0.42 : 1	0.37 : 1	4.57 : 1
2	16.69 : 1	0.14 : 1	4.13 : 1	0.37 : 1	0.88 : 1		2.66 : 1					1.77 : 1
3	0.79 : 1	1.92 : 1	16.33 : 1	0.00 : 1	1.31 : 1	87.37 : 1	1.03 : 1					1.68 : 1
4	6.12 : 1	0.00 : 1										2.60 : 1
5	0.08 : 1	0.54 : 1	0.13 : 1									0.13 : 1
6	10.16 : 1	5.70 : 1	0.21 : 1	13.40 : 1	1.93 : 1	0.40 : 1	1.49 : 1					2.36 : 1
7	4.84 : 1	2.45 : 1	20.35 : 1	8.78 : 1	0.32 : 1	0 : 1		26.14 : 1	0.36 : 1			4.87 : 1
8	5.79 : 1	15.41 : 1		0 : 1	0 : 1							2.81 : 1
9	6.07 : 1	3.75 : 1	0.65 : 1	26.10 : 1		0 : 1	0.64 : 1	0 : 1	10.23 : 1			1.36 : 1
10	0.50 : 1	0.48 : 1	0.39 : 1	0.51 : 1								0.44 : 1
11	1.65 : 1	2.89 : 1	3.98 : 1	0.58 : 1	8.89 : 1							0.83 : 1
12	5.15 : 1	2.42 : 1	4.28 : 1		0 : 1	11.35 : 1	1.68 : 1	13.20 : 1				2.28 : 1
13	0.64 : 1	10.70 : 1	9.57 : 1	4.23 : 1	2.57 : 1	8.61 : 1	0 : 1	19.59 : 1		0 : 1		8.98 : 1
14		5.90 : 1	2.30 : 1	0 : 1	0 : 1	0 : 1	0 : 1	0.21 : 1				2.91 : 1
15		4.52 : 1	6.48 : 1	1.05 : 1								3.10 : 1
16	0 : 1	1.56 : 1	1.90 : 1	0.51 : 1		7.62 : 1	0.55 : 1					1.31 : 1
17	0 : 1	0 : 1		4.65 : 1								0.61 : 1

As shown in **Table 8**, Benefit/Cost ratios associated with the corridor visions vary from less than 1:1 (Corridors 5, 10, 11 and 17) to nearly 9:1 (Corridor 13). Individual improvement packages show broader variation. Corridors with heavier Design improvements (Code D) tend to show lower BCRs than lower cost safety or ITS type improvements.

These BCR's, both by corridor and improvement package, may be used to assist in prioritizing future improvements to the study corridors.

5. CORRIDOR PRIORITIZATION

The corridors were further prioritized to identify up to 3 corridors to be advanced to Phase 3 of the Black Hills Context Sensitive Corridors Study. Phase 3 will provide more detailed design and scoping efforts for a select set of up to three corridors. Criteria used to evaluate the candidacy of all 17 corridors for Phase 3 included:

Purpose/Design Inconsistency: The evaluation of corridor performance provided insight into the primary purpose(s) of each corridor, and the design, safety and operational performance ratings were reviewed to identify improvements needed to bring the corridor look, feel and experience into closer conformity with its purpose. Corridors currently demonstrating a greater gap between purpose and design were assigned higher scores to be advanced to Phase 3.

Safety Benefit/Cost: The corridor BCRs shown in **Table 8** were assigned ratings from 0 to 50.

Crash Frequency: Corridors demonstrating greater crash frequency concerns were assigned higher scores.

Urgency of Condition: There are a few locations along the study corridors that demand more immediate infrastructure action to correct. Corridor 2, for example, needs action to correct roadway surface erosion. Such needs were assigned higher scores.

As shown in **Table 9**, each of the corridors were assigned scores within each criterion, on a scale of 0 to 50. The results indicate that Corridors 3, 7 and 2 should be advanced to Phase 3. A next grouping of corridors in the rankings include corridors 1, 12, 13, and 15. A third tier includes corridors 4, 5, 6, 8, 9,10 and 16. The lowest ranked corridors are 11, 14, and 17.

Table 9. Phase 3 Selection Matrix

Criteria	CORRIDORS																
	NORTH					SOUTH											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Purpose/Design Inconsistency	30	30	50	10	20	30	50	10	20	20	20	30	10	10	20	30	10
Safety Benefit/Cost	40	20	10	30	0	20	40	30	10	0	0	20	50	30	40	10	0
Crash Frequency	20	20	50	30	50	20	20	40	40	50	20	30	30	20	30	10	10
Urgency of condition	10	40	20	10	20	10	15	10	10	10	10	15	10	10	10	30	10
Total Score for Phase 3 Advancement	100	110	130	80	90	80	125	90	80	80	50	95	100	70	100	80	30
Rank	T4	3	1	T10	T8	T10	2	T8	T10	T10	16	7	T4	15	T4	T10	17

APPENDIX A. CORRIDOR CHARACTERISTICS

Black Hills
CONTEXT SENSITIVE CORRIDORS STUDY

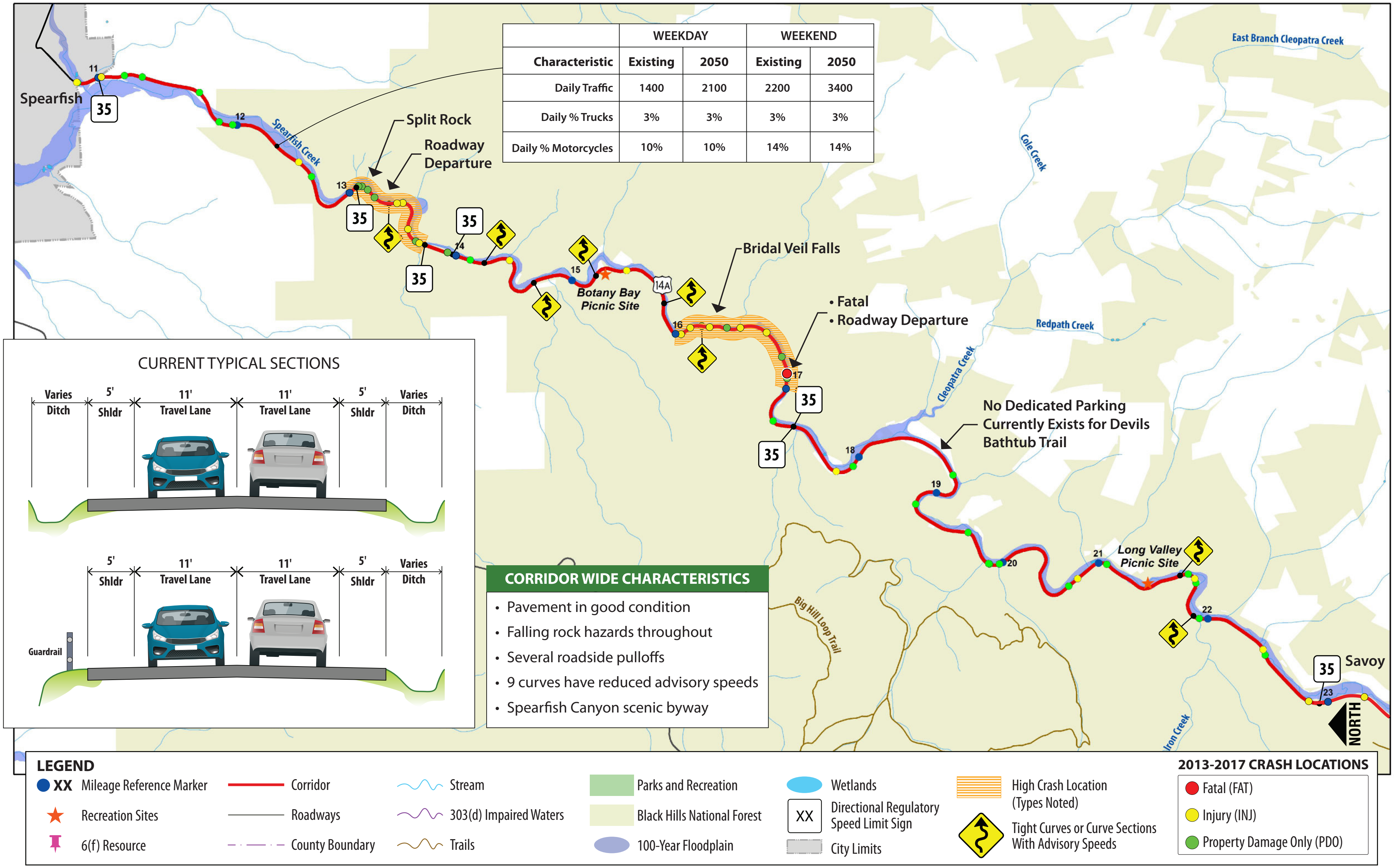
CORRIDOR 1

US 14A: Spearfish Canyon North

Spearfish to Savoy

Corridor Characteristics

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	1400	2100	2200	3400
Daily % Trucks	3%	3%	3%	3%
Daily % Motorcycles	10%	10%	14%	14%



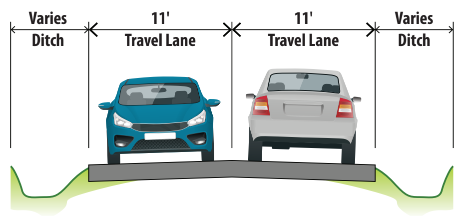
CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Falling rock hazards throughout
- Several roadside pulloffs
- 9 curves have reduced advisory speeds
- Spearfish Canyon scenic byway

CORRIDOR 2
US 14A: Spearfish Canyon South
Savoy to Cheyenne Crossing

Corridor Characteristics

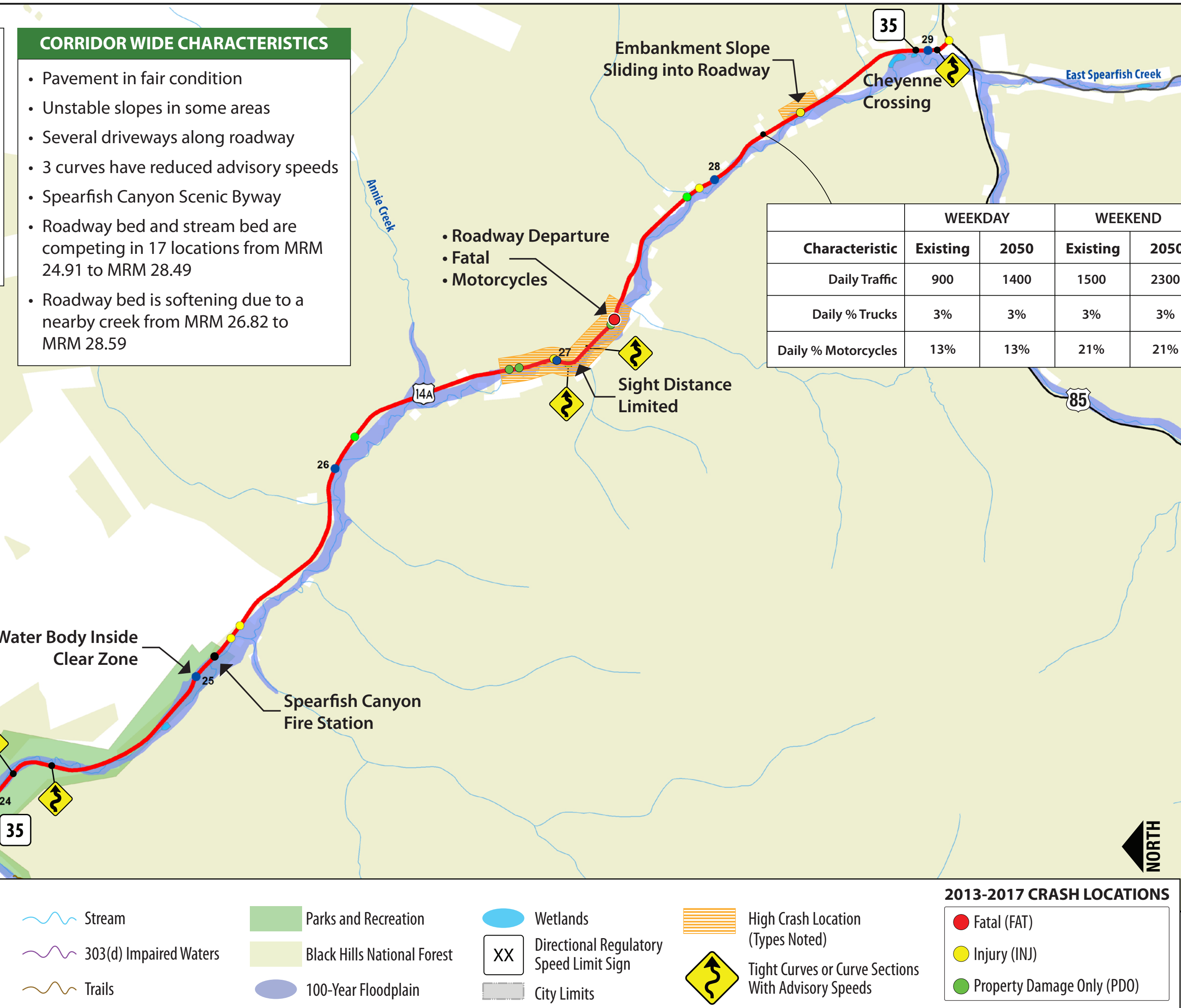
CURRENT TYPICAL SECTIONS



CORRIDOR WIDE CHARACTERISTICS

- Pavement in fair condition
- Unstable slopes in some areas
- Several driveways along roadway
- 3 curves have reduced advisory speeds
- Spearfish Canyon Scenic Byway
- Roadway bed and stream bed are competing in 17 locations from MRM 24.91 to MRM 28.49
- Roadway bed is softening due to a nearby creek from MRM 26.82 to MRM 28.59

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	900	1400	1500	2300
Daily % Trucks	3%	3%	3%	3%
Daily % Motorcycles	13%	13%	21%	21%



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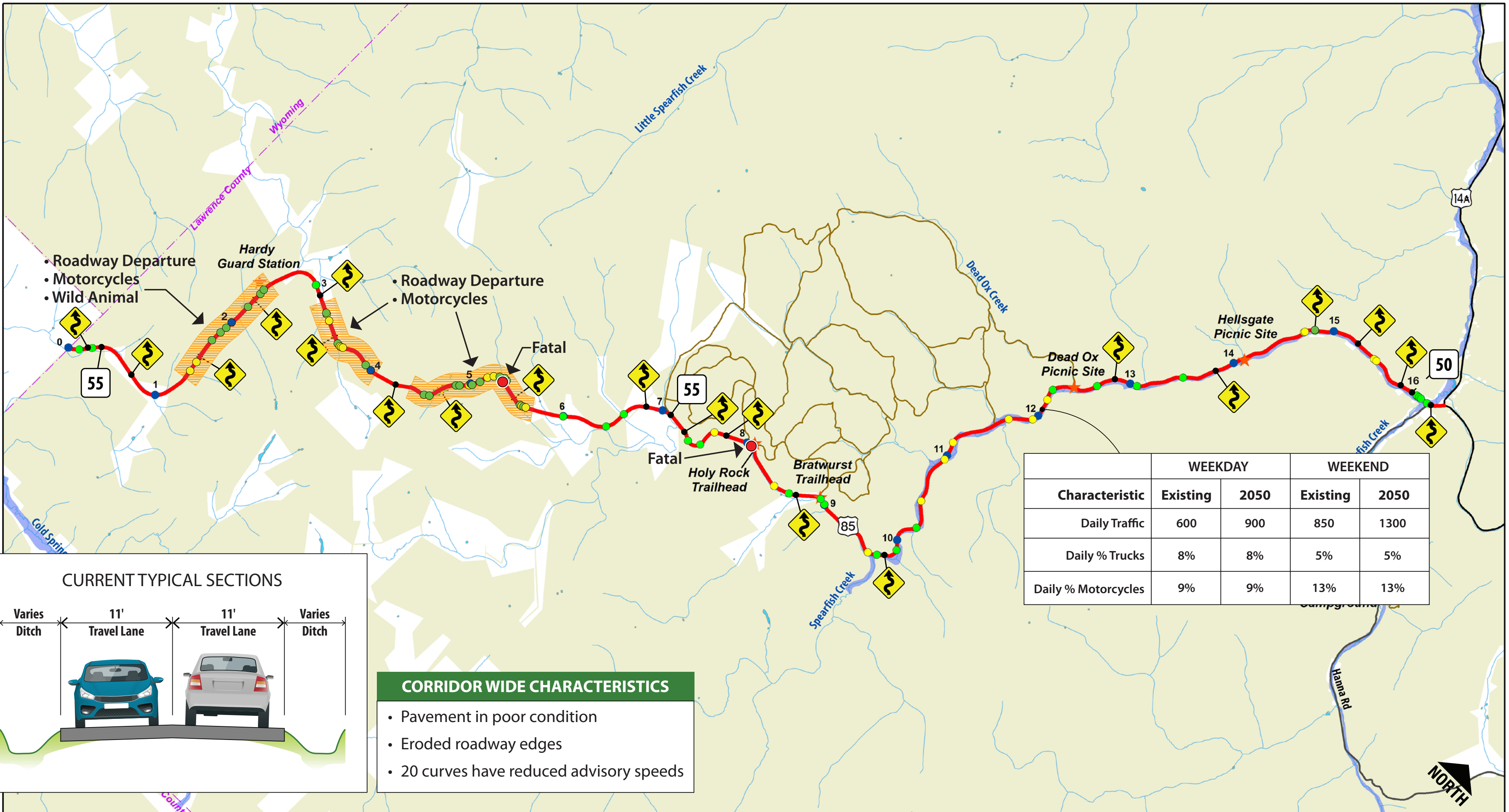
Black Hills
CONTEXT SENSITIVE CORRIDORS STUDY

CORRIDOR 3
US 85: Wyoming to US 14A

Corridor Characteristics



	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	600	900	850	1300
Daily % Trucks	8%	8%	5%	5%
Daily % Motorcycles	9%	9%	13%	13%

CURRENT TYPICAL SECTIONS

Varies Ditch | 11' Travel Lane | 11' Travel Lane | Varies Ditch

CORRIDOR WIDE CHARACTERISTICS

- Pavement in poor condition
- Eroded roadway edges
- 20 curves have reduced advisory speeds

LEGEND

- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

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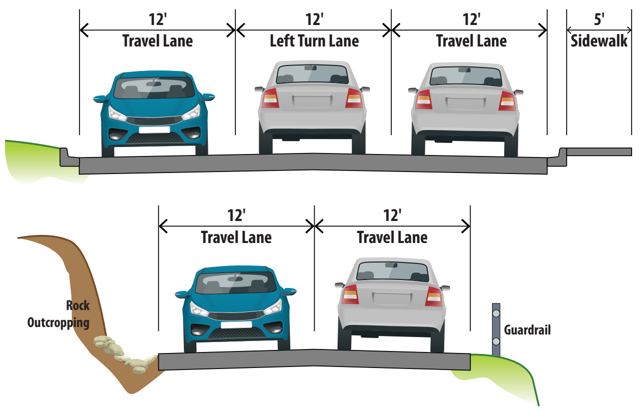
CORRIDOR 4
US 85: West of Pluma

Corridor Characteristics

CURRENT TYPICAL SECTIONS

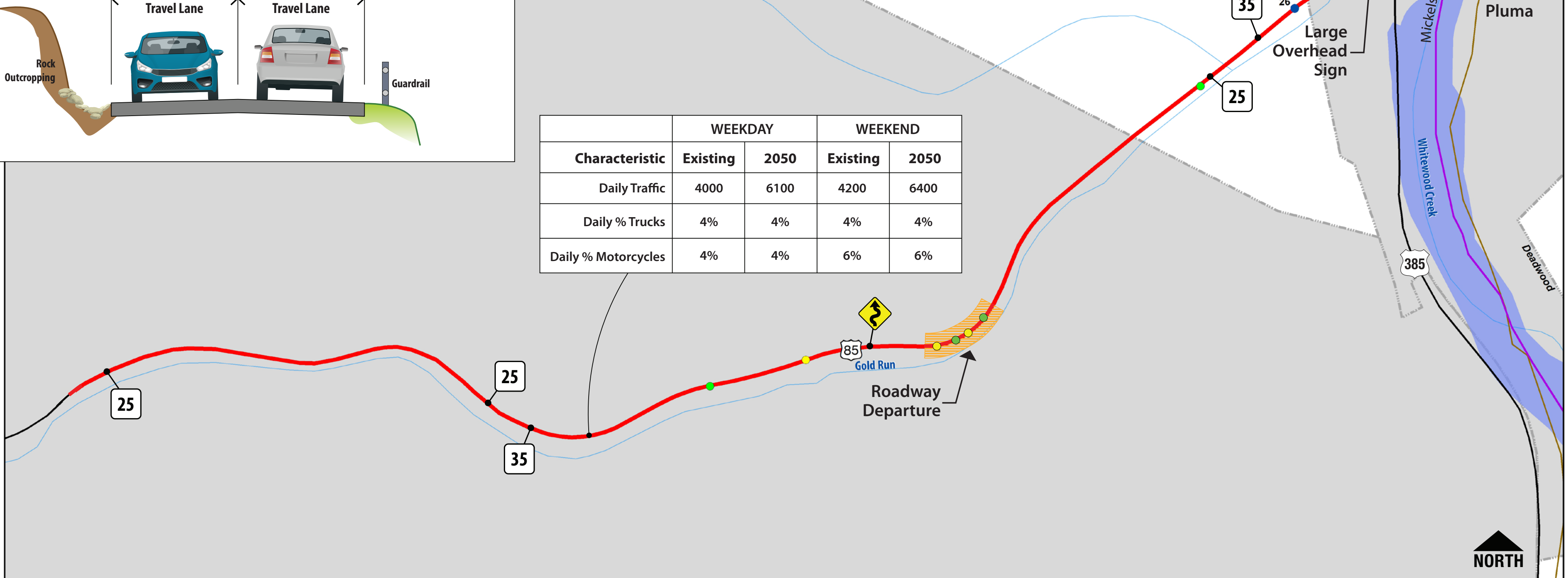


CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Unstable rock outcroppings very close to roadway
- Roadside lighting present along corridor
- 1 curve has a reduced advisory speed

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	5400	8300	6100	9300
Daily % Trucks	11%	11%	10%	10%
Daily % Motorcycles	3%	3%	4%	4%

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	4000	6100	4200	6400
Daily % Trucks	4%	4%	4%	4%
Daily % Motorcycles	4%	4%	6%	6%



LEGEND

- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

2013-2017 CRASH LOCATIONS

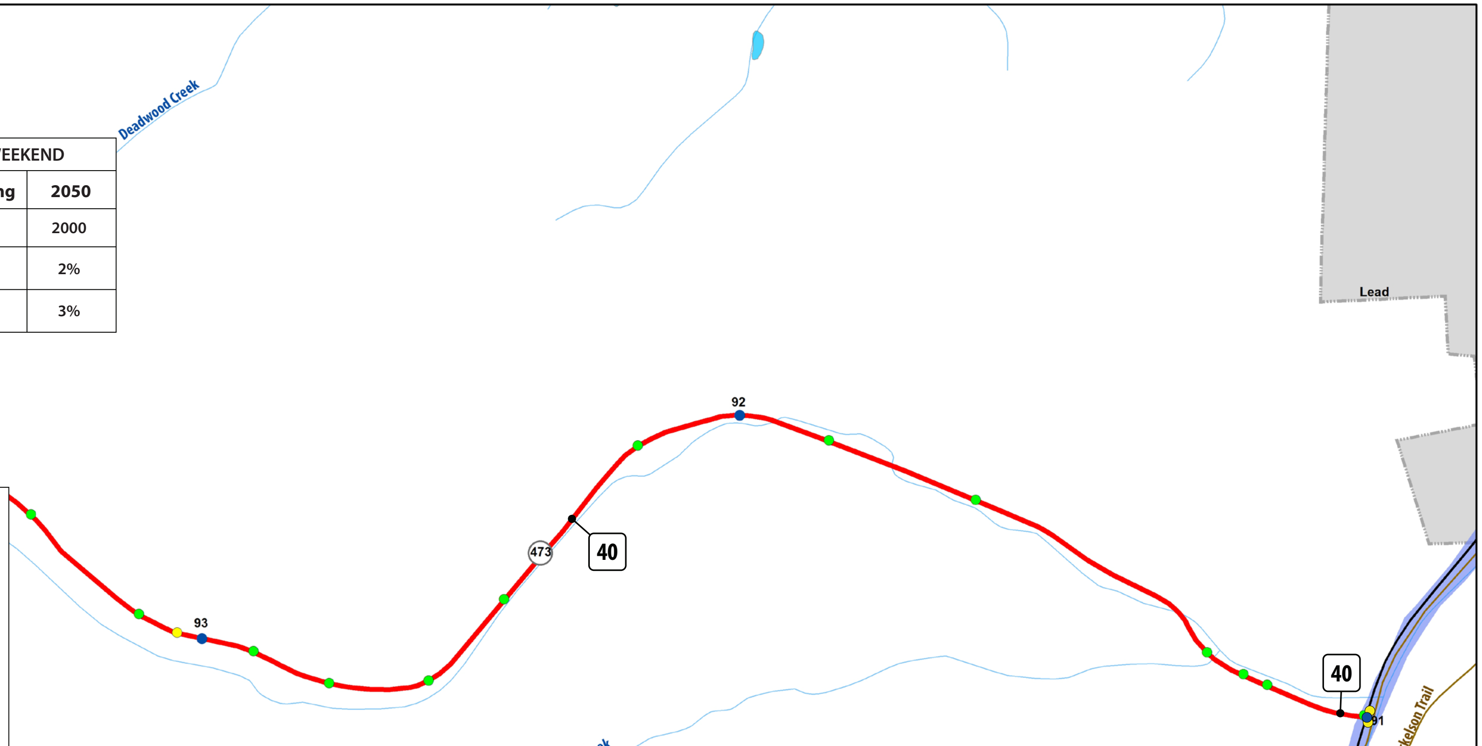
- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

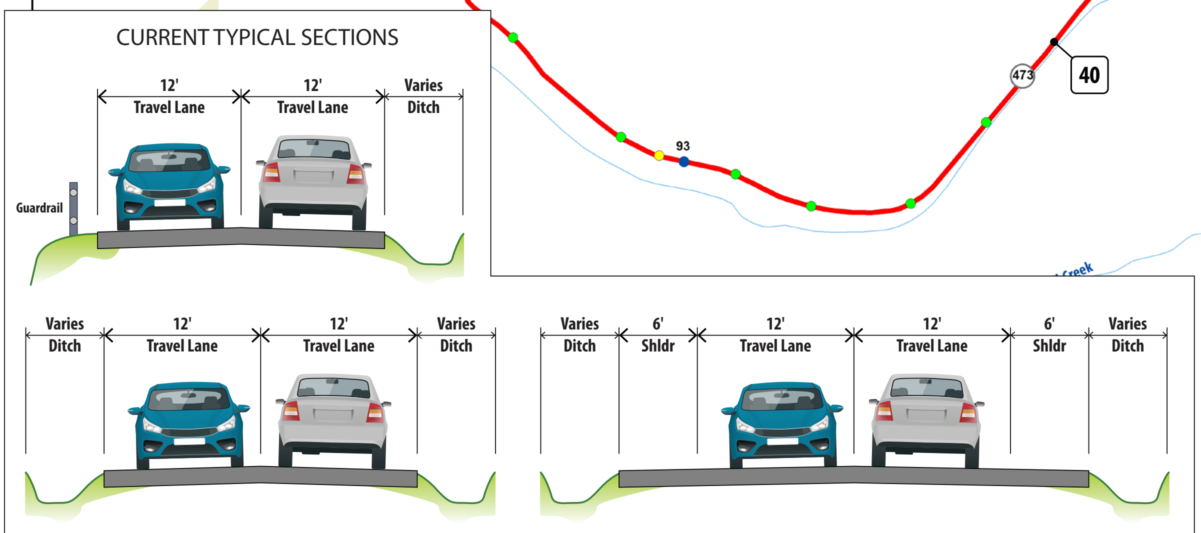
SDDOT Black Hills CSC Study 17-385 2/3/20

CORRIDOR 5
SD 473: Nevada Gulch Rd.

Corridor Characteristics

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	1300	2000	1300	2000
Daily % Trucks	7%	7%	2%	2%
Daily % Motorcycles	3%	3%	3%	3%





CORRIDOR WIDE CHARACTERISTICS

- Pavement in fair condition
- Erosion occuring under guardrail in some areas
- Several overhead utility lines throughout

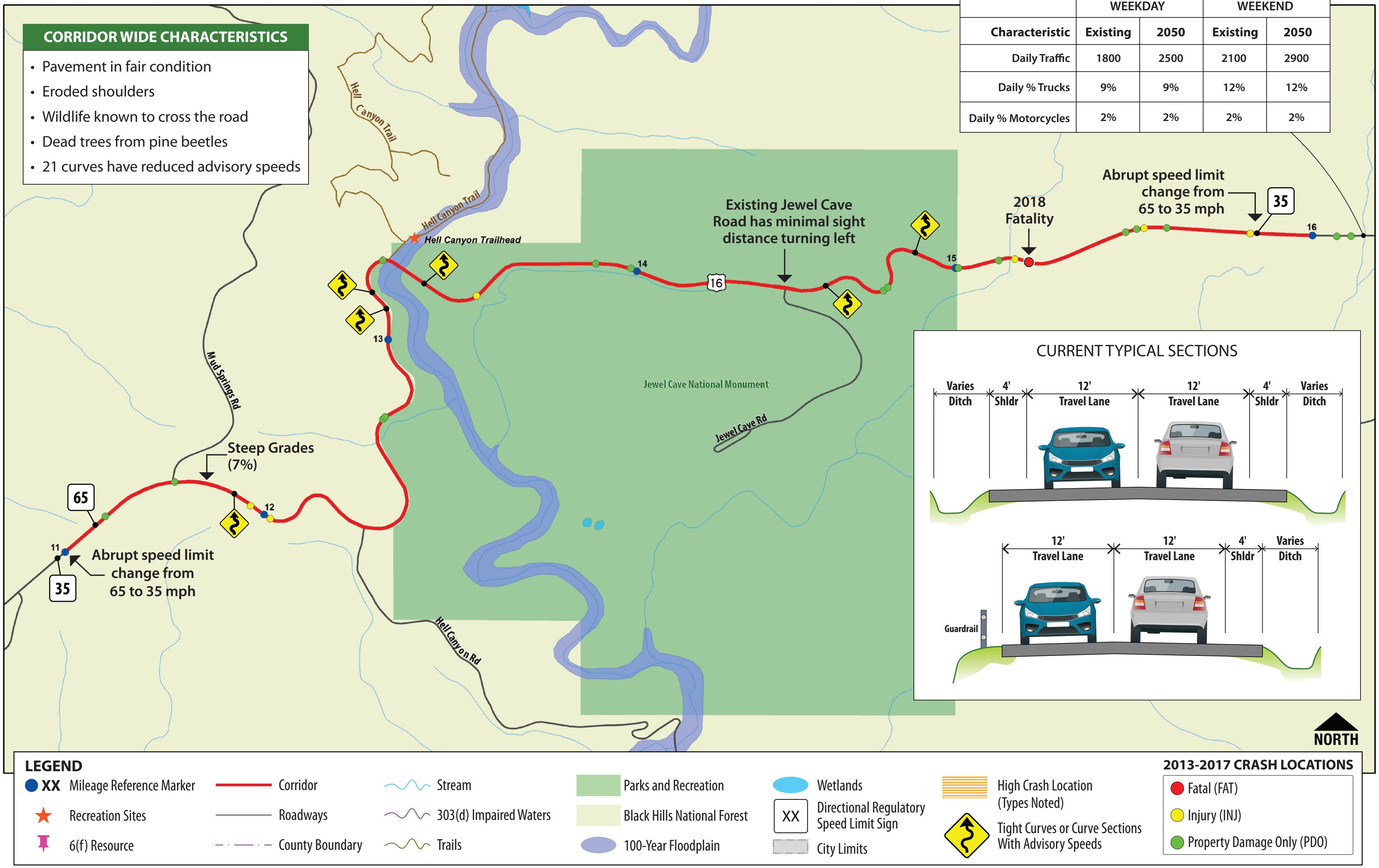
CORRIDOR 6
US 16: Jewel Cave

Corridor Characteristics

CORRIDOR WIDE CHARACTERISTICS

- Pavement in fair condition
- Eroded shoulders
- Wildlife known to cross the road
- Dead trees from pine beetles
- 21 curves have reduced advisory speeds

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	1800	2500	2100	2900
Daily % Trucks	9%	9%	12%	12%
Daily % Motorcycles	2%	2%	2%	2%



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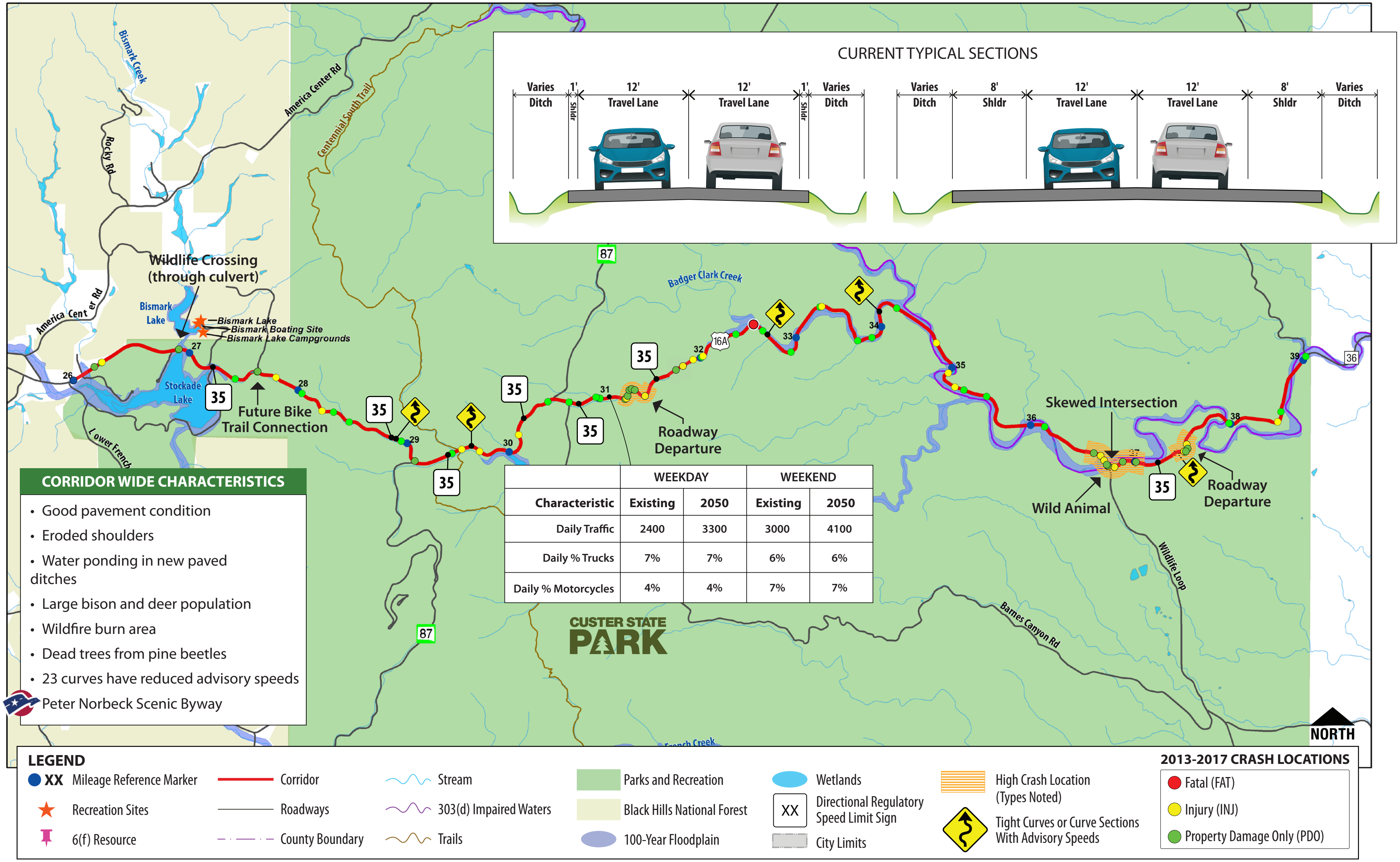
Black Hills
CONTEXT SENSITIVE CORRIDORS STUDY

CORRIDOR 7
US 16A: Custer State Park

Corridor Characteristics



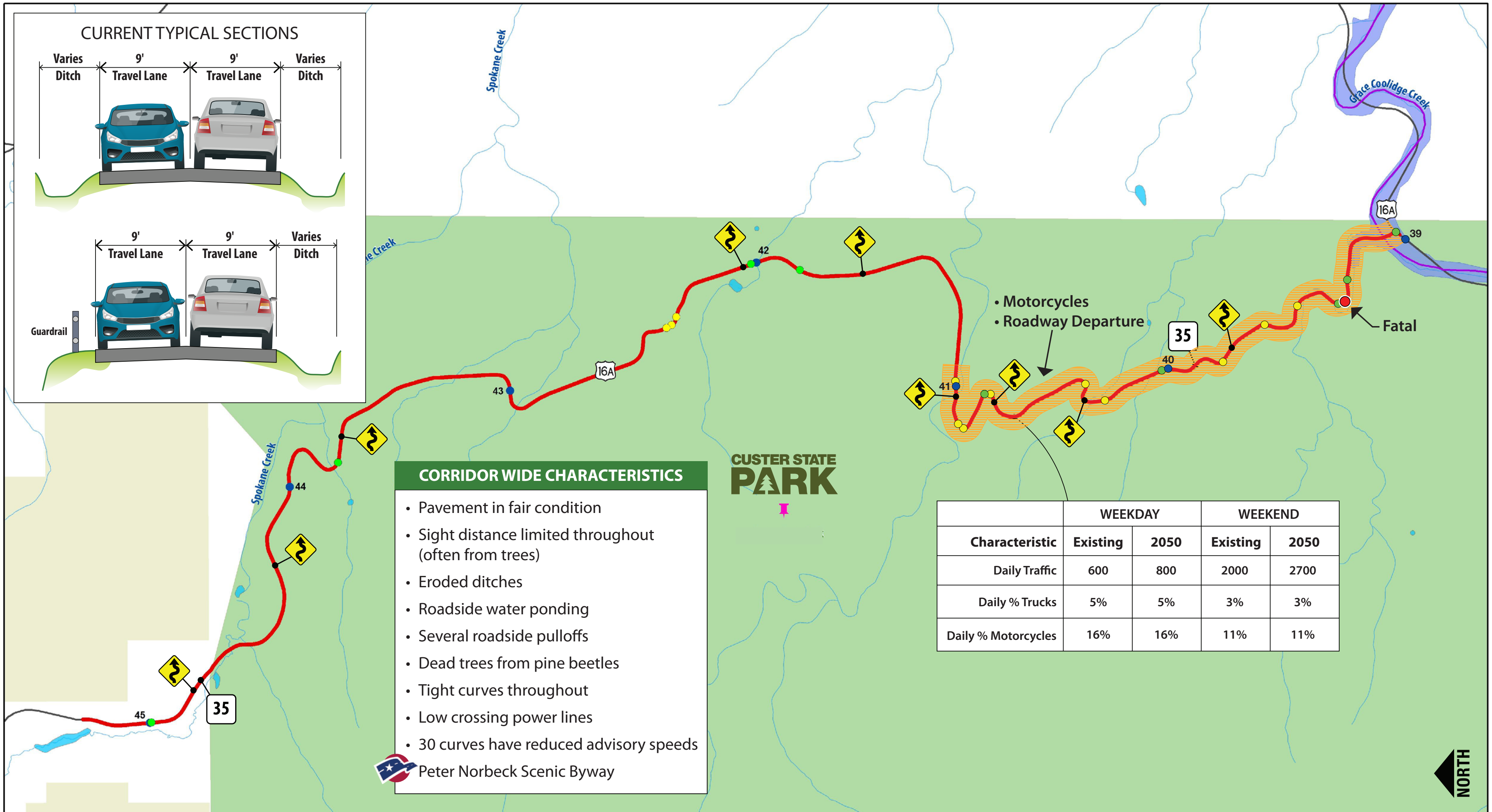
CORRIDOR WIDE CHARACTERISTICS

- Good pavement condition
- Eroded shoulders
- Water ponding in new paved ditches
- Large bison and deer population
- Wildfire burn area
- Dead trees from pine beetles
- 23 curves have reduced advisory speeds
- Peter Norbeck Scenic Byway

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	2400	3300	3000	4100
Daily % Trucks	7%	7%	6%	6%
Daily % Motorcycles	4%	4%	7%	7%

CORRIDOR 8
US 16A: South Iron Mountain Rd.

Corridor Characteristics



CORRIDOR WIDE CHARACTERISTICS

- Pavement in fair condition
- Sight distance limited throughout (often from trees)
- Eroded ditches
- Roadside water ponding
- Several roadside pulloffs
- Dead trees from pine beetles
- Tight curves throughout
- Low crossing power lines
- 30 curves have reduced advisory speeds
- Peter Norbeck Scenic Byway

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	600	800	2000	2700
Daily % Trucks	5%	5%	3%	3%
Daily % Motorcycles	16%	16%	11%	11%

LEGEND

- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

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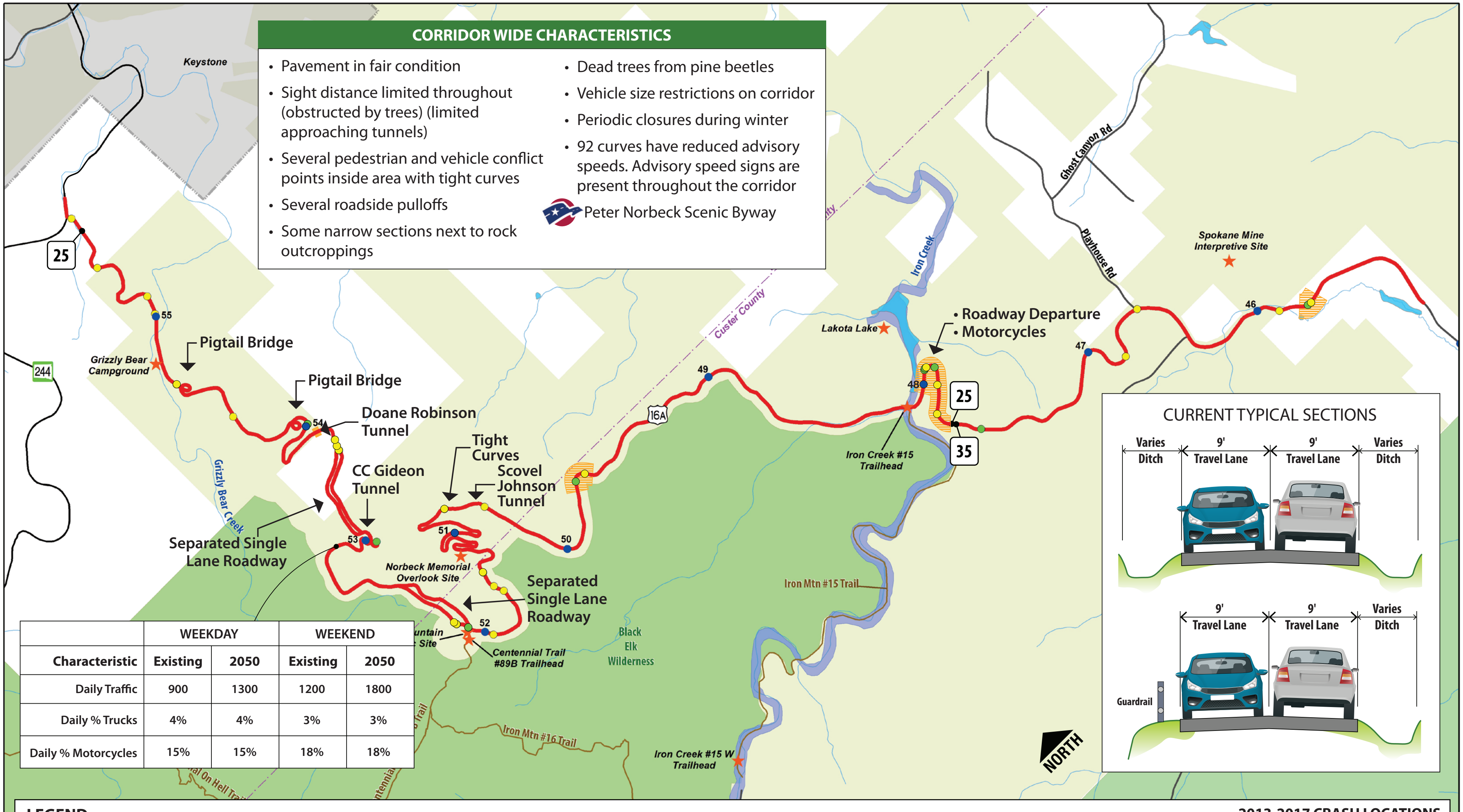
CORRIDOR 9
US 16A: North Iron Mountain Rd.

