



# WB I-70 Peak Period Shoulder Lane

# ALTERNATIVES DEVELOPMENT AND EVALUATION

October 26, 2018

Categorical Exclusion

ALTERNATIVES DEVELOPMENT AND EVALUATION  
**WESTBOUND I-70  
PEAK PERIOD SHOULDER LANE**

*Prepared for:*



*Prepared by:*



October 26, 2018



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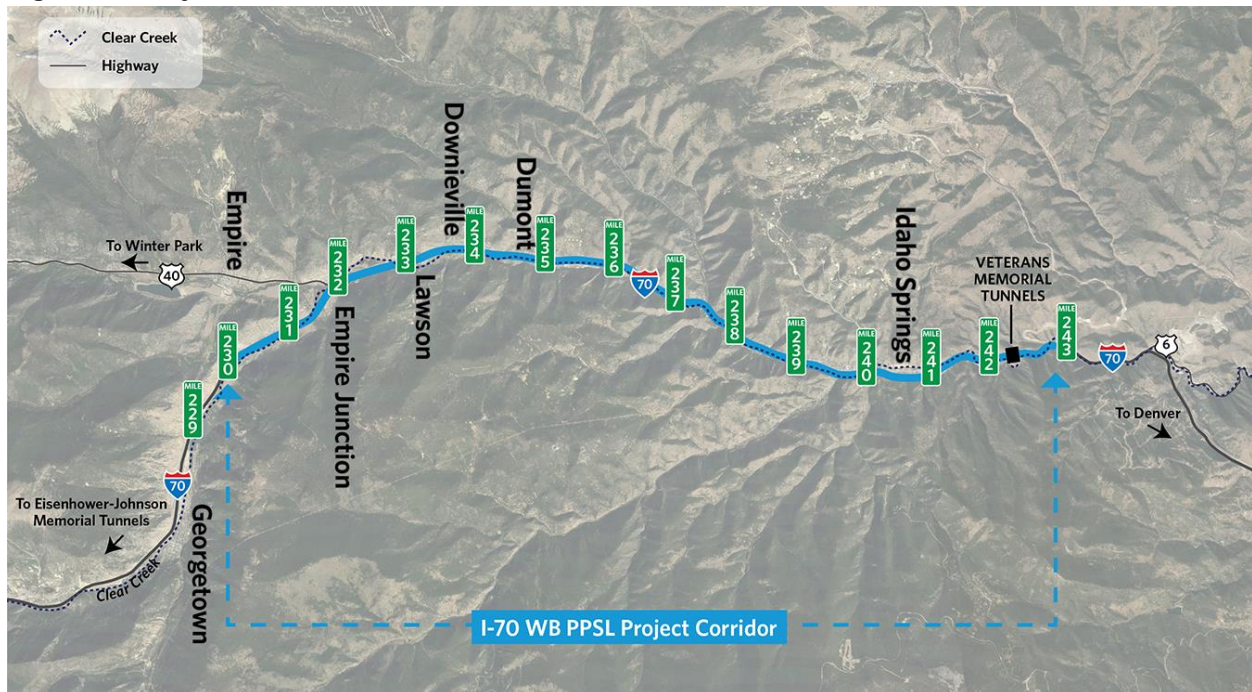
## Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AGS	Automated Guideway System
ATM	Active Traffic Management
CDOT	Colorado Department of Transportation
CSS	Context Sensitive Solutions
CR	County Road
DSRC	dedicated short-range communications
EB	eastbound
FHWA	Federal Highway Administration
FIR	Field Inspection Review
ITF	Issue Task Force
ITS	Intelligent Transportation System
MASH	Manual for Assessing Safety Hardware
MP	milepost
MS4	Municipal Separate Storm Sewer System
NEPA	National Environmental Policy Act
PPSL	Peak Period Shoulder Lane
PEIS	Programmatic Environmental Impact Statement
PLT	Project Leadership Team
ROD	Record of Decision
SCAP	Sediment Control Action
SH	State Highway
SWEEP	Stream and Wetland Ecological Enhancement Program
TT	Technical Team
US 40	U.S. Highway 40
VMS	variable message sign
WB	westbound

## Section 1. Purpose of the Report

The Federal Highway Administration (FHWA), in cooperation with the Colorado Department of Transportation (CDOT), is preparing a Categorical Exclusion for proposed changes to the westbound (WB) lanes of Interstate 70 (I-70) between approximately milepost (MP) 243 and MP 230, in Clear Creek County, Colorado (Proposed Action; Figure 1). The Proposed Action includes the addition of a 12-mile tolled Peak Period Shoulder Lane (PPSL) between east Idaho Springs and the U.S. Highway 40 (US 40)/I-70 interchange in the WB direction, as well as improvements to the State Highway (SH) 103 interchange. The Proposed Action improves operations and travel time reliability in the WB direction of I-70 in the study area. Additionally, the improvements are consistent with the *I-70 Mountain Corridor Programmatic Environmental Impact Statement (PEIS)* (CDOT 2011), and the PEIS Record of Decision (ROD) (FHWA 2011). The Proposed Action fits within the definition of “expanded use of existing transportation infrastructure in and adjacent to the corridor” included in the “Non-Infrastructure Related Components” element within the Preferred Alternative’s Minimum Program of Improvements.

Figure 1. Project Corridor



Source: HDR 2018.

This document discusses the options that were evaluated during the development of the WB PPSL Proposed Action, which occurred both during the Concept Development Process (2016-2017) and this subsequent National Environmental Policy Act (NEPA) process.



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## Section 2. What Process was Followed to Evaluate Options?

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### 2.1 Project Corridor

The project corridor (Figure 1) was divided into sections (