Corridor Characteristics



CORRIDOR WIDE CHARACTERISTICS

- Pavement in fair condition
- Sight distance limited throughout (obstructed by trees) (limited approaching tunnels)
- Several pedestrian and vehicle conflict points inside area with tight curves
- Several roadside pullofs
- Some narrow sections next to rock outcroppings
- Dead trees from pine beetles
- Vehicle size restrictions on corridor
- Periodic closures during winter
- 92 curves have reduced advisory speeds. Advisory speed signs are present throughout the corridor
- Peter Norbeck Scenic Byway

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	900	1300	1200	1800
Daily % Trucks	4%	4%	3%	3%
Daily % Motorcycles	15%	15%	18%	18%

LEGEND

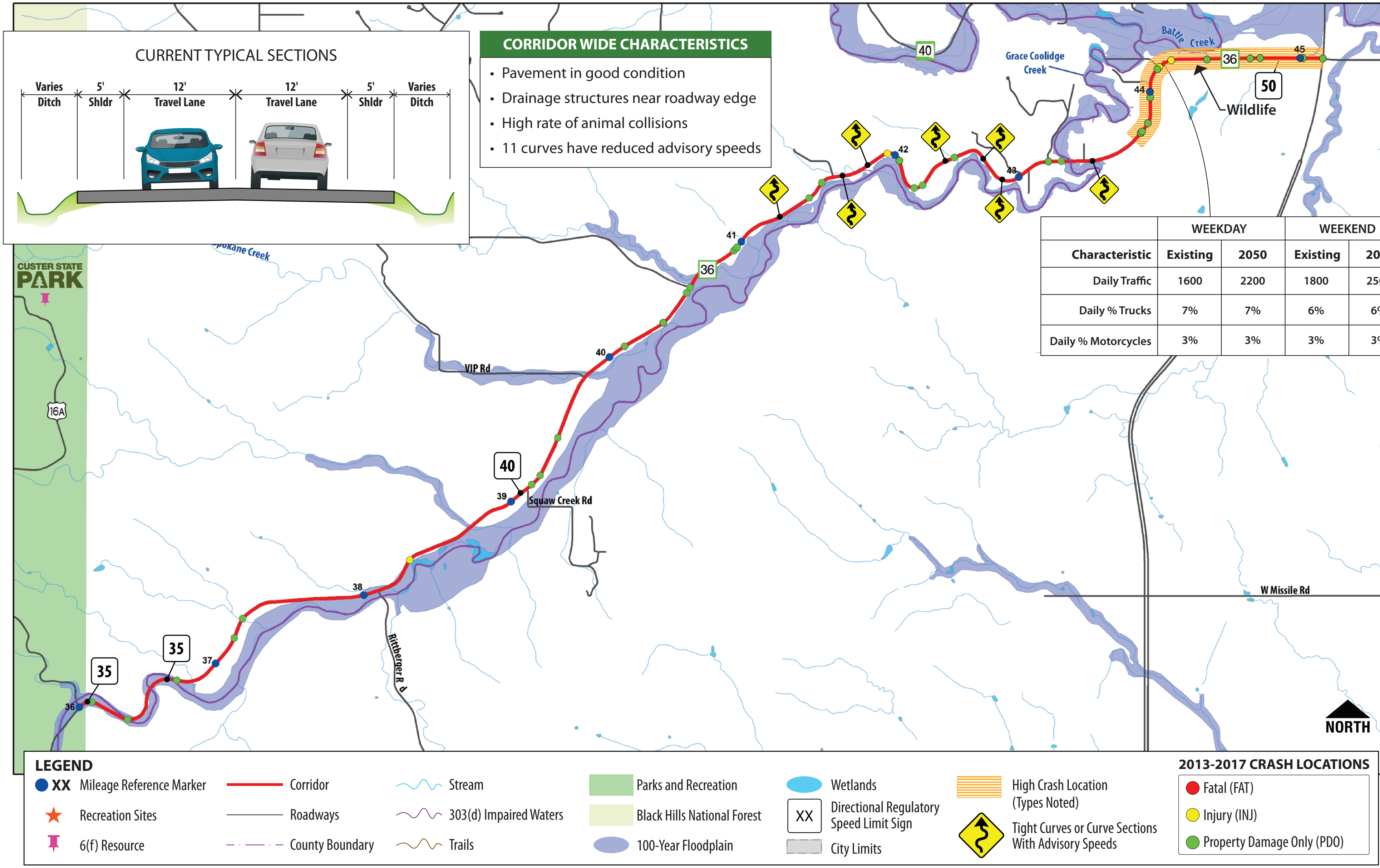
- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

CORRIDOR 10
SD 36: US 16A to SD 79

Corridor Characteristics



CORRIDOR WIDE CHARACTERISTICS

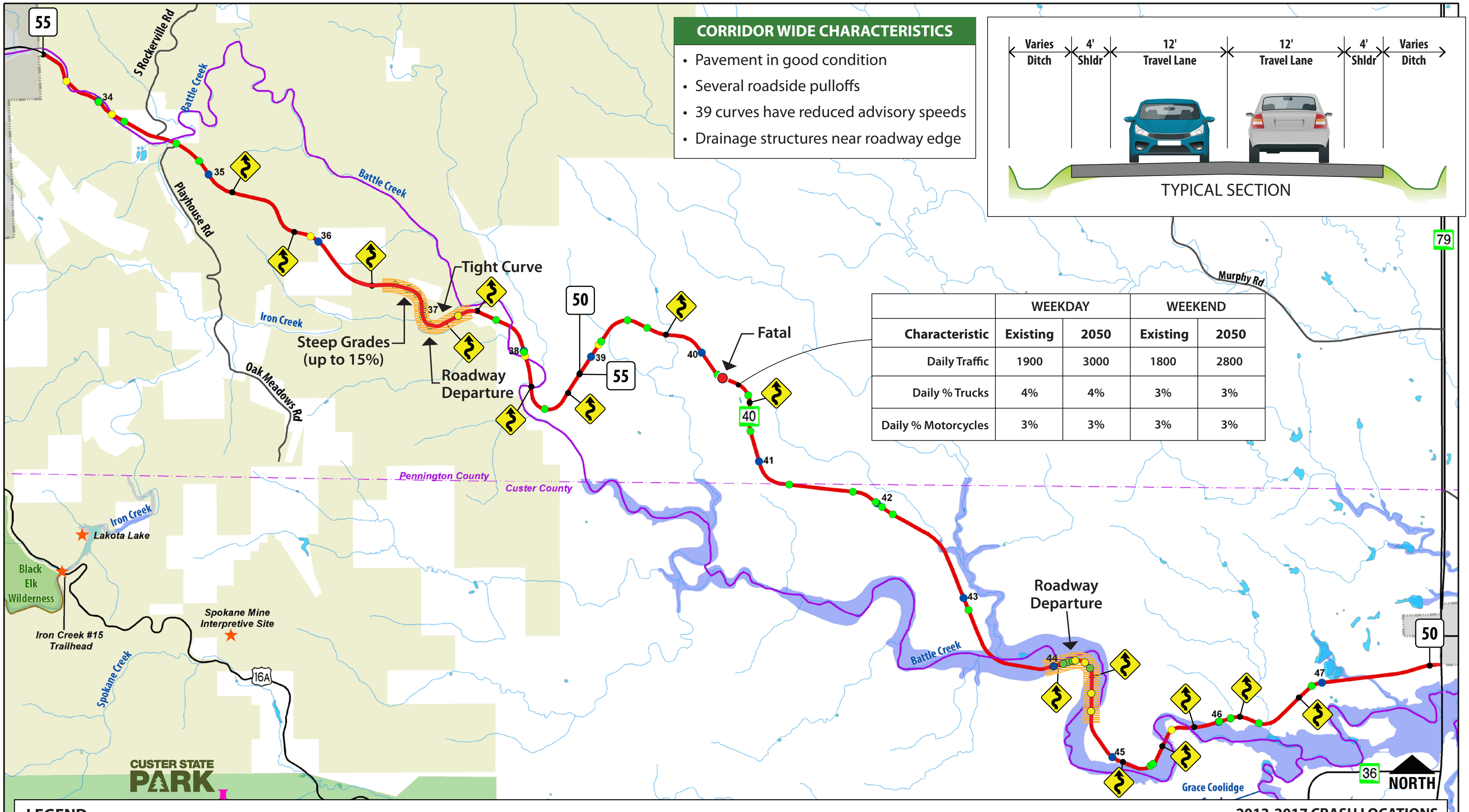
- Pavement in good condition
- Drainage structures near roadway edge
- High rate of animal collisions
- 11 curves have reduced advisory speeds

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	1600	2200	1800	2500
Daily % Trucks	7%	7%	6%	6%
Daily % Motorcycles	3%	3%	3%	3%

SDDOT Black Hills CSC Study 17-385 2/3/20

CORRIDOR 11
SD 40: Keystone to SD 79

Corridor Characteristics



CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Several roadside pulloffs
- 39 curves have reduced advisory speeds
- Drainage structures near roadway edge

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	1900	3000	1800	2800
Daily % Trucks	4%	4%	3%	3%
Daily % Motorcycles	3%	3%	3%	3%

LEGEND

- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

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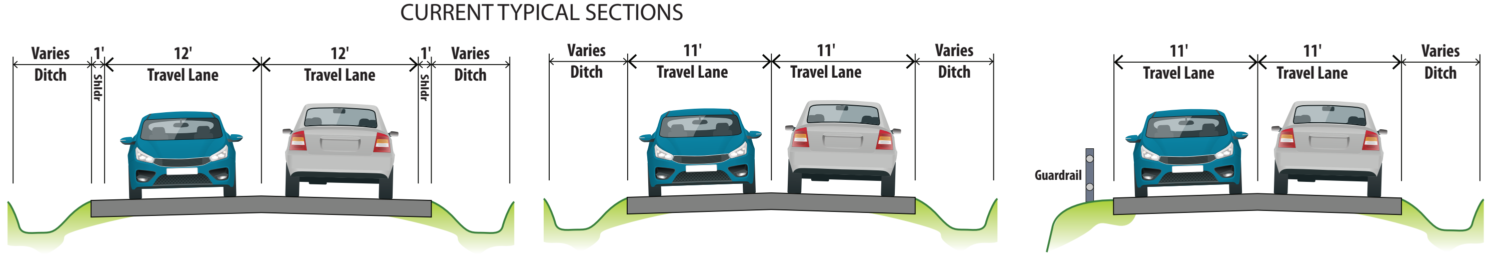
CORRIDOR 12
SD 87: South of US 16A

Corridor Characteristics

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	1200	1900	100	200
Daily % Trucks	5%	5%	3%	3%
Daily % Motorcycles	7%	7%	10%	10%

CURRENT TYPICAL SECTIONS



CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Several roadside pulloffs
- Wildfire burn area
- Dead trees from pine beetles
- 10 curves have reduced advisory speeds
- Drainage structures near roadway edge

LEGEND

- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

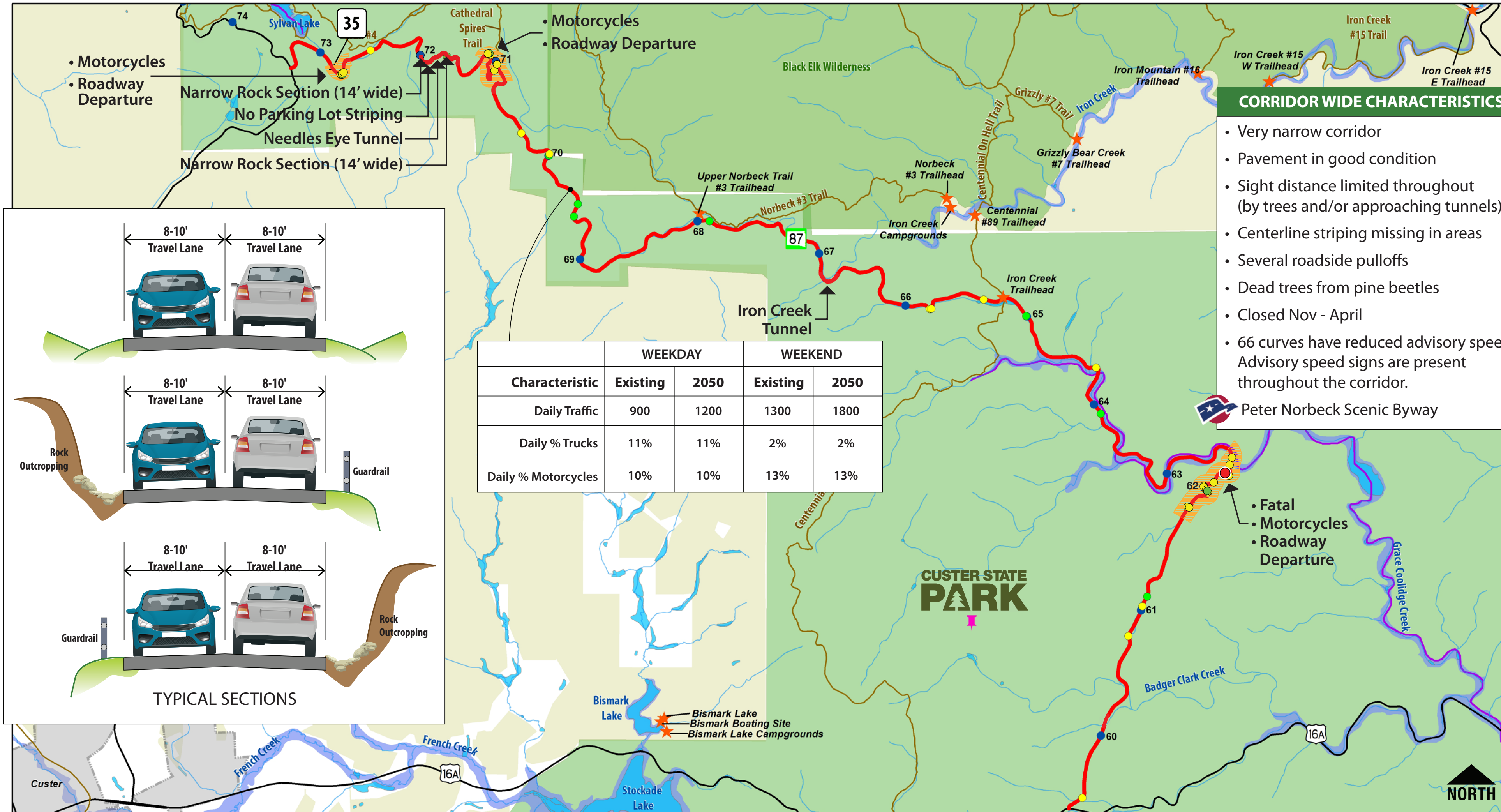
2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

Black Hills
CONTEXT SENSITIVE CORRIDORS STUDY

CORRIDOR 13
SD 87: Needles Hwy.

Corridor Characteristics



	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	900	1200	1300	1800
Daily % Trucks	11%	11%	2%	2%
Daily % Motorcycles	10%	10%	13%	13%

CORRIDOR WIDE CHARACTERISTICS

- Very narrow corridor
- Pavement in good condition
- Sight distance limited throughout (by trees and/or approaching tunnels)
- Centerline striping missing in areas
- Several roadside pullofs
- Dead trees from pine beetles
- Closed Nov - April
- 66 curves have reduced advisory speeds. Advisory speed signs are present throughout the corridor.

Peter Norbeck Scenic Byway

LEGEND

- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

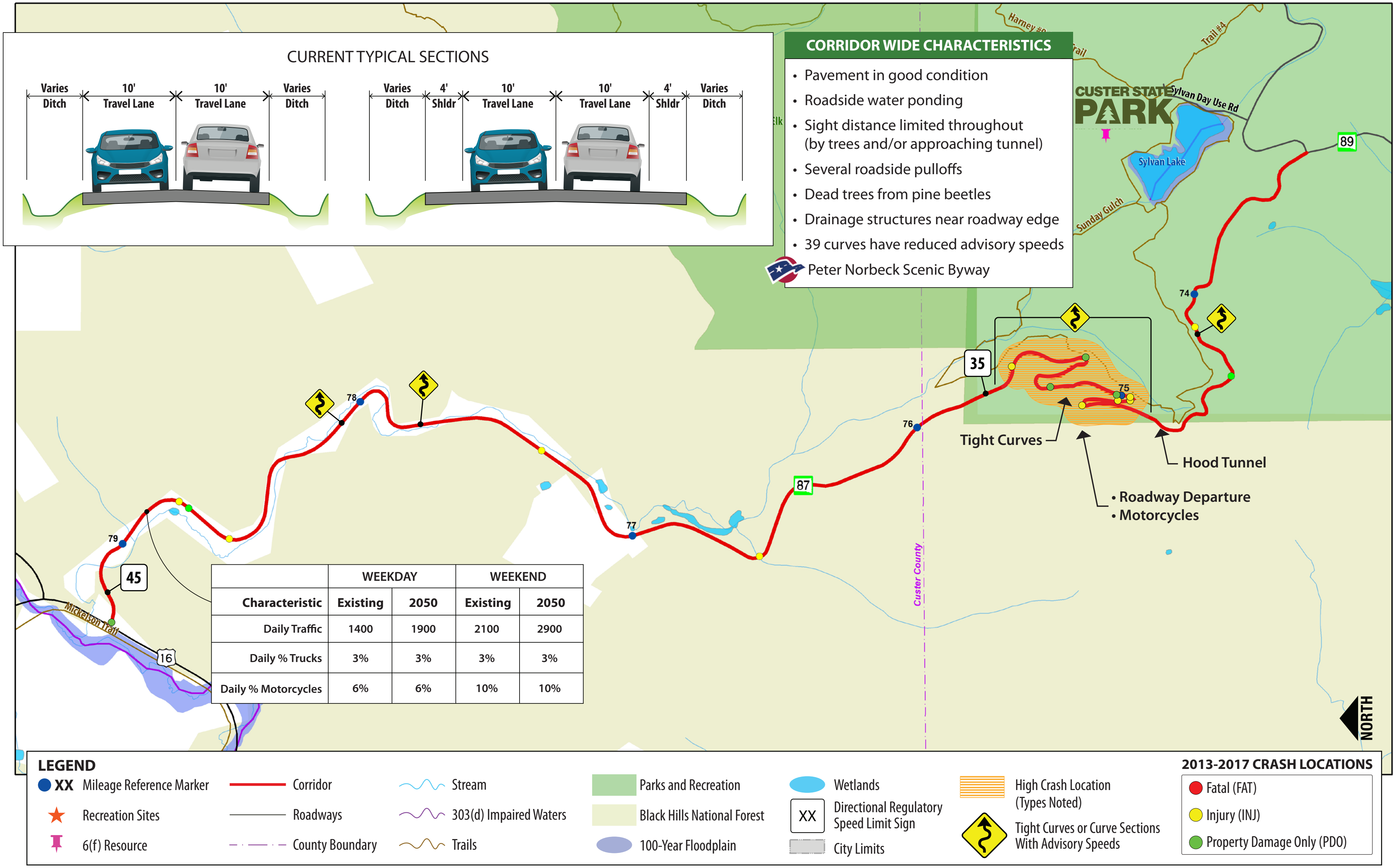
2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

SDDOT Black Hills CSC Study 17-385 2/3/20

CORRIDOR 14
SD 87: Norbeck Byway

Corridor Characteristics



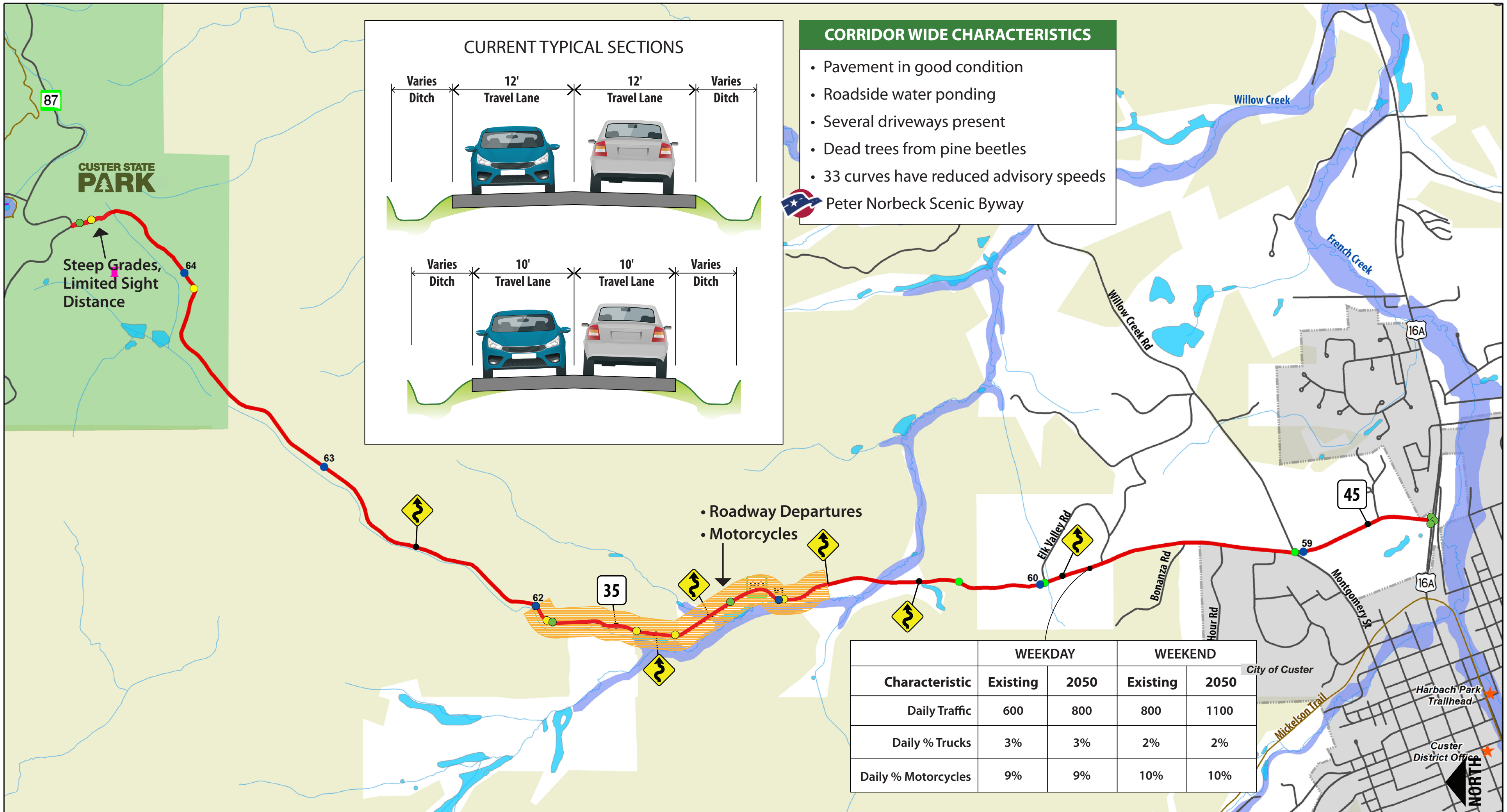
CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Roadside water ponding
- Sight distance limited throughout (by trees and/or approaching tunnel)
- Several roadside pulloffs
- Dead trees from pine beetles
- Drainage structures near roadway edge
- 39 curves have reduced advisory speeds
- Peter Norbeck Scenic Byway

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	1400	1900	2100	2900
Daily % Trucks	3%	3%	3%	3%
Daily % Motorcycles	6%	6%	10%	10%

CORRIDOR 15
SD 89: US 16A to SD 87

Corridor Characteristics



CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Roadside water ponding
- Several driveways present
- Dead trees from pine beetles
- 33 curves have reduced advisory speeds
- Peter Norbeck Scenic Byway

	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	600	800	800	1100
Daily % Trucks	3%	3%	2%	2%
Daily % Motorcycles	9%	9%	10%	10%

LEGEND

- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

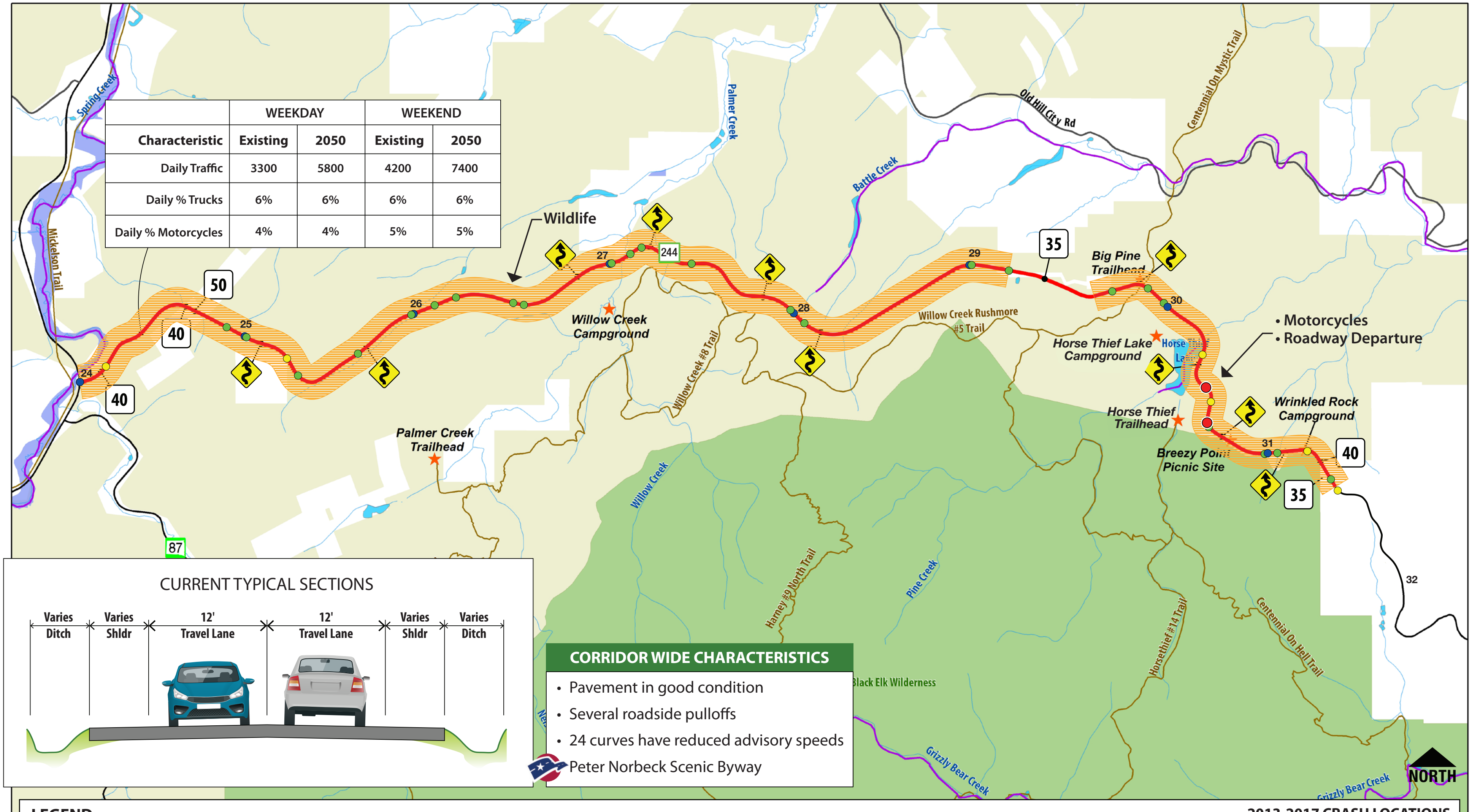
2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

Black Hills
CONTEXT SENSITIVE CORRIDORS STUDY

CORRIDOR 16
SD 244: West of Mt. Rushmore

Corridor Characteristics



	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	3300	5800	4200	7400
Daily % Trucks	6%	6%	6%	6%
Daily % Motorcycles	4%	4%	5%	5%

CURRENT TYPICAL SECTIONS

Varies Ditch	Varies Shldr	12' Travel Lane	12' Travel Lane	Varies Shldr	Varies Ditch

CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Several roadside pulloffs
- 24 curves have reduced advisory speeds
- Peter Norbeck Scenic Byway

LEGEND

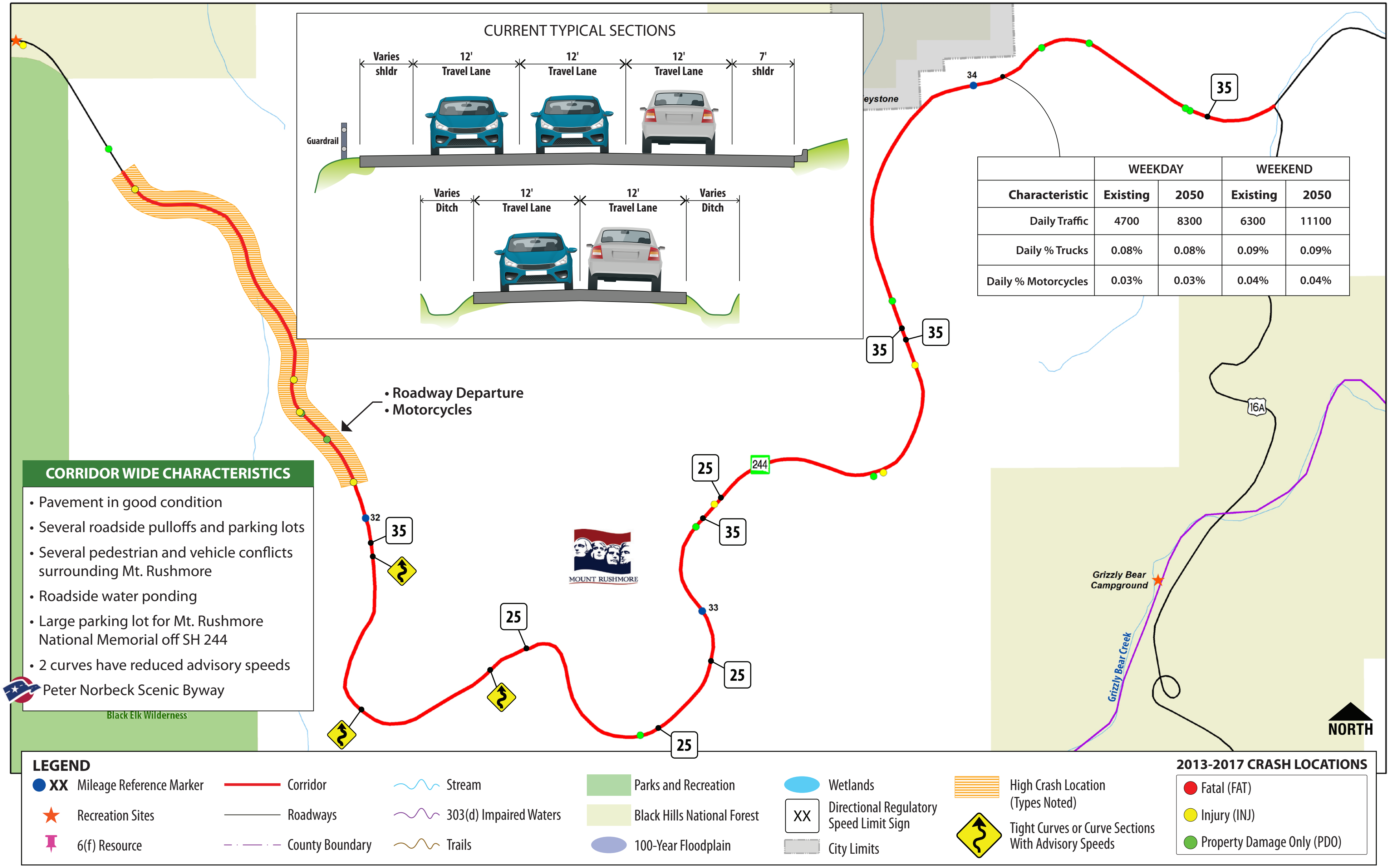
- XX Mileage Reference Marker
- Recreation Sites
- 6(f) Resource
- Corridor
- Roadways
- County Boundary
- Stream
- 303(d) Impaired Waters
- Trails
- Parks and Recreation
- Black Hills National Forest
- 100-Year Floodplain
- Wetlands
- XX Directional Regulatory Speed Limit Sign
- City Limits
- High Crash Location (Types Noted)
- Tight Curves or Curve Sections With Advisory Speeds

2013-2017 CRASH LOCATIONS

- Fatal (FAT)
- Injury (INJ)
- Property Damage Only (PDO)

CORRIDOR 17
SD 244: Mt. Rushmore

Corridor Characteristics



	WEEKDAY		WEEKEND	
Characteristic	Existing	2050	Existing	2050
Daily Traffic	4700	8300	6300	11100
Daily % Trucks	0.08%	0.08%	0.09%	0.09%
Daily % Motorcycles	0.03%	0.03%	0.04%	0.04%

CORRIDOR WIDE CHARACTERISTICS

- Pavement in good condition
- Several roadside pulloffs and parking lots
- Several pedestrian and vehicle conflicts surrounding Mt. Rushmore
- Roadside water ponding
- Large parking lot for Mt. Rushmore National Memorial off SH 244
- 2 curves have reduced advisory speeds

Peter Norbeck Scenic Byway

APPENDIX B. IMPROVEMENTS TO SUPPORT VISION

READER NOTES:

1. The improvement types table is provided as the first 4 pages of the Appendix to allow the reader to reference improvement codes shown on corridor improvement graphics without having to navigate back to the body of the report.
2. Each improvement graphic includes a text box that can be clicked to quickly navigate back to the table provided at the beginning.
3. The corridor improvement graphic you are reviewing may be reached again by paging forward from the table to the corridor of reference.

Improvement Types and Crash Modification Factors

Improvement Type		C or O/M[1]	Description		CMF
DESIGN (D)					
D1	Improve or mitigate horizontal curvature	C	Increase radius, remove compound curve, provide retroreflective markers, add more specific warning signage		0.8
D2	Improve or mitigate vertical curvature	C	Flatten curve, provide retroreflective markers, provide recovery area, add advance and specific signage		0.49
D3	Widen or reduce shoulder width	C	Increase width of shoulder, reduce width of shoulder to increase lane width	Widen from 0 - 2'	0.89
				Widen from 0-4'	0.81
				Widen from 0-6'	0.73
				Widen from 0-8'	0.77
D4	Widen or reduce width of travel lanes	C	Increase lane width, increase lane width by reducing shoulder width, reduce lane width to increase shoulder width	Widen from 9-12'	0.74
				Widen from 10-12'	0.83
				Widen from 11-12'	0.96
D5	Improve sight distance	C	Flatten hillsides around curves, remove and replace/relocate trees, add advanced warning signage		0.63
D6	Adjust curve superelevation	C	Increase superelevation to improve maneuverability around curves or improve drainage runoff of pavement		0.85
	Improve curve superelevation (as safety countermeasure)	C	Improve maneuverability around curves		0.85
D7	Add pullouts	C	Provide more pulloff locations along roadway		0.78
	Improve pullouts	C	Lengthen, widen, more signage/advance warning		
D8	Add parking	C	Provide more spaces in existing parking lots or add more parking lots along roadway		0.78
	Improve parking	C	Add parking spaces, reconfigure parking, increase parking space sizes		0.78
D9	Add drainage ditch	O&M	Keep water and debris off roads, minimize icing		N/A
	Improve erosion control/slope stabilization	O&M	Stabilize slopes, remove dead fallen trees, slide creek over		N/A
	Relocate or identify drainage structures in clear zone	O&M	Add shoulder to place drainage outside clear zone, move drainage outside clear zone		N/A

	Improvement Type	C or O/M[1]	Description		CMF
MULTIMODAL OPERATIONS (O)					
O1	Add passing lanes	C	Add passing lanes to allow cars to pass vehicles uphill and slow-moving vehicles, improve capacity along roadway and reduce congestion		0.65
O2	Increase passing zones	O&M	Add more areas to allow vehicles to pass other vehicles and reduce congestion		0.65
O3	Add more travel or turn lanes	C	Add lanes to improve capacity and reduce congestion to improve safety	Turn Lanes	N/A
				Travel Lanes	0.85
O4	Implement Access Management techniques	C	Adjust driveways, combine accesses, advance signage, reduce access points		0.7
O5	Change intersection traffic control	C	Review stop controlled, signal, roundabouts and other intersection improvements to reduce crashes	STOP signs to signal	0.56
				TWSC to AWSC	0.52
				STOP signs to roundabout	0.42
O6	Improve bike and/or pedestrian facilities	O&M	Widen pathways, add advance or informational signing, add crosswalks, provide shuttle service, add access to existing regional trails		N/A
	Add bike and/or pedestrian facilities	C	Provide bike lanes as appropriate, provide adjacent (barrier-separated trails)	Shared	0.68
				Separate	0.41
				Crosswalks	0.6

Improvement Type		C or O/M[1]	Description	CMF
SAFETY (S)				
S1	Add speed reduction signs and step down speeds in 10 MPH increments	O&M	Identify locations, speeds along roadway need to be reduced and provide appropriate signs per MUTCD, install traffic calming improvements	0.96 0.84
S1	Signing improvements/additions	O&M	Could include rockfall warning static signs, conduct sign audit, change posted speed to more closely reflect design speed, etc.	0.96 0.84
S2	Add or improve guardrail or improve clear zone	C	Flatten slopes to meet clear zone criteria, or add guardrail where flattening is not possible, add rubrail for motorcycles	0.78
S2	Reevaluate existing guardrail installations	O&M	Where slopes can be flattened to meet criteria or rock face locations, remove guardrail and flatten to reduce physical impact crashes, especially dangerous for motorcycles	0.78
S2	Improve pavement drop offs (material lacks hold)	O&M	Improve roadside slopes or add guardrail	0.777
S2	Removal of dead/dying trees	O&M	Fires and beetle kill has resulted in several fallen trees or dying trees, remove to improve aesthetics of view along the roadway that add to the journey	N/A
S3	Motorcycle-specific safety improvements	C	Provide motorcycle-specific sign/device alerts, improve roadway and roadside design for motorcycle forgiveness to prevent falls and crashes	0.7
S3	Sturgis Rally strategies	O&M	Roadway sweeping, temporary transverse rumble strips as ideas, VMS signs during rally	N/A
S4	Add center rumble strips	O&M	Inform drivers when vehicles are crossing the centerline to reduce head-on crashes	0.86 0.79
S4	Add edgeline rumble strips	O&M	Inform drivers when vehicles are running off the road to reduce offroad crashes, use wave-shaped rumble strips	0.85
S4	Provide transverse rumble strips	O&M	Inform drivers of stopping, slowing or sharp curve conditions and high pedestrian crossing locations to reduce crashes	0.66
S5	Provide high friction pavement treatment	C	Improve drivers ability to navigate roadway during adverse weather conditions (may not be good for motorcycles)	0.653
S6	Traffic Calming	C	Implement speed management techniques along roadway, including visual treatments, chicanes, narrowing, etc.	0.94
S7	Modify pavement markings	O&M	Provide reflectors or improve retroreflectivity	0.968
S8	Wildlife collision treatments	C	Construct wildlife fencing with gaps.	0.6
S9	Rockfall mitigation measures	C	Provide wider shoulder for rockfall collection, improve signage, conduct analysis and physical mitigation to prevent rockfall (hexagonal mesh, rockfall netting), evaluate geologic slide areas and potential mitigation, remove rock where feasible	N/A

Improvement Type		C or O/M[1]	Description	CMF
ITS STRATEGIES (I)				
I1	Dynamic Message Signs	C	Provide important crash, weather, debris, tunnels, pigtail bridges, animals, and other information to drivers as needed	0.93
I2	Dynamic Speed Display Signs	C	Adjust and inform drivers of speeds for roadway based on changing conditions, add speed radar signs	0.93
I3	Road Weather Information Systems (RWIS)	C	Collect weather information and communicate information to drivers vehicle website, apps, social media, etc.	0.93
I4	Advance warning signs (vehicle size, curves etc.)	C	Improve notifications to drivers regarding steep grades, sharp curves, tunnels, pulloffs, etc. Provide physical infrastructure to inform oversize vehicle drivers of roadway limitations and provide a means to turn vehicle around	0.93
I5	Cameras (video)	C	SDDOT has been working with GF&P to put cameras on trails, may be able to share with them.	0.93
I6	Traffic sensors (volumes, speed, etc.)	C	Collect information at key locations to inform drivers and use for analysis	0.93
I7	Communications improvements	C	Install equipment or use current devices to communicate between devices and with drivers. Use social media, apps and other means to convey information to drivers, improve cellular coverage	0.93
I8	Positive closure control devices	C	Provide remote closure mechanism to close roads safely during critical events	1
AESTHETIC ENHANCEMENTS (A)				
A1	Guardrail/roadside signage visual treatments	O&M	Consider types of cable barrier. Self-weathering steel has a good look to it. High-tension guardrail has issues with deflection, etc.	N/A
A2	Streetscape beautification	C	Use of materials native to the hills. Enhance the experience of these visitors traveling the roadways.	N/A
A3	Interpretive sites/locations	C	Add more sites that have very interesting information for all ages to add to the experience of traveling these highways for Mount Rushmore, pigtail bridges, scenic byways, etc.	N/A

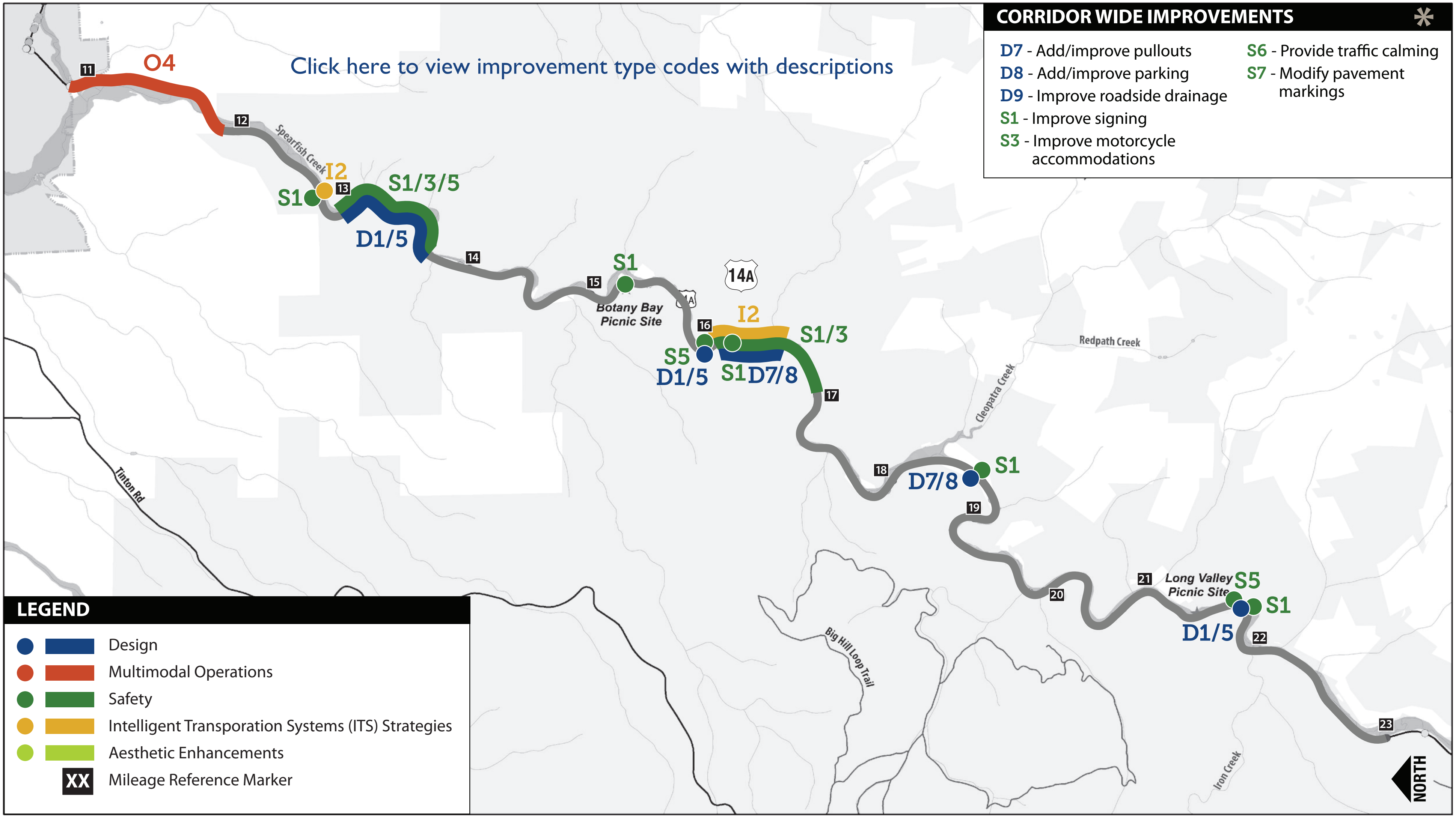
PURPOSE: Destination

CORRIDOR 1

US 14A: Spearfish Canyon North

Spearfish to Savoy

Improvements to Support Vision



CORRIDOR WIDE IMPROVEMENTS *

- D7 - Add/improve pullouts
- D8 - Add/improve parking
- D9 - Improve roadside drainage
- S1 - Improve signing
- S3 - Improve motorcycle accommodations
- S6 - Provide traffic calming
- S7 - Modify pavement markings

LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

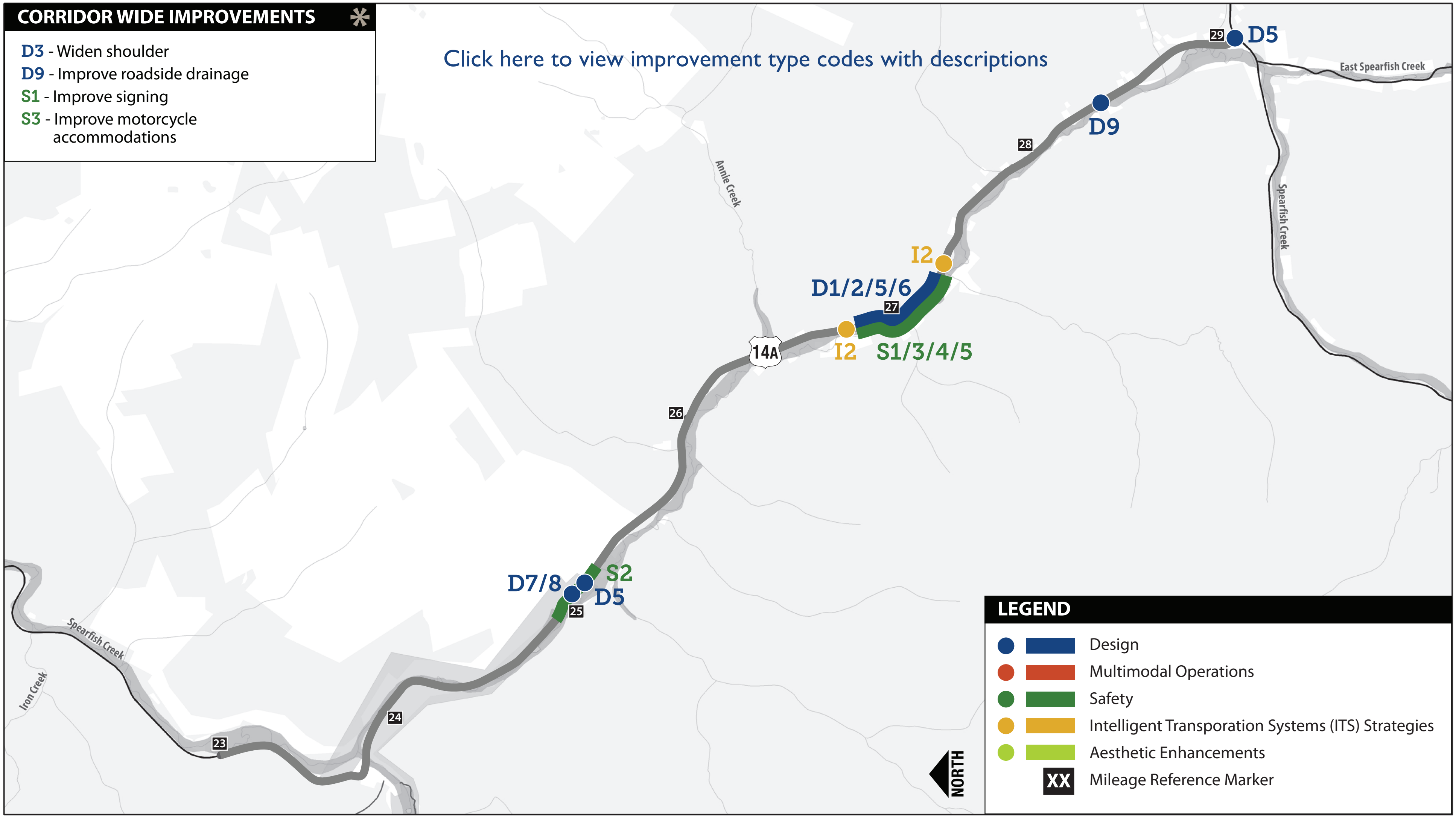
PURPOSE:
Destination Access

CORRIDOR 2

US 14A: Spearfish Canyon South

Savoy to Cheyenne Crossing

Improvements to Support Vision



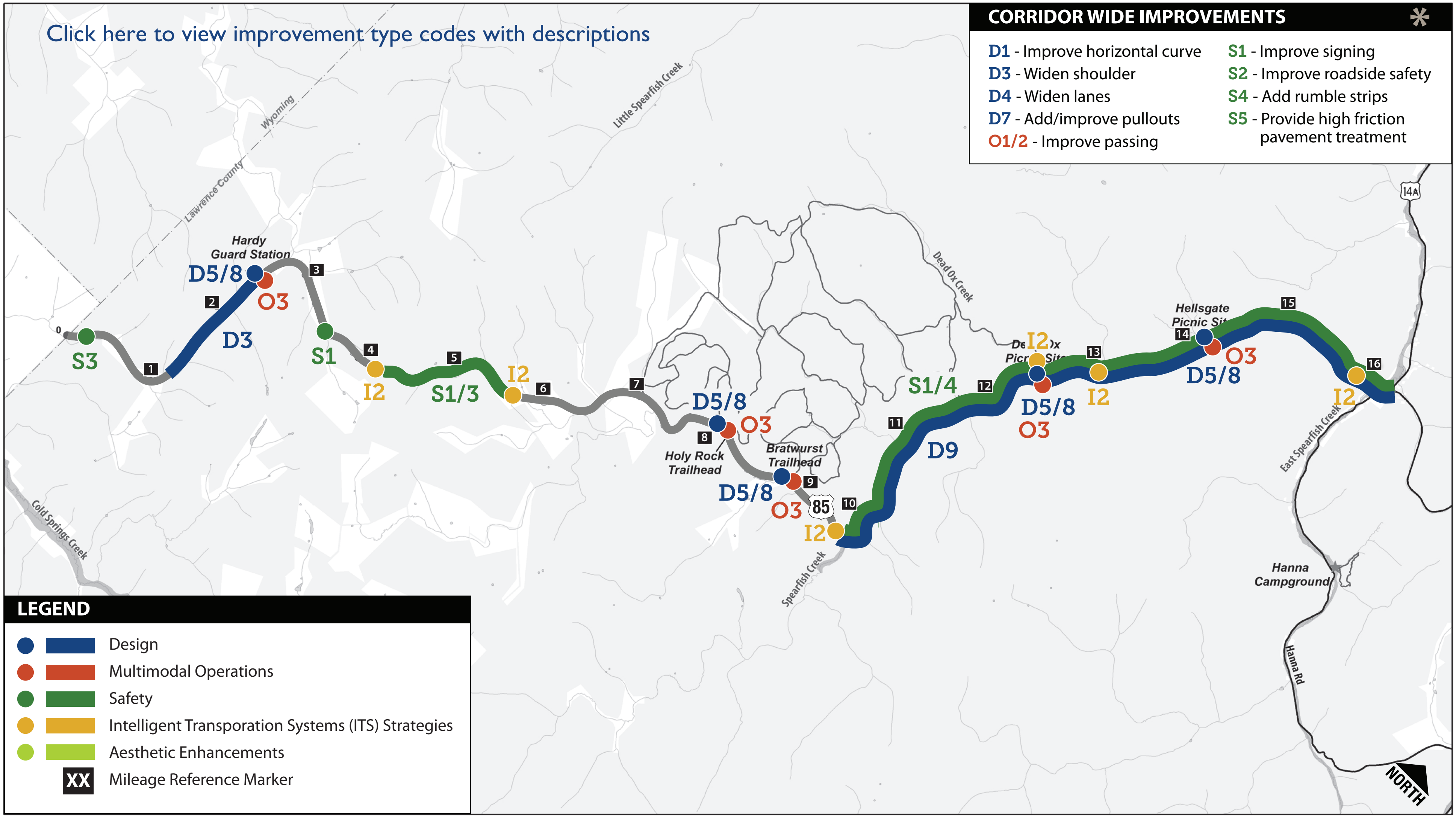
See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Commuter/Commercial Route

CORRIDOR 3

US 85: Wyoming to US 14A

Improvements to Support Vision



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Commuter/Commercial Route

CORRIDOR 4

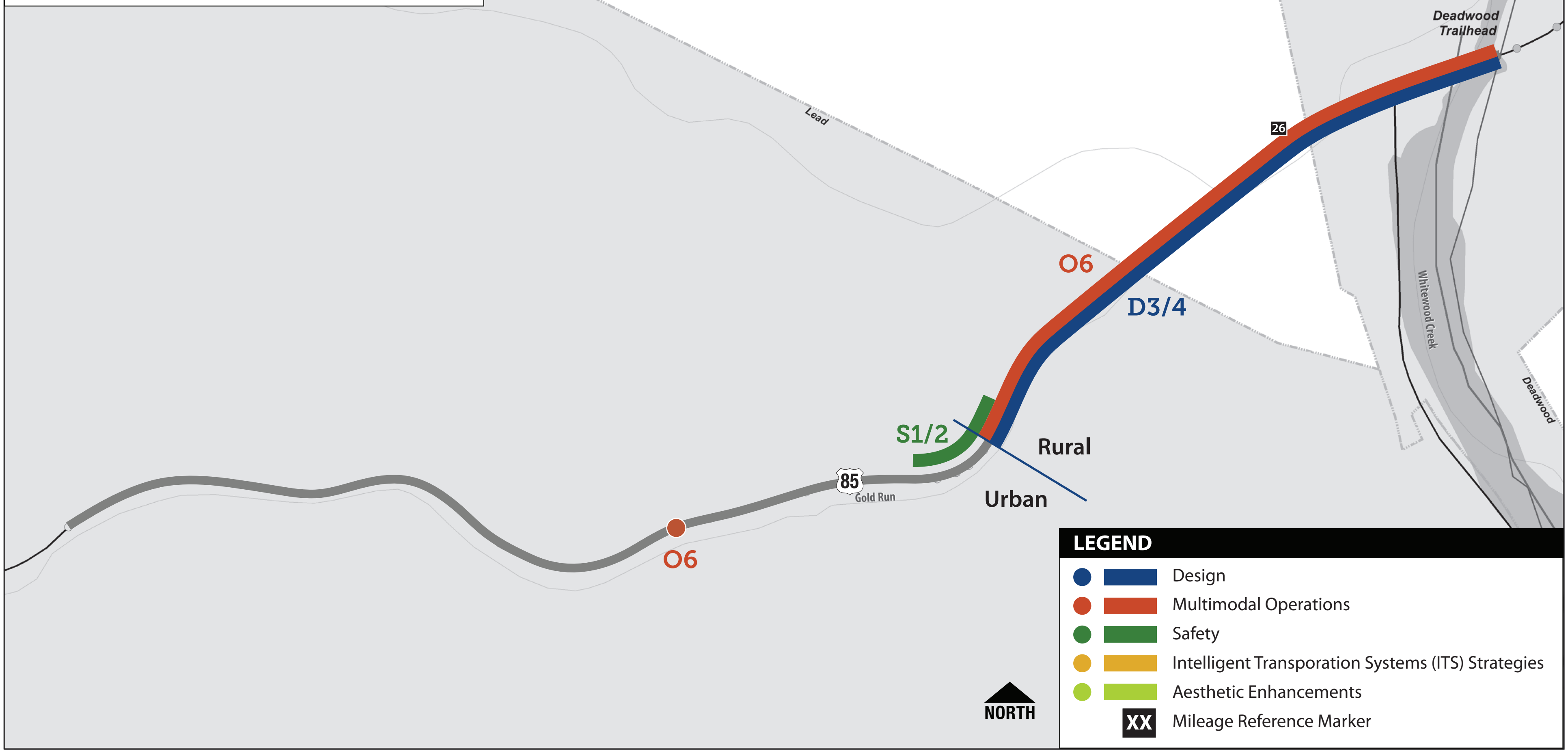
US 85: West of Pluma

Improvements to Support Vision

CORRIDOR WIDE IMPROVEMENTS *

- D3 - Widen shoulder
- D4 - Widen lane
- S1 - Improve signing
- S2 - Improve roadside safety
- S7 - Modify pavement markings
- A2 - Streetscape beautification

Click here to view improvement type codes with descriptions



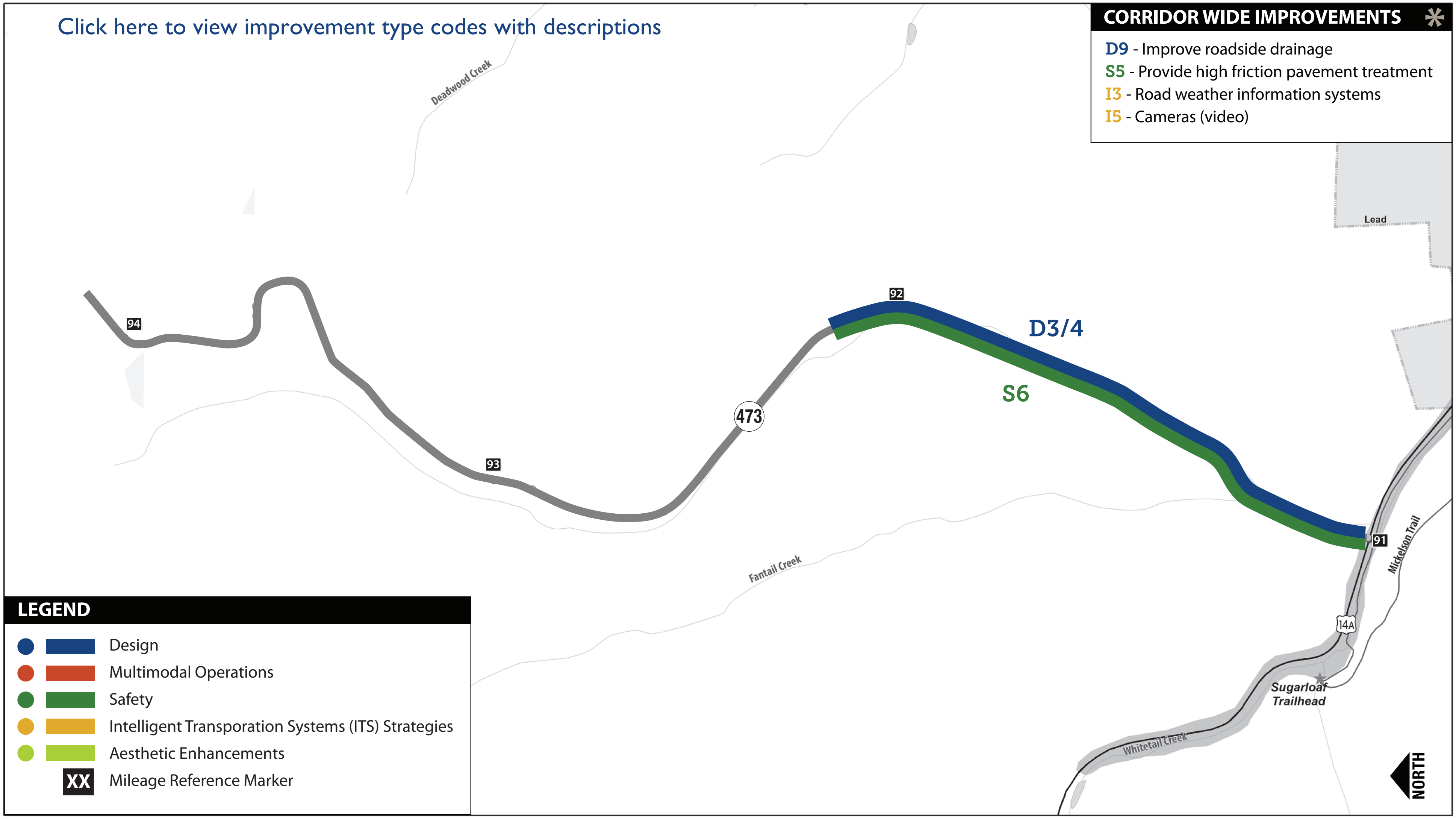
See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination Access

CORRIDOR 5
SD 473: Nevada Gulch Rd.

Improvements to Support Vision

Click here to view improvement type codes with descriptions



CORRIDOR WIDE IMPROVEMENTS *

- **D9** - Improve roadside drainage
- **S5** - Provide high friction pavement treatment
- **I3** - Road weather information systems
- **I5** - Cameras (video)

LEGEND

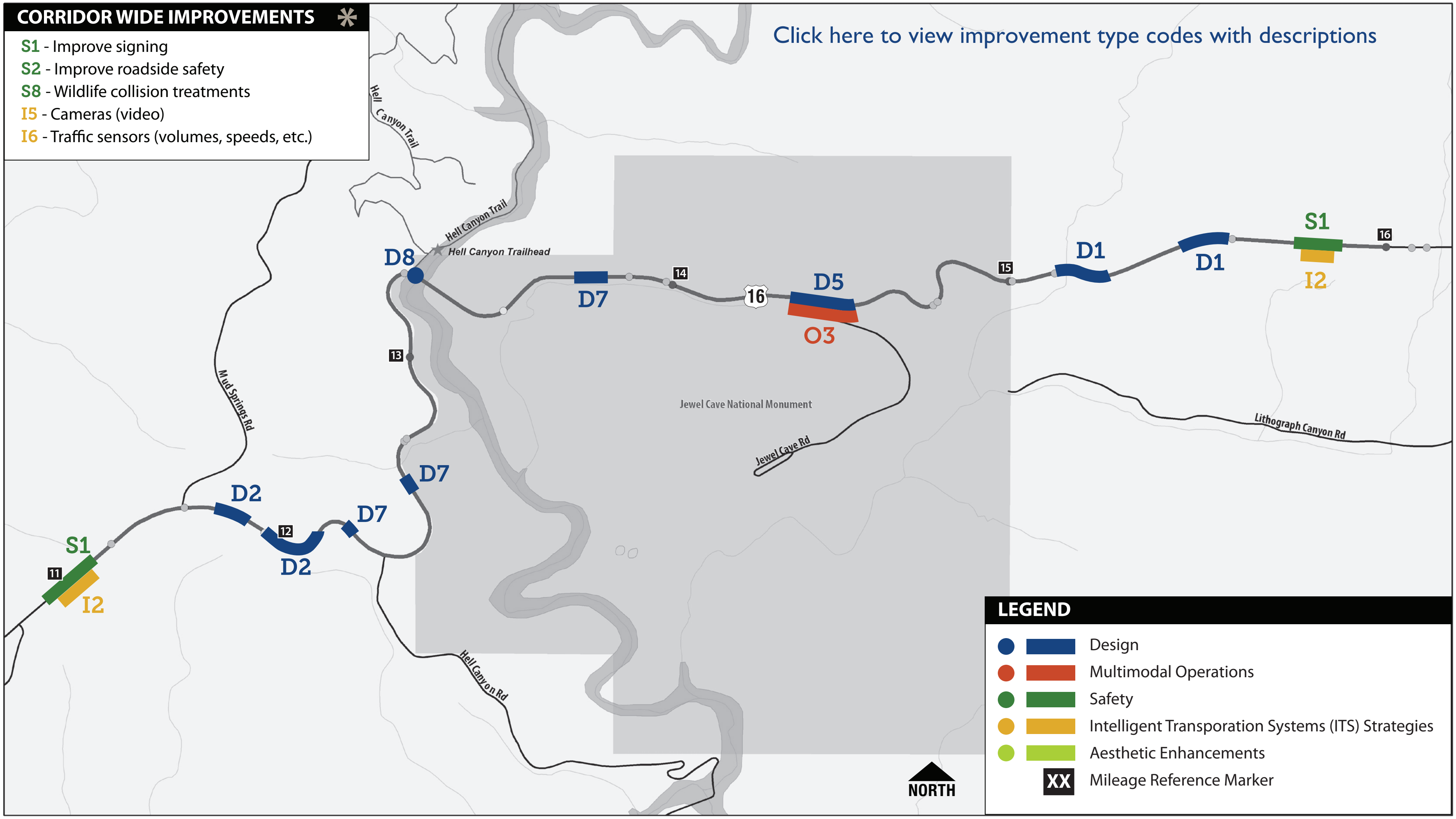
- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Commuter/Commercial Route

CORRIDOR 6
US 16: Jewel Cave

Improvements to Support Vision



** See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Destination Access

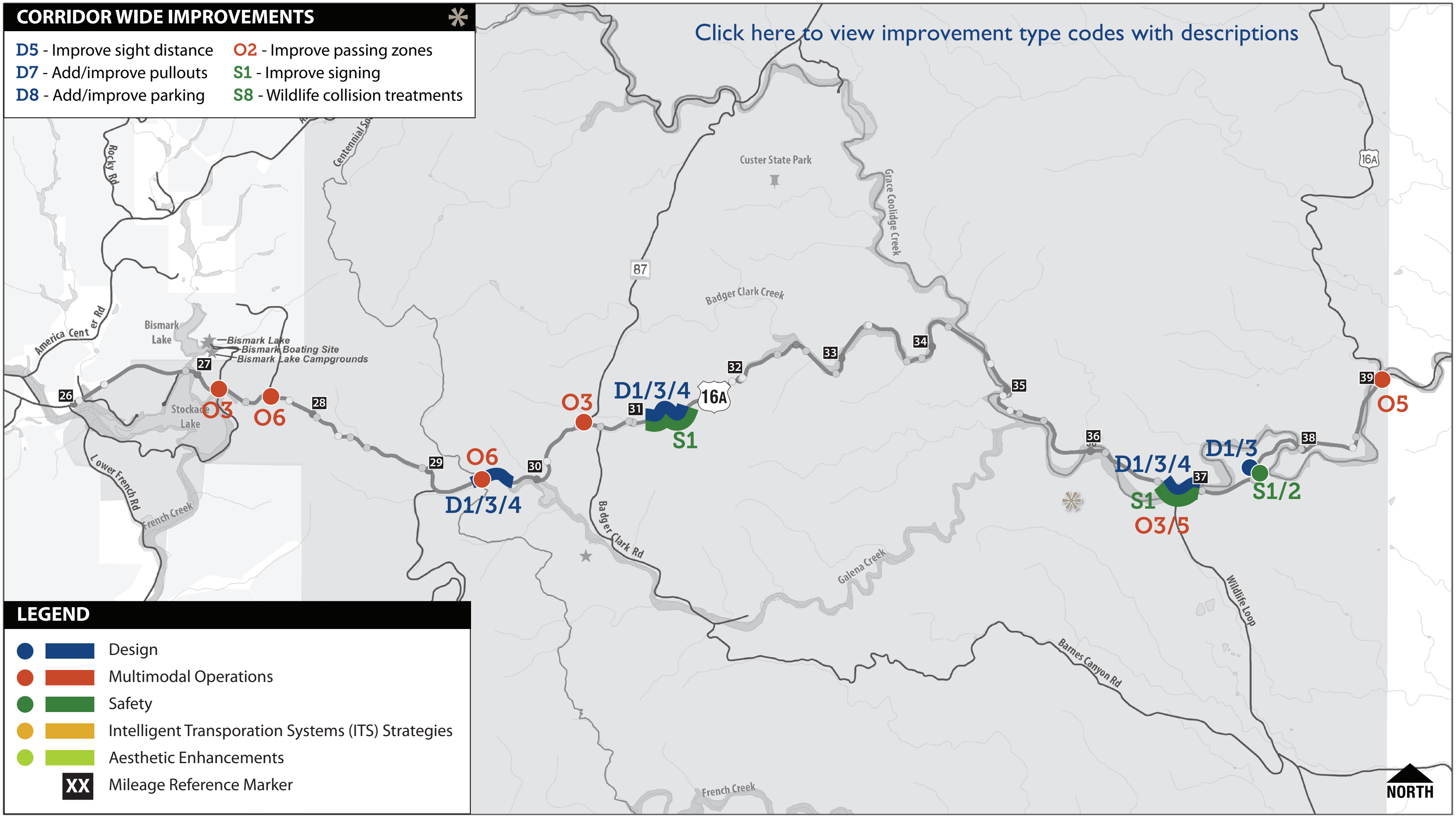
CORRIDOR 7
US 16A: Custer State Park

Improvements to Support Vision

CORRIDOR WIDE IMPROVEMENTS

- **D5** - Improve sight distance
- **D7** - Add/improve pullouts
- **D8** - Add/improve parking
- **O2** - Improve passing zones
- **S1** - Improve signing
- **S8** - Wildlife collision treatments

Click here to view improvement type codes with descriptions



LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination

CORRIDOR 8

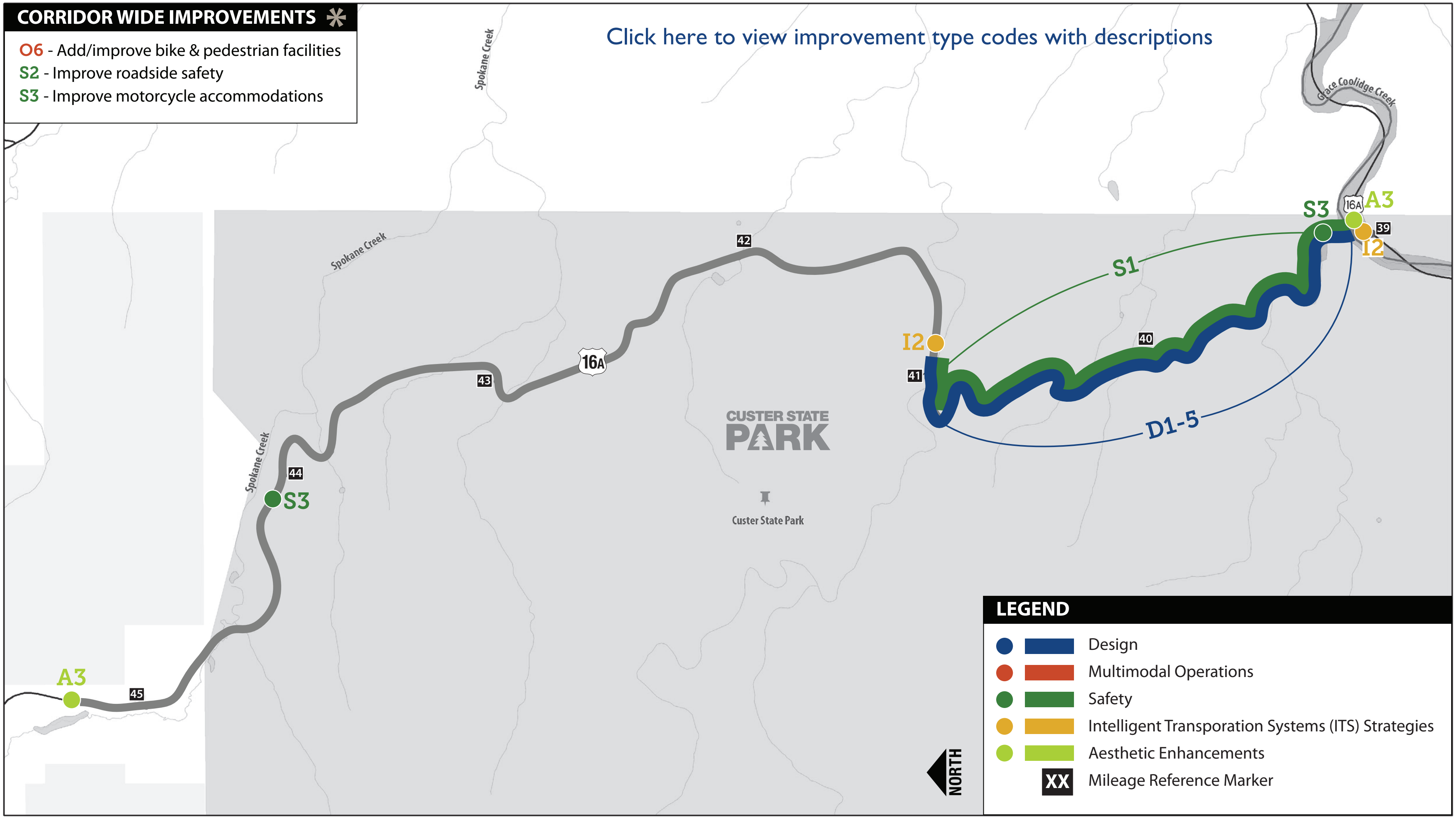
US 16A: South Iron Mountain Rd.

Improvements to Support Vision

CORRIDOR WIDE IMPROVEMENTS *

- O6 - Add/improve bike & pedestrian facilities
- S2 - Improve roadside safety
- S3 - Improve motorcycle accommodations

Click here to view improvement type codes with descriptions

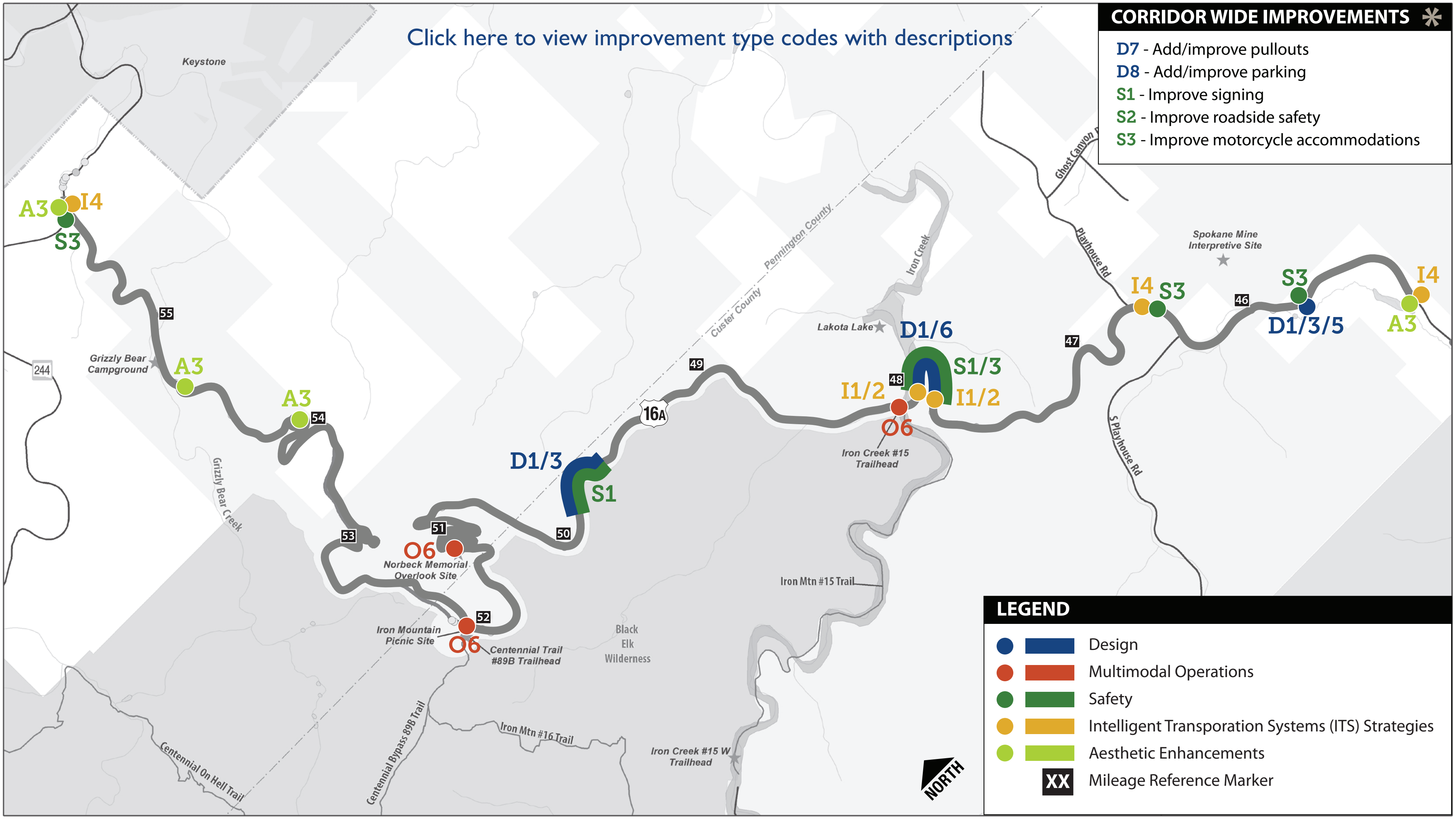


See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination

CORRIDOR 9
US 16A: North Iron Mountain Rd.

Improvements to Support Vision



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination Access

CORRIDOR 10

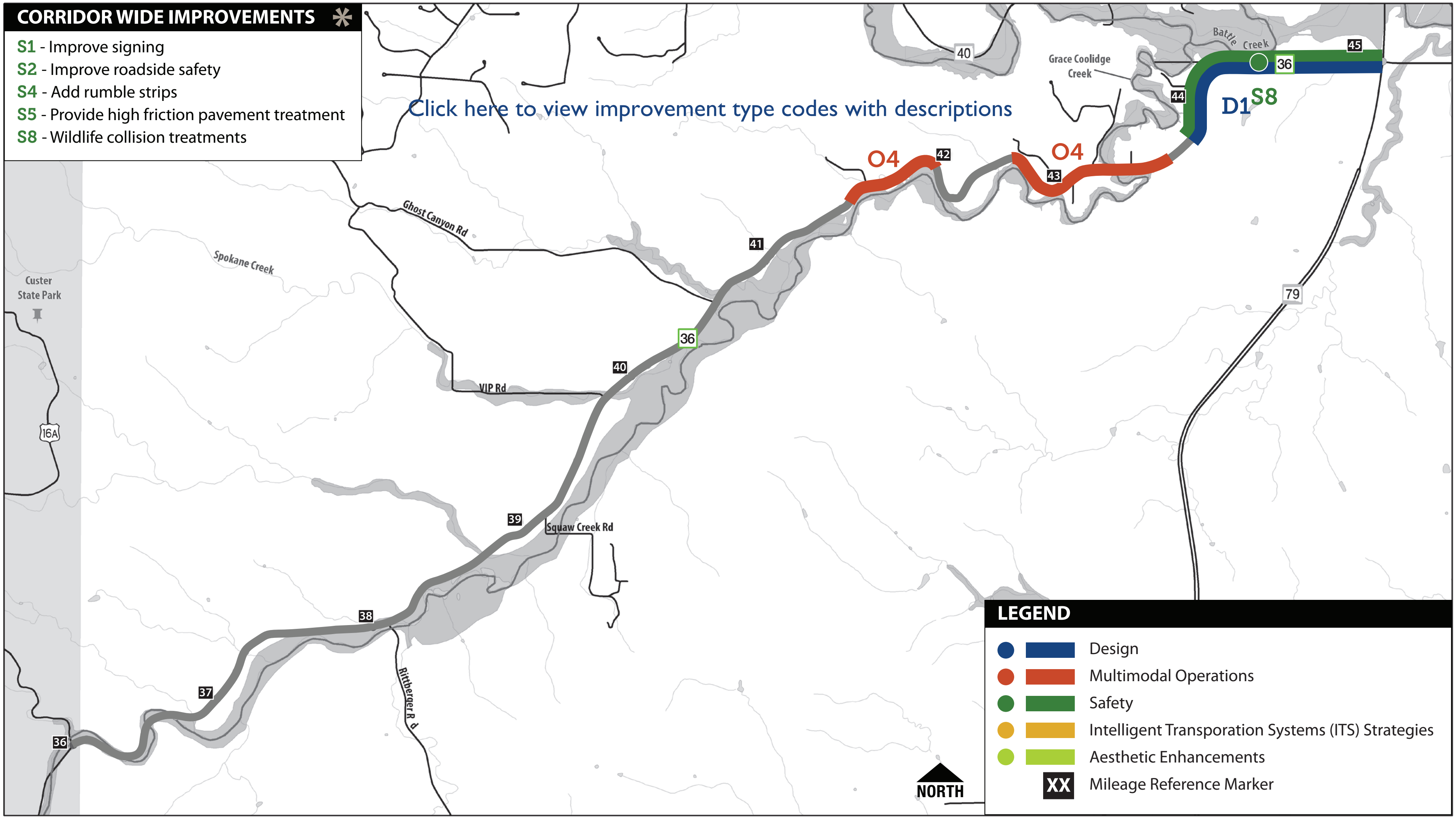
SD 36: US 16A to SD 79

Improvements to Support Vision

CORRIDOR WIDE IMPROVEMENTS *

- **S1** - Improve signing
- **S2** - Improve roadside safety
- **S4** - Add rumble strips
- **S5** - Provide high friction pavement treatment
- **S8** - Wildlife collision treatments

Click here to view improvement type codes with descriptions



LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

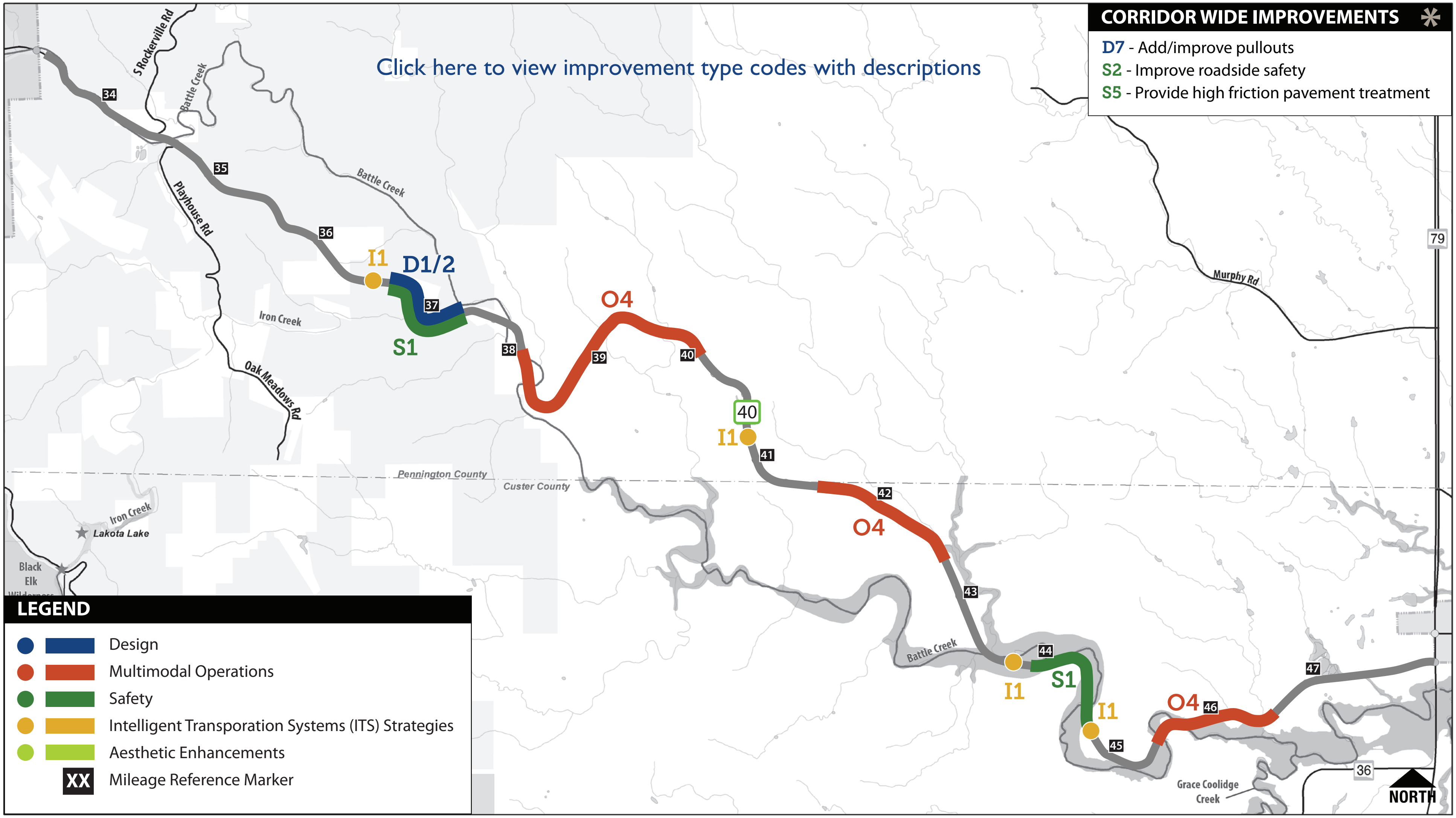
* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Commuter/Commercial Route

CORRIDOR 11

SD 40: Keystone to SD 79

Improvements to Support Vision

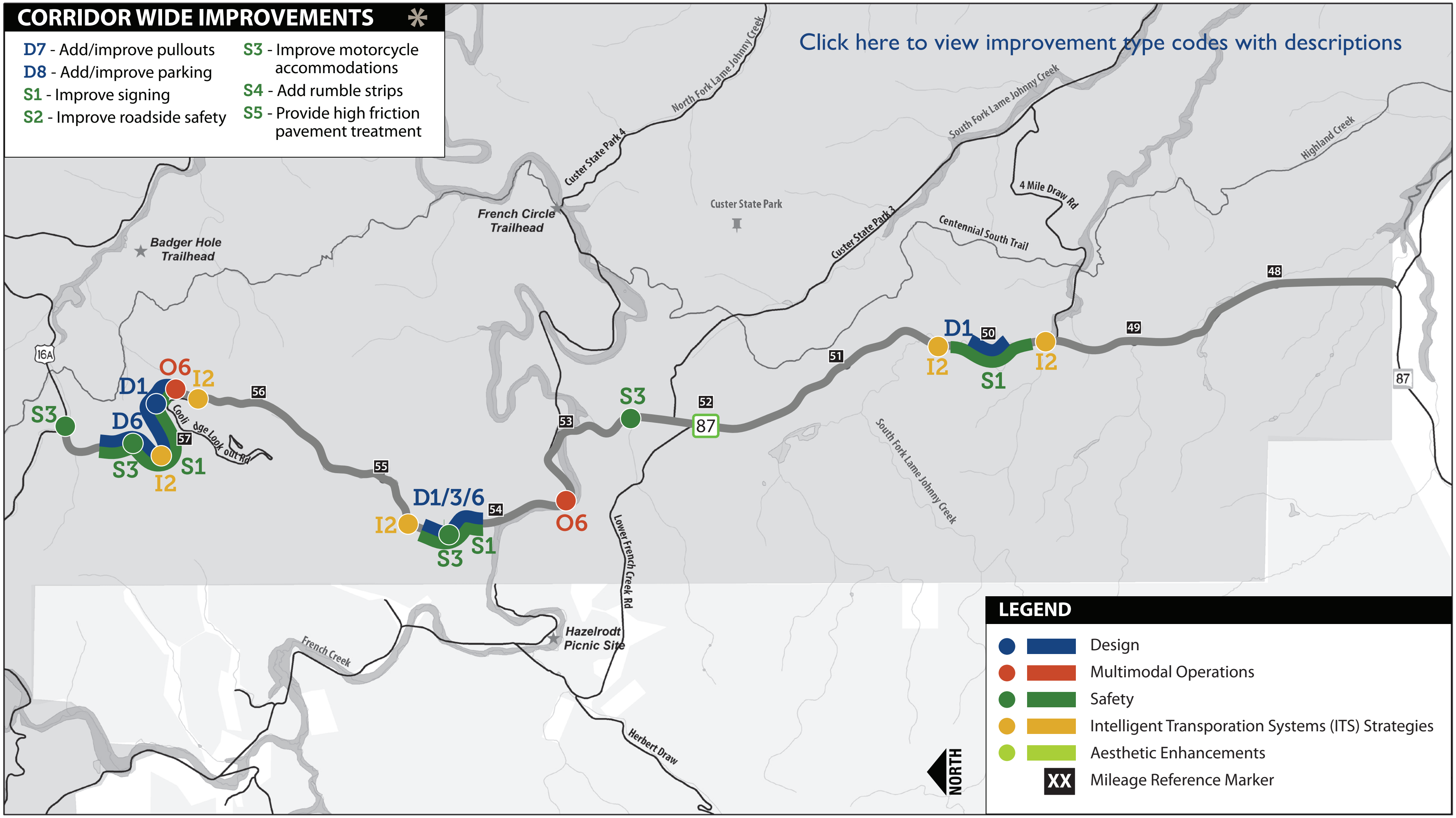


See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination Access

CORRIDOR 12
SD 87: South of US 16A

Improvements to Support Vision

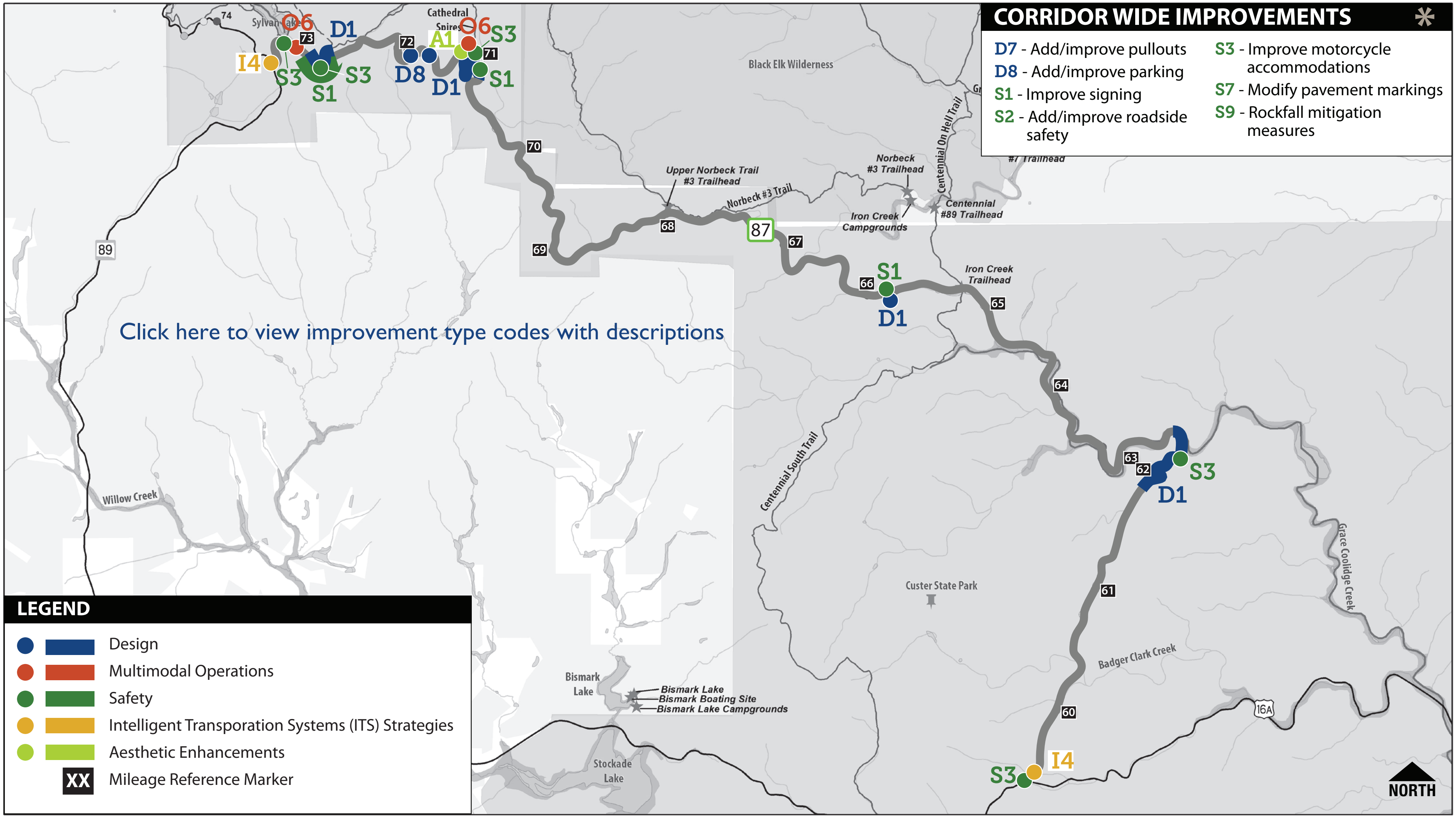


See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination

CORRIDOR 13
SD 87: Needles Hwy.

Improvements to Support Vision



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination

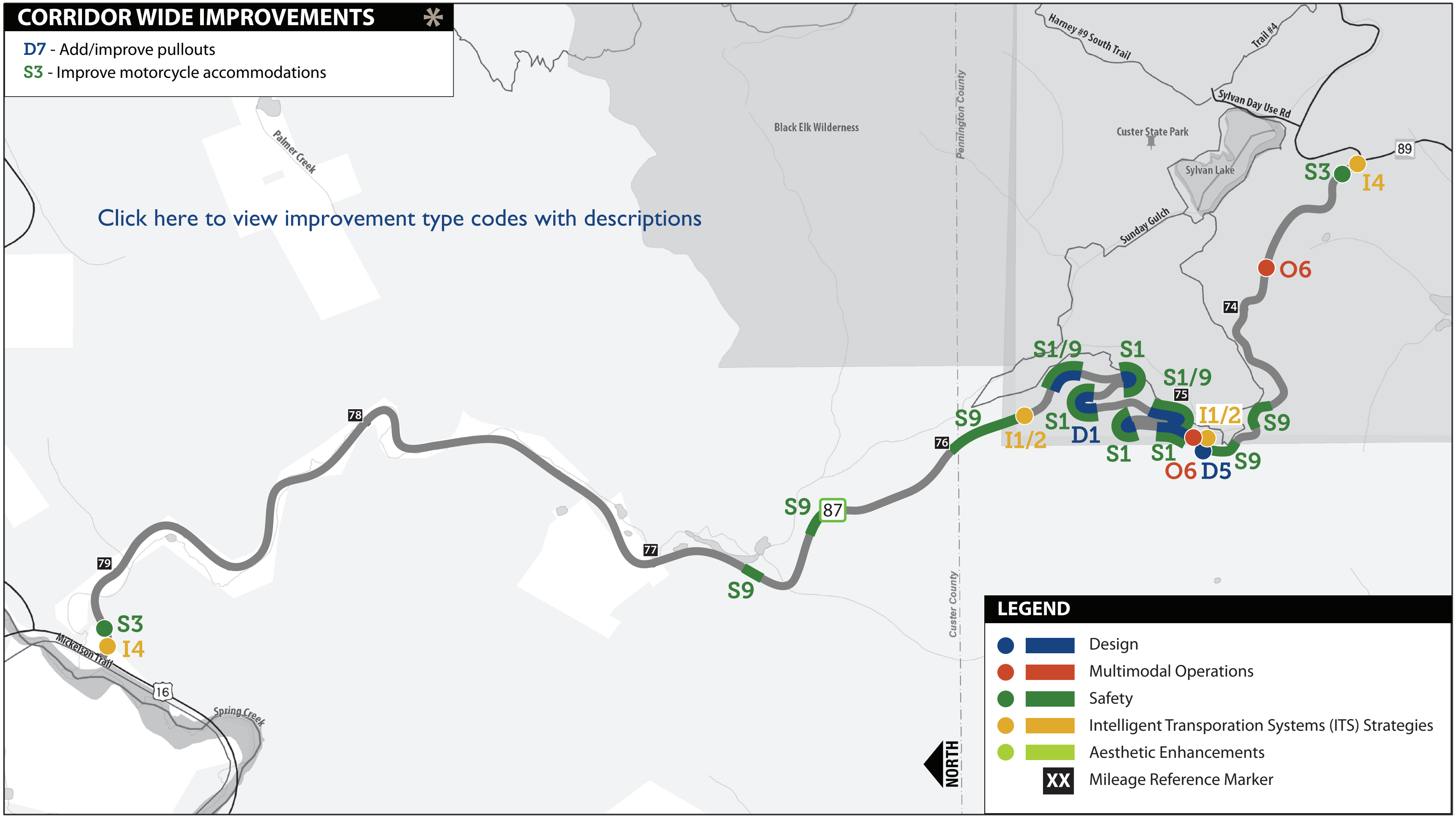
CORRIDOR 14
SD 87: Norbeck Byway

Improvements to Support Vision

CORRIDOR WIDE IMPROVEMENTS *

D7 - Add/improve pullouts
S3 - Improve motorcycle accommodations

Click here to view improvement type codes with descriptions



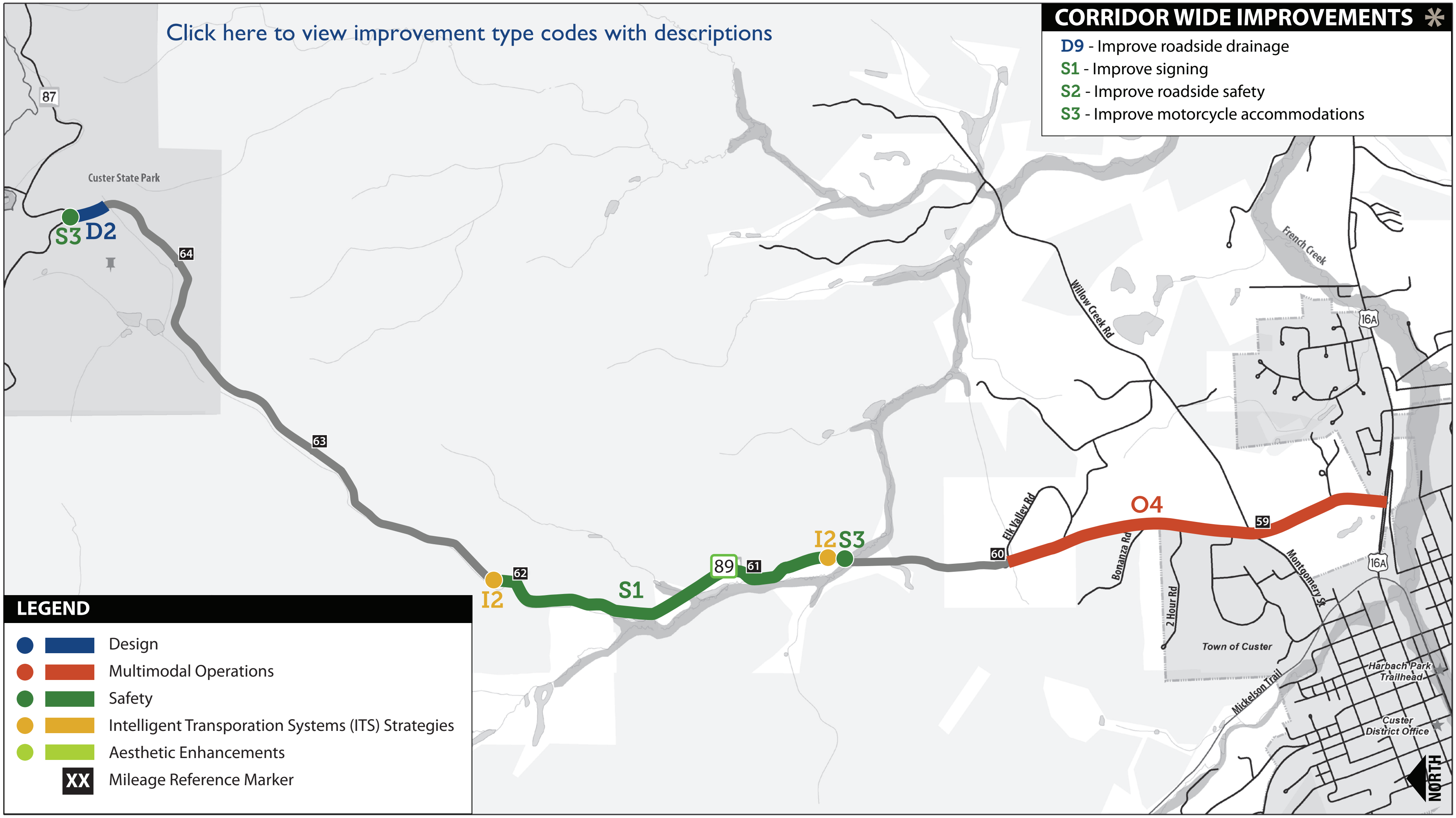
* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Destination Access

CORRIDOR 15

SD 89: US 16A to SD 87

Improvements to Support Vision



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination/Destination Access

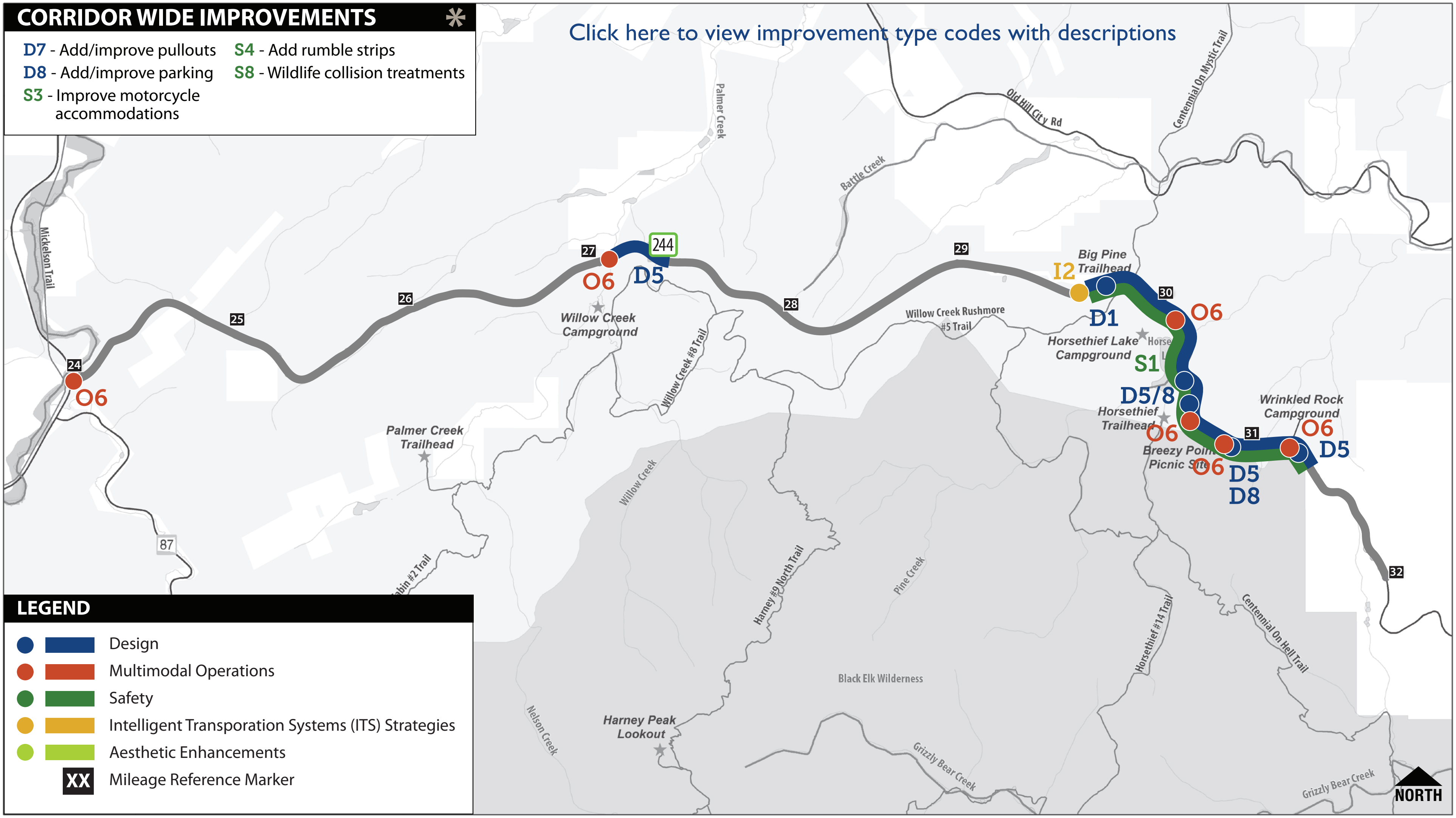
CORRIDOR 16
SD 244: West of Mt. Rushmore

Improvements to Support Vision

CORRIDOR WIDE IMPROVEMENTS *

- D7 - Add/improve pullouts
- D8 - Add/improve parking
- S3 - Improve motorcycle accommodations
- S4 - Add rumble strips
- S8 - Wildlife collision treatments

Click here to view improvement type codes with descriptions



LEGEND

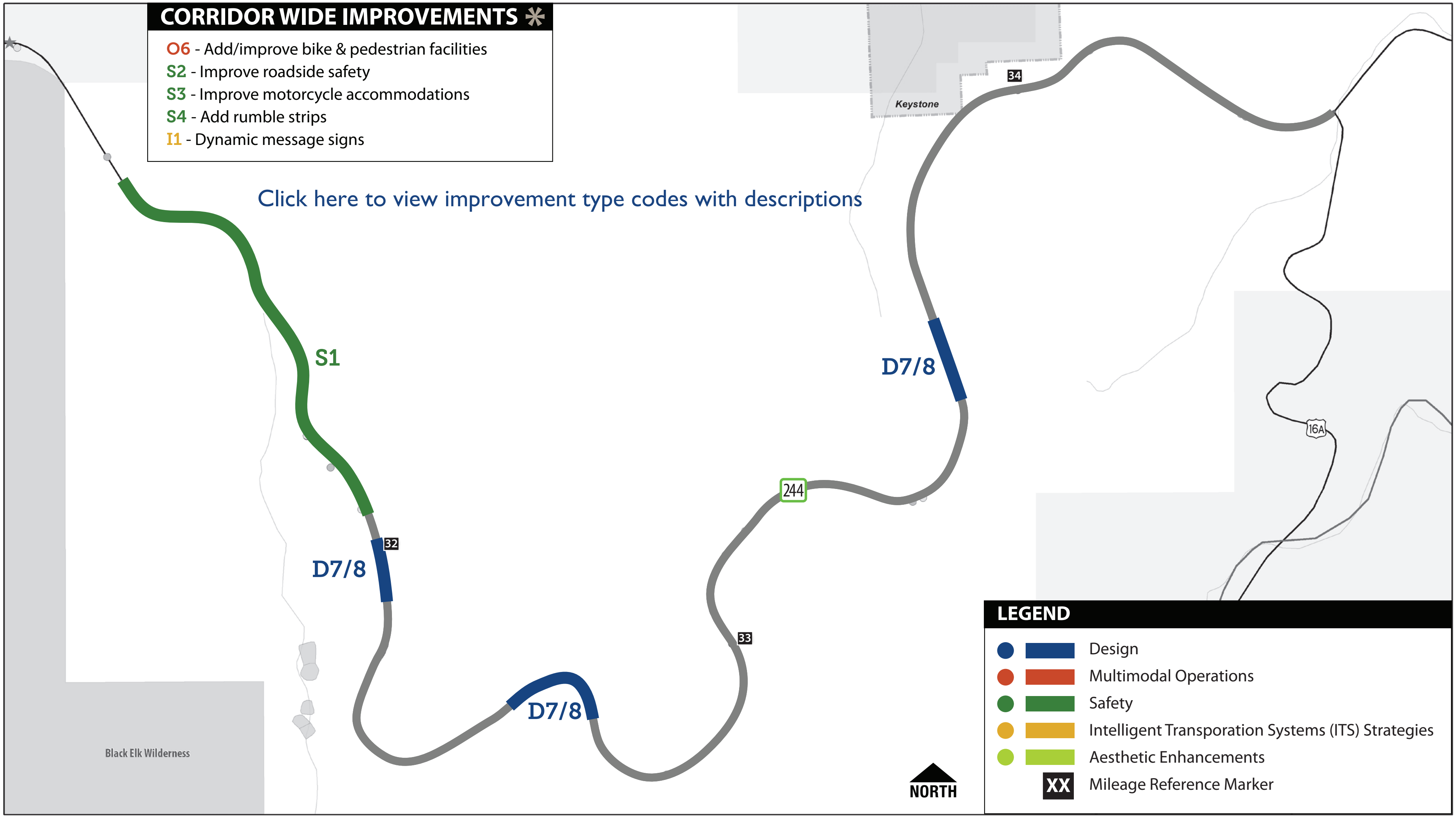
- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

*See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination/Destination Access

CORRIDOR 17
SD 244: Mt. Rushmore

Improvements to Support Vision



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

APPENDIX C. CORRIDOR IMPROVEMENT PACKAGES

READER NOTES:

1. The improvement types table is provided as the first 4 pages of the Appendix to allow the reader to reference improvement codes shown on corridor improvement graphics without having to navigate back to the body of the report.
2. Each improvement graphic includes a text box that can be clicked to quickly navigate back to the table provided at the beginning.
3. The corridor improvement graphic you are reviewing may be reached again by paging forward from the table to the corridor of reference.

Improvement Types and Crash Modification Factors

Improvement Type		C or O/M[1]	Description		CMF
DESIGN (D)					
D1	Improve or mitigate horizontal curvature	C	Increase radius, remove compound curve, provide retroreflective markers, add more specific warning signage		0.8
D2	Improve or mitigate vertical curvature	C	Flatten curve, provide retroreflective markers, provide recovery area, add advance and specific signage		0.49
D3	Widen or reduce shoulder width	C	Increase width of shoulder, reduce width of shoulder to increase lane width	Widen from 0 - 2'	0.89
				Widen from 0-4'	0.81
				Widen from 0-6'	0.73
				Widen from 0-8'	0.77
D4	Widen or reduce width of travel lanes	C	Increase lane width, increase lane width by reducing shoulder width, reduce lane width to increase shoulder width	Widen from 9-12'	0.74
				Widen from 10-12'	0.83
				Widen from 11-12'	0.96
D5	Improve sight distance	C	Flatten hillsides around curves, remove and replace/relocate trees, add advanced warning signage		0.63
D6	Adjust curve superelevation	C	Increase superelevation to improve maneuverability around curves or improve drainage runoff of pavement		0.85
	Improve curve superelevation (as safety countermeasure)	C	Improve maneuverability around curves		0.85
D7	Add pullouts	C	Provide more pulloff locations along roadway		0.78
	Improve pullouts	C	Lengthen, widen, more signage/advance warning		
D8	Add parking	C	Provide more spaces in existing parking lots or add more parking lots along roadway		0.78
	Improve parking	C	Add parking spaces, reconfigure parking, increase parking space sizes		0.78
D9	Add drainage ditch	O&M	Keep water and debris off roads, minimize icing		N/A
	Improve erosion control/slope stabilization	O&M	Stabilize slopes, remove dead fallen trees, slide creek over		N/A
	Relocate or identify drainage structures in clear zone	O&M	Add shoulder to place drainage outside clear zone, move drainage outside clear zone		N/A

Improvement Type		C or O/M[1]	Description		CMF
MULTIMODAL OPERATIONS (O)					
O1	Add passing lanes	C	Add passing lanes to allow cars to pass vehicles uphill and slow-moving vehicles, improve capacity along roadway and reduce congestion		0.65
O2	Increase passing zones	O&M	Add more areas to allow vehicles to pass other vehicles and reduce congestion		0.65
O3	Add more travel or turn lanes	C	Add lanes to improve capacity and reduce congestion to improve safety	Turn Lanes	N/A
				Travel Lanes	0.85
O4	Implement Access Management techniques	C	Adjust driveways, combine accesses, advance signage, reduce access points		0.7
O5	Change intersection traffic control	C	Review stop controlled, signal, roundabouts and other intersection improvements to reduce crashes	STOP signs to signal	0.56
				TWSC to AWSC	0.52
				STOP signs to roundabout	0.42
O6	Improve bike and/or pedestrian facilities	O&M	Widen pathways, add advance or informational signing, add crosswalks, provide shuttle service, add access to existing regional trails		N/A
	Add bike and/or pedestrian facilities	C	Provide bike lanes as appropriate, provide adjacent (barrier-separated trails)	Shared	0.68
				Separate	0.41
				Crosswalks	0.6

	Improvement Type	C or O/M[1]	Description	CMF
SAFETY (S)				
S1	Add speed reduction signs and step down speeds in 10 MPH increments	O&M	Identify locations, speeds along roadway need to be reduced and provide appropriate signs per MUTCD, install traffic calming improvements	0.96 0.84
S1	Signing improvements/additions	O&M	Could include rockfall warning static signs, conduct sign audit, change posted speed to more closely reflect design speed, etc.	0.96 0.84
S2	Add or improve guardrail or improve clear zone	C	Flatten slopes to meet clear zone criteria, or add guardrail where flattening is not possible, add rubrail for motorcycles	0.78
S2	Reevaluate existing guardrail installations	O&M	Where slopes can be flattened to meet criteria or rock face locations, remove guardrail and flatten to reduce physical impact crashes, especially dangerous for motorcycles	0.78
S2	Improve pavement drop offs (material lacks hold)	O&M	Improve roadside slopes or add guardrail	0.777
S2	Removal of dead/dying trees	O&M	Fires and beetle kill has resulted in several fallen trees or dying trees, remove to improve aesthetics of view along the roadway that add to the journey	N/A
S3	Motorcycle-specific safety improvements	C	Provide motorcycle-specific sign/device alerts, improve roadway and roadside design for motorcycle forgiveness to prevent falls and crashes	0.7
S3	Sturgis Rally strategies	O&M	Roadway sweeping, temporary transverse rumble strips as ideas, VMS signs during rally	N/A
S4	Add center rumble strips	O&M	Inform drivers when vehicles are crossing the centerline to reduce head-on crashes	0.86 0.79
S4	Add edgeline rumble strips	O&M	Inform drivers when vehicles are running off the road to reduce offroad crashes, use wave-shaped rumble strips	0.85
S4	Provide transverse rumble strips	O&M	Inform drivers of stopping, slowing or sharp curve conditions and high pedestrian crossing locations to reduce crashes	0.66
S5	Provide high friction pavement treatment	C	Improve drivers ability to navigate roadway during adverse weather conditions (may not be good for motorcycles)	0.653
S6	Traffic Calming	C	Implement speed management techniques along roadway, including visual treatments, chicanes, narrowing, etc.	0.94
S7	Modify pavement markings	O&M	Provide reflectors or improve retroreflectivity	0.968
S8	Wildlife collision treatments	C	Construct wildlife fencing with gaps.	0.6
S9	Rockfall mitigation measures	C	Provide wider shoulder for rockfall collection, improve signage, conduct analysis and physical mitigation to prevent rockfall (hexagonal mesh, rockfall netting), evaluate geologic slide areas and potential mitigation, remove rock where feasible	N/A

Improvement Type		C or O/M[1]	Description	CMF
ITS STRATEGIES (I)				
I1	Dynamic Message Signs	C	Provide important crash, weather, debris, tunnels, pigtail bridges, animals, and other information to drivers as needed	0.93
I2	Dynamic Speed Display Signs	C	Adjust and inform drivers of speeds for roadway based on changing conditions, add speed radar signs	0.93
I3	Road Weather Information Systems (RWIS)	C	Collect weather information and communicate information to drivers vehicle website, apps, social media, etc.	0.93
I4	Advance warning signs (vehicle size, curves etc.)	C	Improve notifications to drivers regarding steep grades, sharp curves, tunnels, pulloffs, etc. Provide physical infrastructure to inform oversize vehicle drivers of roadway limitations and provide a means to turn vehicle around	0.93
I5	Cameras (video)	C	SDDOT has been working with GF&P to put cameras on trails, may be able to share with them.	0.93
I6	Traffic sensors (volumes, speed, etc.)	C	Collect information at key locations to inform drivers and use for analysis	0.93
I7	Communications improvements	C	Install equipment or use current devices to communicate between devices and with drivers. Use social media, apps and other means to convey information to drivers, improve cellular coverage	0.93
I8	Positive closure control devices	C	Provide remote closure mechanism to close roads safely during critical events	1
AESTHETIC ENHANCEMENTS (A)				
A1	Guardrail/roadside signage visual treatments	O&M	Consider types of cable barrier. Self-weathering steel has a good look to it. High-tension guardrail has issues with deflection, etc.	N/A
A2	Streetscape beautification	C	Use of materials native to the hills. Enhance the experience of these visitors traveling the roadways.	N/A
A3	Interpretive sites/locations	C	Add more sites that have very interesting information for all ages to add to the experience of traveling these highways for Mount Rushmore, pigtail bridges, scenic byways, etc.	N/A

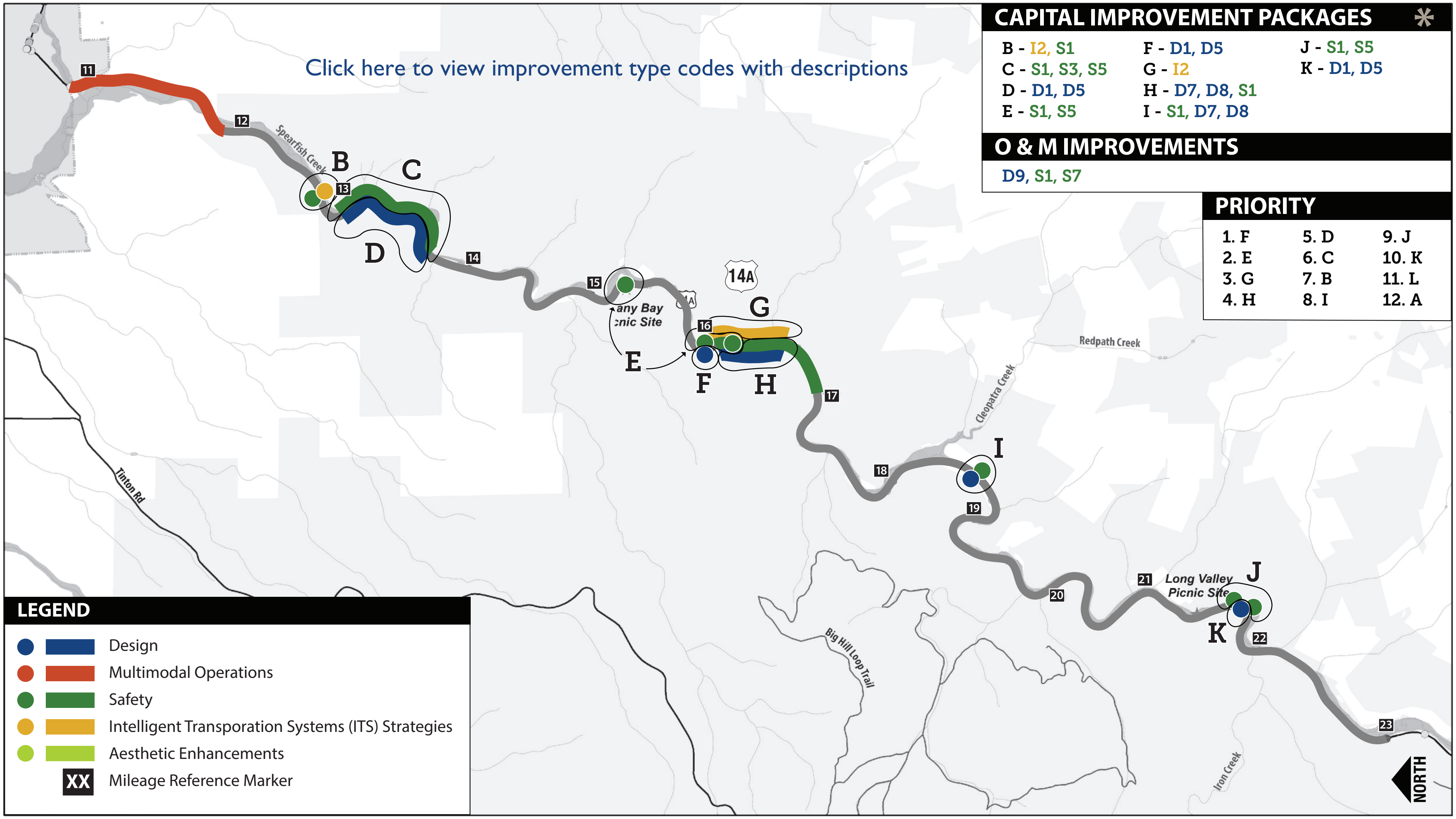
PURPOSE:
Destination

CORRIDOR 1

US 14A: Spearfish Canyon North

Spearfish to Savoy

Improvement Packages



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

SDDOT Black Hills CSC Study 17-385 3/2/20

CORRIDOR 2
US 14A: Spearfish Canyon South
Savoy to Cheyenne Crossing

PURPOSE:
Destination Access

Improvement Packages

CAPITAL IMPROVEMENT PACKAGES *

A - D5, D7, D8, S2
B - I2
C - D1, D2, D5, D6, S1, S3, S4
D - S5
E - I2
G - D3, (corridor-wide)

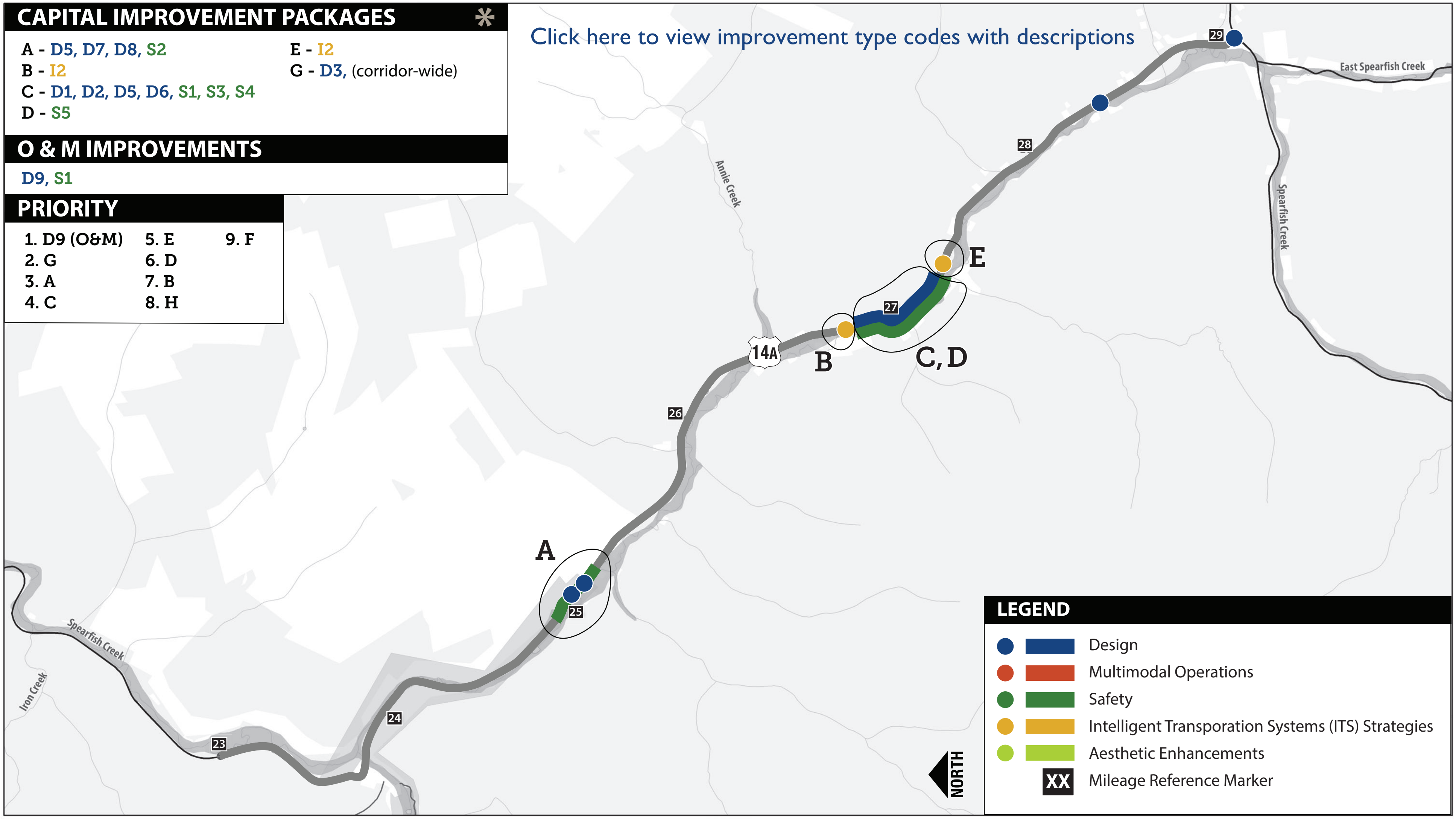
O & M IMPROVEMENTS

D9, S1

PRIORITY

1. D9 (O&M)	5. E	9. F
2. G	6. D	
3. A	7. B	
4. C	8. H	

Click here to view improvement type codes with descriptions



LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

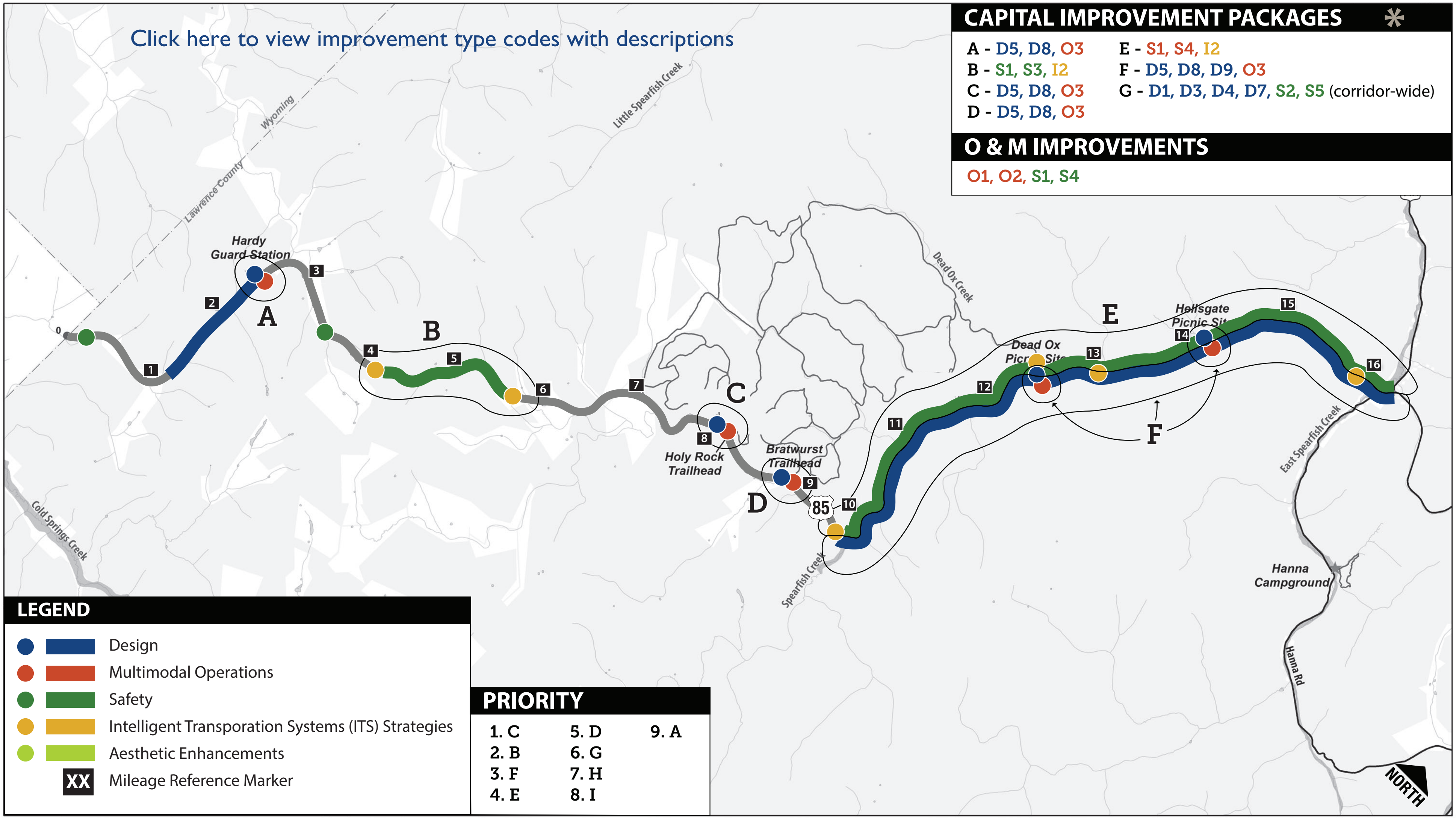
* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Commuter/Commercial Route

CORRIDOR 3
US 85: Wyoming to US 14A

Improvement Packages

Click here to view improvement type codes with descriptions



CAPITAL IMPROVEMENT PACKAGES *

- A - D5, D8, O3
- B - S1, S3, I2
- C - D5, D8, O3
- D - D5, D8, O3
- E - S1, S4, I2
- F - D5, D8, D9, O3
- G - D1, D3, D4, D7, S2, S5 (corridor-wide)

O & M IMPROVEMENTS

O1, O2, S1, S4

LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

PRIORITY

1. C	5. D	9. A
2. B	6. G	
3. F	7. H	
4. E	8. I	

See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Commuter/Commercial Route

CORRIDOR 4
US 85: West of Pluma

Improvement Packages

CAPITAL IMPROVEMENT PACKAGES *

A - D3, D4, O6
B - A2 (corridor-wide)

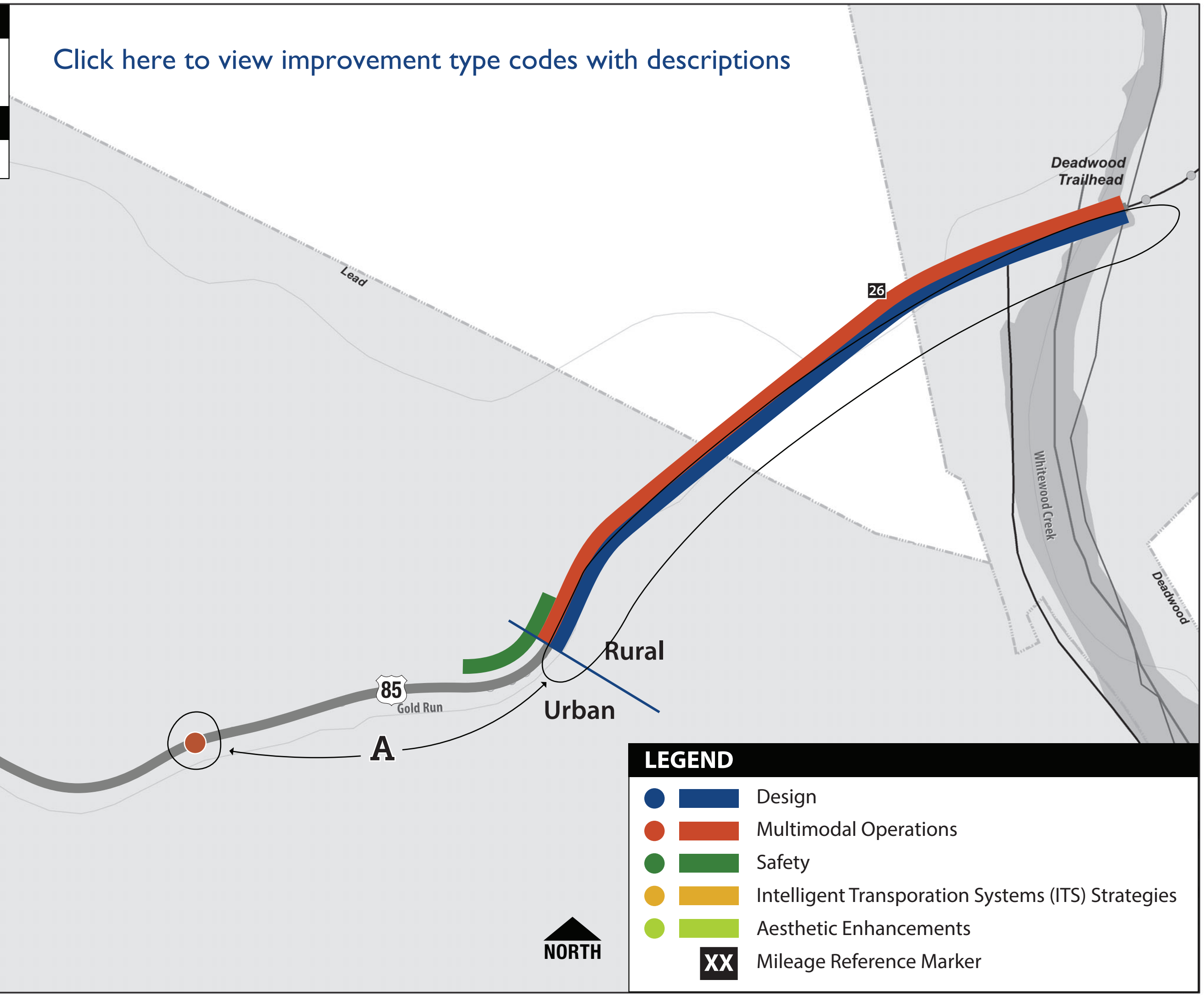
O & M IMPROVEMENTS

S1, S2, S7

PRIORITY

1. A
2. B

Click here to view improvement type codes with descriptions



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination Access

CORRIDOR 5
SD 473: Nevada Gulch Rd.

Improvement Packages

PRIORITY

1. B
2. A
3. C
4. D

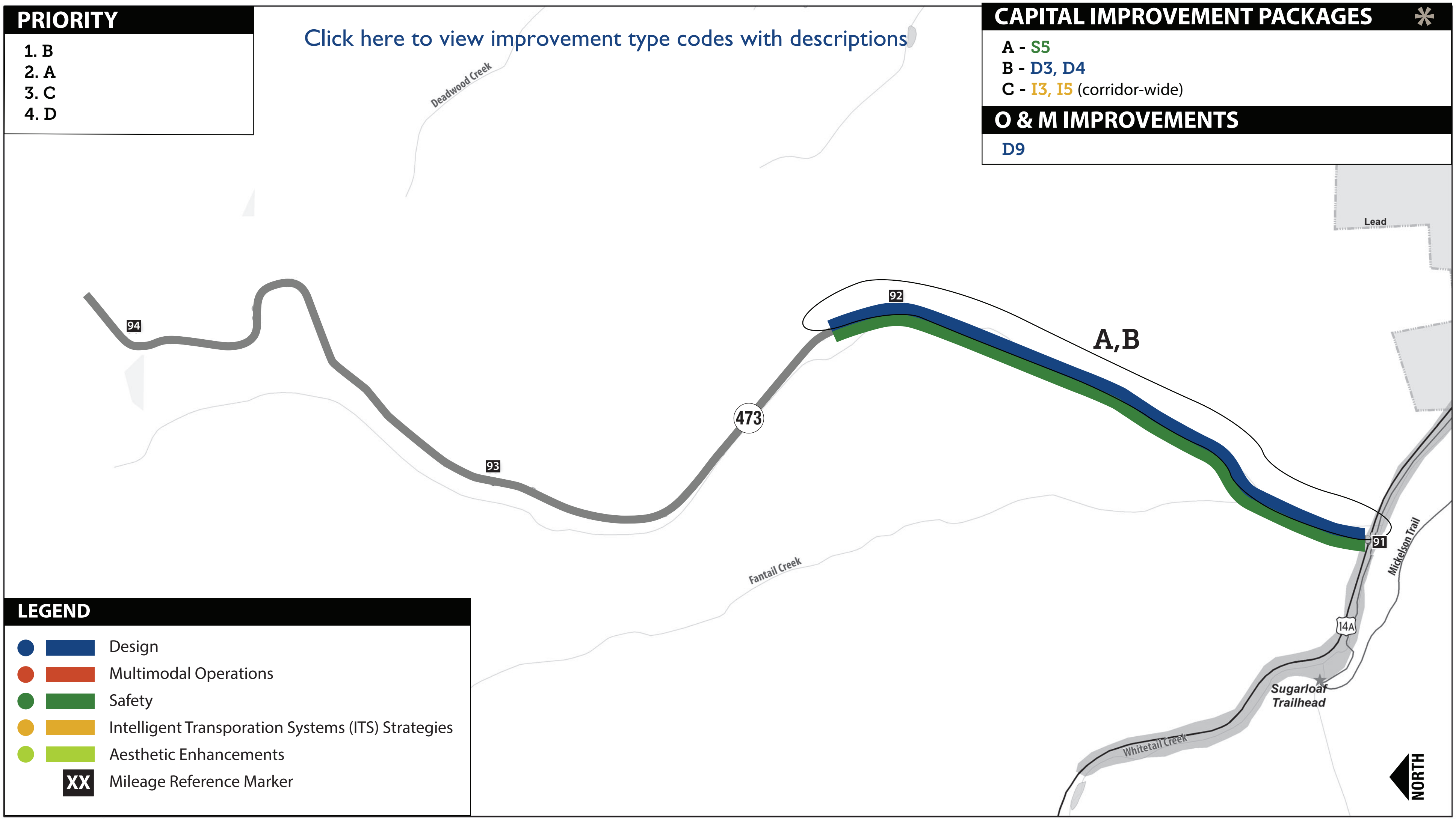
Click here to view improvement type codes with descriptions

CAPITAL IMPROVEMENT PACKAGES *

A - S5
B - D3, D4
C - I3, I5 (corridor-wide)

O & M IMPROVEMENTS

D9



LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

** See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Commuter/Commercial Route

CORRIDOR 6
US 16: Jewel Cave

Improvement Packages

CAPITAL IMPROVEMENT PACKAGES *

A - S1, S2
B - D2
C - D7, D8
D - D5, O3
E - D1
F - S8 (corridor-wide)
G - S2

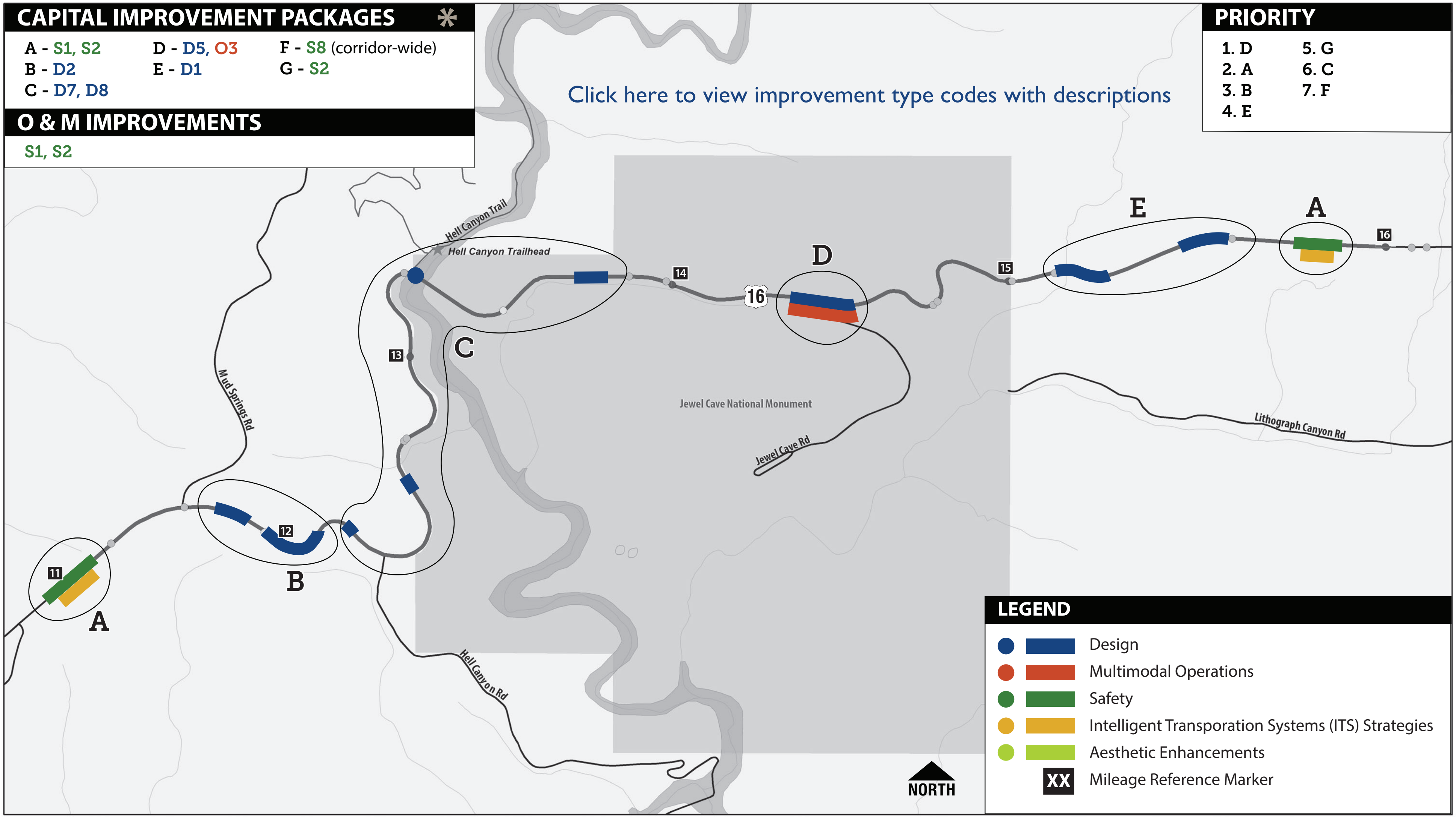
O & M IMPROVEMENTS

S1, S2

PRIORITY

1. D
2. A
3. B
4. E
5. G
6. C
7. F

Click here to view improvement type codes with descriptions



LEGEND

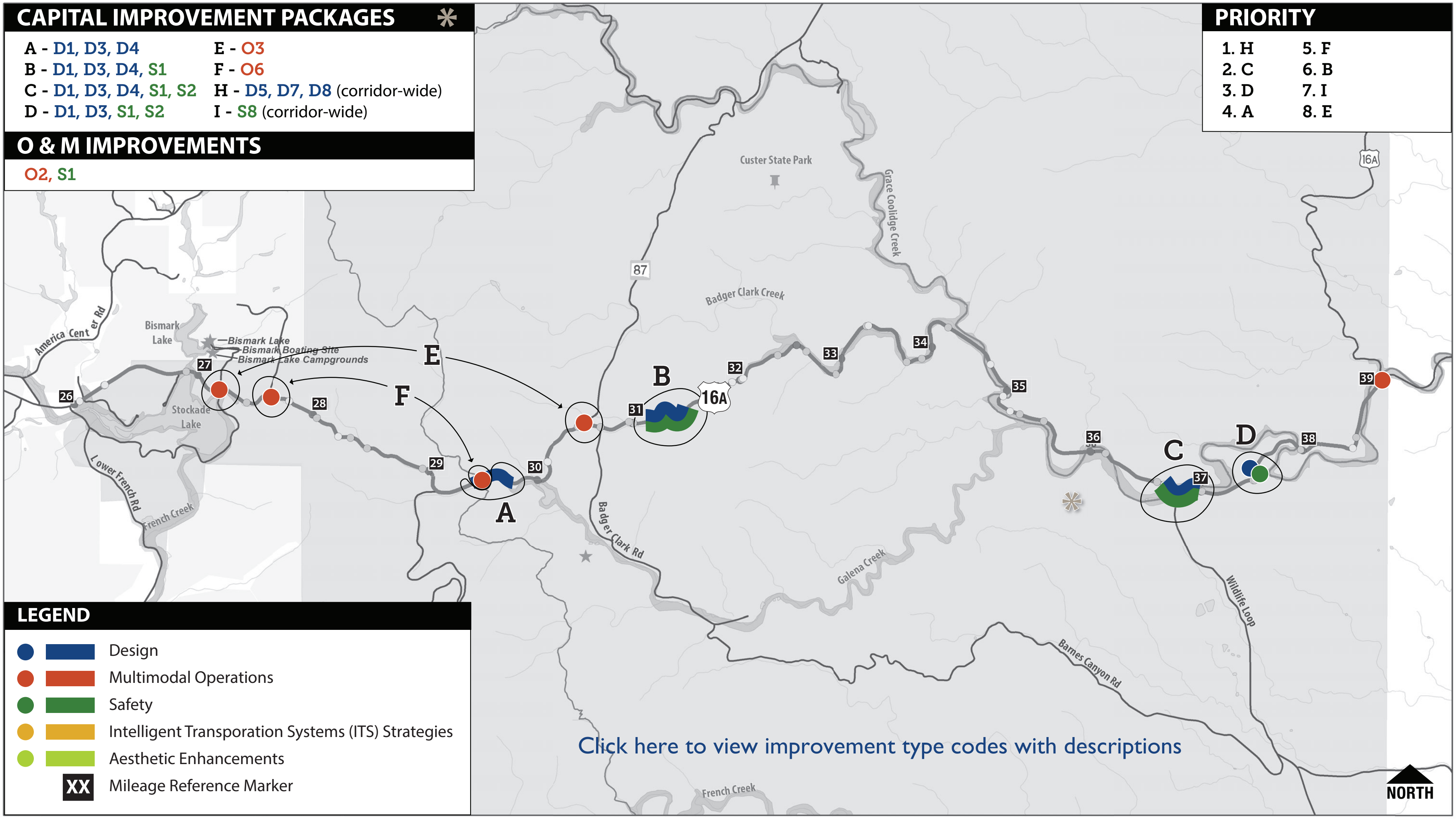
- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Destination Access

CORRIDOR 7
US 16A: Custer State Park

Improvement Packages



CAPITAL IMPROVEMENT PACKAGES *

A - D1, D3, D4	E - O3
B - D1, D3, D4, S1	F - O6
C - D1, D3, D4, S1, S2	H - D5, D7, D8 (corridor-wide)
D - D1, D3, S1, S2	I - S8 (corridor-wide)

O & M IMPROVEMENTS

O2, S1

PRIORITY

1. H	5. F
2. C	6. B
3. D	7. I
4. A	8. E

LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

Click here to view improvement type codes with descriptions

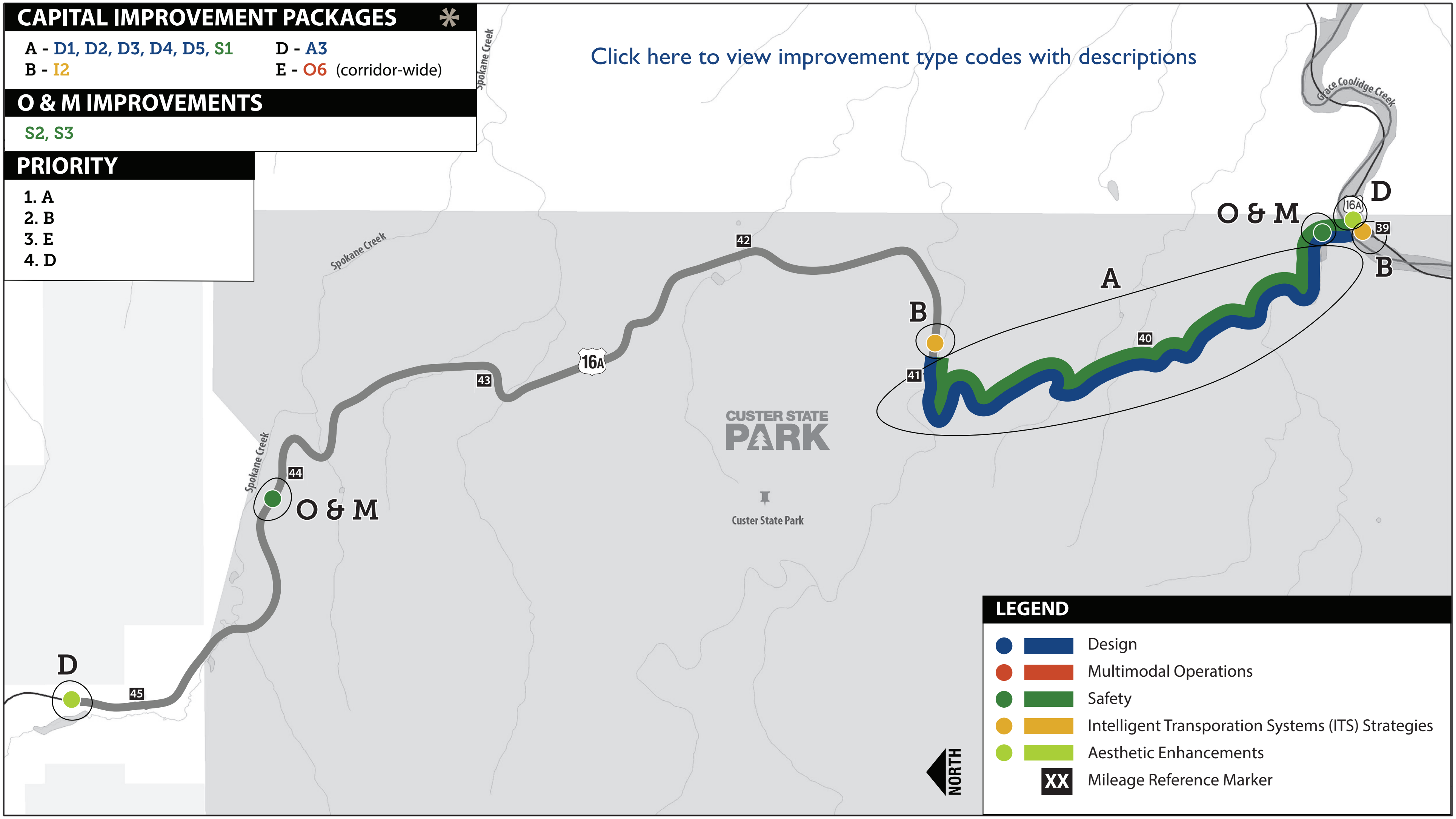
See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

SDDOT Black Hills CSC Study 17-385 3/2/20

PURPOSE:
Destination

CORRIDOR 8
US 16A: South Iron Mountain Rd.

Improvement Packages



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination

CORRIDOR 9
US 16A: North Iron Mountain Rd.

Improvement Packages

Click here to view improvement type codes with descriptions

PRIORITY

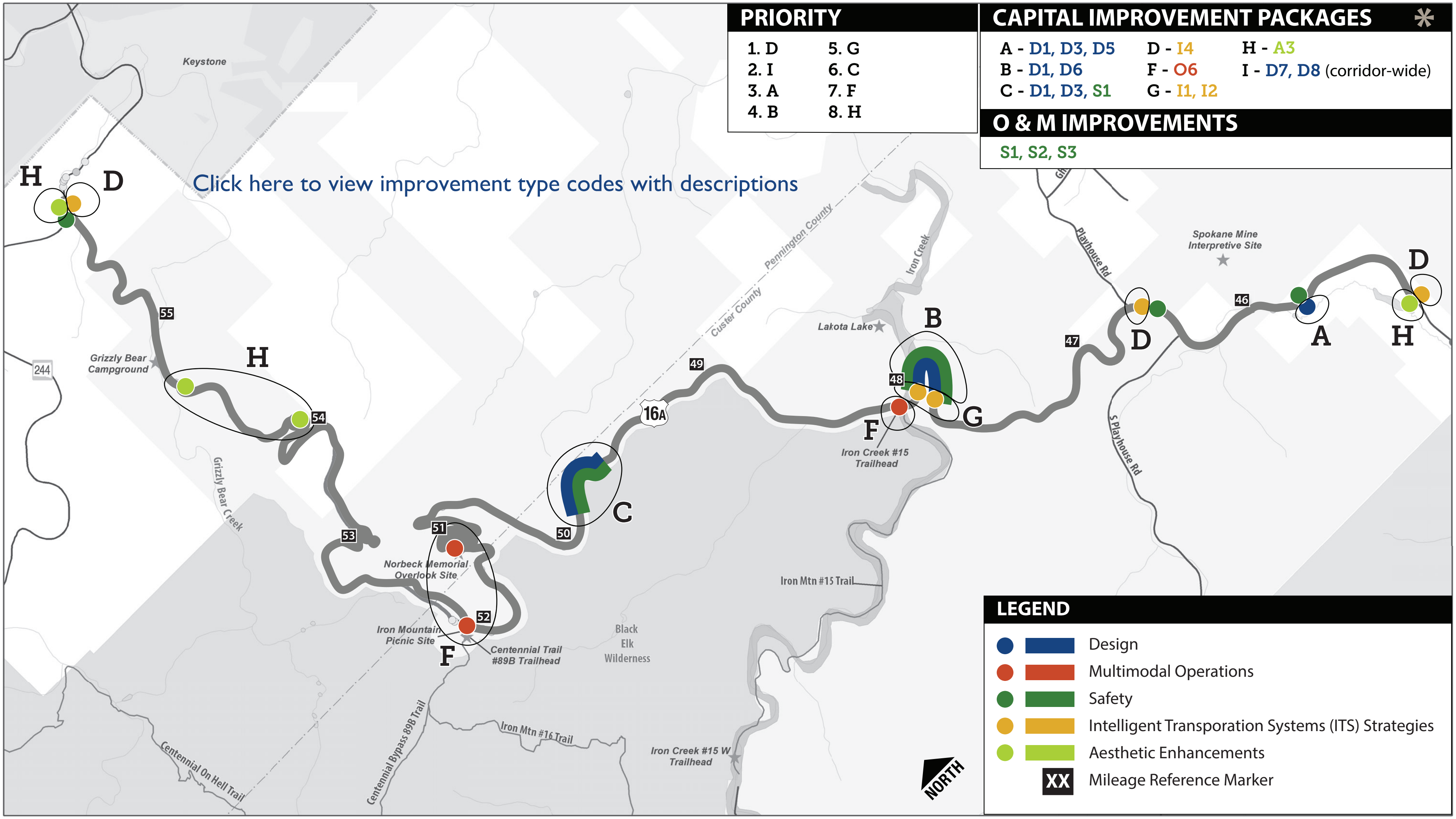
1. D	5. G
2. I	6. C
3. A	7. F
4. B	8. H

CAPITAL IMPROVEMENT PACKAGES *

A - D1, D3, D5	D - I4	H - A3
B - D1, D6	F - O6	I - D7, D8 (corridor-wide)
C - D1, D3, S1	G - I1, I2	

O & M IMPROVEMENTS

S1, S2, S3



LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

*See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination Access

CORRIDOR 10
SD 36: US 16A to SD 79

Improvement Packages

CAPITAL IMPROVEMENT PACKAGES *

A - D1 C - S5 (corridor-wide)
B - S8 D - S2 (corridor-wide)

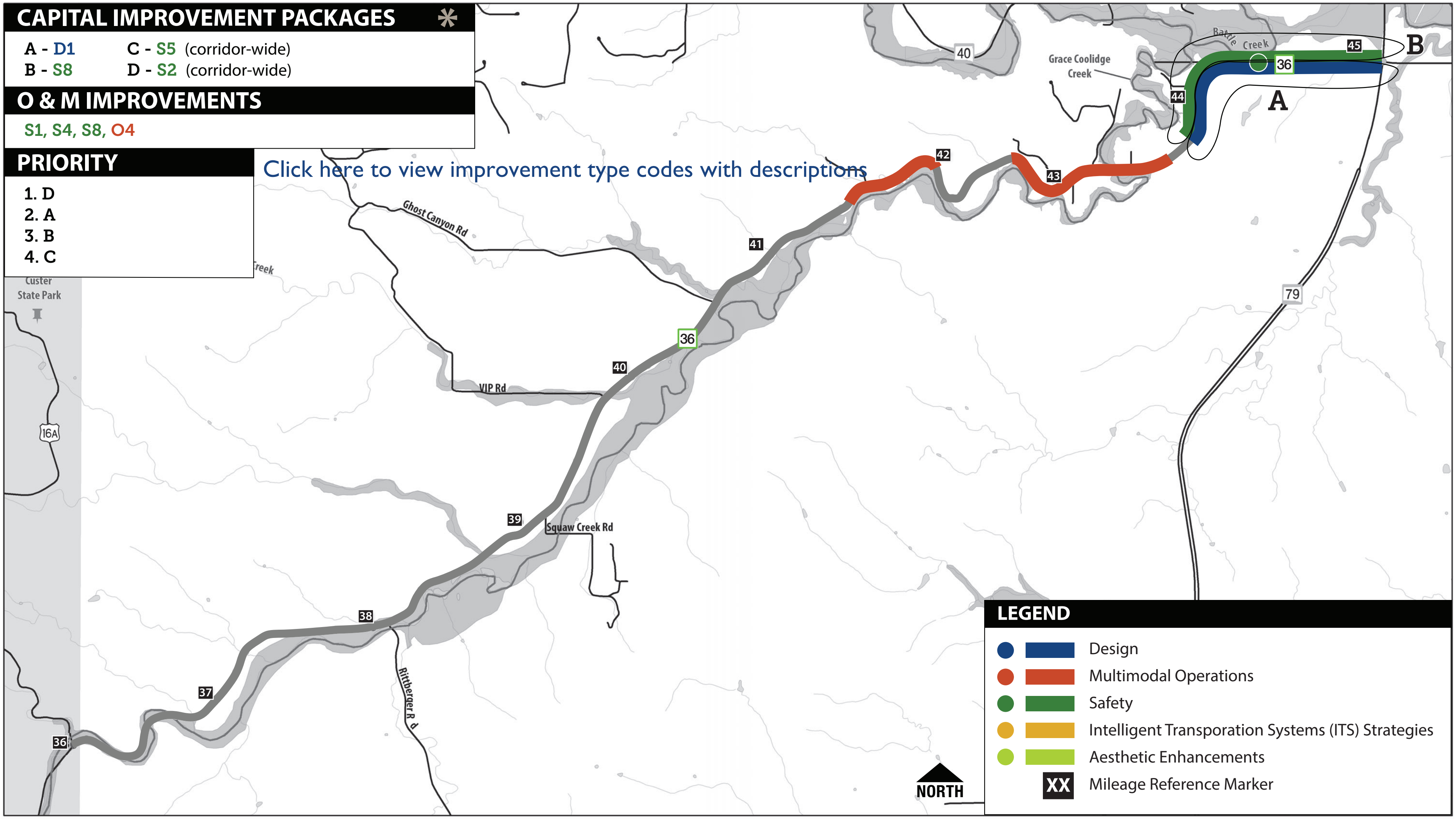
O & M IMPROVEMENTS

S1, S4, S8, O4

PRIORITY

1. D
2. A
3. B
4. C

Click here to view improvement type codes with descriptions



LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

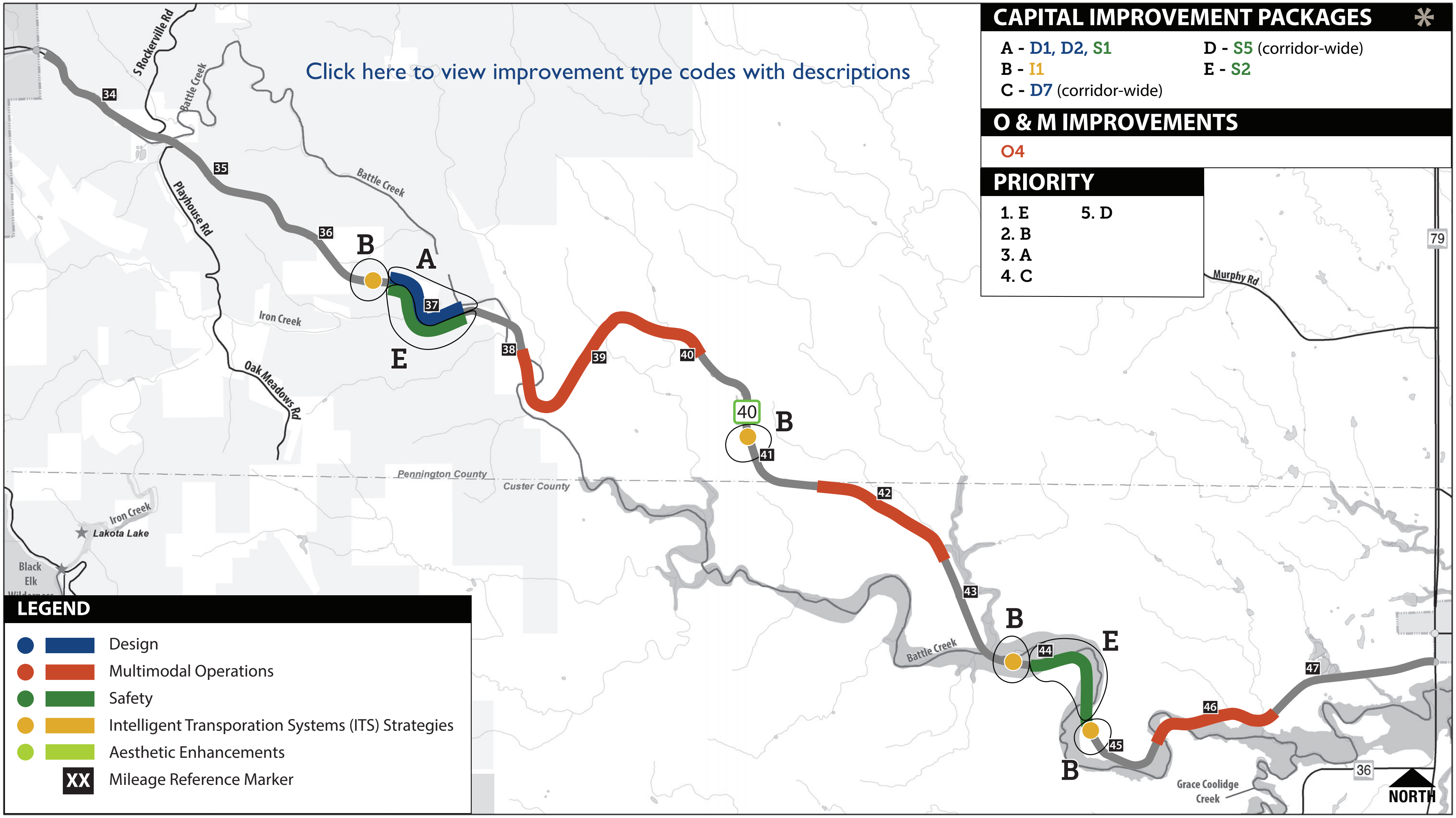
* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Commuter/Commercial Route

CORRIDOR 11
SD 40: Keystone to SD 79

Improvement Packages

Click here to view improvement type codes with descriptions



CAPITAL IMPROVEMENT PACKAGES *

A - D1, D2, S1
B - I1
C - D7 (corridor-wide)
D - S5 (corridor-wide)
E - S2

O & M IMPROVEMENTS

O4

PRIORITY

1. E
2. B
3. A
4. C
5. D

LEGEND

- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

** See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Destination Access

CORRIDOR 12
SD 87: South of US 16A

Improvement Packages

CAPITAL IMPROVEMENT PACKAGES *

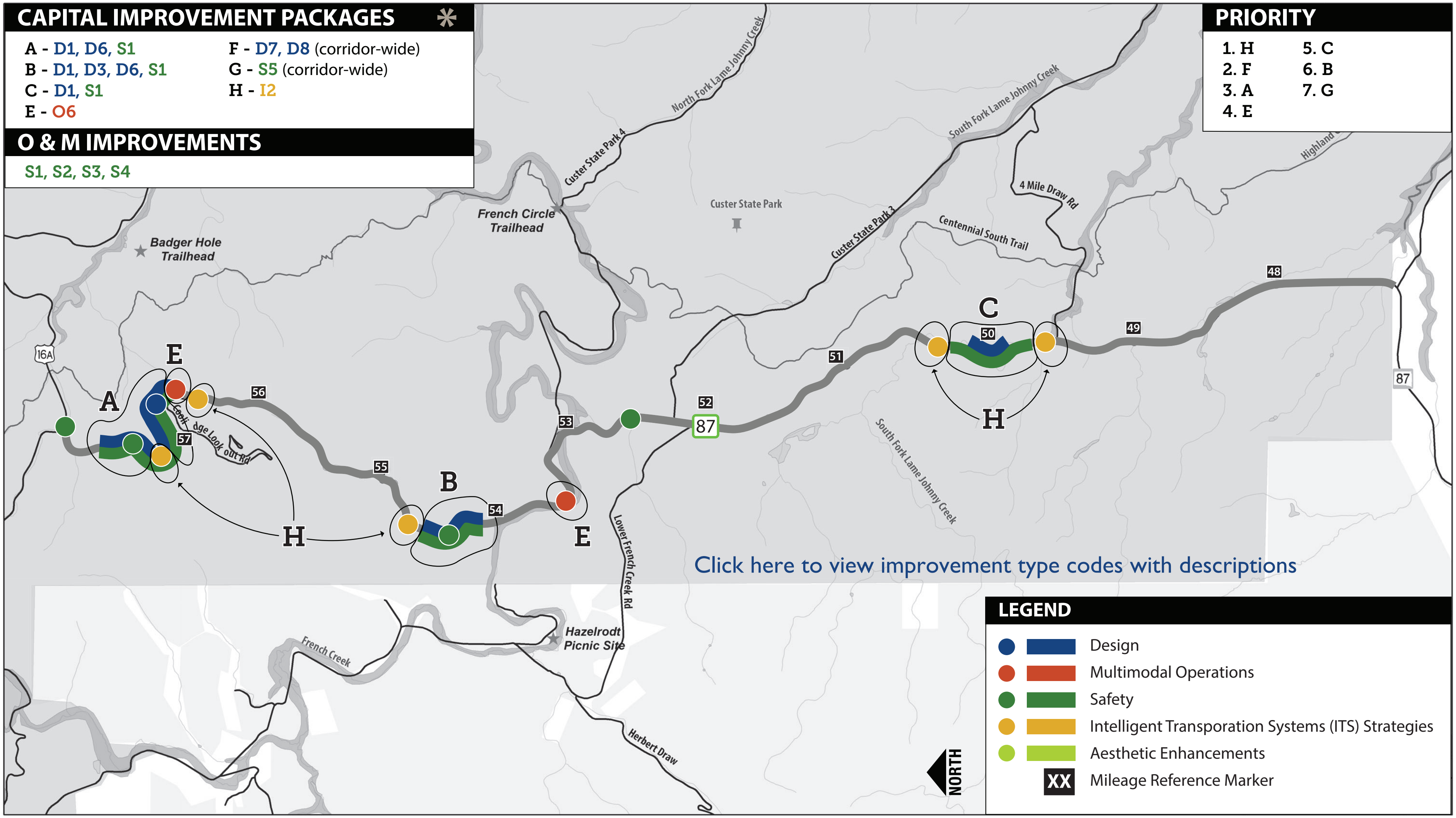
A - D1, D6, S1
B - D1, D3, D6, S1
C - D1, S1
E - O6
F - D7, D8 (corridor-wide)
G - S5 (corridor-wide)
H - I2

O & M IMPROVEMENTS

S1, S2, S3, S4

PRIORITY

1. H
2. F
3. A
4. E
5. C
6. B
7. G



Click here to view improvement type codes with descriptions

LEGEND

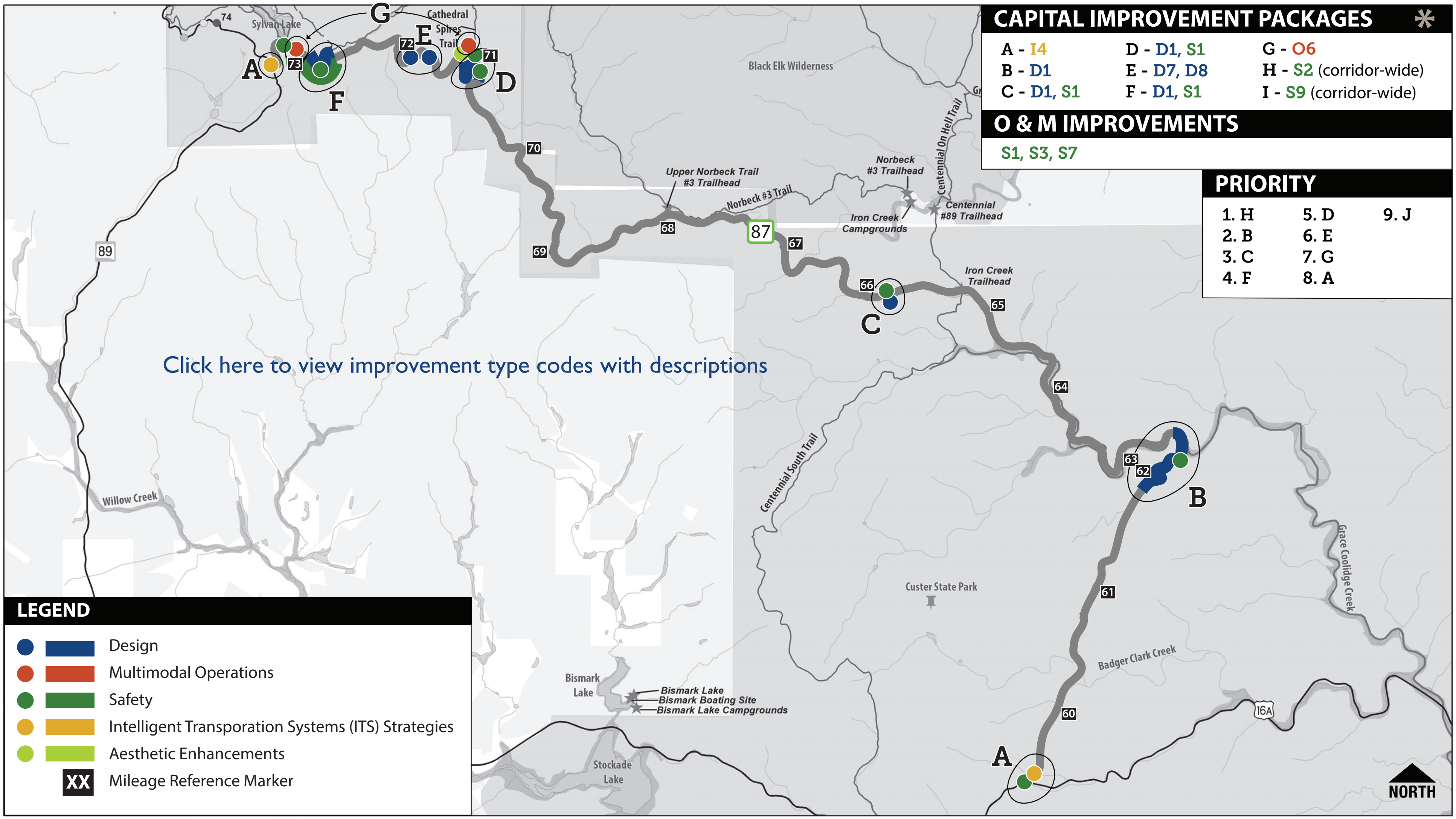
- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination

CORRIDOR 13
SD 87: Needles Hwy.

Improvement Packages



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination

CORRIDOR 14
SD 87: Norbeck Byway

Improvement Packages

CAPITAL IMPROVEMENT PACKAGES *

B - D1, S1, S9
C - I1, I2
D - D5
E - S9
F - O6
G - D7 (corridor-wide)
H - I4

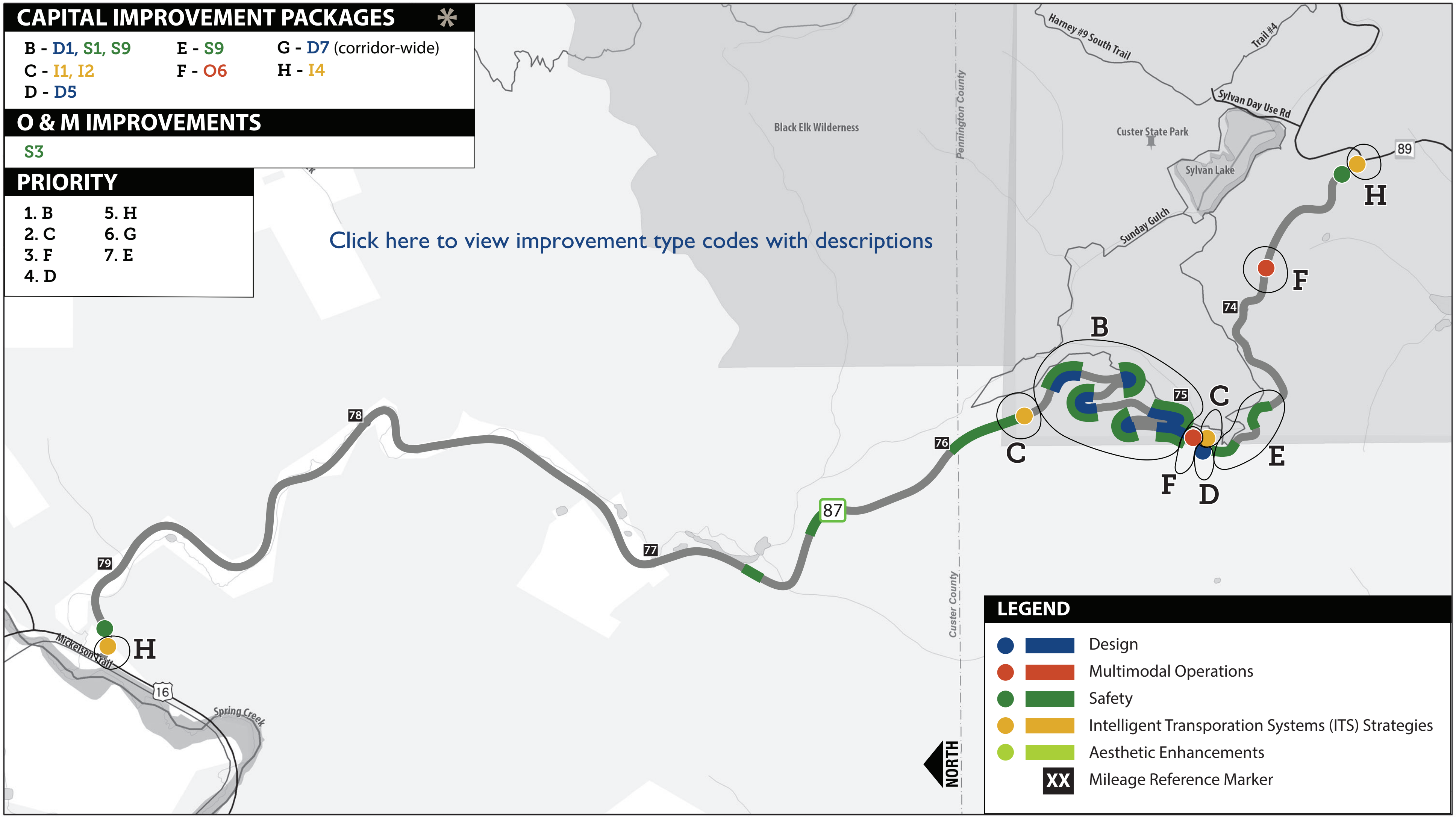
O & M IMPROVEMENTS

S3

PRIORITY

1. B
2. C
3. F
4. D
5. H
6. G
7. E

Click here to view improvement type codes with descriptions



LEGEND

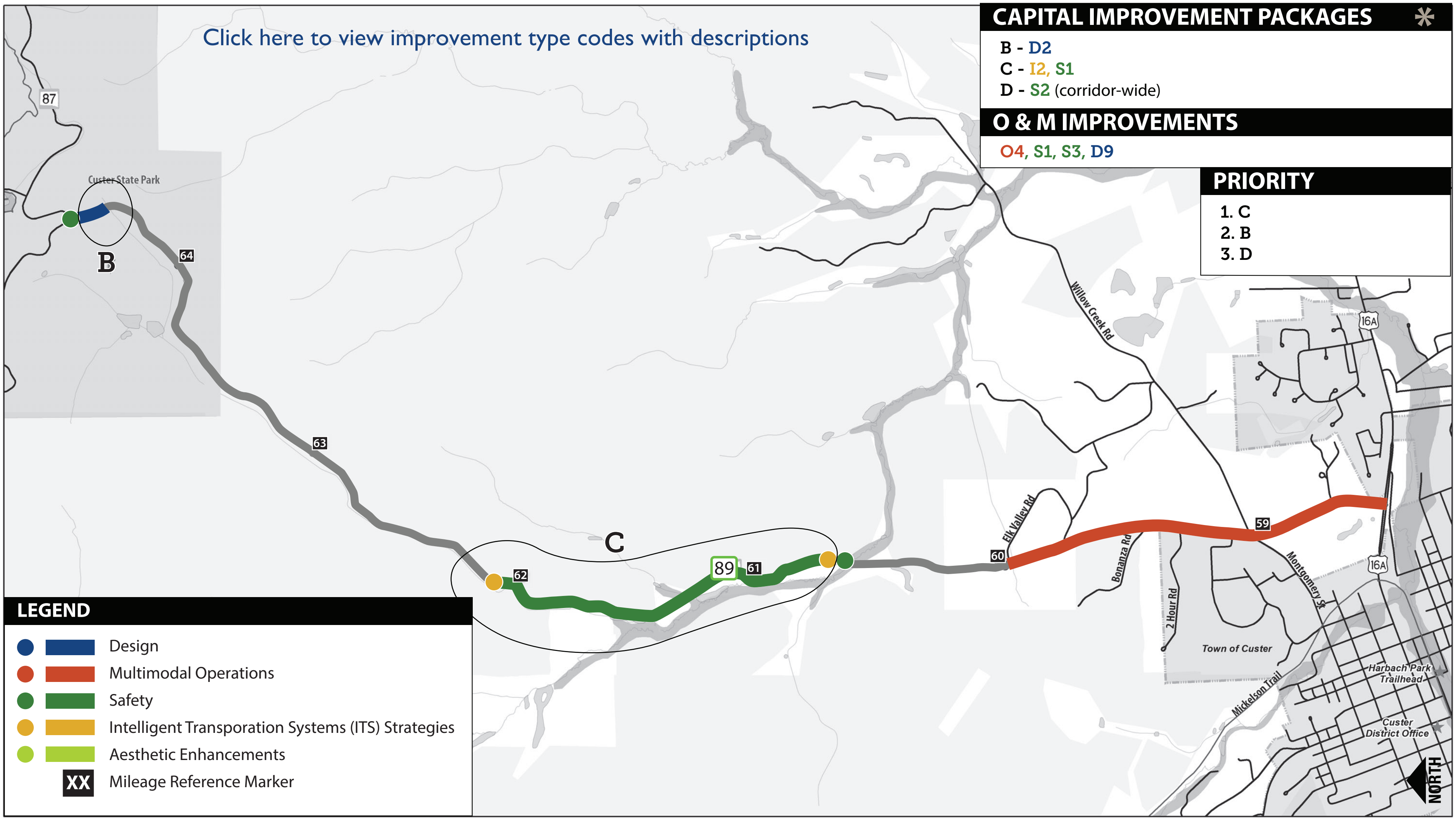
- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Destination Access

CORRIDOR 15
SD 89: US 16A to SD 87

Improvement Packages



* *See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions*

PURPOSE:
Destination/Destination Access

CORRIDOR 16
SD 244: West of Mt. Rushmore

Improvement Packages

CAPITAL IMPROVEMENT PACKAGES *

A - O6
B - D1, D5, D8, S1
C - D5
D - I2
F - D7 (corridor-wide)
G - S8 (corridor-wide)

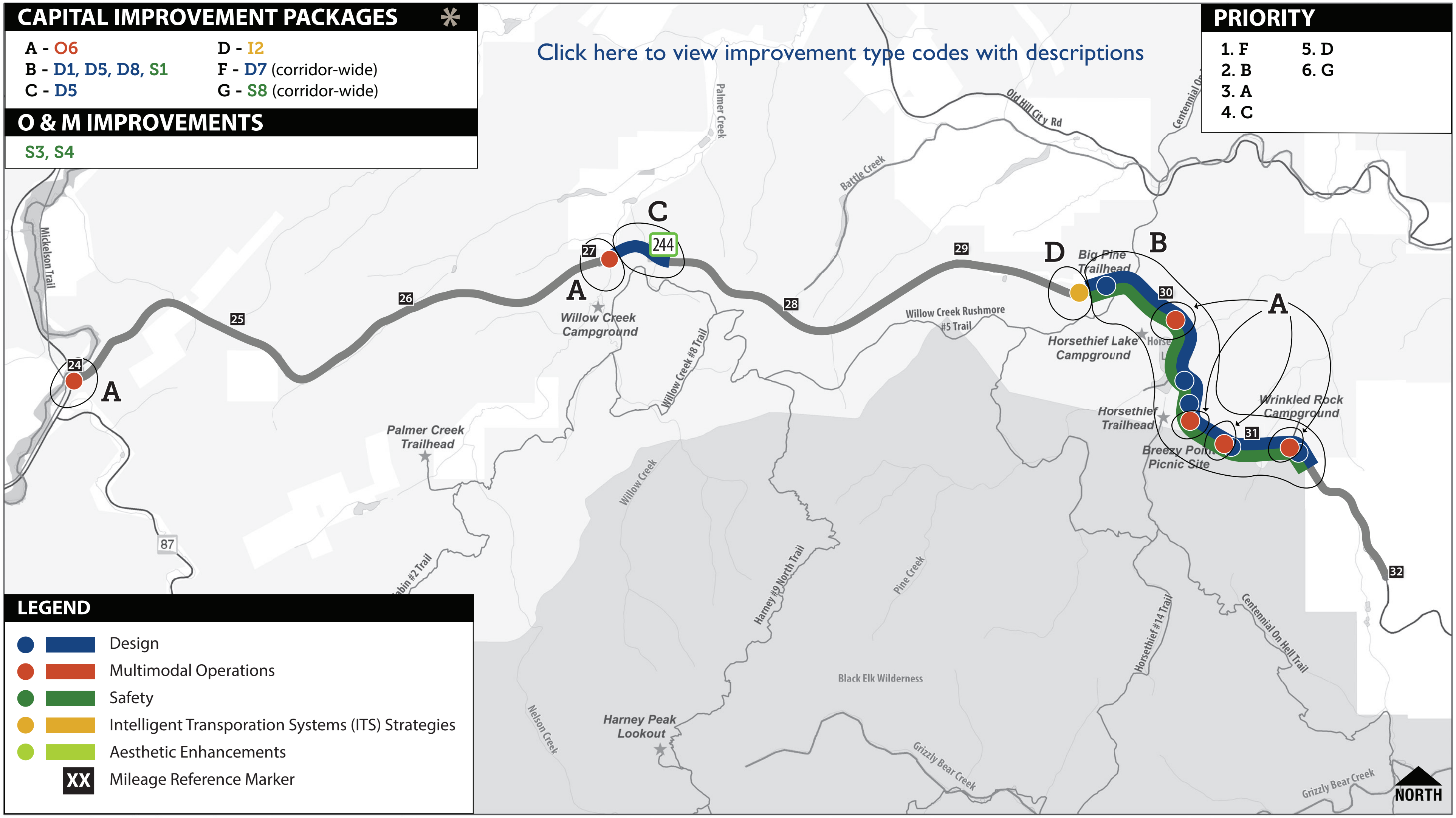
O & M IMPROVEMENTS

S3, S4

PRIORITY

1. F
2. B
3. A
4. C
5. D
6. G

Click here to view improvement type codes with descriptions



LEGEND

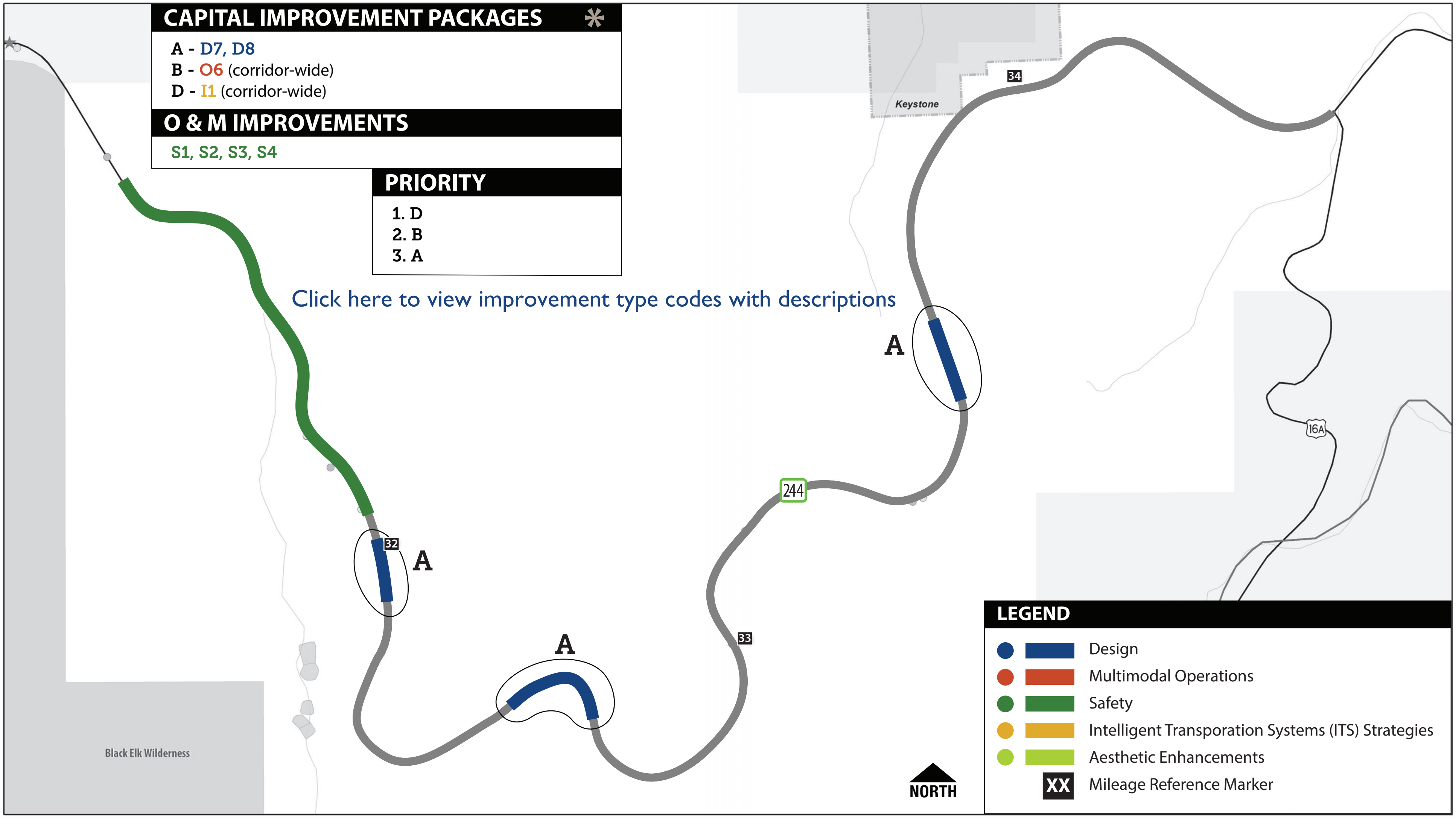
- Design
- Multimodal Operations
- Safety
- Intelligent Transporation Systems (ITS) Strategies
- Aesthetic Enhancements
- XX Mileage Reference Marker

See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

PURPOSE:
Destination/Destination Access

CORRIDOR 17
SD 244: Mt. Rushmore

Improvement Packages



See Corridor Visioning - Potential Improvement Types Table for Specific Element Defintions

APPENDIX D. CORRIDOR RATINGS SUPPORT INFORMATION

USER MIX RATINGS

CORRIDOR	Daily Traffic		Passenger Vehicles						Motorcycles						Heavy Vehicles						Bus/RV					
	Wkdy	Wknd	Wkdy	Wknd	wgt avg	var	score	rating	Wkdy	Wknd	wgt avg	var	score	rating	Wkdy	Wkn	wgt avg	var	score	rating	Wkdy	Wknd	wgt avg	var	score	rating
1	1400	2200	87%	83%	86%	-1%	5.00	5	10%	14%	11%	4%	2.85	3	3%	3%	3%	-3%	5.00	5	0.60%	0.46%	0.56%	-0.52%	5.00	5
2	900	1500	84%	76%	82%	-5%	5.00	5	13%	21%	15%	8%	0.35	1	3%	3%	3%	-3%	5.00	5	0.57%	0.55%	0.56%	-0.51%	5.00	5
3	600	850	83%	82%	83%	-4%	5.00	5	9%	13%	10%	3%	3.45	4	8%	5%	7%	1%	3.58	4	1.07%	0.24%	0.84%	-0.24%	5.00	5
4	5400	6100	86%	86%	86%	-1%	5.00	5	3%	4%	3%	-4%	5.00	5	11%	10%	11%	5%	0.50	1	1.55%	1.13%	1.43%	0.35%	4.01	5
5	1300	1300	90%	95%	91%	5%	1.41	2	3%	3%	3%	-5%	5.00	5	7%	2%	6%	0%	5.00	5	2.20%	0.55%	1.73%	0.66%	2.23	3
6	1800	2100	89%	86%	88%	1%	3.90	4	2%	2%	2%	-6%	5.00	5	9%	12%	10%	4%	0.86	1			0.00%	-1.08%	5.00	NA
7	2400	3000	89%	87%	88%	2%	3.68	4	4%	7%	5%	-3%	5.00	5	7%	6%	7%	1%	4.01	5	2.34%	1.50%	2.10%	1.02%	0.67	1
8	600	2000	79%	86%	81%	-6%	5.00	5	16%	11%	15%	7%	0.78	1	5%	3%	4%	-1%	5.00	5	0.70%	0.10%	0.53%	-0.55%	5.00	5
9	900	1200	81%	79%	80%	-6%	5.00	5	15%	18%	16%	8%	0.00	1	4%	3%	4%	-2%	5.00	5	0.48%	0.17%	0.39%	-0.68%	5.00	5
10	1600	1800	90%	91%	90%	4%	2.27	3	3%	3%	3%	-5%	5.00	5	7%	6%	7%	1%	4.01	5	1.72%	1.82%	1.75%	0.67%	2.16	3
11	1900	1800	93%	94%	93%	7%	0.50	1	3%	3%	3%	-5%	5.00	5	4%	3%	4%	-2%	5.00	5	1.26%	0.29%	0.99%	-0.09%	5.00	5
12	1200	1600	88%	87%	88%	1%	4.22	5	7%	10%	8%	0%	4.83	5	5%	3%	4%	-1%	5.00	5	1.48%	0.53%	1.21%	0.13%	4.44	5
13	900	1300	79%	85%	81%	-6%	5.00	5	10%	13%	11%	3%	3.02	4	11%	2%	8%	3%	2.29	3	0.24%	0.08%	0.20%	-0.88%	5.00	5
14	1400	2100	91%	87%	90%	3%	2.60	3	6%	10%	7%	0%	5.00	5	3%	3%	3%	-3%	5.00	5	0.81%	0.29%	0.66%	-0.42%	5.00	5
15	600	800	88%	88%	88%	1%	4.01	5	9%	10%	9%	2%	3.97	4	3%	2%	3%	-3%	5.00	5	1.50%	0.51%	1.22%	0.14%	4.39	5
16	3300	4200	90%	89%	90%	3%	2.71	3	4%	5%	4%	-3%	5.00	5	6%	6%	6%	0%	4.73	5	2.61%	1.39%	2.26%	1.18%	0.00	1
17	4700	6300	89%	87%	88%	2%	3.68	4	3%	4%	3%	-4%	5.00	5	8%	9%	8%	3%	2.44	3	2.20%	1.08%	1.88%	0.80%	1.61	2
AVG	1818	2362	87%	86%	87%	7%	max		7%	9%	8%	8%	max		6%	5%	6%	5%	max				1.08%	1.18%	max	
						-6%	min					-6%	min					-3%	min					-1.08%	min	

Ratings	Basis
	Percent band within maximum positive range over average
1	80-100%
2	60-80%
3	40-60%
4	20-40%
5	Below average or within 20% of maximum range above average

		CORRIDOR LEVEL OF PEDESTRIAN and BICYCLE ACTIVITY																
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Pedestrian	Notes	Devil's Bathtub, Bridal Veil Falls Ped attractions	Few stopping points	auto-oriented corridor	longitudinal travel	ski resort and residential	auto-oriented corridor	Numerous Custer SP points of interest	campgrounds	parking at points of interest	auto-oriented corridor	auto-oriented corridor	campgrounds	points of interest	lodges	RV parks, residential	points of interest	pullouts, people out of cars
	Rating	1	4	5	1	3	5	1	3	1	5	5	2	1	2	3	3	1
Bicycle	Strava Rides (as of Nov 2019)	7118	679	48	51	150	222	1059	742	3329	0	0	0	3905	0	0	3549	1760
	Rating	1	3	4	4	4	4	3	3	2	5	5	5	2	3	3	2	3

Ratings	Pedestrian Basis	Bicycle Basis
1	Popular corridor to park/cross, etc.	5,000+ recorded Strava ® rides
2		3000-5000 recorded Strava ® rides
3		500-3000 recorded Strava ® rides
4		1-500 recorded Strava ® rides
5	Little to no pedestrian activity	0 recorded Strava ® rides

Ratings	Criteria/Description of Ratings				
	Unique Geologic Features	Unique Viewsheds	Recreational Resources	Private Development	User Enjoyment
1	extensive exposed rock formations, waterfalls, roadside rivers/creeks	extensive scenic overlooks, broad views, vistas	extensive climbing sites, picnic sites, trails, pullouts, ski area	Relatively extensive throughout corridor, high access density	route through natural setting with limited built environment, traffic
3	multiple rock formations, waterfalls, roadside rivers/creeks	multiple scenic overlooks, broad views, vistas	multiple climbing sites, picnic sites, trails, pullouts, ski area	scattered development, limited access	Some portions offer attractive drive with mix of development etc.
5	limited/no unique rock formations, waterfalls, rivers/creeks	limited/no scenic overlooks, broad views, vistas	limited/no climbing sites, picnic sites, trails, pullouts, through private land	limited/no development, or development limited to small portion of the corridor	not a calming drive, higher traffic volumes, higher posted speeds

Ratings	Basis
1	High presence of contextual feature
3	Medium presence of contextual
5	Low presence of contextual feature

	CORRIDOR LEVELS OF SERVICE																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SDDOT Functional Classification	Minor Arterial	Minor Arterial	Principal Arterial	Principal Arterial	Major Collector	Principal Arterial	Minor Arterial	Minor Arterial	Minor Arterial	Minor Arterial	Major Collector	Minor Arterial	Minor Arterial	Minor Arterial	Minor Arterial	Minor Arterial	Minor Arterial
Minimum LOS Criteria	C	C	C	C	D	C	C	C	C	C	D	C	C	C	C	C	C
Current wkdy	B	B	D	C	C	B	B	B	B	B	C	B	B	B	B	C	E
Current wkend	C	B	D	D	B	B	C	C	B	B	B	B	C	B	B	C	E
Intersection LOS (if applicable)	NA	A	A	C	B	NA	B	A	A	A	A	B	B	A	A	NA	NA
Current Rating (based on worst case)	4	5	2	3	5	5	4	4	5	5	5	5	4	5	5	4	1
2025 wkdy	B	B	D	C	D	B	B	B	B	B	C	B	B	B	B	C	E
2025 wkend	C	B	D	D	B	B	C	C	B	B	B	B	C	B	B	D	E
2025 Intersection LOS (if applicable)	NA	B	B	C	B	NA	B	A	B	A	B	B	B	A	A	NA	NA
2025 rating (based on worst case)	4	5	2	3	4	5	4	4	5	5	5	5	4	5	5	3	1
2050 wkdy	B	B	D	D	D	B	C	B	B	B	C	B	B	B	B	D	E
2050 wkend	C	C	D	E	C	B	D	C	C	B	C	C	C	C	B	D	E
2050 Intersection LOS (if applicable)	NA	B	B	D	C	NA	C	A	B	A	B	C	C	B	B	NA	NA
2050 rating (based on worst case)	4	4	2	1	4	5	3	4	4	5	5	4	4	4	5	2	1

Ratings	Basis
5	better than criteria
4	at criteria
3	below criteria by 1 LOS level in one Day-of-week scenario
2	below criteria by 1 LOS level in two Day-of-week scenarios
1	below criteria by 2 LOS levels in any given Day-of-week scenario

Scenario		CORRIDOR LEVEL OF SERVICE OF SAFETY (LOSS)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Total	w/ Sturgis	III	III	IV	III	IV	II	II	IV	III	IV	II	III	III	II	III	I	I
	w/o Sturgis	II	II	IV	II	IV	II	II	II	II	IV	II	I	I	I	II	I	I
Severe only	w/ Sturgis	III	III	IV	III	II	II	II	IV	IV	II	II	IV	IV	III	IV	I	II
	w/o Sturgis	II	II	IV	III	II	II	II	III	III	II	I	II	II	I	II	I	I
Rating	w/ Sturgis	2	2	1	2	1	3	3	1	1	1	3	1	1	2	1	4	3
	w/o Sturgis	3	3	1	2	1	3	3	2	2	1	3	3	3	4	3	4	4

Ratings	Basis
1	LOSS IV either Severe or Total
2	LOSS III either Severe or Total
3	LOSS III either Severe or Total
4	LOSS I either Severe or Total
5	N/A

Scenario	Travel Direction	CORRIDOR TRAVEL SPEEDS (MILES PER HOUR)																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Uncongested (May 2018)	NB/EB	39	36.6	49.1	32.7	41.2	41.7	36.2	29.7	24.5	50.1	51.4	32.4	22.8	27.2	36	45.2	32.6
	SB/WB	35.9	35.7	47.3	32.6	38.3	42.3	34.1	29.4	23.4	49.1	49.6	36.5	24.2	30.3	35.9	43.5	34.5
Congested (June 2018)	NB/EB	41.1	40.8	51.4	33.4	43.3	42.3	36.6	30.5	25.8	49.1	51	34.8	25.7	28.6	35.2	45	33.4
	SB/WB	39.9	38.9	49.7	32.9	38.5	42.4	34.5	32	23.9	50.5	51	31.4	24	28.4	35.2	41.3	34.5
	Average	39.0	38.0	49.4	32.9	40.3	42.2	35.4	30.4	24.4	49.7	50.8	33.8	24.2	28.6	35.6	43.8	33.8
	Rating	3	3	5	2	4	4	3	2	1	5	5	2	1	1	3	4	2

Ratings	Basis
5	45+
4	40-45
3	35-40
2	30-35
1	<30

STUDY WIDE SPEED STATISTICS	
AVG	37.2 mph
MAX	50.8 mph
MIN	24.2 mph

Category	Rating	Criteria
Shoulder Width*	5	greater than 4' consistent shoulders throughout corridor
	4	4' shoulders throughout corridor or 4' and greater than 4' throughout corridor
	3	2' to 4' shoulders throughout corridor
	2	0' to 2' shoulders throughout corridor
	1	No Shoulders entire corridor (Drainage issues as a result of minimal shoulders/clear zone are rated as "1")
Lane Width	5	12' lanes
	4	11' and 12' lanes
	3	10' - 11' lanes
	2	9.5' to 10' lanes or mix of 8' to 10' lanes
	1	less than 9.5' lanes
Horizontal Curve Density	5	less than 1 curve per mile on average with reduced advisory speeds
	4	1 to 2 curves per mile on average with reduced advisory speeds
	3	2 to 4 curves per mile on average with reduced advisory speeds
	2	4 to 6 curves per mile on average with reduced advisory speeds
	1	Greater than 6 curves per mile on average with reduced advisory speeds
Clear Zone*	5	sufficient clearzone throughout the corridor, no guardrail needed or already provided, no or few rockface locations next to road
	4	most of corridor has sufficient clearzone, no guardrail needed or already provided, and no rockface next to road
	3	half the corridor has sufficient clearzone, no guardrail needed or already provided, no rockface next to road
	2	most of the corridor does not have sufficient clearzone, guardrail needed at some locations, many locations with rockface next to road
	1	most (of the corridor does not have sufficient clearzone, guardrail is needed along many areas, several locations with rockface next to road
Sight Distance	5	Very few locations where sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
	4	moderate amount of locations
	3	half the corridor
	2	most of the corridor
	1	a substantial amount of the corridor
Access Spacing	5	Sufficient (>660') spacing throughout corridor
	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient (<660') spacing)
	3	Many issues with spacing throughout corridor (10 - 20 accesses with insufficient (<660') spacing)
	2	Several issues with spacing throughout corridor (20 - 40 accesses with insufficient (<660') spacing)
	1	Substantial amount of spacing issues throughout corridor (greater than 40 accesses with insufficient (<660') spacing)
Grade	5	Minimal steep grade areas or steep grades through curves
	4	Some segments with steep grade areas or steep grades through curves
	3	Moderate steep grade areas or steep grades through curves
	2	Several steep grade areas or steep grades through curves
	1	Substantial steep grade areas or steep grades through curves
Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 1			CORRIDOR 2		
Category	Condition	Rating	Reason for Rating	Condition	Rating	Reason for Rating
Shoulder Width*	5' outside. Req - 10' foot outside	5	shoulders throughout entire corridor although they do not meet criteria	No outside shoulders. Req - 10' foot outside,	1	No Shoulders throughout the corridor
Lane Width	11' lanes - lane widths do not meet standards	4	lane width is 11' through the corridor which does not meet standards, but is wider than most cooridors and this has shoulders	11' lanes - lanes widths do not meet standards	3	lane width is less than 12' through the corridor, which does not meets standards but more than 8' or 9'. There are some corridors with less than 10' lane width.
Horizontal Curve Density	9 curves have reduced speeds over the 12.86 miles segment resulting in an average of 0.7 curves per mile	5	less than 1 curve per mile on average with reduced advisory speeds	3 curves have reduced speeds over the 5.45 miles segment resulting in an average of 0.55 curves per mile	5	less than 1 curve per mile on average with reduced advisory speeds
Clear Zone*	Some locations that may need guardrail and frequent rock faces near roadway.	2	Most of the corridor does not have sufficient clearzone, guardrail needed at some locations, many locations with rockface next to road	Frequent clearing of trees needed close to roadway, rock faces adjacent to roadway, and locations were a guardrail may be required.	1	Most of the corridor does not have sufficient clearzone, guardrail is needed along many areas, several locations with rockface next to road
Sight Distance	Minor sight distance issues at driveways.	4	A moderate amount of sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Minor sight distance issues at driveways.	4	A moderate amount of sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	44 accesses, with 31 private driveways and roads within 660' of eachother.	2	Several issues with spacing throughout corridor (20 - 40 accesses with insufficient spacing)	49 accesses, with 46 private driveways and roads within 660' of eachother.	1	Substantial amount of spacing issues throughout corridor (greater than 40 accesses with insufficient spacing)
Grade	A few steep grades though curves.	4	Some segments with steep grade areas or steep grades through curves	Several Steep Grades through curves.	2	Several steep grade areas or steep grades through curves

Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

Category	CORRIDOR 3 Condition	CORRIDOR 3 Rating	CORRIDOR 3 Reason for Rating	CORRIDOR 4 Condition	CORRIDOR 4 Rating	CORRIDOR 4 Reason for Rating
Shoulder Width*	No outside shoulders. Req - 10' foot outside,	1	No Shoulders throughout the corridor	No outside shoulders. Req - 10' foot outside,	1	No Shoulders throughout the corridor
Lane Width	11' lanes - lanes widths do not meet standards	3	lane width is less than 12' through the corridor, which does not meets standards but more than 8' or 9'. There are some corridors with less than 10' lane width.	lanes widths meet standards	5	lane width is 12' throughout corridor which meets standards
Horizontal Curve Density	20 curves have reduced speeds over the 16.29 miles segment resulting in an average of 1.23	4	1 to 2 curves per mile on average with reduced advisory speeds	1 curve have reduced speeds over the 0.89 miles segment resulting in an average of 1.12	4	1 to 2 curves per mile on average with reduced advisory speeds
Clear Zone*	Frequent clearing of trees needed close to roadway, and a few locations were guardrail may be	3	half the corridor has sufficient clearzone, no guardrail needed or already provided, no rockface next to road	Guardrail exists at steep side slopes, but there are many rock faces adjacent to the roadway.	1	Most of the corridor does not have sufficient clearzone, guardrail is needed along many areas, several locations with rockface next to road
Sight Distance	Few sight distance issues throughout.	5	Very few locations where sight distance is an issues either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Few sight distance issues throughout.	5	Very few locations where sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	53 accesses, with 31 residential or roadway accesses within 660' of eachother.	2	Several issues with spacing throughout corridor (20 - 40 accesses with insufficient spacing)	6 accesses, with 3 residential/ commercial accesses within 660' of major roadway	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)
Grade	A few steep grades for trucks.	4	Some segments with steep grade areas or steep grades through curves	Steep grades throughout.	1	Substantial steep grade areas or steep grades through curves

Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 5			CORRIDOR 6		
Category	**Condition**	**Rating**	**Reason for Rating**	**Condition**	**Rating**	**Reason for Rating**
Shoulder Width*	No outside shoulders.	1	No Shoulders throughout the corridor	0' to 4' outside. Req - 10' foot outside, sections with no outside shoulder	2	has some shoulders even though not entire corridor and and they do not meet criteria
Lane Width	11' and 12' lane widths vary thoughout segment- lane widths do not meet standards.	4	11' and 12' lane widths	lanes widths meet standards	5	lane width is 12' throughout corridor which meets standards
Horizontal Curve Density	no curves have reduced speed	5	Reason for ranking - less than 1 curve per mile on average with reduced advisory speeds	21 curves have reduced speeds over the 5.05 miles segment resulting in an average of 4.16	2	4 to 6 curves per mile on average with reduced advisory speeds
Clear Zone*	Guardrail provided in most locations as needed, few rock faces adjacent to roadway.	4	corridor has sufficient clearzone, guardrail already provided, and few locations with rockface next to road. Dropped rank to a 4 due to steep slopes in the residential portion at low end of the segment	Several areas of steep drop offs and high fill areas without guardrail	2	several locations with steep slopes within Clearzone that need guard rail.
Sight Distance	Minor sight distance issues at driveways.	4	A moderate amount of sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Jewell cave entrance at top of grade at curve and a couple other accesses.	4	A moderate amount of sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	37 accesses, with 35 residential drivways less than 660' apart. All major road intersections meet	2	Several issues with spacing throughout corridor (20 - 40 accesses with insufficient spacing)	There are 9 accesses, and 2 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)
Grade	Several steep down grades.	2	Several steep grade areas or steep grades through curves (road to Terry Peak)	Several steep sag and crest curves.	2	Several steep grade areas or steep grades through curves

Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 7			CORRIDOR 8		
Category	Condition	Rating	Reason for Rating	Condition	Rating	Reason for Rating
Shoulder Width*	1' to 8' outside. Req - 10' foot outside,	2	has some shoulders even though not entire corridor and they do not meet criteria	No outside shoulders. Req - 10' foot outside,	1	No Shoulders throughout the corridor
Lane Width	12' lanes - lanes widths meet standards	5	lane width is 12' throughout corridor which meets standards	9' travel lanes - lanes widths do not meet standards	1	lane width is 9' throughout corridor which does not meet standards and barely accommodates a large vehicle
Horizontal Curve Density	23 curves have reduced speeds over the 12.91 miles segment resulting in an average of 1.78	4	1 to 2 curves per mile on average with reduced advisory speeds	30 curves have reduced speeds over the 5.72 miles segment resulting in an average of 5.24	2	4 to 6 curves per mile on average with reduced advisory speeds
Clear Zone*	Several areas of steep drop offs and high fill areas without guardrail	2	several locations with steep slopes within Clearzone that need guard rail.	Most of the corridor is constrained by rock face next to road and steep slopes	1	most of the corridor does not have sufficient clearzone, guardrail is needed along many areas, several locations with rockface next to road
Sight Distance	Sight distances issues due to curves and driveways.	2	Much of the corridor has sight distance as an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Sight distance issues throughout mostly due to trees.	1	A substantial amount of the corridor has sight distance issues either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	There are 22 accesses, and 10 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)	There are 4 accesses, and 1 is less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)
Grade	No major steep grades throughout corridor.	5	Minimal steep grade areas or steep grades through curves	Steep grades through the sharp curves.	2	Several steep grade areas or steep grades through curves

Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 9			CORRIDOR 10		
Category	Condition	Rating	Reason for Rating	Condition	Rating	Reason for Rating
Shoulder Width*	No outside shoulders. Req - 10' foot outside,	1	No Shoulders throughout the corridor	5' outside shoulders. Req - 10' foot outside,	5	shoulders throughout entire corridor although they do not meet criteria
Lane Width	9' travel lanes - lanes widths do not meet standards	1	lane width is 9' throughout corridor which does not meet standards and barely accommodates a large vehicle	12' travel lanes - lanes widths do not meet standards	5	lane width is 12' throughout corridor which meets standards
Horizontal Curve Density	92 curves have reduced speeds over the 11.03 miles segment resulting in an average of 8.34	1	Greater than 6 curves per mile on average with reduced advisory speed	11 curves have reduced speeds over the 9.21 miles segment resulting in an average of 1.19	4	1 to 2 curves per mile on average with reduced advisory speeds
Clear Zone*	Most of the corridor is constrained by rock face next to road and steep slopes	1	most of the corridor does not have sufficient clearzone, guardrail is needed along many areas, several locations with rockface next to road	Guardrail provided along most of the corridor, few locations with rock close to roadway.	5	corridor has sufficient clearzone, guardrail already provided, and few locations with rockface next to road
Sight Distance	Sight distance issues throughout mostly due to trees, tunnels, and pigtail bridges.	1	A substantial amount of the corridor has sight distance issues either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Few sight distance issues throughout.	5	Very few locations where sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	There are 22 accesses, and 9 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)	There are 51 accesses, and 32 are less than 660' apart.	2	Several issues with spacing throughout corridor (20 - 40 accesses with insufficient spacing)
Grade	Steep grades through the sharp curves.	1	Substantial steep grade areas or steep grades through curves	No steep grades	5	Minimal steep grade areas or steep grades through curves

Ratings		
	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 11			CORRIDOR 12		
Category	Condition	Rating	Reason for Rating	Condition	Rating	Reason for Rating
Shoulder Width*	4' outside shoulders. Req - 10' foot outside,	4	shoulders throughout entire corridor although they do not meet criteria	0' to 1' outside. Req - 10' foot outside,	1	minimal or no shoulders thoughout entire corridor and they do not meet criteria
Lane Width	12' travel lanes - lanes widths do meet standards	5	lane width is 12' throughout corridor which meets standards	11' - 12' lanes - lanes widths meet standards	4	lane width is 12' through some of corridor which meets standards, but much of the corridor has 11' lanes
Horizontal Curve Density	39 curves have reduced speeds over the 14.34 miles segment resulting in an average of 2.72	3	2 to 4 curves per mile on average with reduced advisory speeds	10 curves have reduced speeds over the 10.58 miles segment resulting in an average of 0.95	5	less than 1 curve per mile on average with reduced advisory speeds
Clear Zone*	Guardrail provided along most of the corridor, few locations with rock close to roadway.	5	corridor has sufficient clearzone, guardrail already provided, and few locations with rockface next to road	Several areas of steep drop offs and high fill areas without guardrail	2	\several locations with steep slopes within Clearzone that need guard rail.
Sight Distance	Moderate sight distance issues due to curves and grades throughout.	4	A moderate amount of sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Much of the corridor has sight distance issues due to curves and grades.	2	Much of the corridor has sight distance issues either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	There are 137 accesses, and 62 are less than 660' apart, several less than 200'.	1	Substantial amount of spacing issues throughout corridor (greater than 40 accesses with insufficient spacing	There are 22 accesses, and 8 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)
Grade	Steepest grade (15%) in South Dakota highways.	1	Substantial steep grade, steep grade areas or steep grades through curves	Steep grades through the sharp curves.	2	Several steep grade areas or steep grades through curves

Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 13			CORRIDOR 14		
Category	**Condition**	**Rating**	**Reason for Rating**	**Condition**	**Rating**	**Reason for Rating**
Shoulder Width*	No outside shoulders. Req - 10' foot outside,	1	No Shoulders throughout the corridor	0' to 4' outside. Req - 10' foot outside, sections with no outside shoulder	2	has some shoulders even though not entire corridor and and they do not meet criteria
Lane Width	8' - 10' lanes - lanes widths do not meet standards	2	lane width is much less than 12' through the corridor which does not meets standards, but there are some corridors with less than 10' lane width.	10' lanes - lanes widths do not meet standards	3	lane width is less than 12' through the corridor, which does not meets standards but more than 8' or 9'. There are some corridors with less than 10' lane width.
Horizontal Curve Density	66 curves have reduced speeds over the 14.04 miles segment resulting in an average of 4.70	2	4 to 6 curves per mile on average with reduced advisory speeds	39 curves have reduced speeds over the 5.96 miles segment resulting in an average of 6.54	1	Greater than 6 curves per mile on average with reduced advisory speed
Clear Zone*	Most of the corridor is constrained by rock face next to road and steep slopes	1	most of the corridor does not have sufficient clearzone, guardrail is needed along many areas, several locations with rockface next to road	Most of the corridor is constrained by rock face next to road and steep slopes	1	most of the corridor does not have sufficient clearzone, guardrail is needed along many areas, several locations with rockface next to road
Sight Distance	Sight distance issues throughout mostly due to trees, tunnels, and pigtail bridges.	1	A substantial amount of the corridor has sight distance issues either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Sight distance issues throughout mostly due to trees and tunnels.	1	A substantial amount of the corridor has sight distance issues either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	There are 21 accesses, and 6 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)	There are 25 accesses, and 10 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)
Grade	Steep grades through the sharp curves.	1	Substantial steep grade areas or steep grades through curves	Steep grades through the sharp curves.	1	Substantial steep grade areas or steep grades through curves

Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 15			CORRIDOR 16		
Category	Condition	Rating	Reason for Rating	Condition	Rating	Reason for Rating
Shoulder Width*	No outside shoulders. Req - 10' foot outside,	1	No Shoulders throughout the corridor	4' - 6' outside shoulders. Req - 10' foot outside,	4	shoulders throughout entire corridor although they do not meet criteria
Lane Width	10' - 12' lanes - lanes widths meet standards	4	lane width is 12' through much of corridor which meets standards, but some of the corridor has 10' lanes	12' travel lanes - lanes widths do meet standards	5	lane width is 12' throughout corridor which meets standards
Horizontal Curve Density	33 curves have reduced speeds over the 6.07 miles segment resulting in an average of 5.44	2	4 to 6 curves per mile on average with reduced advisory speeds	24 curves have reduced speeds over the 10.46 miles segment resulting in an average of 2.29	3	2 to 4 curves per mile on average with reduced advisory speeds
Clear Zone*	Several rock outcroppings next to road, long distance of steep drop offs, drainage features	2	most of the corridor does not have sufficient clearzone, guardrail needed at some locations, many locations with rockface next to road - 2	Guardrail provided along most of the corridor, few locations with rock close to roadway.	4	most of corridor has sufficient clearzone, a few areas with steep slopes and high fill section, guardrail already provided, and few locations with rockface next to road
Sight Distance	Sight distances issues due to curves and driveways.	2	much of the corridor has sight distance is an issues either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades	Sight distances issues due to curves and driveways.	2	Much of the corridor has sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	There are 31 accesses, and 18 are less than 660' apart.	3	Many issues with spacing throughout corridor (10 - 20 accesses with insufficient spacing)	There are 24 accesses, and 9 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)
Grade	A few long moderate downgrade curves south.	4	Some segments with steep grade areas or steep grades through curves	Some moderate grades.	5	Minimal steep grade areas or steep grades through curves

Ratings	5	Few deficiencies
	4	
	3	
	2	
	1	More deficiencies

	CORRIDOR 17		
Category	**Condition**	**Rating**	**Reason for Rating**
Shoulder Width*	7' outside shoulders most of corridor, small segment 2' or less shoulder width. Req - 10' foot outside,	4	shoulders throughout entire corridor although they do not meet criteria
Lane Width	12' travel lanes - lanes widths do not meet standards	5	lane width is 12' throughout corridor which meets standards
Horizontal Curve Density	2 curves have reduced speeds over the 3.12 miles segment resulting in an average of 0.64 curves per	5	less than 1 curve per mile on average with reduced advisory speeds
Clear Zone*	Guardrail provided along most of the corridor, few locations with rock close to roadway.	5	corridor has sufficient clearzone, guardrail already provided, and few locations with rockface next to road
Sight Distance	Few sight distance issues throughout.	5	Very few locations where sight distance is an issue either due to curves, steep grades, at specific tight driveways locations, or specific intersections on curves or due to grades
Access Spacing	There are 10 accesses, and 3 are less than 660' apart.	4	A few issues with spacing throughout corridor (less than 10 accesses with insufficient spacing)
Grade	One long moderately steep downgrade east.	4	Some segments with steep grade areas or steep grades through curves
Ratings	5	Few deficiencies	
	4		
	3		
	2		
	1	More deficiencies	

Black Hills
CONTEXT SENSITIVE CORRIDORS STUDY

APPENDIX E. CORRIDOR COST ESTIMATES

Cost Summary for Corridor Improvements

Improvement Type/Item		Costs by Corridor - North Corridors					Costs by Corridor - South Corridors											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Corridor Purpose: Destination (D), Destination Access (DA) or Commuter/Commercial Route (C)		D	DA	C	C	DA	C	DA	D	D	DA	C	DA	D	D	DA	DA	D/DA
Corridor Length		12.8	5.5	16.3	0.9	3.2	4.5	12.8	5.7	11	9.1	14.1	10.6	14.1	6	6	7.4	3.1
Cost shown in $1000's																		
Design																		
D	Overall Total	$ 727	$ 823	$ 5,378	$ 84	$ 158	$ 607	$ 1,021	$ 1,310	$ 906	$ 1,121	$ 639	$ 1,625	$ 865	$ 218	$ 179	$ 1,543	$ 26
Multimodal Operations																		
O	Overall Total	$ -	$ -	$ 155	$ 315	$ -	$ 62	$ 89	$ 547	$ 40	$ -	$ -	$ 215	$ 81	$ 27	$ -	$ 3	$ 1,098
Safety																		
S	Overall Total	$ 324	$ 605	$ 9,320	$ -	$ 534	$ 1,306	$ 1,626	$ -	$ -	$ 3,630	$ 155	$ -	$ 887	$ 192	$ 562	$ 940	$ -
ITS Improvements																		
I	Overall Total	$ 150	$ 150	$ 525	$ -	$ 140	$ 80	$ -	$ 30	$ 225	$ -	$ 300	$ 75	$ 15	$ 120	$ 30	$ 15	$ 75
Aesthetic Enhancements																		
A	Overall Total	$ -	$ -	$ -	$ 540	$ -	$ -	$ -	$ 1,140	$ 2,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subtotals	$ 1,200	$ 1,580	$ 15,380	$ 940	$ 830	$ 2,060	$ 2,740	$ 3,030	$ 3,370	$ 4,750	$ 1,090	$ 1,920	$ 1,850	$ 560	$ 770	$ 2,500	$ 1,200
	Contingency (20%)	$ 240	$ 320	$ 3,080	$ 190	$ 170	$ 410	$550	$ 610	$ 670	$ 950	$ 220	$ 380	$ 370	$ 110	$ 150	$500	$ 240
Total Cost per Corridor		$ 1,400	$ 1,900	$ 18,500	$ 1,100	$ 1,000	$ 2,500	$ 3,300	$ 3,600	$ 4,000	$ 5,700	$ 1,300	$ 2,300	$ 2,200	$ 700	$ 900	$ 3,000	$ 1,400
Average Cost per Mile		*$ 100*	*$ 300*	*$ 1,100*	*$ 1,200*	*$ 300*	*$ 600*	*$ 300*	*$ 600*	*$ 400*	*$ 600*	*$ 100*	*$ 200*	*$ 200*	*$ 100*	*$ 200*	*$ 400*	*$ 500*

Note: Red Costs reflect higher cost corridors for an Improvement Type or Totals (higher 1/3).

Orange Costs reflect moderate cost corridors for an Improvement Type or Totals (mid 1/3).

Green Costs reflect low cost corridors for an Improvement Type or Totals (lower 1/3).

Segment/Location Improvements by Corridor
Corridor 1

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**12.8**	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$530,637.04	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D5	Improved Sight Distance	Per Location			See D1 Costs above.
D7	Pullouts				
	Add New Pullout (Destination)	Per Location	$12,571.98	$12,571.98	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
	Improve Existing Pullout	Per Location	$10,077.96	$141,091.41	
D8	Parking				
	Add New Parking	Per Location	$20,868.35	$41,736.71	Assume a new parking lot is 20 spaces and includes one handicap space with van access. Spaces are 9' wide by 18.5' long and at 90 degrees. One directional lane used. Estimate SY and document. Use base and pavement unit costs for areas. Striping is included in the contingency.
D9	Roadside Characteristics				
	Add Drainage Ditch	Mile	$10,016.16		O&M not included in cost
	Improved Erosion Control/Slope Stabilization	Linear Foot	$1,300.00		O&M not included in cost
	Improve Drainage Structure in Clearzone	Per Location	$3,432.74		O&M not included in cost
Multimodal Operations					
O4	Purchase/Consolidate/Relocate Access	Per Location			*Future Phase*
Safety					
S1	Signing				
	Speed Reduction Signage	Per Location	$1,965.20		O&M not included in cost
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		O&M not included in cost
S5	Provide High Friction Pavement Treatment	Mile	$300,000.00	$324,000.0	Use SDDOT average unit costs for High Friction Pavement Treatment.
S6	Traffic Calming	Per Location			*Future Phase*
S7	Modify Pavement Markings	Mile	$1,584.00		O&M not included in cost
ITS Improvements					
I2	Add Dynamic Speed Display Sign			$150,000	Corridor-specific cost developed based on corridor needs. *Low Intensity* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). *Moderate* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). *High* - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required *low* intensity, Destination Access Corridors 2,5,7,12,15 required *moderate*, and Commuter Corridors 3,4,6,10,11 were considered *high*.
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$1,200,000	
	Contingency (20%)			$240,000	
	Total Capital Cost per Corridor (Rounded)			**$1,400,000**	

Segment/Location Improvements by Corridor
Corridor 2

Improvement Type/Item			Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length		**Miles**	**N/A**	**5.5**	
Design						
D1	Improve Horizontal Curve		SY	$37.31	$72,962.59	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D2	Improve Vertical Curve		SY	$37.31		
D3	Widen Shoulder to:					
		6 Feet	SY	$18.73	$718,520.73	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D6	Improve/Correct Superelevation		Per Location			See D1 Costs above.
D7	Pullouts					
		Improve Existing Pullout	Per Location	$10,077.96	$10,077.96	
D8	Parking					
		Add New Parking	Per Location	$20,868.35	$20,868.35	
D9	Roadside Characteristics					
		Improved Erosion Control/Slope Stabilization	Linear Foot	$1,300.00		O&M not included in cost
		Improve Drainage Structure in Clearzone	Per Location	$3,432.74		O&M not included in cost
Multimodal Operations - Not Used						
Safety						
S1	Signing					
		Speed Reduction Signage	Per Location	$1,965.20		O&M not included in cost
		Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail					
		Add/Improve Guardrail	Linear Foot	$51.50	$95,172.00	Identify and document W beam guardrail locations and length needed. Ancillary items captured in contingency for grading, and end treatments.
S3	Motorcycle					
		Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
		Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		O&M not included in cost
S4	Pavement Surface Treatments					
		Add Centerline Rumble Strips	Mile	$530.80		O&M not included in cost
		Add Edgeline Rumble Strips	Mile	$978.20		
S5		Provide High Friction Pavement Treatment	Mile	$300,000.00	$510,000.00	O&M not included in cost
S9	Rockfall Mitigation Measures					
		Widened shoulder for Rockfall Collection	Linear Foot			See corridor wide shoulder added above
ITS Improvements						
I2	Add Dynamic Speed Display Sign				$150,000	Corridor-specific cost developed based on corridor needs. *Low Intensity* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). *Moderate* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). *High* - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required *low* intensity, Destination Access Corridors 2,5,7,12,15 required *moderate*, and Commuter Corridors 3,4,6,10,11 were considered *high*.
Aesthetic Enhancements - Not Used						
	Subtotals (Capital Costs Only)				$1,580,000	Corridor-specific cost developed based on corridor needs. Corridor 4 is considered High Intensity for aesthetics and has a cost of $600,000 per mile for improvements and the
	Contingency (20%)				$316,000	
	Total Capital Cost per Corridor (Rounded)				$1,900,000	

Segment/Location Improvements by Corridor
Corridor 3

Improvement Type/Item			Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length		Miles	N/A	16.3	
Design						
D1	Improve Horizontal Curve		SY	$37.31	$2,125,000.00	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D3	Widen Shoulder to:					
		6 Feet	SY	$18.73	$2,147,651.88	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D4	Widen Lanes to:					
		12 Feet	SY	$46.54	$889,618.62	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D5	Improved Sight Distance		Per Location			See D1, D3 and D4 costs
D7	Pullouts					
		Improve Existing Pullout	Per Location	$10,077.96	$110,857.54	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
D8	Parking					
		Add New Parking	Per Location	$20,868.35	$104,341.77	Assume a new parking lot is 20 spaces and includes one handicap space with van access. Spaces are 9' wide by 18.5' long and at 90 degrees. One directional lane used. Estimate SY and document. Use base and pavement unit costs for areas. Striping is included in the contingency.
D9	Roadside Characteristics					
		Add Drainage Ditch	Mile	$10,016.16		O&M not included in cost
		Improved Erosion Control/Slope Stabilization	Linear Foot	$1,300.00		O&M not included in cost
		Improve Drainage Structure in Clearzone	Per Location	$3,432.74		O&M not included in cost
Multimodal Operations						
O3	Lanes					
		Additional Turn Lanes	Per Location	$31,029.17	$155,145.83	For applicable corridors multiply the additional width for the length of the corridor for SF and use the developed SF cost for base, pavement and grading to apply to corridor. Assume no guardrail resets are included - added a contingency for corridor to capture such items.
Safety						
S1	Signing					
		Speed Reduction Signage	Per Location	$1,965.20		O&M not included in cost
		Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail					
		Add/Improve Guardrail	Linear Foot	$51.50	$4,429,576.80	Identify and document W beam guardrail locations and length needed. Ancillary items captured in contingency for grading, and end treatments.
S3	Motorcycle					
		Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
		Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		O&M not included in cost
S4	Pavement Surface Treatments					
		Add Centerline Rumble Strips	Mile	$530.80		O&M not included in cost
		Add Edgeline Rumble Strips	Mile	$978.20		
S5		Provide High Friction Pavement Treatment	Mile	$300,000.00	$4,890,000.00	O&M not included in cost
ITS Improvements						
I2	Add Dynamic Speed Display Sign				$525,000	Corridor-specific cost developed based on corridor needs. *Low Intensity* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). *Moderate* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). *High* - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required *low* intensity, Destination Access Corridors 2,5,7,12,15 required *moderate* , and Commuter Corridors 3,4,6,10,11 were considered *high* .
Aesthetic Enhancements - Not Used						
	Subtotals (Capital Costs Only)				$15,380,000	
	Contingency (20%)				$3,076,000	
	Total Capital Cost per Corridor (Rounded)				**$18,500,000**	

Segment/Location Improvements by Corridor
Corridor 4

Improvement Type/Item			Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length		**Miles**	**N/A**	**0.9**	
Design						
D3	Widen Shoulder to:					
		8 Feet (2 Feet Asphalt & 6 Feet Gravel)	SY	$25.54	$83,919.73	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D4	Widen Lanes to:					
		12 Feet	SY	$46.54		Lanes already 12' wide - no costs
Multimodal Operations						
O6	Add/Improve Bike/Ped Facilities					
		Shared	Linear Foot	$18.18	$67,185.07	Base quantity on the locations provided on the Vision corridor map or on assumed locations and document. Use SDDOT average unit costs for the items included.
		Separate	Linear Foot	$67.09	$247,979.36	
Safety						
S1	Signing					
		Speed Reduction Signage	Per Location	$1,965.20		O&M not included in cost
		Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail					
		Evaluate Existing Guardrail	Linear Foot	$30.13		O&M not included in cost
S7		Modify Pavement Markings	Mile	$1,584.00		O&M not included in cost
ITS Improvements - Not Used						
Aesthetic Enhancements						
A2	Streetscape Beautification				$540,000	Corridor-specific cost developed based on corridor needs. Corridor 4 is considered High Intensity for aesthetics and has a cost of $600,000 per mile for improvements and the remaining corridors are considered Low Intensity for aesthetics and has a cost of $200,000 per mile for improvements.
	Subtotals (Capital Costs Only)				$940,000	
	Contingency (20%)				$188,000	
	Total Capital Cost per Corridor (Rounded)				**$1,100,000**	

Segment/Location Improvements by Corridor
Corridor 5

Improvement Type/Item			Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length		**Miles**	**N/A**	**3.2**	
Design						
D3	Widen Shoulder to:					
		6 Feet	SY	$18.73	$158,206.40	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D4	Widen Lanes to:					
		11 Feet	SY	$46.54	$0	These are taken care of with the shoulder widening
D9	Roadside Characteristics					
		Add Drainage Ditch	Mile	$10,016.16		O&M not included in cost
		Improved Erosion Control/Slope Stabilization	Linear Foot	$1,300.00		O&M not included in cost
		Improve Drainage Structure in Clearzone	Per Location	$3,432.74		O&M not included in cost
Multimodal Operations - Not Used						
Safety						
S5		Provide High Friction Pavement Treatment	Mile	$300,000.00	$534,000.00	O&M not included in cost
S6		Traffic Calming	Per Location			*Future Phase*
S9	Rockfall Mitigation Measures					
		Widened shoulder for Rockfall Collection	Linear Foot			Use widen shoulders costs noted above for assumed and documented locations, since only one corridor.
ITS Improvements						
I3	Add Road Weather Information Systems (RWIS) Stations				$100,000	Corridor-specific cost developed based on corridor needs. *Low Intensity* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). *Moderate* – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). *High* - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required *low* intensity, Destination Access Corridors 2,5,7,12,15 required *moderate*, and Commuter Corridors 3,4,6,10,11 were considered *high*.
I5	Add Cameras (video)				$40,000	
Aesthetic Enhancements - Not Used						
	Subtotals (Capital Costs Only)				$800,000	
	Contingency (20%)				$160,000	
	Total Capital Cost per Corridor (Rounded)				**$1,000,000**	

Segment/Location Improvements by Corridor
Corridor 6

	Improvement Type/Item	Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**4.5**	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$291,850.37	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D2	Improve Vertical Curve	SY	$37.31	$238,786.67	
D5	Improved Sight Distance	SY	$37.31	$2,487.36	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic for this item. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
D7	Pullouts				
	Add New Pullout - Commuter	Per Location	$46.54	$52,501.35	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
D8	Parking				
	Add New Parking	Per Location	$20,868.35	$20,868.35	Assume a new parking lot is 20 spaces and includes one handicap space with van access. Spaces are 9' wide by 18.5' long and at 90 degrees. One directional lane used. Estimate SY and document. Use base and pavement unit costs for areas. Striping is included in the contingency.
Multimodal Operations					
O3	Lanes				
	Additional Turn Lanes	Per Location	$31,029.17	$62,058.33	For applicable corridors multiply the additional width for the length of the corridor for SF and use the developed SF cost for base, pavement and grading to apply to corridor. Assume no guardrail resets are included - added a contingency for corridor to capture such items.
Safety					
S1	Signing				
	Speed Reduction Signage	Per Location	$1,965.20		O&M not included in cost
	Signage improvements	Mile	$7,109.00		
S2	Guardrail				
	Add/Improve Guardrail	Linear Foot	$51.50	$734,184.00	Identify and document W beam guardrail locations and length needed based on available resources. Ancillary items captured in contingency for grading, and end treatments.
S8	Wildlife Collision Treatments				
	Add Deer Fence and Game Ramps	Mile	$127,000.00	$571,500.00	Used CDOT cost information for 5 miles of US 285 for deer fence and game ramps including spacing of ramps at an average cost of $127,000 per mile was used for a portion or the entire corridor. Reviewed existing culverts as potential wildlife crossings with expanding the culvert based on a unit cost.
ITS Improvements					
I2	Add Dynamic Speed Display Sign			$30,000	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
I5	Add Cameras (video)			$25,000	
I6	Add Traffic sensors (volumes, speed, etc.)			$25,000	
	Overall Total				
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$ 2,100,000	
	Contingency (20%)			$ 420,000	
	Total Capital Cost per Corridor (Rounded)			**$ 2,500,000**	

Segment/Location Improvements by Corridor
Corridor 7

	Improvement Type/Item	Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	Miles	N/A	12.8	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$543,902.96	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D3	Widen Shoulder to:				
	6 Feet	SY	$18.73	$136,499.63	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D4	Widen Lanes to:				
	12 Feet	SY	$46.54	$42,406.53	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D5	Improved Sight Distance	SY	$37.31	$263,179.39	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic for this item. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
D7	Pullouts				
	Improve Existing Pullout	Per Location	$5,061.78	$15,185.34	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
D8	Parking				
	Add New Parking	Per Location	$20,868.35	$20,868.35	Assume a new parking lot is 20 spaces and includes one handicap space with van access. Spaces are 9' wide by 18.5' long and at 90 degrees. One directional lane used. Estimate SY and document. Use base and pavement unit costs for areas. Striping is included in the contingency.
Multimodal Operations					
O2	Increase Passing Zones	Per Location			O&M not included in cost
O3	Lanes				
	Additional Turn Lanes	Per Location	$31,029.17	$62,058.33	No additional travel lanes. For turn lanes, multiply the additional width for the assumed length of the turn lane for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets are included in the contingency.
O5	Intersection Control				Costs to be determined during the next Phase, since site-specific.
O6	Add/Improve Bike/Ped Facilities				
	Separate	Linear Foot	$67.09	$26,837.59	Base quantity on the locations provided on the Vision corridor map or assumed locations. For shared facilities, assumed 6' pave over shoulder widening. For separate facilities, assumed improved trail access with C & G with 5' conc walk and 4" of base. Used SDDOT average unit costs for the items included. Crosswalks were considered included in the contingency.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail				
	Evaluate Existing Guardrail	Linear Foot	$30.13		O&M not included in cost
S8	Wildlife Collision Treatments				
	Add Deer Fence and Game Ramps	Mile	$127,000.00	$1,625,600.00	Used CDOT cost information for 5 miles of US 285 for deer fence and game ramps including spacing of ramps at an average cost of $127,000 per mile was used for a portion or the entire corridor. Reviewed existing culverts as potential wildlife crossings with expanding the culvert based on a unit cost.
ITS Improvements - Not Used					
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$ 2,740,000	
	Contingency (20%)			$ 550,000	
	Total Capital Cost per Corridor (Rounded)			**$ 3,300,000**	

Segment/Location Improvements by Corridor
Corridor 8

	Improvement Type/Item	Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**5.7**	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$1,155,727.47	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D2	Improve Vertical Curve	SY	$37.31	$0.00	
D3	Widen Shoulder to:				
	4 Feet* (Used 2 feet)	SY	$18.73	$153,811.78	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D4	Widen Lanes to:				
	12 Feet	SY	$46.54	$0.00	If the same curve locations are improved with items D1 and D2, then this item was not quantified.
	11 Feet	SY	$46.54	$0.00	
D5	Improved Sight Distance	Per Location		$0.00	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic for this item. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
Multimodal Operations					
O6	Add/Improve Bike/Ped Facilities				
	Shared	Linear Foot	$18.18	$547,078.40	Base quantity on the locations provided on the Vision corridor map or assumed locations. For shared facilities, assumed 6' pave over shoulder widening. For separate facilities, assumed improved trail access with C & G with 5' conc walk and 4" of base. Used SDDOT average unit costs for the items included. Crosswalks were considered included in the contingency.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail				
	Evaluate Existing Guardrail	Linear Foot	$30.13		O&M not included in cost
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
ITS Improvements					
I2	Add Dynamic Speed Display Sign			$30,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
Aesthetic Enhancements					
A3	Add Interpretive Sites/Locations			$1,140,000	Corridor-specific cost developed based on corridor needs. Corridor 4 is considered High Intensity for aesthetics and has a cost of $600,000 per mile for improvements and the remaining corridors are considered Low Intensity for aesthetics and has a cost of $200,000 per mile for improvements.
	Subtotals (Capital Costs Only)			$3,000,000	
	Contingency (20%)			$600,000	
	Total Capital Cost per Corridor (Rounded)			**$3,600,000**	

Segment/Location Improvements by Corridor
Corridor 9

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	Miles	N/A	11	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$388,028.33	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D3	Widen Shoulder to:				
	4 Feet* (Used 2 feet)	SY	$18.73	$450,948.17	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D5	Improved Sight Distance - Captured in D1 and D3 above	Per Location		$0.00	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic for this item. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
D6	Improve/Correct Superelevation - Captured in D1 above	Per Location		$0.00	Assume a changed length based on location called out on Visioning graphic or assumed and documented. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
D7	Pullouts				
	Improve Existing Pullout	Per Location	$5,061.78	$15,185.34	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
D8	Parking				
	Add New Parking	Per Location	$20,868.35	$41,736.71	Assume a new parking lot is 20 spaces and includes one handicap space with van access. Spaces are 9' wide by 18.5' long and at 90 degrees. One directional lane used. Estimate SY and document. Use base and pavement unit costs for areas. Striping is included in the contingency.
	Improve Existing Parking	Per Location	$10,434.18	$10,434.18	Assume 10 additional spaces and includes one handicap space with van access is added to existing parking. See above for additional information.
Multimodal Operations					
O6	Add/Improve Bike/Ped Facilities				
	Separate	Linear Foot	$67.09	$40,256.39	Base quantity on the locations provided on the Vision corridor map or assumed locations. For shared facilities, assumed 6' pave over shoulder widening. For separate facilities, assumed improved trail access with C & G with 5' conc walk and 4" of base. Used SDDOT average unit costs for the items included. Crosswalks were considered included in the contingency.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail				
	Evaluate Existing Guardrail	Linear Foot	$30.13		O&M not included in cost
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
ITS Improvements					
I1	Add Dynamic Message Sign			$150,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
I2	Add Dynamic Speed Display Sign			$30,000.00	
I4	Install Advanced Warning Signs			$45,000.00	
Aesthetic Enhancements					
A3	Add Interpretive Sites/Locations			$2,200,000	Corridor-specific cost developed based on corridor needs. Corridor 4 is considered High Intensity for aesthetics and has a cost of $600,000 per mile for improvements and the remaining corridors are considered Low Intensity for aesthetics and has a cost of $200,000 per mile for improvements.
	Subtotals (Capital Costs Only)			$3,372,000	
	Contingency (20%)			$674,000	
	Total Capital Cost per Corridor (Rounded)			$ 4,000,000	

Segment/Location Improvements by Corridor
Corridor 10

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**9.1**	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$1,120,705.42	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
Multimodal Operations					
O4	Purchase/Consolidate/Relocate Access	Linear Foot	$229.00		No costs assumed for this level of analysis.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail				
	Add/Improve Guardrail	Linear Foot	$51.50	$2,474,472.00	Identify and document W beam guardrail locations and length needed based on available resources. Ancillary items captured in contingency for grading, and end treatments.
S4	Pavement Surface Treatments				
	Add Centerline Rumble Strips	Mile	$530.80		O&M not included in cost
	Add Edgeline Rumble Strips	Mile	$978.20		
S5	Provide High Friction Pavement Treatment	Mile	$300,000.00		O&M not included in cost
S8	Wildlife Collision Treatments				
	Add Deer Fence and Game Ramps	Mile	$127,000.00	$ 1,155,700.00	Used CDOT cost information for 5 miles of US 285 for deer fence and game ramps including spacing of ramps at an average cost of $127,000 per mile was used for a portion or the entire corridor. Reviewed existing culverts as potential wildlife crossings with expanding the culvert based on a unit cost.
ITS Improvements - Not Used					
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$ 4,751,000	
	Contingency (20%)			$ 950,000	
	Total Capital Cost per Corridor (Rounded)			**$5,700,000**	

Segment/Location Improvements by Corridor
Corridor 11

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	Miles	N/A	14.1	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$560,352.71	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D2	Improve Vertical Curve	SY	$37.31	$0.00	
D7	Pullouts				
	Add New Pullout - Commuter	Per Location	$5,670.48	$79,386.71	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
Multimodal Operations					
O4	Purchase/Consolidate/Relocate Access	Linear Foot	$229.00		No costs assumed for this level of analysis.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail				
	Add/Improve Guardrail	Linear Foot	$51.50	$154,500.00	Identify and document W beam guardrail locations and length needed based on available resources. Ancillary items captured in contingency for grading, and end treatments.
S5	Provide High Friction Pavement Treatment	Mile	$300,000.00		O&M not included in cost
ITS Improvements					
I1	Add Dynamic Message Sign			$300,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$1,100,000	
	Contingency (20%)			$200,000	
	Total Capital Cost per Corridor (Rounded)			**$ 1,300,000**	

Segment/Location Improvements by Corridor
Corridor 12

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**10.6**	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$1,318,102.40	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D3	Widen Shoulder to:				
	4 Feet	SY	$18.73	$248,096.40	For applicable corridors multiply the additional width for the length of the corridor for SY and use the developed SY cost for base, pavement and grading to apply to corridor. Assume guardrail resets and other items are included in the contingency.
D6	Improve/Correct Superelevation	Per Location		$0.00	Assume a changed length based on location called out on Visioning graphic or assumed and documented. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
D7	Pullouts				
	Add New Pullout - Destination	Per Location	$1,725.75	$17,257.55	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
D8	Parking				
	Add New Parking	Per Location	$20,868.35	$41,736.71	Assume a new parking lot is 20 spaces and includes one handicap space with van access. Spaces are 9' wide by 18.5' long and at 90 degrees. One directional lane used. Estimate SY and document. Use base and pavement unit costs for areas. Striping is included in the contingency.
Multimodal Operations					
O6	Add/Improve Bike/Ped Facilities				
	Separate	Linear Foot	$67.09	$ 214,700.74	Base quantity on the locations provided on the Vision corridor map or on assumed locations and document. Use SDDOT average unit costs for the items included.
Safety					
S1	Signing				
	Speed Reduction Signage	Per Location			O&M not included in cost
	Signage improvements	Mile	$7,109.00		
S2	Guardrail				
	Add/Improve Guardrail	Linear Foot	$51.50		O&M not included in cost
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
S4	Pavement Surface Treatments				
	Add Centerline Rumble Strips	Mile	$530.80		O&M not included in cost
	Add Edgeline Rumble Strips	Mile	$978.20		
S5	Provide High Friction Pavement Treatment	Mile	$300,000.00		O&M not included in cost
ITS Improvements					
I2	Add Dynamic Speed Display Sign			$ 75,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$ 1,900,000	
	Contingency (20%)			$ 380,000	
	Total Capital Cost per Corridor (Rounded)			**$ 2,300,000**	

Segment/Location Improvements by Corridor
Corridor 13

Improvement Type/Item			Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length		**Miles**	**N/A**	**14.1**	
Design						
D1	Improve Horizontal Curve		SY	$37.31	$746,208.33	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D7	Pullouts					
		Add New Pullout (Commuter)	Per Location	$9,158.78	$0.00	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
		Add New Pullout (Destination)	Per Location	$6,314.44	$88,402.10	
D8	Parking					
		Improve Existing Parking	Per Location	$10,434.18	$31,302.53	Assume 10 additional spaces and includes one handicap space with van access is added to existing parking. See above for additional information.
Multimodal Operations						
O6	Add/Improve Bike/Ped Facilities					
		Separate	Linear Foot	$67.09	$80,512.78	Base quantity on the locations provided on the Vision corridor map or assumed locations. For shared facilities, assumed 6' pave over shoulder widening. For separate facilities, assumed improved trail access with C & G with 5' conc walk and 4" of base. Used SDDOT average unit costs for the items included. Crosswalks were considered included in the contingency.
Safety						
S1	Signing					
		Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail					
		Add/Improve Guardrail	Linear Foot	$51.50	$236,900.00	Identify and document W beam guardrail locations and length needed based on available resources. Ancillary items captured in contingency for grading, and end treatments.
S3	Motorcycle					
		Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
		Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
S7		Modify Pavement Markings	Mile	$1,584.00		O&M not included in cost
S9	Rockfall Mitigation Measures					
		Install Rockfall netting/mesh	Linear Foot	$1,300.00	$650,000.00	Shoulder widening was already accounted for with D3. On US 24, Colorado spent $1300 per linear foot on labor and materials to stabilize a slope. Lengths were based on where rock was adjacent to the roadway.
ITS Improvements						
I4	Install Advanced Warning Signs		Per System		$15,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
Aesthetic Enhancements						
A1	Guardrail/roadside signage visual treatments					O&M not included in cost
	Subtotals (Capital Costs Only)				$ 1,850,000	
	Contingency (20%)				$ 370,000	
	Total Capital Cost per Corridor (Rounded)				**$ 2,200,000**	

Segment/Location Improvements by Corridor
Corridor 14

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**6**	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$159,191.11	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D5	Improved Sight Distance	SY	$37.31	$52,234.58	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic for this item. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
D7	Pullouts				
	Add New Pullout (Destination)	Per Location	$1,725.75	$1,725.75	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
	Improve Existing Pullout	Per Location	$5,061.78	$5,061.78	
Multimodal Operations					
O6	Add/Improve Bike/Ped Facilities				
	Separate	Linear Foot	$67.09	$26,837.59	Base quantity on the locations provided on the Vision corridor map or assumed locations. For shared facilities, assumed 6' pave over shoulder widening. For separate facilities, assumed improved trail access with C & G with 5' conc walk and 4" of base. Used SDDOT average unit costs for the items included. Crosswalks were considered included in the contingency.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
S9	Rockfall Mitigation Measures				
	Install Rockfall netting/mesh	Linear Foot	$1,300.00	$191,750.00	Shoulder widening was already accounted for with D3. On US 24, Colorado spent $1300 per linear foot on labor and materials to stabilize a slope. Lengths were based on where rock was adjacent to the roadway.
ITS Improvements					
I1	Add Dynamic Message Sign	Per System		$75,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
I2	Add Dynamic Speed Display Sign	Per System		$30,000.00	
I4	Install Advanced Warning Signs	Per System		$15,000.00	
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$560,000	
	Contingency (20%)			$112,000	
	Total Capital Cost per Corridor (Rounded)			**$ 700,000**	

Segment/Location Improvements by Corridor
Corridor 15

	Improvement Type/Item	Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**6**	
Design					
D2	Improve Vertical Curve	SY	$37.31	$179,090.00	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remov pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D9	Roadside Characteristics				
	Add Drainage Ditch	Mile	$10,016.16		O&M not included in cost
	Improve Drainage Structure in Clearzone	Per Location	$3,432.74		O&M not included in cost
Multimodal Operations					
O4	Purchase/Consolidate/Relocate Access	Linear Foot	$229.00		No costs assumed for this level of analysis.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail				
	Add/Improve Guardrail	Linear Foot	$51.50	$236,900.00	Identify and document W beam guardrail locations and length needed based on available resources. Ancillary items captured in contingency for grading, a end treatments.
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
S9	Rockfall Mitigation Measures				
	Install Rockfall netting/mesh	Linear Foot	$1,300.00	$325,000.00	Shoulder widening was already accounted for with D3. On US 24, Colorado spent $1300 per linear foot on labor and materials to stabilize a slope. Lengths based on where rock was adjacent to the roadway.
ITS Improvements					
I2	Add Dynamic Speed Display Sign	Per System		$30,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000), Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$770,000	
	Contingency (20%)			$150,000	
	Total Capital Cost per Corridor (Rounded)			**$ 900,000**	

Segment/Location Improvements by Corridor
Corridor 16

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**7.4**	
Design					
D1	Improve Horizontal Curve	SY	$37.31	$795,955.56	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency.
D5	Improved Sight Distance	SY	$37.31	$671,587.50	Assume a changed length based on curve to be straightened for just the curve(s) called out on Visioning graphic for this item. Items to consider for costs include; Remove pavement, grade, provide new base and pavement based on SY unit cost. Striping is included in the contingency. If the same curve locations are improved with items D1 and D2, then this item was not quantified.
D7	Pullouts				
	Add New Pullout (Destination)	Per Location	$6,314.44	$44,201.05	Assume a commuter pullout for 150 feet to accommodate WB-67 (about 75' long) and room for a emergency vehicle (25')and 25' either side min. Assume a destination pullout of 100 feet for a mobile home (30') or car pulling a camper (50') and 25' either side min. Assume 11:1 tapers min. based on VDOT and CDOT standards for pullouts. Use base and pavement unit costs for areas.
D8	Parking				
	Add New Parking	Per Location	$20,868.35	$20,868.35	Assume a new parking lot is 20 spaces and includes one handicap space with van access. Spaces are 9' wide by 18.5' long and at 90 degrees. One directional lane used. Estimate SY and document. Use base and pavement unit costs for areas. Striping is included in the contingency.
	Improve Existing Parking	Per Location	$10,434.18	$10,434.18	Assume 10 additional spaces and includes one handicap space with van access is added to existing parking. See above for additional information.
Multimodal Operations					
O6	Add/Improve Bike/Ped Facilities				
	Separate	Linear Foot	$67.09	$2,900.00	Base quantity on the locations provided on the Vision corridor map or assumed locations. For shared facilities, assumed 6' pave over shoulder widening. For separate facilities, assumed improved trail access with C & G with 5' conc walk and 4" of base. Used SDDOT average unit costs for the items included. Crosswalks were considered included in the contingency.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
S4	Pavement Surface Treatments				
	Add Centerline Rumble Strips	Mile	$530.80		O&M not included in cost
	Add Edgeline Rumble Strips	Mile	$978.20		
S8	Wildlife Collision Treatments				
	Add Deer Fence and Game Ramps	Mile	$127,000.00	$939,800.00	Used CDOT cost information for 5 miles of US 285 for deer fence and game ramps including spacing of ramps at an average cost of $127,000 per mile was used for a portion or the entire corridor. Reviewed existing culverts as potential wildlife crossings with expanding the culvert based on a unit cost.
ITS Improvements					
I2	Add Dynamic Speed Display Sign	Per System		$15,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$2,500,000	
	Contingency (20%)			$500,000	
	Total Capital Cost per Corridor (Rounded)			**$ 3,000,000**	

Segment/Location Improvements by Corridor
Corridor 17

Improvement Type/Item		Unit of Measure	Cost Per Unit	Total Cost	Assumptions
	Corridor Length	**Miles**	**N/A**	**3.1**	
Design					
D7	Pullouts				
	Improve Existing Pullout - 1 (east side)	Per Location	$5,061.78	$5,061.78	See above. Include removing existing pavement.
D8	Parking				
	Improve Existing Parking - 2 (west side)	Per Location	$10,434.18	$20,868.35	Assume 10 additional spaces and includes one handicap space with van access is added to existing parking. See above for additional information.
Multimodal Operations					
O6	Add/Improve Bike/Ped Facilities				
	Separate	Linear Foot	$67.09	$1,098,194.29	Base quantity on the locations provided on the Vision corridor map or assumed locations. For shared facilities, assumed 6' pave over shoulder widening. For separate facilities, assumed improved trail access with C & G with 5' conc walk and 4" of base. Used SDDOT average unit costs for the items included. Crosswalks were considered included in the contingency.
Safety					
S1	Signing				
	Signage improvements	Mile	$7,109.00		O&M not included in cost
S2	Guardrail				
	Evaluate Existing Guardrail	Linear Foot	$30.13		O&M not included in cost
S3	Motorcycle				
	Roadway Sweeping (During Sturgis Rally)	Mile	$51.50		O&M not included in cost
	Variable Message Signs (During Sturgis Rally)	Per Location	$567.00		
S4	Pavement Surface Treatments				
	Add Centerline Rumble Strips	Mile	$530.80		O&M not included in cost
	Add Edgeline Rumble Strips	Mile	$978.20		
ITS Improvements					
I1	Add Dynamic Message Sign	Per System		$75,000.00	Corridor-specific cost developed based on corridor needs. Low Intensity – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 5 miles ($25,000); 1 Traffic sensor per 10 miles ($25,000). Moderate – 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000);1 Dynamic speed sign per 5 miles ($15,000). High - 1 Roadside DMS per 10 miles ($75,000); 1 Camera per 2.5 miles ($25,000); 1 Traffic sensor per 5 miles ($25,000); 1 Dynamic speed sign per 5 miles ($15,000). Destination Corridors 1,8,9,13,14,16,17 required low intensity, Destination Access Corridors 2,5,7,12,15 required moderate, and Commuter Corridors 3,4,6,10,11 were considered high.
Aesthetic Enhancements - Not Used					
	Subtotals (Capital Costs Only)			$1,200,000	
	Contingency (20%)			$240,000	
	Total Capital Cost per Corridor (Rounded)			**$ 1,400,000**	

APPENDIX F. BENEFIT-COST RATIO CALCULATIONS

Corridor 1

Crash History Length 5 years

Crash Record						Improvement												Improvement																
ID	Date	Direction	Type	MRM	Severity	CMF	A 0.70	B 0.93	C 0.65	D 0.63	E 0.65	F 0.63	G 0.93	H 0.78	I 0.78	J 0.65	K 0.63	A	B	C	D	E	F	G	H	I	J	K	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1614840	11/11/2016	Northbound	Animal - wild	11.00	PDO													1	1	1	1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1508102	7/12/2015	Northbound	Ran off road right, Tree/shrubbery	10.96	INJ													1	1	1	1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1600676	1/16/2016	Westbound	Delineator post, Ran off road right	10.84	PDO		x											0.7	1	1	1	1	1	1	1	1	1	1	1	0	0	0.70	0.00	0.00
1309779	8/11/2013	Southbound	Overturn/rollover, Ran off road right	10.84	INJ		x											0.7	1	1	1	1	1	1	1	1	1	1	0	1	0	0.00	0.70	0.00
1308154	8/1/2013	Westbound	Animal - wild	12.55	PDO													1	1	1	1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1308772	8/12/2013	Southbound	Motor vehicle in transport	12.43	INJ													1	1	1	1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1611196	9/5/2016	Eastbound	Overturn/rollover, Ran off road right	13.63	INJ				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	0	1	0	0.00	0.41	0.00
1711241	9/3/2017	Eastbound	Animal - wild	13.60	PDO													1	1	1	1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1710541	8/20/2017	Westbound	Ran off road right, Rock	13.51	INJ				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	0	1	0	0.00	0.41	0.00
1502643	3/14/2015	Westbound	Delineator post, Overturn/rollover, Ran off road right	13.31	INJ				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	0	1	0	0.00	0.41	0.00
1308144	7/31/2013	Southbound	Cargo/equipment loss or shift, Cross median/centerline, Motor vehicle in transport, Overturn/rollover	13.31	INJ													1	1	1	1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1308756	8/15/2013	Eastbound	Overturn/rollover	13.28	INJ				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	0	1	0	0.00	0.41	0.00
1402300	2/24/2014	Eastbound	Ran off road right, Tree/shrubbery	13.13	PDO				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	1	0	0	0.41	0.00	0.00
1401561	2/10/2014	Southbound	Ditch, Ran off road right, Tree/shrubbery	13.07	PDO				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	1	0	0	0.41	0.00	0.00
1610916	9/7/2016	Westbound	Cargo/equipment loss or shift, Delineator post, Ran off road right	13.03	PDO				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	1	0	0	0.41	0.00	0.00
1405012	4/29/2014	Eastbound	Cross median/centerline, Ran off road left, Tree/shrubbery	13.01	PDO				x	x								1	1	0.7	0.6	1	1	1	1	1	1	1	1	0	0	0.41	0.00	0.00
1611882	10/1/2016	Eastbound	Motor vehicle in transport	15.20	INJ													1	1	1	1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1713847	10/7/2017	Eastbound; Southbound	Motor vehicle in transport, Overturn/rollover, Ran off	15.86	INJ						x	x						1	1	1	1	0.7	0.6	1	1	1	1	1	0	1	0	0.00	0.41	0.00
1416834	12/10/2014	Eastbound	Ran off road right, Tree/shrubbery	15.80	PDO						x	x						1	1	1	1	0.7	0.6	1	1	1	1	1	1	0	0	0.41	0.00	0.00
1611205	9/10/2016	Westbound	Ditch, Motor vehicle in transport, Overturn/rollover, Ran off road right	15.80	INJ						x	x						1	1	1	1	0.7	0.6	1	1	1	1	1	0	1	0	0.00	0.41	0.00
1405192	4/29/2014	Westbound	Embankment, Overturn/rollover, Ran off road right	16.65	FAT								x	x				1	1	1	1	1	1	0.9	0.8	1	1	1	0	0	1	0.00	0.00	0.73
1510267	9/6/2015	Eastbound	Motor vehicle in transport	16.66	PDO								x	x				1	1	1	1	1	1	0.9	0.8	1	1	1	1	0	0	0.73	0.00	0.00
1500451	1/11/2015	Eastbound	Embankment, Ran off road right	16.53	PDO								x	x				1	1	1	1	1	1	0.9	0.8	1	1	1	1	0	0	0.73	0.00	0.00
1406996	6/14/2014	Westbound	Cross median/centerline, Overturn/rollover, Ran off road right,	16.35	INJ								x	x				1	1	1	1	1	1	0.9	0.8	1	1	1	0	1	0	0.00	0.73	0.00
1612933	9/28/2016	Southbound	Overturn/rollover, Ran off road right	16.18	INJ								x	x				1	1	1	1	1	1	0.9	0.8	1	1	1	0	1	0	0.00	0.73	0.00
1701310	1/27/2017	Eastbound	Overturn/rollover, Ran off road right	16.10	PDO								x	x				1	1	1	1	1	1	0.9	0.8	1	1	1	1	0	0	0.73	0.00	0.00
1509681	8/2/2015	Northbound	Overturn/rollover	15.99	INJ								x	x				1	1	1	1	1	1	0.9	0.8	1	1	1	0	1	0	0.00	0.73	0.00

Corridor I

Crash History Length 5 years

Crash Record					
ID	**Date**	**Direction**	**Type**	**MRM**	**Severity**
1307431	7/14/2013	Northbound	Motor vehicle in transport	15.94	PDO
1611195	9/5/2016	Eastbound; Westbound	Motor vehicle in transport	18.01	PDO
1604567	4/19/2016	Eastbound	Ran off road left, Tree/shrubbery	21.14	PDO
1506459	6/13/2015	Eastbound	Animal - wild, Overturn/rollover	21.11	INJ
1601003	1/29/2016	Westbound	Ditch, Ran off road left	21.06	PDO

ID	Improvement										
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
	CMF	**0.70**	**0.93**	**0.65**	**0.63**	**0.65**	**0.63**	**0.93**	**0.78**	**0.78**	**0.65**	**0.63**
1307431								x	x			
1611195										x		
1604567											x	x
1506459												
1601003											x	x

ID	Improvement											Obs.	Obs.	Obs.	Expec.	Expec.	Expec.
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**PDO**	**INJ**	**FAT**	**PDO**	**INJ**	**FAT**
1307431	1	1	1	1	1	1	0.9	0.8	1	1	1	1	0	0	0.73	0.00	0.00
1611195	1	1	1	1	1	1	1	1	0.8	1	1	1	0	0	0.78	0.00	0.00
1604567	1	1	1	1	1	1	1	1	1	0.7	0.6	1	0	0	0.41	0.00	0.00
1506459	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1601003	1	1	1	1	1	1	1	1	1	0.7	0.6	1	0	0	0.41	0.00	0.00
											Total	**16.00**	**15.00**	**1.00**	**10.26**	**10.34**	**0.73**
											Annual	**3.20**	**3.00**	**0.20**	**2.05**	**2.07**	**0.15**

	A	B	C	D	E	F	G	H	I	J	K
Affected PDO %	6%	0%	25%	25%	6%	6%	25%	25%	6%	13%	13%
Approx. PDO Decrease	0.02	0.00	0.09	0.09	0.02	0.02	0.02	0.06	0.01	0.04	0.05
% of PDO Reduction	4%	0%	21%	22%	5%	6%	4%	13%	3%	10%	11%
Affected INJ %	7%	0%	27%	27%	13%	13%	20%	20%	0%	0%	0%
Approx. INJ Decrease	0.02	0.00	0.09	0.10	0.05	0.05	0.01	0.04	0.00	0.00	0.00
% of INJ Reduction	5%	0%	25%	27%	13%	14%	4%	12%	0%	0%	0%
Affected FAT %	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.22	0.00	0.00	0.00
% of FAT Reduction	0%	0%	0%	0%	0%	0%	24%	76%	0%	0%	0%

Corridor I

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	O4 - Access		40	0.70
B	S1, I2 - DSMD signs	$ 90,000.00	12	0.93
C	S1/5 - HFST	$ 270,000.00	10	0.65
D	D1/5 - Horiz Curves, Sight Distance	$ 335,000.00	40	0.63
E	S1/5 - HFST	$ 61,000.00	10	0.65
F	D1/5 - Horiz Curves, Sight Distance	$ 143,000.00	40	0.63
G	I2 - DSMD Signs	$ 90,000.00	12	0.93
H	S1, D7/8 - Parking, Pullouts	$ 169,000.00	40	0.78
I	S1, D7/8 - Parking, Pullouts	$ 15,000.00	40	0.78
J	S1/5 - HFST	$ 58,000.00	10	0.65
K	D1/5 - Horiz Curves, Sight Distance	$ 159,000.00	40	0.63

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	5.08	$ 531,236.11	$ -	
B	0.00	$ 12,997.24	$ 203,254.85	0.06 : 1
C	23.48	$ 2,457,852.39	$ 658,872.84	3.73 : 1
D	25.04	$ 2,620,764.80	$ 335,000.00	7.82 : 1
E	5.87	$ 1,201,290.96	$ 148,856.46	8.07 : 1
F	6.26	$ 1,280,915.44	$ 143,000.00	8.96 : 1
G	15.11	$ 1,613,323.01	$ 203,254.85	7.94 : 1
H	5.59	$ 58,933.92	$ 169,000.00	0.35 : 1
I	15.33	$ 58,933.92	$ 15,000.00	3.93 : 1
J	0.00	$ 58,933.92	$ 141,535.65	0.42 : 1
K	0.00	$ 58,933.92	$ 159,000.00	0.37 : 1
Total	**86.44**	**$ 9,954,115.63**	**$ 2,176,774.65**	**4.57 : 1**

Corridor 2

Crash History Length 5 years

Crash Record						Improvement									Improvement													
ID	Date	Direction	Type	MRM	Severity	CMF	A 0.51	B 0.93	C 0.62	D 0.65	E 0.93	F 0.00	G 0.73	H 0.00	A	B	C	D	E	F	G	H	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1408609	7/23/2014	Northbound	Embankment, Ran off road right	24.71	INJ		x						x		0.5	1	1	1	1	1	0.7	1	0	1	0	0.00	0.37	0.00
1506196	6/7/2015	Northbound	Embankment, Overturn/rollover, Ran off road right	24.63	INJ		x						x		0.5	1	1	1	1	1	0.7	1	0	1	0	0.00	0.37	0.00
1409865	8/24/2014	Westbound	Embankment, Ran off road left	26.78	PDO			x					x		1	0.9	1	1	1	1	0.7	1	1	0	0	0.68	0.00	0.00
1606967	6/18/2016	Southbound	Ran off road right, Tree/shrubbery	26.73	PDO			x					x		1	0.9	1	1	1	1	0.7	1	1	0	0	0.68	0.00	0.00
1400016	1/1/2014	Westbound	Cross median/centerline, Ran off road left, Snow bank	27.00	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1307433	7/16/2013	Southbound	Immersion, Overturn/rollover, Ran off road right	26.96	INJ				x	x			x		1	1	0.6	0.7	1	1	0.7	1	0	1	0	0.00	0.30	0.00
1709739	8/3/2017	Eastbound	Embankment, Overturn/rollover, Ran off road right,	27.06	FAT						x		x		1	1	1	1	0.9	1	0.7	1	0	0	1	0.00	0.00	0.68
1503935	4/4/2015	Eastbound	Overturn/rollover, Ran off road right	27.04	PDO						x		x		1	1	1	1	0.9	1	0.7	1	1	0	0	0.68	0.00	0.00
1308860	7/28/2013	Westbound	Delineator post, Overturn/rollover, Ran off road left,	28.29	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1501013	1/24/2015	Westbound	Guardrail face, Ran off road right	29.15	INJ								x		1	1	1	1	1	1	0.7	1	0	1	0	0.00	0.73	0.00

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	**4.00**	**5.00**	**1.00**	**3.04**	**2.77**	**0.68**
Annual	**0.80**	**1.00**	**0.20**	**0.61**	**0.55**	**0.14**

	A	B	C	D	E	F	G	H
Affected PDO %	0%	50%	0%	0%	25%	0%	75%	0%
Approx. PDO Decrease	0.00	0.04	0.00	0.00	0.02	0.00	0.20	0.00
% of PDO Reduction	0%	14%	0%	0%	7%	0%	79%	0%
Affected INJ %	40%	0%	20%	20%	0%	0%	80%	0%
Approx. INJ Decrease	0.20	0.00	0.08	0.07	0.00	0.00	0.22	0.00
% of INJ Reduction	35%	0%	13%	12%	0%	0%	39%	0%
Affected FAT %	0%	0%	0%	0%	100%	0%	100%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.07	0.00	0.27	0.00
% of FAT Reduction	0%	0%	0%	0%	21%	0%	79%	0%

Corridor 2

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	S2, D5/7/8 - Guardrail, Parking, Pullouts	$ 94,000.00	40	0.51
B	I2 - DSMD Signs	$ 75,000.00	12	0.93
C	D1/2/5/6,S1/2/3/4 - Curves, Super, Guardrail	$ 145,000.00	40	0.62
D	S5 - HFST	$ 612,000.00	10	0.65
E	I2 - DSMD Signs	$ 75,000.00	12	0.93
F				
G	D3 - Shoulder	$ 862,000.00	40	0.73
H				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	0.00	$ 1,568,738.85	$ 94,000.00	16.69 : 1
B	5.13	$ 23,123.01	$ 169,379.04	0.14 : 1
C	0.00	$ 598,220.90	$ 145,000.00	4.13 : 1
D	0.00	$ 552,081.52	$ 1,493,445.11	0.37 : 1
E	2.56	$ 148,385.74	$ 169,379.04	0.88 : 1
F	0.00	$ -	$ -	
G	29.67	$ 2,296,274.14	$ 862,000.00	2.66 : 1
H	0.00	$ -	$ -	
Total	**37.36**	**$ 5,186,824.16**	**$ 2,933,203.19**	**1.77 : 1**

Corridor 3

Crash History Length 5 years

							Improvement								Improvement								Obs.	Obs.	Obs.	Expec.	Expec.	Expec.
Crash Record							A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H	PDO	INJ	FAT	PDO	INJ	FAT
ID	Date	Direction	Type	MRM	Severity	CMF	0.35	0.93	0.35	0.35	0.93	0.35	0.47	0.00														
1704424	4/12/2017	Southbound	Animal - domestic	0.09	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1709342	7/27/2017	Northbound	Animal - wild	0.19	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1511627	8/23/2015	Northbound	Cross median/centerline, Fence, Overturn/rollover, Ran off road left	1.22	INJ								x		1	1	1	1	1	1	0.5	1	0	1	0	0.00	0.47	0.00
1709713	8/8/2017	Eastbound	Ditch, Overturn/rollover, Ran off road right	1.30	INJ								x		1	1	1	1	1	1	0.5	1	0	1	0	0.00	0.47	0.00
1401556	2/9/2014	Northbound	Ran off road right, Snow bank	1.52	PDO								x		1	1	1	1	1	1	0.5	1	1	0	0	0.47	0.00	0.00
1707426	6/16/2017	Northbound	Animal - wild	1.61	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1709461	7/30/2017	Southbound	Animal - wild	1.67	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1508874	7/30/2015	Northbound	Overturn/rollover, Ran off road right	1.91	PDO								x		1	1	1	1	1	1	0.5	1	1	0	0	0.47	0.00	0.00
1300012	1/2/2013	Northbound	Highway traffic sign post/sign, Ran off road	2.05	PDO		x						x		0.4	1	1	1	1	1	0.5	1	1	0	0	0.17	0.00	0.00
1609932	8/9/2016	Westbound	Animal - wild	2.09	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1409214	8/1/2014	Northbound	Overturn/rollover, Ran off road right	3.12	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1618062	12/20/2016	Northbound	Highway traffic sign post/sign, Ran off road right	3.10	PDO								x		1	1	1	1	1	1	0.5	1	1	0	0	0.47	0.00	0.00
1408319	6/28/2014	Northbound	Overturn/rollover, Ran off road right	3.13	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1409062	7/15/2014	Eastbound	Overturn/rollover, Ran off road left, Ran off road	3.14	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1302374	3/11/2013	Northbound	Highway traffic sign post/sign, Overturn/rollover, Ran off road right	3.92	PDO			x					x		1	0.9	1	1	1	1	0.5	1	1	0	0	0.44	0.00	0.00
1609341	7/24/2016	Northbound	Overturn/rollover, Ran off road right	3.97	INJ			x					x		1	0.9	1	1	1	1	0.5	1	0	1	0	0.00	0.44	0.00
1312203	11/1/2013	Northbound; Southbound	Cross median/centerline, Motor vehicle in transport, Motor vehicle used as equipment (snowplow plowing), Ran off road right	3.97	PDO								x		1	1	1	1	1	1	0.5	1	1	0	0	0.47	0.00	0.00
1609801	8/12/2016	Northbound	Approach, Ran off road right	3.97	INJ			x					x		1	0.9	1	1	1	1	0.5	1	0	1	0	0.00	0.44	0.00
1609802	8/12/2016	Northbound	Highway traffic sign post/sign, Ran off road right	3.97	PDO			x					x		1	0.9	1	1	1	1	0.5	1	1	0	0	0.44	0.00	0.00
1409029	8/4/2014	Northbound	Overturn/rollover, Ran off road right	4.03	PDO			x					x		1	0.9	1	1	1	1	0.5	1	1	0	0	0.44	0.00	0.00
1609640	8/11/2016	Northbound	Overturn/rollover, Ran off road right	4.06	INJ			x					x		1	0.9	1	1	1	1	0.5	1	0	1	0	0.00	0.44	0.00
1606279	6/3/2016	Northbound	Ditch, Ran off road right	4.11	PDO			x					x		1	0.9	1	1	1	1	0.5	1	1	0	0	0.44	0.00	0.00
1605726	5/21/2016	Northbound	Animal - wild	4.20	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00

Corridor 3

Crash History Length 5 years

							Improvement								Improvement								Obs.	Obs.	Obs.	Expec.	Expec.	Expec.
Crash Record							A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H	PDO	INJ	FAT	PDO	INJ	FAT
ID	Date	Direction	Type	MRM	Severity	CMF	0.35	0.93	0.35	0.35	0.93	0.35	0.47	0.00														
1710095	8/12/2017	Southbound	Animal - wild	4.23	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1509680	8/1/2015	Northbound	Overturn/rollover, Ran off road right	4.30	INJ			x					x		1	0.9	1	1	1	1	0.5	1	0	1	0	0.00	0.44	0.00
1712544	9/17/2017	Southbound	Motor vehicle in	4.33	PDO			x					x		1	0.9	1	1	1	1	0.5	1	1	0	0	0.44	0.00	0.00
1606118	5/28/2016	Westbound	Animal - wild	4.39	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1511658	9/21/2015	Westbound	Overturn/rollover, Ran off road left, Ran off road	4.46	INJ			x					x		1	0.9	1	1	1	1	0.5	1	0	1	0	0.00	0.44	0.00
1411147	8/7/2014	Southbound	Overturn/rollover, Ran off road right	4.51	INJ			x					x		1	0.9	1	1	1	1	0.5	1	0	1	0	0.00	0.44	0.00
1508754	7/30/2015	Westbound	Animal - wild	4.51	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1304821	5/10/2013	Northbound	Animal - wild	4.60	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1610256	8/9/2016	Northbound	Highway traffic sign post/sign, Overturn/rollover, Ran off road right,	4.59	INJ			x					x		1	0.9	1	1	1	1	0.5	1	0	1	0	0.00	0.44	0.00
1310008	8/23/2013	Northbound; Southbound	Cross median/centerline, Motor vehicle in transport, Ran off road	4.59	FAT			x					x		1	0.9	1	1	1	1	0.5	1	0	0	1	0.00	0.00	0.44
1718002	12/25/2017	Eastbound	Cross median/centerline, Ditch, Ran off road left	4.58	PDO			x					x		1	0.9	1	1	1	1	0.5	1	1	0	0	0.44	0.00	0.00
1305556	5/31/2013	Northbound	Ran off road right, Rock, Tree/shrubbery	4.57	PDO			x					x		1	0.9	1	1	1	1	0.5	1	1	0	0	0.44	0.00	0.00
1506561	6/4/2015	Southbound	Embankment, Highway traffic sign post/sign, Ran off road right	7.21	FAT				x				x		1	1	0.4	1	1	1	0.5	1	0	0	1	0.00	0.00	0.17
1713209	10/11/2017	Eastbound	Animal - domestic	8.26	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1409861	8/23/2014	Westbound	Overturn/rollover, Ran off road left	8.19	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1307843	7/24/2013	Northbound	Overturn/rollover	8.93	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1705013	4/28/2017	Northbound	Animal - wild	9.03	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1307842	7/24/2013	Northbound	Overturn/rollover, Separation of units	9.25	PDO						x	x	x		1	1	1	1	0.9	0.4	0.5	1	1	0	0	0.16	0.00	0.00
1404248	4/6/2014	Southbound	Cross median/centerline, Guardrail end	9.61	PDO						x	x	x		1	1	1	1	0.9	0.4	0.5	1	1	0	0	0.16	0.00	0.00
1308247	8/5/2013	Westbound	Overturn/rollover, Ran off road right	9.89	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1705544	5/6/2017	Northbound	Motor vehicle in	10.40	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1715937	11/22/2017	Southbound	Cargo/equipment loss or shift, Cross median/centerline, Overturn/rollover, Ran off road right	10.59	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1307580	7/19/2013	Southbound	Delineator post, Overturn/rollover, Ran off road right	11.21	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1411168	9/7/2014	Northbound	Overturn/rollover, Ran off road right	11.45	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00

Corridor 3

Crash History Length 5 years

Crash Record							Improvement								Improvement								Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
							A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H						
ID	Date	Direction	Type	MRM	Severity	CMF	0.35	0.93	0.35	0.35	0.93	0.35	0.47	0.00														
1402962	2/23/2014	Westbound	Overturn/rollover, Ran off road left	11.70	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1606399	6/5/2016	Southbound	Ditch, Highway traffic sign post/sign, Ran off road right	11.82	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1513133	10/20/2015	Southbound	Ditch, Ran off road left	12.28	PDO						x	x	x		1	1	1	1	0.9	0.4	0.5	1	1	0	0	0.16	0.00	0.00
1408606	7/19/2014	Southbound	Motor vehicle in	12.70	PDO						x	x	x		1	1	1	1	0.9	0.4	0.5	1	1	0	0	0.16	0.00	0.00
1610180	7/22/2016	Eastbound; Not on roadway (also use for parked motor vehicle)	Parked motor vehicle	13.18	PDO						x	x	x		1	1	1	1	0.9	0.4	0.5	1	1	0	0	0.16	0.00	0.00
1604555	4/20/2016	Northbound	Cross median/centerline, Ditch, Ran off road left	14.50	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1409784	8/5/2014	Southbound	Overturn/rollover, Ran off road right	14.51	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1600417	1/10/2016	Southbound	Ditch, Motor vehicle in transport, Ran off road right	14.62	PDO								x		1	1	1	1	1	1	0.5	1	1	0	0	0.47	0.00	0.00
1713799	10/19/2017	Northbound	Overturn/rollover, Tree/shrubbery	15.31	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1707464	6/21/2017	Eastbound	Embankment, Other fixed object (wall, building, tunnel, etc.), Ran off road right, Utility pole	15.34	INJ						x	x	x		1	1	1	1	0.9	0.4	0.5	1	0	1	0	0.00	0.16	0.00
1506560	5/30/2015	Eastbound	Guardrail face, Ran off road left	15.89	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1712852	10/2/2017	Northbound	Animal - wild	15.92	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1506557	6/16/2015	Eastbound	Animal - wild	15.94	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1610338	8/22/2016	Northbound	Animal - wild	16.02	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
						Affected PDO %	3%	20%	0%	0%	14%	14%	51%	0%								**Total**	**35.00**	**24.00**	**2.00**	**23.41**	**9.75**	**0.61**
						Approx. PDO Decrease	0.02	0.01	0.00	0.00	0.01	0.09	0.27	0.00								**Annual**	**7.00**	**4.80**	**0.40**	**4.68**	**1.95**	**0.12**
						% of PDO Reduction	5%	3%	0%	0%	2%	23%	67%	0%														
						Affected INJ %	0%	29%	0%	0%	46%	46%	83%	0%														
						Approx. INJ Decrease	0.00	0.02	0.00	0.00	0.03	0.30	0.44	0.00														
						% of INJ Reduction	0%	3%	0%	0%	4%	38%	56%	0%														
						Affected FAT %	0%	50%	50%	0%	0%	0%	100%	0%														
						Approx. FAT Decrease	0.00	0.04	0.32	0.00	0.00	0.00	0.53	0.00														
						% of FAT Reduction	0%	4%	37%	0%	0%	0%	59%	0%														

Corridor 3

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	O3, D5/8 - Turn Lanes, Sight Dist, Parking	$ 62,000.00	40	0.35
B	I2, S1/3 - DSMD signs, Motorcycles	$ 210,000.00	12	0.93
C	O3, D5/8 - Turn Lanes, Sight Dist, Parking	$ 62,000.00	40	0.35
D	O3, D5/8 - Turn Lanes, Sight Dist, Parking	$ 62,000.00	40	0.35
E	I2, S1/4 - DSMD signs	$ 420,000.00	12	0.93
F	D5/8/9, O3 - Turn Lanes, Sight Dist, Parking	$ 125,000.00	40	0.35
G	D1/3/4/7, S2/S5 - Curves/P-outs, G-rail/HFST	$ 17,511,000.00	40	0.47
H				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	13.20	$ 49,182.53	$ 62,000.00	0.79 : 1
B	10.00	$ 911,809.22	$ 474,261.32	1.92 : 1
C	0.00	$ 1,012,269.63	$ 62,000.00	16.33 : 1
D	0.00	$ -	$ 62,000.00	0 : 1
E	7.14	$ 1,241,875.03	$ 948,522.64	1.31 : 1
F	66.02	$ 10,921,234.26	$ 125,000.00	87.37 : 1
G	192.97	$ 18,122,523.96	$ 17,511,000.00	1.03 : 1
H	0.00	$ -	$ -	
Total	**289.33**	**$ 32,258,894.64**	**$ 19,244,783.96**	**1.68 : 1**

Corridor 4

Crash History Length 5 years

Crash Record							Improvement								Improvement													
							A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
ID	Date	Direction	Type	MRM	Severity	CMF	0.52	1.00	0.00	0.00	0.00	0.00	0.00	0.00														
1712482	10/2/2017	Southbound	Light/luminaire support, Ran off road right	25.40	PDO		x								0.5	1	1	1	1	1	1	1	1	0	0	0.52	0.00	0.00
1603259	2/28/2016	Eastbound	Guardrail face, Ran off road right	25.48	INJ		x								0.5	1	1	1	1	1	1	1	0	1	0	0.00	0.52	0.00
1509438	8/8/2015	Southbound	Overturn/rollover, Ran off road right	25.60	INJ		x								0.5	1	1	1	1	1	1	1	0	1	0	0.00	0.52	0.00
1710228	8/17/2017	Northbound	Animal - wild	25.62	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1508103	7/17/2015	Northbound	Guardrail face, Ran off road right	25.63	INJ		x								0.5	1	1	1	1	1	1	1	0	1	0	0.00	0.52	0.00
1417029	11/11/2014	Eastbound	Guardrail face, Ran off road right	25.65	PDO		x								0.5	1	1	1	1	1	1	1	1	0	0	0.52	0.00	0.00
1604772	4/22/2016	Northbound	Cross median/centerline, Overturn/rollover	25.93	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1706277	5/14/2017	Southbound	Other non-collision	26.05	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1307044	6/23/2013	Southbound	Motor vehicle in transport	26.06	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
						Affected PDO %	40%	0%	0%	0%	0%	0%	0%	0%								Total	5.00	4.00	0.00	4.05	2.57	0.00
						Approx. PDO Decrease	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00								Annual	1.00	0.80	0.00	0.81	0.51	0.00
						% of PDO Reduction	100%	0%	0%	0%	0%	0%	0%	0%														
						Affected INJ %	75%	0%	0%	0%	0%	0%	0%	0%														
						Approx. INJ Decrease	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00														
						% of INJ Reduction	100%	0%	0%	0%	0%	0%	0%	0%														
						Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%														
						Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00														
						% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%														

Corridor 4

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	O6, D3/4 - Pedestrian, Shoulder/Lanes	$ 479,000.00	40	0.52
B	A2 - Streetscape Beautification	$ 648,000.00	40	1.00
C				
D				
E				
F				
G				
H				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	25.31	$ 2,929,491.48	$ 479,000.00	6.12 : 1
B	0.00	$ -	$ 648,000.00	0 : 1
C	0.00	$ -	$ -	
D	0.00	$ -	$ -	
E	0.00	$ -	$ -	
F	0.00	$ -	$ -	
G	0.00	$ -	$ -	
H	0.00	$ -	$ -	
Total	**25.31**	**$ 2,929,491.48**	**$ 1,127,000.00**	**2.6 : 1**

Corridor 5

Crash History Length 5 years

Crash Record							Improvement								Improvement													
							A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H	Obs.	Obs.	Obs.	Expec.	Expec.	Expec.
ID	Date	Direction	Type	MRM	Severity	CMF	0.65	0.73	0.93	0.00	0.00	0.00	0.00	0.00									PDO	INJ	FAT	PDO	INJ	FAT
1608046	7/9/2016	Eastbound	Motor vehicle in	91.00	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1508818	8/5/2015	Northbound; Southbound	Equipment failure (tires, brakes, etc.), Motor vehicle in transport	91.00	INJ										1	1	1	1	1	1	1	1	0	1	0	0.00	1.00	0.00
1401377	2/2/2014	Southbound	Embankment, Ran off road right	91.00	PDO		x	x	x						0.7	0.7	0.9	1	1	1	1	1	1	0	0	0.44	0.00	0.00
1608060	7/8/2016	Southbound	Animal - wild	91.12	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1406749	6/10/2014	Southbound	Animal - wild	91.16	PDO										1	1	1	1	1	1	1	1	1	0	0	1.00	0.00	0.00
1316308	12/21/2013	Southbound	Ran off road right, Tree/shrubbery	91.21	PDO		x	x	x						0.7	0.7	0.9	1	1	1	1	1	1	0	0	0.44	0.00	0.00
1301815	1/31/2013	Eastbound	Guardrail face, Ran off road right	91.54	PDO		x	x	x						0.7	0.7	0.9	1	1	1	1	1	1	0	0	0.44	0.00	0.00
1514324	11/5/2015	Westbound	Overturn/rollover, Ran off road right,	91.97	PDO		x	x	x						0.7	0.7	0.9	1	1	1	1	1	1	0	0	0.44	0.00	0.00
1516711	12/17/2015	Not on roadway (also use for parked motor vehicle); Westbound	Parked motor vehicle, Ran off road right	91.73	PDO		x	x	x						0.7	0.7	0.9	1	1	1	1	1	1	0	0	0.44	0.00	0.00

	A	B	C	D	E	F	G	H
Affected PDO %	71%	71%	71%	0%	0%	0%	0%	0%
Approx. PDO Decrease	0.25	0.19	0.05	0.00	0.00	0.00	0.00	0.00
% of PDO Reduction	51%	39%	10%	0%	0%	0%	0%	0%
Affected INJ %	0%	0%	0%	0%	0%	0%	0%	0%
Approx. INJ Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of INJ Reduction	0%	0%	0%	0%	0%	0%	0%	0%
Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	**7.00**	**2.00**	**0.00**	**4.22**	**2.00**	**0.00**
Annual	**1.40**	**0.40**	**0.00**	**0.84**	**0.40**	**0.00**

Corridor 5

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	S5 - HFST	$ 641,000.00	10	0.65
B	D3/4 - Shoulders/Lanes	$ 190,000.00	40	0.73
C	I3/5 - RWIS, Cameras	$ 168,000.00	12	0.93
D				
E				
F				
G				
H				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	14.94	$ 130,701.14	$ 1,564,212.93	0.08 : 1
B	11.62	$ 101,698.30	$ 190,000.00	0.54 : 1
C	3.01	$ 50,627.73	$ 379,409.06	0.13 : 1
D	0.00	$ -	$ -	
E	0.00	$ -	$ -	
F	0.00	$ -	$ -	
G	0.00	$ -	$ -	
H	0.00	$ -	$ -	
Total	**29.57**	**$ 283,027.17**	**$ 2,133,621.99**	**0.13 : 1**

Corridor 6

Crash History Length 5 years

Crash Record							Improvement										Improvement															
							A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
ID	Date	Direction	Type	MRM	Severity	CMF	0.93	0.49	0.78	0.35	0.80	0.60	0.87	0.00	0.00	0.00																
1308056	7/21/2013	Eastbound	Overturn/rollover, Ran off road right	11	PDO		x						x				0.9	1	1	1	1	1	0.9	1	1	1	1	0	0	0.80724	0	0
1608082	6/25/2016	Eastbound	Fire/explosion	11	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1702014	2/6/2017	Eastbound	Fence, Ran off road right	11.27	INJ		x	x					x				0.9	0.5	1	1	1	1	0.9	1	1	1	0	1	0	0	0.39555	0
1507524	6/28/2015	Eastbound	Overturn/rollover, Ran off road right	11.51	INJ		x	x					x				0.9	0.5	1	1	1	1	0.9	1	1	1	0	1	0	0	0.39555	0
1609671	7/24/2016	Eastbound	Animal - wild	12.64	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0
1310552	9/22/2013	Eastbound	Overturn/rollover, Ran off road right, Rock	12.64	PDO								x				1	1	1	1	1	1	0.9	1	1	1	1	0	0	0.868	0	0
1600648	1/16/2016	Westbound	Highway traffic sign post/sign, Ran off road right	13.07	PDO		x		x				x				0.9	1	0.8	1	1	1	0.9	1	1	1	1	0	0	0.62965	0	0
1507966	7/12/2015	Westbound	Delineator post, Ran off road left, Rock	13.3	INJ		x						x				0.9	1	1	1	1	1	0.9	1	1	1	0	1	0	0	0.80724	0
1516548	5/26/2015	Westbound	Animal - wild	13.6	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0
1613448	10/26/2016	Eastbound	Animal - wild	13.67	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0
1404688	4/16/2014	Eastbound	Work zone/maintenance equipment	14.22	PDO		x										0.9	1	1	1	1	1	1	1	1	1	1	0	0	0.93	0	0
1401009	1/30/2014	Eastbound; Westbound	Cross median/centerline, Angle	14.23	PDO		x										0.9	1	1	1	1	1	1	1	1	1	1	0	0	0.93	0	0
1414184	11/24/2014	Eastbound	Animal - wild	14.43	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0
1304957	5/14/2013	Westbound	Embankment, Overturn/rollover, Ran off road right	14.51	PDO		x				x		x				0.9	1	1	1	0.8	1	0.9	1	1	1	1	0	0	0.64579	0	0
1306170	5/24/2013	Westbound	Overturn/rollover, Ran off road right	14.54	INJ		x				x		x				0.9	1	1	1	0.8	1	0.9	1	1	1	0	1	0	0	0.64579	0
1407368	6/22/2014	Westbound	Overturn/rollover	14.76	PDO		x				x						0.9	1	1	1	0.8	1	1	1	1	1	1	0	0	0.744	0	0
1401772	1/17/2014	Westbound	Animal - wild	14.78	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0
1408506	7/20/2014	Eastbound; Westbound	Cross median/centerline, Sideswipe (opposite)	14.79	INJ		x			x	x						0.9	1	1	0.4	0.8	1	1	1	1	1	0	1	0	0	0.26248	0
1501965	2/24/2015	Westbound	Animal - wild	14.84	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0
1602752	3/3/2016	Westbound	Overturn/rollover, Ran off road right	14.99	INJ		x						x				0.9	1	1	1	1	1	0.9	1	1	1	0	1	0	0	0.80724	0
1602752	3/3/2016	Westbound	Overturn/rollover, Ran off road right	14.99	INJ		x						x				0.9	1	1	1	1	1	0.9	1	1	1	0	1	0	0	0.80724	0
1609672	8/7/2016	Westbound	Animal - wild	15.68	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0
1305518	5/26/2013	Eastbound	Animal - wild	15.8	PDO							x					1	1	1	1	1	0.6	1	1	1	1	1	0	0	0.6	0	0

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	38%	0%	6%	0%	13%	50%	25%	0%	0%	0%
Approx. PDO Decrease	0.03	0.00	0.01	0.00	0.03	0.20	0.03	0.00	0.00	0.00
% of PDO Reduction	9%	0%	5%	0%	8%	67%	11%	0%	0%	0%
Affected INJ %	100%	29%	0%	14%	29%	0%	86%	0%	0%	0%
Approx. INJ Decrease	0.07	0.15	0.00	0.09	0.06	0.00	0.11	0.00	0.00	0.00
% of INJ Reduction	15%	30%	0%	19%	12%	0%	24%	0%	0%	0%
Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	16.00	7.00	0.00	11.35	4.12	0.00
Annual	3.20	1.40	0.00	2.27	0.82	0.00

Corridor 6

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	S1/I2 - Improve Signing, DSMD Signs	$ 36,000.00	12	0.93
B	D2 - Vertical Curve	$ 286,800.00	40	0.49
C	D7/D8 - Add Pullouts, Parking	$ 88,800.00	40	0.78
D	D5/O3 - Improve Sight Distance, Add Turn	$ 77,400.00	40	0.35
E	D1 - Mitigate Horizontal Curve	$ 350,400.00	40	0.80
F	S8 - Wildlife Mitigation	$ 685,800.00	40	0.60
G	S2 - Improve Roadside Safety (Guardrail)	$ 880,800.00	40	0.78
H				
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	8.14	$ 826,188.30	$ 81,301.94	10.16 : 1
B	8.60	$ 1,634,720.92	$ 286,800.00	5.7 : 1
C	2.10	$ 18,690.73	$ 88,800.00	0.21 : 1
D	5.45	$ 1,037,246.45	$ 77,400.00	13.4 : 1
E	7.19	$ 675,050.17	$ 350,400.00	1.93 : 1
F	30.57	$ 271,865.16	$ 685,800.00	0.4 : 1
G	11.72	$ 1,314,170.46	$ 880,800.00	1.49 : 1
H	0.00	$ -	$ -	
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**73.77**	**$ 5,777,932.19**	**$ 2,451,301.94**	**2.36 : 1**

Corridor 7

Crash History Length 5 years

Crash Record						Improvement											Improvement										Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
							A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J						
ID	Date	Direction	Type	MRM	Severity	CMF	0.73	0.73	0.41	0.73	0.73	0.60	1.00	0.63	0.60	0.00																
1314000	11/23/2013	Westbound	Animal - wild	26.00	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1701340	1/28/2017	Westbound	Embankment, Overturn/rollover, Ran off road right	26.00	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1312602	11/7/2013	Northbound	Animal - wild	26.65	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1713085	10/5/2017	Westbound	Animal - wild	27.09	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1310484	9/25/2013	Eastbound	Animal - wild	27.29	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1509105	8/10/2015	Westbound	Overturn/rollover, Ran off road right	27.44	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1604886	5/3/2016	Southbound	Animal - wild	27.68	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1616804	12/10/2016	Eastbound	Ran off road left, Tree/shrubbery	27.90	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1702993	3/11/2017	Eastbound	Ran off road right, Tree/shrubbery	27.98	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1416246	12/22/2014	Westbound	Animal - wild	28.13	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1415417	11/30/2014	Westbound	Animal - wild	28.57	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1507012	6/2/2015	Westbound	Ran off road right, Rock	29.09	PDO		x										0.7	1	1	1	1	1	1	1	1	1	1	0	0	0.73	0	0
1508911	8/6/2015	Eastbound	Overturn/rollover, Ran off road right	29.18	INJ		x										0.7	1	1	1	1	1	1	1	1	1	0	1	0	0	0.73	0
1704218	4/3/2017	Eastbound	Ran off road right, Tree/shrubbery	29.33	INJ		x										0.7	1	1	1	1	1	1	1	1	1	0	1	0	0	0.73	0
1410353	9/14/2014	Westbound	Other fixed object (wall, building, tunnel, etc.), Overturn/rollover, Ran off road right	29.78	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1417653	8/28/2014	Westbound	Animal - wild	30.15	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1306617	6/11/2013	Northbound; Westbound	Angle	30.32	PDO						x			x			1	1	1	1	0.7	1	1	0.6	1	1	1	0	0	0.4599	0	0
1414181	10/21/2014	Westbound	Delineator post, Ditch, Ran off road right	30.32	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1307484	7/16/2013	Westbound	Animal - wild	30.55	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1706314	5/22/2017	Eastbound	Animal - wild	30.58	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1606862	6/10/2016	Westbound	Highway traffic sign post/sign, Overturn/rollover, Ran off road right, Separation of units	30.78	PDO			x									1	0.7	1	1	1	1	1	1	1	1	1	0	0	0.73	0	0
1615974	12/2/2016	Westbound	Overturn/rollover, Ran off road left	30.79	INJ			x									1	0.7	1	1	1	1	1	1	1	1	0	1	0	0	0.73	0
1702633	2/1/2017	Eastbound	Overturn/rollover, Ran off road right	30.81	PDO			x									1	0.7	1	1	1	1	1	1	1	1	1	0	0	0.73	0	0
1300398	1/16/2013	Westbound	Ditch, Ran off road right, Tree/shrubbery	30.85	PDO			x									1	0.7	1	1	1	1	1	1	1	1	1	0	0	0.73	0	0
1410113	9/4/2014	Eastbound	Cross median/centerline, Overturn/rollover	30.85	PDO			x									1	0.7	1	1	1	1	1	1	1	1	1	0	0	0.73	0	0
1410479	9/6/2014	Eastbound	Animal - wild	30.85	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1309641	8/28/2013	Westbound	Delineator post, Ran off road right, Rock	30.87	PDO			x									1	0.7	1	1	1	1	1	1	1	1	1	0	0	0.73	0	0
1505086	5/9/2015	Eastbound; Westbound	Cross median/centerline, Sideswipe (opposite)	30.90	PDO			x									1	0.7	1	1	1	1	1	1	1	1	1	0	0	0.73	0	0
1307626	7/19/2013	Eastbound	Overturn/rollover, Ran off road right, Rock	31.00	INJ			x									1	0.7	1	1	1	1	1	1	1	1	0	1	0	0	0.73	0
1610112	8/6/2016	Eastbound	Overturn/rollover	31.36	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1710227	8/18/2017	Eastbound	Cross median/centerline, Overturn/rollover, Ran off road right	31.40	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0

Corridor 7

Crash History Length 5 years

Crash Record							Improvement										Improvement										Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
ID	Date	Direction	Type	MRM	Severity	CMF	A 0.73	B 0.73	C 0.41	D 0.73	E 0.73	F 0.60	G 1.00	H 0.63	I 0.60	J 0.00	A	B	C	D	E	F	G	H	I	J						
1300544	1/12/2013	Eastbound; Westbound	Cross median/centerline, Angle, Ran off road right	31.49	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1708853	7/19/2017	Westbound	Animal - wild	31.55	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1409243	8/1/2014	Northbound	Sideswipe (same)	31.57	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1511375	9/26/2015	Westbound	Animal - wild	31.89	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1514167	11/3/2015	Westbound	Overturn/rollover, Ran off road right,	32.05	FAT									x			1	1	1	1	1	1	1	0.6	1	1	0	0	1	0	0	0.63
1508455	7/14/2015	Eastbound	Animal - wild	32.14	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1308403	8/1/2013	Eastbound	Animal - wild	32.43	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1703770	3/22/2017	Westbound	Embankment, Ran off road left, Tree/shrubbery	32.87	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1508887	8/6/2015	Eastbound	Overturn/rollover, Ran off road right	32.88	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1408929	8/1/2014	Eastbound	Ran off road right, Rock	33.28	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1614045	11/1/2016	Eastbound	Ran off road right, Rock, Tree/shrubbery	33.38	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1500074	1/4/2015	Eastbound	Overturn/rollover, Ran off road left	33.78	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1508894	8/3/2015	Eastbound	Overturn/rollover, Ran off road left	34.71	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1608171	7/3/2016	Eastbound	Cross median/centerline, Overturn/rollover, Ran off road left	35.01	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1700174	1/4/2017	Eastbound	Ran off road right, Tree/shrubbery	35.02	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0
1705688	5/15/2017	Eastbound	Embankment, Ran off road right,	35.02	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1707319	6/19/2017	Eastbound; Not on roadway	Parked motor vehicle	35.02	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1508654	8/1/2015	Eastbound	Overturn/rollover, Ran off road right	35.98	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1510164	9/5/2015	Westbound	Animal - wild	36.42	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1610105	8/9/2016	Westbound	Overturn/rollover, Ran off road right, Rock	36.46	INJ				x								1	1	0.4	1	1	1	1	1	1	1	0	1	0	0	0.4088	0
1503651	4/8/2015	Westbound	Cross median/centerline, Angle	36.52	PDO				x								1	1	0.4	1	1	1	1	1	1	1	1	0	0	0.4088	0	0
1307726	7/14/2013	Eastbound	Animal - wild	36.52	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1409043	8/4/2014	Westbound	Sideswipe (same), Overturn/rollover	36.53	INJ				x								1	1	0.4	1	1	1	1	1	1	1	0	1	0	0	0.4088	0
1709860	8/7/2017	Eastbound; Westbound	Cross median/centerline, Angle, Overturn/rollover, Ran off road left, Ran off road right	36.57	INJ				x								1	1	0.4	1	1	1	1	1	1	1	0	1	0	0	0.4088	0
1710065	8/13/2017	Eastbound	Animal - wild	36.62	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1708844	6/29/2017	Eastbound	Animal - wild	36.69	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1308326	8/6/2013	Eastbound	Guardrail face, Ran off road right	36.97	INJ					x							1	1	1	0.7	1	1	1	1	1	1	0	1	0	0	0.73	0
1508651	7/31/2015	Westbound	Animal - wild	36.98	PDO										x		1	1	1	1	1	1	1	1	0.6	1	1	0	0	0.6	0	0
1609684	8/13/2016	Eastbound	Guardrail face, Overturn/rollover, Ran off road right	37.00	PDO					x							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.73	0	0
1600798	1/24/2016	Eastbound	Cross median/centerline, Embankment, Ran off road left, Ran off road	37.38	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1606646	5/29/2016	Eastbound	Guardrail face, Ran off road right	37.74	INJ									x			1	1	1	1	1	1	1	0.6	1	1	0	1	0	0	0.63	0

Corridor 7

Crash History Length 5 years

Crash Record						Improvement											Improvement										Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
							A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J						
ID	Date	Direction	Type	MRM	Severity	CMF	0.73	0.73	0.41	0.73	0.73	0.60	1.00	0.63	0.60	0.00																
1510160	8/24/2015	Eastbound	Embankment, Other fixed object (wall, building, tunnel, etc.), Ran off road left	37.82	PDO									x			1	1	1	1	1	1	1	0.6	1	1	1	0	0	0.63	0	0
1404358	4/5/2014	Southbound	Ditch, Ran off road right - Hwy 87	57.94	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	2%	14%	2%	2%	2%	0%	0%	30%	47%	0%
Approx. PDO Decrease	0.01	0.04	0.01	0.01	0.01	0.00	0.00	0.11	0.19	0.00
% of PDO Reduction	2%	10%	4%	2%	2%	0%	0%	30%	51%	0%
Affected INJ %	10%	10%	15%	5%	0%	0%	0%	60%	0%	0%
Approx. INJ Decrease	0.03	0.03	0.09	0.01	0.00	0.00	0.00	0.22	0.00	0.00
% of INJ Reduction	7%	7%	23%	4%	0%	0%	0%	59%	0%	0%
Affected FAT %	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00
% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	**43.00**	**20.00**	**1.00**	**27.27**	**12.44**	**0.63**
Annual	**8.60**	**4.00**	**0.20**	**5.45**	**2.49**	**0.13**

Corridor 7

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	D1/3/4 - Horiz. Curves, Shoulders, Lanes	$ 213,000.00	40	0.73
B	D1/3/4, S1 - Horiz. Curves, Shoulder, Lanes,	$ 468,000.00	40	0.73
C	D1/3/4, S1, O3 - Horiz. Curves, Shoulders, L	$ 165,000.00	40	0.41
D	D1/3, S1/2 - Horiz. Curves, Shoulders, Road	$ 60,000.00	40	0.73
E	O3 - Turn Lanes	$ 74,000.00	40	0.73
F	O6 - Improve Bike/Ped Facilities	$ 32,000.00	40	0.60
G			40	1.00
H	D5/D7/D8 - Sight Distance, Pullouts, Parking	$ 359,000.00	40	0.63
I	S8 - Wildlife Treatment	$ 1,951,000.00	40	0.60
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	7.92	$ 1,030,212.20	$ 213,000.00	4.84 : 1
B	21.08	$ 1,147,191.40	$ 468,000.00	2.45 : 1
C	23.15	$ 3,358,060.61	$ 165,000.00	20.35 : 1
D	5.28	$ 526,804.02	$ 60,000.00	8.78 : 1
E	2.63	$ 23,395.84	$ 74,000.00	0.32 : 1
F	0.00	$ -	$ 32,000.00	0 : 1
G	0.00	$ -	$ -	
H	94.02	$ 9,384,916.03	$ 359,000.00	26.14 : 1
I	77.94	$ 693,210.09	$ 1,951,000.00	0.36 : 1
J	0.00	$ -	$ -	
Total	**154.07**	**$ 16,163,790.19**	**$ 3,322,000.00**	**4.87 : 1**

Corridor 8

Crash History Length 5 years

Crash Record							Improvement									
							A	B	C	D	E	F	G	H	I	J
ID	Date	Direction	Type	MRM	Severity	CMF	0.49	0.93	1.00	1.00	0.60	0.00	0.00	0.00	0.00	0.00
1309394	9/1/2013	Westbound	Rear-End	39.02	PDO											
1710497	8/10/2017	Northbound	Overturn/rollover	39.26	PDO		x	x	x							
1510361	9/6/2015	Westbound	Guardrail face, Overturn/rollover, Ran off road left, Ran off road	39.32	FAT		x	x	x							
1710498	8/10/2017	Northbound	Overturn/rollover	39.34	PDO		x	x	x							
1408308	7/16/2014	Eastbound	Overturn/rollover, Ran off road right	39.48	INJ		x	x	x							
1709016	7/24/2017	Eastbound	Overturn/rollover, Ran off road right	39.62	INJ		x	x	x							
1710398	8/21/2017	Eastbound	Ran off road right, Rock	39.79	INJ		x	x	x							
1508912	8/7/2015	Southbound	Ditch, Ran off road right, Rock	39.98	PDO		x	x								
1508938	8/6/2015	Northbound	Cross median/centerline, Overturn/rollover, Ran off road left	40.16	INJ		x	x	x							
1508431	7/28/2015	Eastbound	Cross median/centerline, Overturn/rollover, Ran off road left	40.27	INJ		x	x	x							
1408938	8/3/2014	Northbound	Overturn/rollover, Ran off road right	40.61	INJ		x	x	x							
1308765	8/17/2013	Southbound	Overturn/rollover, Ran off road left	40.63	PDO		x	x	x							
1509032	8/5/2015	Southbound	Overturn/rollover, Ran off road right	40.75	INJ		x	x	x							
1308413	8/6/2013	Southbound	Overturn/rollover, Ran off road right	40.77	INJ		x	x	x							
1610121	8/3/2016	Eastbound	Culvert, Overturn/rollover, Ran off road right,	40.90	INJ		x	x	x							
1609651	8/11/2016	Southbound	Overturn/rollover	41.66	PDO				x							
1307831	7/25/2013	Eastbound	Animal - wild	41.82	PDO											
1308716	8/10/2013	Northbound; Southbound	Cross median/centerline, Angle, Overturn/rollover	42.10	INJ				x							
1508885	8/3/2015	Westbound	Overturn/rollover, Ran off road right	42.13	INJ				x							
1308278	8/7/2013	Westbound	Overturn/rollover, Ran off road right	42.14	INJ				x							
1508630	7/30/2015	Northbound	Ditch, Ran off road right	43.37	PDO											
1307728	7/8/2013	Southbound	Overturn/rollover, Ran off road left	44.53	PDO				x							

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	44%	44%	56%	0%	0%	0%	0%	0%	0%	0%
Approx. PDO Decrease	0.23	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of PDO Reduction	88%	12%	0%	0%	0%	0%	0%	0%	0%	0%
Affected INJ %	75%	75%	100%	0%	0%	0%	0%	0%	0%	0%
Approx. INJ Decrease	0.38	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of INJ Reduction	88%	12%	0%	0%	0%	0%	0%	0%	0%	0%
Affected FAT %	100%	100%	100%	0%	0%	0%	0%	0%	0%	0%
Approx. FAT Decrease	0.51	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	88%	12%	0%	0%	0%	0%	0%	0%	0%	0%

ID	Improvement A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1309394	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1710497	0.5	0.9	1	1	1	1	1	1	1	1	1	0	0	0.4557	0	0
1510361	0.5	0.9	1	1	1	1	1	1	1	1	0	0	1	0	0	0.4557
1710498	0.5	0.9	1	1	1	1	1	1	1	1	1	0	0	0.4557	0	0
1408308	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1709016	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1710398	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1508912	0.5	0.9	1	1	1	1	1	1	1	1	1	0	0	0.4557	0	0
1508938	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1508431	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1408938	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1308765	0.5	0.9	1	1	1	1	1	1	1	1	1	0	0	0.4557	0	0
1509032	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1308413	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1610121	0.5	0.9	1	1	1	1	1	1	1	1	0	1	0	0	0.4557	0
1609651	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1307831	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1308716	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1508885	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1308278	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1508630									1	1	1	0	0	1	0	0
1307728	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
										Total	9.00	12.00	1.00	6.82	7.10	0.46
										Annual	1.80	2.40	0.20	1.36	1.42	0.09

Corridor 8

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	D1/2/3/4/5, S1 - Curves/Lns/Shldrs/Sight, Sigi	$ 1,571,000.00	40	0.49
B	I2 - DSMD Signs	$ 36,000.00	12	0.93
C	S3 - Motorcycle Specific Improvements (O&			1.00
D	A3 - Interpretive Sites/Locations	$ 1,368,000.00	40	1.00
E	O6 - Bike/Ped improvements	$ 656,000.00	40	0.60
F				
G				
H				
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	65.69	$ 9,090,478.42	$ 1,571,000.00	5.79 : 1
B	9.02	$ 1,252,911.62	$ 81,301.94	15.41 : 1
C	0.00	$ -	$ -	
D	0.00	$ -	$ 1,368,000.00	0 : 1
E	0.00	$ -	$ 656,000.00	0 : 1
F	0.00	$ -	$ -	
G	0.00	$ -	$ -	
H	0.00	$ -	$ -	
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**74.71**	**$ 10,343,390.04**	**$ 3,676,301.94**	**2.81 : 1**

Corridor 9

Crash History Length 5 years

			Crash Record			Improvement											Improvement															
							A	B	C	D	E	F	G	H	I	J																
ID	Date	Direction	Type	MRM	Severity	CMF	0.80	0.80	0.80	0.93	1.00	0.60	0.93	1.00	0.78	0.00	A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1406646	6/12/2014	Eastbound; Westbound	Cross median/centerline, Angle	45.26	INJ		x			x	x						0.8	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.744	0
1508652	8/3/2015	Eastbound; Westbound	Cross median/centerline, Sideswipe (opposite)	45.27	INJ		x			x	x						0.8	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.744	0
1508740	8/4/2015	Eastbound	Fence, Ran off road right	45.27	PDO		x			x	x						0.8	1	1	0.9	1	1	1	1	1	1	1	0	0	0.744	0	0
1308414	8/8/2013	Eastbound; Westbound	Cross median/centerline, Head-on, Ran off road right	45.38	INJ		x			x	x						0.8	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.744	0
1407641	7/5/2014	Eastbound; Westbound	Cross median/centerline, Angle	45.99	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1710569	8/24/2017	Eastbound	Overturn/rollover, Ran off road right	46.19	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1607691	5/20/2016	Westbound	Other movable object	46.91	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1308320	8/4/2013	Northbound	Overturn/rollover, Ran off road left	47.11	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1406643	5/26/2014	Northbound; Southbound	Cross median/centerline, Head-on, Overturn/rollover	47.25	INJ			x		x	x		x				1	0.8	1	0.9	1	1	0.9	1	1	1	0	1	0	0	0.69192	0
1709910	8/12/2017	Northbound	Embankment, Fence, Ran off road right	47.34	PDO			x					x				1	0.8	1	1	1	1	0.9	1	1	1	1	0	0	0.744	0	0
1408972	8/2/2014	Eastbound	Overturn/rollover, Ran off road right	47.38	INJ			x		x	x		x				1	0.8	1	0.9	1	1	0.9	1	1	1	0	1	0	0	0.69192	0
1609099	8/1/2016	Eastbound; Westbound	Cross median/centerline, Sideswipe (opposite)	47.39	PDO			x					x				1	0.8	1	1	1	1	0.9	1	1	1	1	0	0	0.744	0	0
1701555	1/31/2017	Eastbound	Ran off road right, Tree/shrubbery	47.39	PDO			x					x				1	0.8	1	1	1	1	0.9	1	1	1	1	0	0	0.744	0	0
1602293	2/26/2016	Southbound	Overturn/rollover, Ran off road left	49.51	INJ				x								1	1	0.8	1	1	1	1	1	1	1	0	1	0	0	0.8	0
1509599	8/19/2015	Westbound	Embankment, Overturn/rollover, Ran off road left,	49.58	PDO				x								1	1	0.8	1	1	1	1	1	1	1	1	0	0	0.8	0	0
1508920	8/3/2015	Southbound	Cross median/centerline, Ran off road left, Rock, Tree/shrubbery	50.36	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1508963	8/7/2015	Southbound	Cross median/centerline, Overturn/rollover, Ran off road left,	50.52	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1510161	8/24/2015	Unknown	Overturn/rollover	51.63	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1709767	8/6/2017	Southbound	Cross median/centerline, Overturn/rollover, Ran off road left	51.74	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1709950	8/9/2017	Northbound	Overturn/rollover, Ran off road right	51.81	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1306219	6/6/2013	Southbound	Ran off road right, Tree/shrubbery	52.06	PDO					x	x						1	1	1	0.9	1	1	1	1	1	1	1	0	0	0.93	0	0
1606394	6/3/2016	Eastbound	Ran off road right, Tree/shrubbery	52.11	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1710495	8/11/2017	Southbound	Overturn/rollover, Ran off road right	52.12	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1406593	6/7/2014	Northbound	Overturn/rollover, Ran off road right	52.23	INJ										x		1	1	1	1	1	1	1	1	0.8	1	0	1	0	0	0.78	0
1710555	8/22/2017	Northbound; Southbound	Cross median/centerline, Sideswipe (opposite)	53.14	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1609288	8/5/2016	Northbound	Overturn/rollover, Ran off road right	53.24	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0

Corridor 9

Crash History Length 5 years

							Improvement										**Improvement**															
Crash Record							**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**											**Obs.**	**Obs.**	**Obs.**	**Expec.**	**Expec.**	**Expec.**
ID	**Date**	**Direction**	**Type**	**MRM**	**Severity**	**CMF**	**0.80**	**0.80**	**0.80**	**0.93**	**1.00**	**0.60**	**0.93**	**1.00**	**0.78**	**0.00**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**PDO**	**INJ**	**FAT**	**PDO**	**INJ**	**FAT**
1610131	8/18/2016	Eastbound	Overturn/rollover, Ran off road right,	53.26	INJ					x	x				x		1	1	1	0.9	1	1	1	1	0.8	1	0	1	0	0	0.7254	0
1609476	8/6/2016	Northbound	Overturn/rollover	53.29	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1309536	8/31/2013	Northbound; Southbound	Cross median/centerline, Sideswipe (opposite)	53.81	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1509427	8/16/2015	Southbound	Overturn/rollover, Ran off road right	54.33	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1509162	8/2/2015	Southbound	Cross median/centerline, Overturn/rollover, Ran off road left	54.77	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1610575	8/29/2016	Southbound	Overturn/rollover, Ran off road right	55.06	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1708023	7/2/2017	Northbound; Southbound	Cross median/centerline, Sideswipe (opposite), Ran off road right	55.14	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1308099	7/30/2013	Northbound	Cross median/centerline, Overturn/rollover, Ran off road left	55.52	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1407669	7/2/2014	Northbound	Overturn/rollover	55.72	INJ					x	x						1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
						Affected PDO %	11%	33%	11%	22%	22%	0%	33%	0%	0%	0%										**Total**	**9.00**	**26.00**	**0.00**	**7.71**	**22.66**	**0.00**
						Approx. PDO Decrease	0.02	0.07	0.02	0.02	0.00	0.00	0.02	0.00	0.00	0.00										**Annual**	**1.80**	**5.20**	**0.00**	**1.54**	**4.53**	**0.00**
						% of PDO Reduction	15%	44%	15%	10%	0%	0%	16%	0%	0%	0%																
						Affected INJ %	12%	8%	4%	92%	92%	0%	8%	0%	8%	0%																
						Approx. INJ Decrease	0.02	0.02	0.01	0.06	0.00	0.00	0.01	0.00	0.02	0.00																
						% of INJ Reduction	17%	12%	6%	49%	0%	0%	4%	0%	13%	0%																
						Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%																
						Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																
						% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%																

Corridor 9

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	D1/3/5 - Horiz. Curves, Shoulders, Sight Dis	$ 189,000.00	40	0.80
B	D1/6, S1 - Horiz. Curves, Super, Signs	$ 215,000.00	40	0.80
C	D1/3, S1 - Horiz. Curves, Shoulders, Signs	$ 603,000.00	40	0.80
D	I4 - Advance Warning Signs	$ 54,000.00	12	0.93
E	S3 - Motorcycle Improvements			1.00
F	O6 - Bike/Ped Improvements	$ 48,000.00	40	0.60
G	I1/2 - Dynamic Speed/Message Signs	$ 216,000.00	12	0.93
H	A3 - Interpretive sites/locations	$ 2,640,000.00	40	1.00
I	D7/8 - Pullouts/Parking	$ 81,000.00	40	0.78
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	8.00	$ 1,146,943.15	$ 189,000.00	6.07 : 1
B	9.97	$ 805,440.26	$ 215,000.00	3.75 : 1
C	3.99	$ 393,974.81	$ 603,000.00	0.65 : 1
D	18.22	$ 3,182,508.81	$ 121,952.91	26.1 : 1
E	0.00	$ -	$ -	
F	0.00	$ -	$ 48,000.00	0 : 1
G	3.49	$ 313,097.46	$ 487,811.65	0.64 : 1
H	0.00	$ -	$ 2,640,000.00	0 : 1
I	4.41	$ 828,265.17	$ 81,000.00	10.23 : 1
J	0.00	$ -	$ -	
Total	**43.67**	**$ 5,841,964.49**	**$ 4,304,764.56**	**1.36 : 1**

Corridor 10

Crash History Length 5 years

			Crash Record				Improvement										Improvement															
ID	Date	Direction	Type	MRM	Severity	CMF	A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
							0.80	0.60	0.65	0.78	0.00	0.00	0.00	0.00	0.00	0.00																
1409307	8/6/2014	Eastbound	Equipment failure (tires, brakes, etc.), Overturn/rollover	36.02	PDO				x								1	1	0.7	1	1	1	1	1	1	1	1	0	0	0.653	0	0
1710116	8/12/2017	Westbound	Animal - wild	36.20	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1404047	4/7/2014	Westbound	Ran off road right, Tree/shrubbery	36.71	PDO				x	x							1	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.50934	0	0
1610987	9/3/2016	Eastbound	Animal - wild	36.90	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1501073	1/30/2015	Westbound	Animal - wild	37.01	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1412970	10/25/2014	Eastbound	Guardrail face, Ran off road right	37.93	INJ				x	x							1	1	0.7	0.8	1	1	1	1	1	1	0	1	0	0	0.50934	0
1511798	10/3/2015	Eastbound	Animal - wild	38.65	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1608917	7/27/2016	Eastbound	Animal - wild	38.71	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1700936	1/20/2017	Westbound	Animal - wild	38.91	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1510245	9/1/2015	Westbound	Rear-End	39.49	PDO				x								1	1	0.7	1	1	1	1	1	1	1	1	0	0	0.653	0	0
1510244	9/1/2015	Westbound	Overturn/rollover, Ran off road right	39.49	PDO				x	x							1	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.50934	0	0
1707100	6/6/2017	Eastbound	Cross median/centerline, Overturn/rollover, Ran off road left, Ran off road	39.68	PDO				x	x							1	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.50934	0	0
1500676	1/5/2015	Eastbound	Animal - wild	39.90	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1706310	5/26/2017	Westbound	Rear-End	39.93	PDO				x								1	1	0.7	1	1	1	1	1	1	1	1	0	0	0.653	0	0
1312599	10/23/2013	Unknown	Animal - wild	40.22	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1315508	12/19/2013	Westbound	Animal - wild	40.23	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1309336	8/21/2013	Westbound	Rear-End	40.24	INJ				x								1	1	0.7	1	1	1	1	1	1	1	0	1	0	0	0.653	0
1616268	12/7/2016	Eastbound	Embankment, Ran off road left	40.24	PDO				x	x							1	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.50934	0	0
1714567	11/6/2017	Westbound	Animal - wild	40.68	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1303300	3/21/2013	Eastbound	Overturn/rollover, Ran off road right	40.78	PDO				x	x							1	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.50934	0	0
1707618	6/25/2017	Eastbound	Cross median/centerline, Ran off road left, Tree/shrubbery	41.14	INJ				x	x							1	1	0.7	0.8	1	1	1	1	1	1	0	1	0	0	0.50934	0
1516383	12/15/2015	Eastbound; Westboun	Cross median/centerline, Angle	41.18	PDO				x								1	1	0.7	1	1	1	1	1	1	1	1	0	0	0.653	0	0
1501703	2/20/2015	Westbound	Cargo/equipment loss or shift, Guardrail end, Separation of units	41.38	PDO				x								1	1	0.7	1	1	1	1	1	1	1	1	0	0	0.653	0	0
1416127	12/27/2014	Eastbound	Ditch, Fence, Ran off road right	41.42	PDO				x	x							1	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.50934	0	0
1507963	7/11/2015	Westbound	Rear-End	41.63	PDO				x								1	1	0.7	1	1	1	1	1	1	1	1	0	0	0.653	0	0
1404699	4/2/2014	tbound; Not on road	Parked motor vehicle, Ran off road left	42.66	PDO				x	x							1	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.50934	0	0
1301310	2/6/2013	Westbound	Animal - wild	42.87	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1708848	7/16/2017	Westbound	Animal - wild	43.53	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1608180	7/11/2016	Westbound	Sideswipe (same)	43.54	PDO		x		x								0.8	1	0.7	1	1	1	1	1	1	1	1	0	0	0.5224	0	0
1517196	12/31/2015	Eastbound	Animal - wild	43.56	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1614346	11/10/2016	Eastbound	Animal - wild	43.63	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1601092	1/20/2016	Westbound	Animal - wild	43.72	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1600843	1/24/2016	Eastbound; Westboun	Cross median/centerline, Sideswipe (opposite)	43.72	PDO		x		x								0.8	1	0.7	1	1	1	1	1	1	1	1	0	0	0.5224	0	0
1605398	5/15/2016	Eastbound	Animal - wild	43.72	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1713968	10/23/2017	Westbound	Cross median/centerline, Overturn/rollover, Ran off road left, Ran off road	43.72	INJ		x		x	x							0.8	1	0.7	0.8	1	1	1	1	1	1	0	1	0	0	0.40747	0
1508882	8/6/2015	Westbound	Overturn/rollover, Ran off road right	43.76	INJ		x		x	x							0.8	1	0.7	0.8	1	1	1	1	1	1	0	1	0	0	0.40747	0

Corridor 10

Crash History Length 5 years

Crash Record						Improvement											Improvement										Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
							A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J						
ID	Date	Direction	Type	MRM	Severity	CMF	0.80	0.60	0.65	0.78	0.00	0.00	0.00	0.00	0.00	0.00																
1505526	5/27/2015	Eastbound	Animal - wild	43.85	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1412989	11/8/2014	Eastbound	Animal - wild	43.97	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1400275	1/9/2014	Eastbound	Animal - wild	43.99	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1414182	10/13/2014	Eastbound	Animal - wild	44.99	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.6	0	0
1408403	7/18/2014	Northbound	Highway traffic sign post/sign, Ran off road left - Hwy 79	59.26	PDO		x		x	x							0.8	1	0.7	0.8	1	1	1	1	1	1	1	0	0	0.40747	0	0

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	8%	56%	44%	22%	0%	0%	0%	0%	0%	0%
Approx. PDO Decrease	0.02	0.22	0.15	0.05	0.00	0.00	0.00	0.00	0.00	0.00
% of PDO Reduction	4%	50%	35%	11%	0%	0%	0%	0%	0%	0%
Affected INJ %	40%	0%	100%	80%	0%	0%	0%	0%	0%	0%
Approx. INJ Decrease	0.08	0.00	0.35	0.18	0.00	0.00	0.00	0.00	0.00	0.00
% of INJ Reduction	13%	0%	58%	29%	0%	0%	0%	0%	0%	0%
Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	**36.00**	**5.00**	**0.00**	**20.94**	**2.49**	**0.00**
Annual	**7.20**	**1.00**	**0.00**	**4.19**	**0.50**	**0.00**

Corridor 10

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	D1- Horiz. Curves	$ 1,345,000.00	40	0.80
B	S8 - Wildlife Fencing	$ 1,387,000.00	40	0.60
C	S5 - High Friction Pavement Treatment	$ 3,276,000.00	10	0.65
D	S2 - Guardrail	$ 2,969,000.00	40	0.78
E				
F				
G				
H				
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	8.84	$ 671,241.98	$ 1,345,000.00	0.5 : 1
B	74.25	$ 660,449.58	$ 1,387,000.00	0.48 : 1
C	65.71	$ 3,155,011.61	$ 7,994,323.81	0.39 : 1
D	23.53	$ 1,513,057.09	$ 2,969,000.00	0.51 : 1
E	0.00	$ -	$ -	
F	0.00	$ -	$ -	
G	0.00	$ -	$ -	
H	0.00	$ -	$ -	
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**172.33**	**$ 5,999,760.26**	**$ 13,695,323.81**	**0.44 : 1**

Corridor 11

Crash History Length 5 years

			Crash Record			Improvement											Improvement															
							A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
ID	Date	Direction	Type	MRM	Severity	CMF	0.49	0.93	0.78	0.65	0.78	0.00	0.00	0.00	0.00	0.00																
1310992	9/30/2013	Westbound	Rear-end	33.72	INJ				×	×							1	1	0.8	0.7	1	1	1	1	1	1	0	1	0	0	0.50934	0
1501615	2/16/2015	Westbound	Guardrail face, Ran off road right, Rock	33.96	PDO					×							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1608927	7/16/2016	Eastbound	Guardrail face, Ran off road left	33.96	PDO					×							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1509186	8/13/2015	Westbound	Overturn/rollover	34.04	INJ					×							1	1	1	0.7	1	1	1	1	1	1	0	1	0	0	0.653	0
1512829	10/27/2015	Westbound	Animal - wild	34.11	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1307261	6/23/2013	Northbound	Guardrail end, Ran off road left	34.43	PDO					×							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1710586	8/18/2017	Westbound	Animal - wild	34.62	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1410604	9/18/2014	Eastbound	Animal - wild	35.60	INJ												1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1501614	2/13/2015	Westbound	Embankment, Ran off road right	36.32	PDO		×	×		×	×						0.5	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.23211	0	0
1709928	8/7/2017	Westbound	Animal - wild	36.41	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1401924	2/22/2014	Eastbound	Ditch, Embankment, Ran off road left	36.48	PDO		×	×		×	×						0.5	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.23211	0	0
1401925	2/22/2014	Eastbound	Cross median/centerline, Guardrail end, Ran off road left	36.48	PDO		×	×		×	×						0.5	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.23211	0	0
1305176	5/10/2013	Eastbound	Cross median/centerline, Guardrail face, Ran off road left	36.56	PDO		×	×		×	×						0.5	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.23211	0	0
1405121	4/2/2014	Eastbound	Guardrail end, Ran off road right	36.64	PDO		×	×		×	×						0.5	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.23211	0	0
1413223	11/10/2014	Eastbound	Guardrail face, Ran off road right,	36.72	PDO		×	×		×	×						0.5	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.23211	0	0
1415232	12/11/2014	Westbound	Guardrail end, Ran off road right	36.93	INJ		×	×		×	×						0.5	0.9	1	0.7	0.8	1	1	1	1	1	0	1	0	0	0.23211	0
1311369	10/9/2013	Eastbound	Animal - wild	37.21	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1611160	9/16/2016	Westbound	Animal - wild	37.52	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1304344	4/20/2013	outhbound; Westboun	Angle, Ran off road left	37.55	INJ			×		×							1	0.9	1	0.7	1	1	1	1	1	1	0	1	0	0	0.60729	0
1613925	11/5/2016	Westbound	Animal - wild	37.96	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1609650	8/11/2016	Eastbound	Overturn/rollover	38.63	INJ			×		×							1	0.9	1	0.7	1	1	1	1	1	1	0	1	0	0	0.60729	0
1412541	11/2/2014	Westbound	Animal - wild	38.67	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1610031	8/11/2016	Eastbound	Animal - wild	38.99	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1401346	2/5/2014	Westbound	Animal - wild	39.18	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1315519	12/20/2013	Eastbound	Approach, Ditch, Equipment failure (tires, brakes, etc.), Ran off road right	39.99	PDO			×		×							1	0.9	1	0.7	1	1	1	1	1	1	1	0	0	0.60729	0	0
1610370	8/27/2016	Westbound	Animal - wild	39.99	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1712238	9/26/2017	Eastbound	Overturn/rollover, Ran off road right	40.05	FAT			×		×							1	0.9	1	0.7	1	1	1	1	1	1	0	0	1	0	0	0.60729
1616560	12/9/2016	Westbound	Fence, Ran off road left	40.34	PDO			×		×							1	0.9	1	0.7	1	1	1	1	1	1	1	0	0	0.60729	0	0
1409502	8/14/2014	Westbound	Delineator post, Fence, Ran off road left, Ran off road right	40.66	PDO			×		×							1	0.9	1	0.7	1	1	1	1	1	1	1	0	0	0.60729	0	0
1413680	11/12/2014	Westbound	Animal - wild	41.30	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1610603	9/1/2016	Eastbound	Animal - wild	41.79	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1500005	1/1/2015	Westbound	Animal - wild	41.98	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1709041	7/18/2017	Westbound	Approach, Cross median/centerline, Ran off road left	42.04	PDO					×							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1306613	6/23/2013	Eastbound	Animal - wild	42.14	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1505674	5/31/2015	Eastbound	Animal - wild	43.12	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1714563	10/30/2017	Westbound	Animal - wild	44.09	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0

Corridor 11

Crash History Length 5 years

Crash Record							Improvement										Improvement															
ID	Date	Direction	Type	MRM	Severity		A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
						CMF	0.49	0.93	0.78	0.65	0.78	0.00	0.00	0.00	0.00	0.00																
1709303	7/14/2017	Westbound	Overturn/rollover, Ran off road right	44.12	PDO			x		x	x						1	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.47369	0	0
1600999	1/15/2016	Westbound	Delineator post, Fence, Ran off road right, Tree/shrubbery	44.16	PDO			x		x	x						1	0.9	1	0.7	0.8	1	1	1	1	1	1	0	0	0.47369	0	0
1309617	9/7/2013	Westbound	Overturn/rollover, Ran off road right	44.18	INJ			x		x	x						1	0.9	1	0.7	0.8	1	1	1	1	1	0	1	0	0	0.47369	0
1614660	11/15/2016	Eastbound; Westbound	Cross median/centerline, Sideswipe (opposite)	44.26	INJ			x		x							1	0.9	1	0.7	1	1	1	1	1	1	0	1	0	0	0.60729	0
1608777	7/18/2016	Eastbound; Westbound	Cargo/equipment loss or shift, Motor vehicle in transport, Motor vehicle used as equipment (snowplow plowing)	44.32	PDO			x		x							1	0.9	1	0.7	1	1	1	1	1	1	1	0	0	0.60729	0	0
1511903	9/26/2015	Westbound	Approach, Overturn/rollover, Ran off road right	44.51	INJ			x		x	x						1	0.9	1	0.7	0.8	1	1	1	1	1	0	1	0	0	0.47369	0
1314695	12/7/2013	Westbound	Ran off road right, Tree/shrubbery	44.65	INJ			x		x	x						1	0.9	1	0.7	0.8	1	1	1	1	1	0	1	0	0	0.47369	0
1406090	5/31/2014	Westbound	Ditch, Fence, Ran off road left	45.36	PDO					x							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1700237	1/9/2017	Eastbound	Delineator post, Ditch, Ran off road right	45.39	PDO					x							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1409092	8/4/2014	Westbound	Overturn/rollover, Ran off road right	45.69	INJ					x							1	1	1	0.7	1	1	1	1	1	1	0	1	0	0	0.653	0
1512251	10/13/2015	Westbound	Animal - wild	46.06	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1315521	12/20/2013	Eastbound	Fence, Highway traffic sign post/sign, Mailbox, Ran off road right	46.15	PDO					x							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1404256	4/12/2014	Westbound	Animal - wild	46.15	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1617089	12/19/2016	Eastbound	Fence, Ran off road left	46.38	PDO					x							1	1	1	0.7	1	1	1	1	1	1	1	0	0	0.653	0	0
1511890	10/7/2015	Eastbound	Animal - wild	46.89	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	15%	31%	0%	51%	21%	0%	0%	0%	0%	0%
Approx. PDO Decrease	0.08	0.02	0.00	0.18	0.05	0.00	0.00	0.00	0.00	0.00
% of PDO Reduction	24%	7%	0%	55%	14%	0%	0%	0%	0%	0%
Affected INJ %	9%	64%	9%	91%	36%	0%	0%	0%	0%	0%
Approx. INJ Decrease	0.05	0.04	0.02	0.32	0.08	0.00	0.00	0.00	0.00	0.00
% of INJ Reduction	9%	9%	4%	62%	16%	0%	0%	0%	0%	0%
Affected FAT %	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%
Approx. FAT Decrease	0.00	0.07	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	0%	17%	0%	83%	0%	0%	0%	0%	0%	0%

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	39.00	11.00	1.00	28.99	6.29	0.61
Annual	7.80	2.20	0.20	5.80	1.26	0.12

Corridor 11

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	D1/2, S1 - Horiz./Vert. Curves, Signs	$ 672,000.00	40	0.49
B	I1 - Dynamic Message Signs	$ 360,000.00	40	0.93
C	D7 - Pullouts	$ 95,000.00	40	0.78
D	S5 - High Friction Surface Treatment	$ 5,076,000.00	10	0.65
E	S2 - Guardrail	$ 185,000.00	40	0.78
F				
G				
H				
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	31.22	$ 1,106,613.65	$ 672,000.00	1.65 : 1
B	12.52	$ 1,038,682.08	$ 360,000.00	2.89 : 1
C	2.03	$ 377,785.71	$ 95,000.00	3.98 : 1
D	95.72	$ 7,145,922.27	$ 12,386,809.42	0.58 : 1
E	23.37	$ 1,643,912.23	$ 185,000.00	8.89 : 1
F	0.00	$ -	$ -	
G	0.00	$ -	$ -	
H	0.00	$ -	$ -	
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**164.86**	**$ 11,312,915.94**	**$ 13,698,809.42**	**0.83 : 1**

Corridor 12

Crash History Length 5 years

Crash Record						CMF	Improvement A 0.80	B 0.80	C 0.80	D 1.00	E 0.60	F 0.78	G 0.65	H 0.93	I 0.00	J 0.00	Improvement A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
ID	Date	Direction	Type	MRM	Severity																											
1610961	9/3/2016	Southbound	Rear-end	49.40	PDO					x		x	x	x			1	1	1	1	1	0.8	0.7	0.9	1	1	1	0	0	0.47369	0	0
1611419	9/7/2016	Southbound	Overturn/rollover, Ran off road right	49.68	FAT				x	x			x	x			1	1	0.8	1	1	1	0.7	0.9	1	1	0	0	1	0	0	0.48583
1610108	8/12/2016	Southbound	Ditch, Ran off road right, Tree/shrubbery	49.71	INJ				x				x	x			1	1	0.8	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1315008	7/4/2013	orthbound; Southbour	Animal - wild, Cross median/centerline, Motor vehicle in transport	51.21	INJ												1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1706910	5/31/2017	Northbound	Animal - wild	52.00	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1606015	5/24/2016	Northbound	Cross median/centerline, Overturn/rollover, Ran off road right	52.14	INJ								x				1	1	1	1	1	1	0.7	1	1	1	0	1	0	0	0.653	0
1308329	8/8/2013	Northbound	Overturn/rollover	53.42	INJ					x			x	x			1	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.60729	0
1710494	8/10/2017	Southbound	Overturn/rollover, Ran off road right	53.86	INJ			x		x			x	x			1	0.8	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1705287	5/4/2017	Southbound	Overturn/rollover, Ran off road right, Rock, Tree/shrubbery	53.99	PDO			x					x	x			1	0.8	1	1	1	1	0.7	0.9	1	1	1	0	0	0.48583	0	0
1709951	8/10/2017	Southbound	Embankment, Overturn/rollover, Ran off road right	53.99	INJ			x		x			x	x			1	0.8	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1309988	9/13/2013	Southbound	Overturn/rollover, Ran off road right	54.00	INJ			x		x			x	x			1	0.8	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1508752	8/4/2015	Southbound	Other movable object, Ran off road right	54.03	INJ			x		x			x	x			1	0.8	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1508456	7/18/2015	Southbound	Ditch, Overturn/rollover, Ran off road right, Rock	54.09	INJ			x		x			x	x			1	0.8	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1709682	8/7/2017	Southbound	Overturn/rollover	54.35	PDO					x		x	x	x			1	1	1	1	1	0.8	0.7	0.9	1	1	1	0	0	0.47369	0	0
1408304	7/17/2014	Southbound	Jackknife, Ran off road right	54.64	PDO								x				1	1	1	1	1	1	0.7	1	1	1	1	0	0	0.653	0	0
1608083	6/22/2016	Southbound	Rear-end	54.68	PDO							x	x				1	1	1	1	1	0.8	0.7	1	1	1	1	0	0	0.50934	0	0
1409208	8/9/2014	Southbound	Overturn/rollover, Ran off road right	54.89	INJ					x		x	x				1	1	1	1	1	0.8	0.7	1	1	1	0	1	0	0	0.50934	0
1308057	7/29/2013	Southbound	Ditch, Overturn/rollover, Ran off road right	55.14	INJ					x			x				1	1	1	1	1	1	0.7	1	1	1	0	1	0	0	0.653	0
1610111	8/12/2016	Northbound	Overturn/rollover, Ran off road right,	56.49	INJ		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1510770	8/3/2015	Northbound	Overturn/rollover, Ran off road right	56.49	FAT		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	0	1	0	0	0.48583
1308143	8/1/2013	Northbound	Overturn/rollover	56.64	INJ		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1507971	7/10/2015	Southbound	Overturn/rollover, Ran off road right	56.80	INJ		x			x			x				0.8	1	1	1	1	1	0.7	1	1	1	0	1	0	0	0.5224	0
1307497	7/3/2013	orthbound; Southbour	Cross median/centerline, Motor vehicle in transport,	57.17	INJ		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1508631	8/3/2015	Northbound	Ditch, Ran off road right, Rock	57.23	INJ		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1308394	8/10/2013	Northbound	Overturn/rollover, Ran off road right, Rock	57.27	INJ		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1401017	2/1/2014	Northbound	Culvert, Embankment, Ran off road right	57.30	PDO		x						x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	1	0	0	0.48583	0	0
1408939	8/3/2014	Northbound	Overturn/rollover, Ran off road right	57.30	INJ		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1610113	8/9/2016	Northbound	Overturn/rollover, Ran off road right	57.30	INJ		x			x			x	x			0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0

Corridor 12

Crash History Length 5 years

Crash Record						Improvement										
							A	B	C	D	E	F	G	H	I	J
ID	Date	Direction	Type	MRM	Severity	CMF	0.80	0.80	0.80	1.00	0.60	0.78	0.65	0.93	0.00	0.00
1709810	8/5/2017	Northbound	Ditch, Overturn/rollover, Ran off road right	57.30	INJ		x			x			x	x		
1611678	9/23/2016	Northbound	Ran off road right, Tree/shrubbery	57.32	PDO		x						x	x		
1508918	8/1/2015	Northbound	Overturn/rollover, Ran off road right	57.34	INJ		x			x			x	x		
1707318	6/18/2017	Northbound	Overturn/rollover, Ran off road right	57.35	INJ		x			x		x	x	x		
1408309	7/17/2014	Northbound	Overturn/rollover, Ran off road right	57.36	INJ		x			x			x	x		
1510941	9/11/2015	Northbound	Ditch, Overturn/rollover, Ran off road right	57.44	PDO		x			x			x	x		
1508923	8/7/2015	Northbound	Overturn/rollover, Ran off road right	57.46	INJ		x			x			x	x		
1311025	9/16/2013	Northbound	Equipment failure (tires, brakes, etc.), Overturn/rollover, Ran off road right	57.46	PDO		x			x			x	x		
1508758	8/5/2015	Northbound	Overturn/rollover, Ran off road right	57.46	INJ		x			x			x	x		

ID	Improvement										Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
	A	B	C	D	E	F	G	H	I	J						
1709810	0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1611678	0.8	1	1	1	1	1	0.7	0.9	1	1	1	0	0	0.48583	0	0
1508918	0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1707318	0.8	1	1	1	1	0.8	0.7	0.9	1	1	0	1	0	0	0.37895	0
1408309	0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1510941	0.8	1	1	1	1	1	0.7	0.9	1	1	1	0	0	0.48583	0	0
1508923	0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
1311025	0.8	1	1	1	1	1	0.7	0.9	1	1	1	0	0	0.48583	0	0
1508758	0.8	1	1	1	1	1	0.7	0.9	1	1	0	1	0	0	0.48583	0
Total											**10.00**	**25.00**	**2.00**	**5.54**	**13.07**	**0.97**
Annual											**2.00**	**5.00**	**0.40**	**1.11**	**2.61**	**0.19**

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	40%	10%	0%	40%	0%	30%	90%	70%	0%	0%
Approx. PDO Decrease	0.08	0.02	0.00	0.00	0.00	0.07	0.31	0.05	0.00	0.00
% of PDO Reduction	15%	4%	0%	0%	0%	13%	59%	9%	0%	0%
Affected INJ %	56%	20%	4%	88%	0%	8%	96%	80%	0%	0%
Approx. INJ Decrease	0.11	0.04	0.01	0.00	0.00	0.02	0.33	0.06	0.00	0.00
% of INJ Reduction	20%	7%	1%	0%	0%	3%	59%	10%	0%	0%
Affected FAT %	50%	0%	50%	100%	0%	0%	100%	100%	0%	0%
Approx. FAT Decrease	0.10	0.00	0.10	0.00	0.00	0.00	0.35	0.07	0.00	0.00
% of FAT Reduction	16%	0%	16%	0%	0%	0%	56%	11%	0%	0%

Corridor 12

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	D1/6, S1 - Horiz. Curves, Super, Signs	$ 1,009,000.00	40	0.80
B	D1/3/6, S1 - Horiz. Curves, Shoulder, Super,	$ 712,000.00	40	0.80
C	D1, S1 - Horiz. Curves, Signs	$ 159,000.00	40	0.80
D	S3 - Motorcycle Improvements			1.00
E	O6 - Bike/Ped Improvements	$ 258,000.00	40	0.60
F	D7/D8 - Pullouts/Parking	$ 71,000.00	40	0.78
G	S5 - High Friction Surface Treatment	$ 3,816,000.00	10	0.65
H	I2 - DSMD signs	$ 90,000.00	12	0.93
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	34.93	$ 5,191,498.03	$ 1,009,000.00	5.15 : 1
B	11.03	$ 1,726,330.24	$ 712,000.00	2.42 : 1
C	3.66	$ 680,538.27	$ 159,000.00	4.28 : 1
D	0.00	$ -	$ -	
E	0.00	$ -	$ 258,000.00	0 : 1
F	10.14	$ 805,551.89	$ 71,000.00	11.35 : 1
G	111.66	$ 15,668,545.37	$ 9,312,069.49	1.68 : 1
H	18.66	$ 2,683,676.09	$ 203,254.85	13.2 : 1
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**190.08**	**$ 26,756,139.89**	**$ 11,724,324.34**	**2.28 : 1**

Corridor 13

Crash History Length 5 years

Crash Record						Improvement											Improvement										Obs.	Obs.	Obs.	Expec.	Expec.	Expec.
							A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J	PDO	INJ	FAT	PDO	INJ	FAT
ID	Date	Direction	Type	MRM	Severity	CMF	0.93	0.80	0.80	0.80	0.78	0.80	0.60	0.78	1.00	1.00																
1708854	7/6/2017	Southbound	Fell/jumped from motor vehicle, Overturn/rollover, Ran	59.44	INJ										x		1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1409088	8/5/2014	Southbound	Overturn/rollover, Ran off road right	59.68	INJ										x		1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1306528	6/24/2013	orthbound; Southbour	Cross median/centerline, Sideswipe (opposite)	59.77	PDO		x										0.9	1	1	1	1	1	1	1	1	1	1	0	0	0.93	0	0
1409306	8/4/2014	Northbound	Overturn/rollover, Ran off road right	60.54	INJ			x			x			x	x		1	0.8	1	1	0.8	1	1	0.8	1	1	0	1	0	0	0.48672	0
1709949	8/9/2017	Northbound	Overturn/rollover, Ran off road right	60.76	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1709769	8/7/2017	Northbound	Overturn/rollover, Ran off road right	60.76	PDO			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	1	0	0	0.624	0	0
1709768	8/8/2017	Northbound	Overturn/rollover, Ran off road right	60.76	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1709683	8/7/2017	Southbound	Overturn/rollover, Ran off road right	60.77	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1308231	8/4/2013	orthbound; Southbour	Cross median/centerline, Sideswipe (opposite), Ran off road right	60.81	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1308763	8/10/2013	orthbound; Southbour	Sideswipe (opposite), Ran off road right	60.81	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1508629	8/2/2015	Northbound	Ditch, Ran off road right	60.81	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1507968	7/18/2015	Northbound	Overturn/rollover, Ran off road left	60.90	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1309023	8/4/2013	orthbound; Southbour	Fell/jumped from motor vehicle, Motor vehicle in transport, Overturn/rollover	61.03	FAT			x							x		1	0.8	1	1	1	1	1	1	1	1	0	0	1	0	0	0.8
1408979	8/3/2014	Northbound	Overturn/rollover, Ran off road right	61.05	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1607245	6/22/2016	Northbound	Overturn/rollover, Ran off road right	61.14	INJ			x						x	x		1	0.8	1	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1508576	7/28/2015	orthbound; Southbour	Cross median/centerline, Angle, Overturn/rollover	61.20	INJ			x							x		1	0.8	1	1	1	1	1	1	1	1	0	1	0	0	0.8	0
1308762	8/10/2013	orthbound; Southbour	Cross median/centerline, Sideswipe (opposite), Ran off road right	62.90	PDO										x		1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1510246	9/5/2015	Northbound	Overturn/rollover, Ran off road right	63.31	INJ										x		1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1403375	3/22/2014	Southbound	Guardrail face, Ran off road right	64.06	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1714216	10/25/2017	Northbound	Barricade	64.45	INJ										x		1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1308418	8/10/2013	Southbound	Overturn/rollover, Ran off road right	64.90	INJ				x					x	x		1	1	0.8	1	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1508457	7/16/2015	astbound; Westbound	Cross median/centerline, Sideswipe (opposite)	64.91	PDO				x						x		1	1	0.8	1	1	1	1	1	1	1	1	0	0	0.8	0	0
1310854	9/29/2013	Westbound	Overturn/rollover	64.91	INJ				x						x		1	1	0.8	1	1	1	1	1	1	1	0	1	0	0	0.8	0
1609568	8/10/2016	Northbound	Animal - wild	67.20	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1709136	7/24/2017	Northbound	Overturn/rollover, Ran off road right	68.82	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1707621	6/16/2017	on roadway; Westbo	Parked motor vehicle, Ran off road right	68.92	PDO										x		1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1508913	8/3/2015	Southbound	Guardrail face, Ran off road right	69.41	PDO		x										0.9	1	1	1	1	1	1	1	1	1	1	0	0	0.93	0	0

Corridor 13

Crash History Length 5 years

ID	Date	Direction	Type	MRM	Severity	CMF	Improvement A 0.93	B 0.80	C 0.80	D 0.80	E 0.78	F 0.80	G 0.60	H 0.78	I 1.00	J 1.00	Improvement A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1309630	9/5/2013	Eastbound	Overturn/rollover, Ran off road right	69.43	INJ										x		1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1709486	8/3/2017	Northbound	Embankment, Ran off road right	69.74	INJ										x		1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1308550	8/3/2013	Eastbound	Overturn/rollover	70.41	INJ					x					x		1	1	1	0.8	1	1	1	1	1	1	0	1	0	0	0.8	0
1407638	7/1/2014	Southbound	Ran off road left, Rock, Tree/shrubbery	70.54	INJ					x				x	x		1	1	1	0.8	1	1	1	0.8	1	1	0	1	0	0	0.624	0
1507973	7/20/2015	Southbound	Overturn/rollover	70.83	INJ					x					x		1	1	1	0.8	1	1	1	1	1	1	0	1	0	0	0.8	0
1308549	8/3/2013	Eastbound; Westbound	Sideswipe (opposite)	70.84	PDO		x			x					x		0.9	1	1	0.8	1	1	1	1	1	1	1	0	0	0.744	0	0
1508572	7/31/2015	orthbound; Southbour	Cross median/centerline, Sideswipe (opposite), Overturn/rollover, Rock	70.84	INJ					x					x		1	1	1	0.8	1	1	1	1	1	1	0	1	0	0	0.8	0
1508884	8/7/2015	orthbound; Southbour	Sideswipe (opposite)	71.33	PDO		x								x		0.9	1	1	1	1	1	1	1	1	1	1	0	0	0.93	0	0
1508922	8/6/2015	orthbound; Southbour	Cross median/centerline, Motor vehicle in transport,	72.17	INJ										x		1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1409183	8/6/2014	Southbound	Overturn/rollover, Ran off road right	72.47	INJ							x		x	x		1	1	1	1	1	0.8	1	0.8	1	1	0	1	0	0	0.624	0
1409157	8/6/2014	Northbound	Cross median/centerline, Sideswipe (opposite), Overturn/rollover	72.49	PDO							x			x		1	1	1	1	1	0.8	1	1	1	1	1	0	0	0.8	0	0
1509039	7/29/2015	Eastbound	Overturn/rollover, Ran off road right	72.49	INJ							x		x	x		1	1	1	1	1	0.8	1	0.8	1	1	0	1	0	0	0.624	0
1308338	8/8/2013	Northbound	Overturn/rollover, Ran off road right	72.49	INJ							x		x	x		1	1	1	1	1	0.8	1	0.8	1	1	0	1	0	0	0.624	0

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	33%	8%	8%	8%	0%	8%	0%	8%	58%	0%
Approx. PDO Decrease	0.02	0.02	0.02	0.02	0.00	0.02	0.00	0.02	0.00	0.00
% of PDO Reduction	22%	15%	15%	15%	0%	15%	0%	17%	0%	0%
Affected INJ %	0%	41%	7%	15%	4%	11%	0%	56%	100%	0%
Approx. INJ Decrease	0.00	0.08	0.01	0.03	0.01	0.02	0.00	0.12	0.00	0.00
% of INJ Reduction	0%	29%	5%	11%	3%	8%	0%	44%	0%	0%
Affected FAT %	0%	100%	0%	0%	0%	0%	0%	0%	100%	0%
Approx. FAT Decrease	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	12.00	27.00	1.00	10.76	20.22	0.80
Annual	2.40	5.40	0.20	2.15	4.04	0.16

Corridor 13

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	I4 - Adv Warning Signs	$ 18,000.00	12	0.93
B	D1 - Horiz. Curves (southeast)	$ 382,000.00	40	0.80
C	D1, S1 - Horiz Curves, Signs (east)	$ 72,000.00	40	0.80
D	D1, S1 - Horiz Curves, Signs (cath. spires)	$ 322,000.00	40	0.80
E	D7/8 - Pullouts/Parking	$ 144,000.00	40	0.78
F	D1, S1 - Horiz Curves, Signs (west)	$ 119,000.00	40	0.80
G	O6 - Bike/Ped improvements	$ 97,000.00	40	0.60
H	S2 - Guardrail	$ 284,000.00	40	0.78
I	S3 - Motorcycle Improvements			1.00
J	S9 - Rockfall Mitigation	$ 780,000.00	40	1.00

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	2.62	$ 25,926.53	$ 40,650.97	0.64 : 1
B	23.27	$ 4,086,278.97	$ 382,000.00	10.7 : 1
C	5.41	$ 688,793.44	$ 72,000.00	9.57 : 1
D	8.94	$ 1,360,924.68	$ 322,000.00	4.23 : 1
E	1.94	$ 369,672.18	$ 144,000.00	2.57 : 1
F	7.17	$ 1,024,859.06	$ 119,000.00	8.61 : 1
G	0.00	$ -	$ 97,000.00	0 : 1
H	31.22	$ 5,563,411.15	$ 284,000.00	19.59 : 1
I	0.00	$ -	$ -	
J	0.00	$ -	$ 780,000.00	0 : 1
Total	**80.58**	**$ 13,119,866.01**	**$ 1,460,650.97**	**8.98 : 1**

Corridor 14

Crash History Length 5 years

Crash Record						Improvement									
							A	B	C	D	E	F	G	H	I	J
ID	Date	Direction	Type	MRM	Severity	CMF	1.00	0.80	0.93	0.63	1.00	0.60	0.78	0.93	0.00	0.00
1406739	6/13/2014	Northbound; Southbound	Angle	37.25	PDO									x		
1410482	8/11/2014	Southbound	Embankment, Ran off road right	74.02	INJ		x									
1410483	8/11/2014	Southbound	Embankment, Ran off road right	74.02	INJ		x									
1508573	7/31/2015	Southbound	Ran off road right, Rock	74.21	PDO		x									
1507010	6/19/2015	Northbound	Overturn/rollover	74.77	INJ		x	x	x							
1508886	8/3/2015	Northbound	Overturn/rollover, Ran off road right,	74.88	INJ		x	x	x							
1706447	5/31/2017	Northbound	Overturn/rollover, Ran off road right	74.92	INJ		x	x	x							
1709859	8/6/2017	Northbound	Overturn/rollover, Ran off road right	74.94	INJ		x	x	x							
1308412	8/9/2013	Northbound	Overturn/rollover	74.98	PDO		x	x	x							
1712017	9/12/2017	Northbound	Overturn/rollover, Ran off road right	75.18	PDO		x	x	x							
1713503	10/8/2017	Northbound	Overturn/rollover, Ran off road right	75.42	PDO			x	x							
1609434	8/5/2016	Northbound	Overturn/rollover, Ran off road right,	75.66	INJ		x	x	x							
1609567	8/7/2016	Northbound	Animal - wild, Overturn/rollover	76.41	INJ											
1606832	6/12/2016	Southbound	Overturn/rollover, Ran off road right	76.94	INJ		x									
1610117	8/10/2016	Eastbound	Overturn/rollover, Ran off road right	77.79	INJ		x									
1306473	6/17/2013	Northbound	Animal - wild	77.89	PDO											
1409205	8/8/2014	Southbound	Angle, Overturn/rollover	77.92	INJ		x									
						Affected PDO %	50%	50%	50%	0%	0%	0%	0%	17%	0%	0%
						Approx. PDO Decrease	0.00	0.10	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.00
						% of PDO Reduction	0%	68%	24%	0%	0%	0%	0%	8%	0%	0%
						Affected INJ %	91%	45%	45%	0%	0%	0%	0%	0%	0%	0%
						Approx. INJ Decrease	0.00	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						% of INJ Reduction	0%	74%	26%	0%	0%	0%	0%	0%	0%	0%
						Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
						Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

ID	Improvement A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1406739	1	1	1	1	1	1	1	0.9	1	1	1	0	0	0.93	0	0
1410482	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1410483	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1508573	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1507010	1	0.8	0.9	1	1	1	1	1	1	1	0	1	0	0	0.744	0
1508886	1	0.8	0.9	1	1	1	1	1	1	1	0	1	0	0	0.744	0
1706447	1	0.8	0.9	1	1	1	1	1	1	1	0	1	0	0	0.744	0
1709859	1	0.8	0.9	1	1	1	1	1	1	1	0	1	0	0	0.744	0
1308412	1	0.8	0.9	1	1	1	1	1	1	1	1	0	0	0.744	0	0
1712017	1	0.8	0.9	1	1	1	1	1	1	1	1	0	0	0.744	0	0
1713503	1	0.8	0.9	1	1	1	1	1	1	1	1	0	0	0.744	0	0
1609434	1	0.8	0.9	1	1	1	1	1	1	1	0	1	0	0	0.744	0
1609567	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1606832	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1610117	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1306473	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1409205	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
										Total	6.00	11.00	0.00	5.16	9.72	0.00
										Annual	1.20	2.20	0.00	1.03	1.94	0.00

Corridor 14

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	S3 - Motorcycle Improvements			1.00
B	D1/S1/S9 - Horiz Curves, Signs, Rockfall	$ 308,000.00	40	0.80
C	I1/I2 - Dynamic Message/Speed Signs	$ 126,000.00	12	0.93
D	D5 - Sight Distance	$ 63,000.00	40	0.63
E	S9 - Rockfall Mitigation	$ 117,000.00	40	1.00
F	O6 - Bike/Ped Improvements	$ 32,000.00	40	0.60
G	D7 - Pullouts	$ 8,100.00	40	0.78
H	I4 - Adv Warning Signs	$ 18,000.00	12	0.93
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	0.00	$ -	$ -	
B	14.90	$ 1,817,622.05	$ 308,000.00	5.9 : 1
C	5.21	$ 654,363.85	$ 284,556.79	2.3 : 1
D	0.00	$ -	$ 63,000.00	0 : 1
E	0.00	$ -	$ 117,000.00	0 : 1
F	0.00	$ -	$ 32,000.00	0 : 1
G	0.00	$ -	$ 8,100.00	0 : 1
H	0.65	$ 8,412.22	$ 40,650.97	0.21 : 1
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**20.76**	**$ 2,480,398.12**	**$ 853,307.76**	**2.91 : 1**

Corridor 15

Crash History Length 5 years

Crash Record						Improvement										
							A	B	C	D	E	F	G	H	I	J
ID	Date	Direction	Type	MRM	Severity	CMF	1.00	0.49	0.93	0.97	0.00	0.00	0.00	0.00	0.00	0.00
1408503	7/14/2014	Eastbound; Westbound	Angle	35.67	PDO											
1717732	12/4/2017	Westbound	Motor vehicle in transport, Motor vehicle used as equipment (snowplow plowing)	35.69	PDO											
1708847	7/14/2017	Eastbound	Animal - wild	35.70	PDO											
1305726	5/29/2013	Southbound	Overturn/rollover	58.81	PDO											
1500441	1/13/2015	Eastbound; Southbound	Angle	58.81	PDO											
1507008	6/15/2015	Northbound	Animal - wild	59.60	PDO											
1310551	9/14/2013	Northbound	Animal - wild	59.88	PDO											
1307481	6/26/2013	Southbound	Cross median/centerline, Overturn/rollover	60.44	INJ		x		x							
1709492	8/2/2017	Northbound	Overturn/rollover, Ran off road right, Rock	60.62	PDO				x	x						
1505083	5/10/2015	Southbound	Other post, pole, or support, Ran off road right, Rock	60.83	INJ				x	x						
1609248	8/5/2016	Southbound	Overturn/rollover, Ran off road right	60.95	INJ		x		x	x						
1409086	8/5/2014	Southbound	Overturn/rollover, Ran off road right	61.27	PDO		x		x	x						
1509041	8/7/2015	Southbound	Overturn/rollover, Ran off road right	61.30	INJ		x		x	x						
1510162	9/2/2015	Northbound	Overturn/rollover, Ran off road right	63.42	INJ		x			x						
1708851	7/18/2017	Southbound	Overturn/rollover, Ran off road right	63.99	INJ			x		x						
1409202	8/6/2014	Westbound	Overturn/rollover, Ran off road right	64.31	PDO		x	x		x						

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	20%	10%	20%	30%	0%	0%	0%	0%	0%	0%
Approx. PDO Decrease	0.00	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
% of PDO Reduction	0%	68%	19%	13%	0%	0%	0%	0%	0%	0%
Affected INJ %	67%	17%	67%	83%	0%	0%	0%	0%	0%	0%
Approx. INJ Decrease	0.00	0.09	0.05	0.03	0.00	0.00	0.00	0.00	0.00	0.00
% of INJ Reduction	0%	54%	29%	17%	0%	0%	0%	0%	0%	0%
Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

ID	Improvement															
	A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1408503	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1717732	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1708847	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1305726	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1500441	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1507008	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1310551	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1307481	1	1	0.9	1	1	1	1	1	1	1	0	1	0	0	0.93	0
1709492	1	1	0.9	1	1	1	1	1	1	1	1	0	0	0.90029	0	0
1505083	1	1	0.9	1	1	1	1	1	1	1	0	1	0	0	0.90029	0
1609248	1	1	0.9	1	1	1	1	1	1	1	0	1	0	0	0.90029	0
1409086	1	1	0.9	1	1	1	1	1	1	1	1	0	0	0.90029	0	0
1509041	1	1	0.9	1	1	1	1	1	1	1	0	1	0	0	0.90029	0
1510162	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0.96806	0
1708851	1	0.5	1	1	1	1	1	1	1	1	0	1	0	0	0.47435	0
1409202	1	0.5	1	1	1	1	1	1	1	1	1	0	0	0.47435	0	0
Total											**10.00**	**6.00**	**0.00**	**9.27**	**5.07**	**0.00**
Annual											**2.00**	**1.20**	**0.00**	**1.85**	**1.01**	**0.00**

Corridor 15

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	S3 - Motorcycle Improvements			1.00
B	D2 - Vertical Curve	$ 215,000.00	40	0.49
C	I2/S1 - DSMD Signs, Signs	$ 36,000.00	12	0.93
D	S2 - Guardrail	$ 284,000.00	40	0.78
E				
F				
G				
H				
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	0.00	$ -	$ -	
B	9.74	$ 971,088.69	$ 215,000.00	4.52 : 1
C	4.01	$ 526,477.29	$ 81,301.94	6.48 : 1
D	2.44	$ 298,710.25	$ 284,000.00	1.05 : 1
E	0.00	$ -	$ -	
F	0.00	$ -	$ -	
G	0.00	$ -	$ -	
H	0.00	$ -	$ -	
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**16.19**	**$ 1,796,276.23**	**$ 580,301.94**	**3.1 : 1**

Corridor 16

Crash History Length 5 years

Crash Record						Improvement											Improvement										Obs.	Obs.	Obs.	Expec.	Expec.	Expec.
							A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	F	G	H	I	J	PDO	INJ	FAT	PDO	INJ	FAT
ID	Date	Direction	Type	MRM	Severity	CMF	0.60	0.63	0.63	0.93	1.00	0.78	0.60	0.00	0.00	0.00																
1709521	8/6/2017	Eastbound	Angle	24.01	INJ						x						1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1603606	4/1/2016	Westbound	Animal - wild	24.29	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1711314	8/31/2017	Eastbound	Animal - wild	24.40	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1309691	8/30/2013	Eastbound	Guardrail face, Ran off road right	24.63	INJ						x						1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0
1608729	7/23/2016	Eastbound	Animal - wild	24.74	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1502794	3/19/2015	Westbound	Animal - wild	25.09	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1704416	4/18/2017	Eastbound	Animal - wild	25.42	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1706381	5/31/2017	Eastbound	Animal - wild	25.55	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1413527	11/14/2014	Westbound	Animal - wild	25.66	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1702091	2/16/2017	Eastbound	Animal - wild	25.96	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1711316	9/7/2017	Westbound	Animal - wild	26.01	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1708109	6/29/2017	Westbound	Animal - wild	26.51	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1506041	6/8/2015	Westbound	Rear-end	26.62	INJ				x			x					1	1	0.6	1	1	0.8	1	1	1	1	0	1	0	0	0.4914	0
1602875	3/11/2016	Westbound	Animal - wild	26.68	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1709135	7/21/2017	Westbound	Sideswipe (same)	26.95	PDO				x		x						1	1	0.6	1	1	1	1	1	1	1	1	0	0	0.63	0	0
1711275	9/8/2017	Eastbound	Animal - wild	27.54	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1613079	10/16/2016	Eastbound	Animal - wild	27.63	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1306601	6/18/2013	Eastbound	Animal - wild	28.57	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1508624	8/2/2015	Eastbound	Animal - wild	28.77	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1416287	12/17/2014	Eastbound	Cross median/centerline, Guardrail face, Highway traffic sign post/sign	29.34	PDO			x		x							1	0.6	1	0.9	1	1	1	1	1	1	1	0	0	0.5859	0	0
1715633	11/11/2017	Eastbound	Embankment, Overturn/rollover, Ran off road right	29.55	PDO			x		x							1	0.6	1	0.9	1	1	1	1	1	1	1	0	0	0.5859	0	0
1705836	5/18/2017	Westbound	Animal - wild	29.67	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1409389	8/6/2014	Northbound	Overturn/rollover	30.06	INJ			x			x						1	0.6	1	1	1	1	1	1	1	1	0	1	0	0	0.63	0
1508914	8/7/2015	Westbound	Ditch, Ran off road right	30.36	INJ			x			x						1	0.6	1	1	1	1	1	1	1	1	0	1	0	0	0.63	0
1509692	8/7/2015	Westbound	Cross median/centerline, Embankment, Overturn/rollover, Ran off road left	30.47	FAT			x			x						1	0.6	1	1	1	1	1	1	1	1	0	0	1	0	0	0.63
1612056	10/3/2016	Westbound	Delineator post, Embankment, Ran off road right,	30.50	PDO			x									1	0.6	1	1	1	1	1	1	1	1	1	0	0	0.63	0	0
1611785	9/27/2016	Eastbound	Animal - wild	30.85	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1708955	7/9/2017	Westbound	Animal - wild	30.92	PDO								x				1	1	1	1	1	1	0.6	1	1	1	1	0	0	0.6	0	0
1713069	10/9/2017	Southbound	Rear-end	31.09	PDO			x		x		x					1	0.6	1	0.9	1	0.8	1	1	1	1	1	0	0	0.457	0	0
1717766	12/23/2017	Northbound	Ran off road right, Tree/shrubbery	31.30	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
						Affected PDO %	0%	17%	4%	13%	4%	4%	75%	0%	0%	0%										Total	24.00	5.00	1.00	14.69	3.75	0.63
						Approx. PDO Decrease	0.00	0.06	0.02	0.01	0.00	0.01	0.30	0.00	0.00	0.00										Annual	4.80	1.00	0.20	2.94	0.75	0.13
						% of PDO Reduction	0%	16%	4%	2%	0%	2%	76%	0%	0%	0%																
						Affected INJ %	0%	40%	20%	0%	80%	20%	0%	0%	0%	0%																
						Approx. INJ Decrease	0.00	0.15	0.07	0.00	0.00	0.04	0.00	0.00	0.00	0.00																
						% of INJ Reduction	0%	56%	28%	0%	0%	17%	0%	0%	0%	0%																
						Affected FAT %	0%	100%	0%	0%	100%	0%	0%	0%	0%	0%																
						Approx. FAT Decrease	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																
						% of FAT Reduction	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%																

Corridor 16

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	O6 - Bike/Ped Improvements	$ 3,500.00	40	0.60
B	D1/5/8, S1 - Horiz Curves, Sight, Parking, Sig	$ 1,351,000.00	40	0.63
C	D5 - Sight Distance	$ 358,000.00	40	0.63
D	I2 - DSMD Signs	$ 18,000.00	12	0.93
E	S3 - Motorcycle Improvements			1.00
F	D7 - Pullouts	$ 53,000.00	40	0.78
G	S8 - Wildlife Fencing	$ 1,128,000.00	40	0.60
H				
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	0.00	$ -	$ 3,500.00	0 : 1
B	24.69	$ 2,111,884.71	$ 1,351,000.00	1.56 : 1
C	6.97	$ 679,324.47	$ 358,000.00	1.9 : 1
D	2.02	$ 20,585.70	$ 40,650.97	0.51 : 1
E	0.00	$ -	$ -	
F	4.14	$ 403,922.66	$ 53,000.00	7.62 : 1
G	69.33	$ 616,671.44	$ 1,128,000.00	0.55 : 1
H	0.00	$ -	$ -	
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**107.16**	**$ 3,832,388.97**	**$ 2,934,150.97**	**1.31 : 1**

Corridor 17

Crash History Length 5 years

Crash Record							Improvement										Improvement															
							A	B	C	D	E	F	G	H	I	J																
ID	Date	Direction	Type	MRM	Severity	CMF	0.78	0.60	1.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	A	B	C	D	E	F	G	H	I	J	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
1406617	6/10/2014	Eastbound	Overturn/rollover, Ran off road right	31.34	INJ				x	x							1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1409561	8/7/2014	Eastbound	Guardrail face, Ran off road right	31.34	INJ				x	x							1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1510451	9/5/2015	Eastbound	Delineator post, Overturn/rollover, Ran off road right	31.34	INJ				x	x							1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1612292	10/5/2016	Eastbound	Animal - wild	31.34	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1613853	10/29/2016	Eastbound; Westbound	Cross median/centerline, Head-on	31.34	INJ					x							1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1707298	6/18/2017	Northbound	Animal - wild	31.34	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1504989	5/9/2015	Eastbound	Ran off road right, Rock	32.18	PDO					x							1	1	1	0.9	1	1	1	1	1	1	1	0	0	0.93	0	0
1710035	8/14/2017	Northbound	Animal - wild	32.86	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1409247	8/8/2014	Northbound	Overturn/rollover	32.94	INJ				x	x							1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1410344	9/12/2014	Westbound	Animal - wild	33.24	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1306871	6/29/2013	Eastbound	Overturn/rollover, Ran off road right	33.25	INJ				x	x							1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1608935	7/17/2016	Westbound	Ran off road left, Tree/shrubbery	33.43	INJ					x							1	1	1	0.9	1	1	1	1	1	1	0	1	0	0	0.93	0
1311632	9/17/2013	Eastbound	Animal - wild	33.54	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1711220	9/2/2017	Westbound	Equipment failure (tires, brakes, etc.), Fell/jumped from motor vehicle, Tree/shrubbery	34.07	PDO					x							1	1	1	0.9	1	1	1	1	1	1	1	0	0	0.93	0	0
1407601	7/3/2014	Westbound	Sideswipe (same)	34.14	PDO					x							1	1	1	0.9	1	1	1	1	1	1	1	0	0	0.93	0	0
1614743	11/15/2016	Eastbound	Animal - wild	34.32	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0
1510182	9/5/2015	Eastbound	Animal - wild	34.32	PDO												1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0

	A	B	C	D	E	F	G	H	I	J
Affected PDO %	0%	0%	0%	30%	0%	0%	0%	0%	0%	0%
Approx. PDO Decrease	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
% of PDO Reduction	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Affected INJ %	0%	0%	71%	100%	0%	0%	0%	0%	0%	0%
Approx. INJ Decrease	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00
% of INJ Reduction	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Affected FAT %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Approx. FAT Decrease	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% of FAT Reduction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	Obs. PDO	Obs. INJ	Obs. FAT	Expec. PDO	Expec. INJ	Expec. FAT
Total	**10.00**	**7.00**	**0.00**	**9.79**	**6.51**	**0.00**
Annual	**2.00**	**1.40**	**0.00**	**1.96**	**1.30**	**0.00**

Corridor 17

Crash History Length 5 years

Impr.	Description	Replacement Cost	Lifespan	CMF
A	D7/8 - Pullouts/Parking	$ 31,000.00	40	0.78
B	O6 - Bike/Ped Improvements	$ 1,318,000.00	40	0.60
C	S3 - Motorcycle Improvements			1.00
D	I1 - Dynamic Message Signs	$ 90,000.00	12	0.93
E				
F				
G				
H				
I				
J				

Impr.	Crash Difference	NPV Ben. & Resid.	NPV Capital Costs	BCR
A	0.00	$ -	$ 31,000.00	0 : 1
B	0.00	$ -	$ 1,318,000.00	0 : 1
C	0.00	$ -	$ -	
D	6.86	$ 944,902.18	$ 203,254.85	4.65 : 1
E	0.00	$ -	$ -	
F	0.00	$ -	$ -	
G	0.00	$ -	$ -	
H	0.00	$ -	$ -	
I	0.00	$ -	$ -	
J	0.00	$ -	$ -	
Total	**6.86**	**$ 944,902.18**	**$ 1,552,254.85**	**0.61 : 1**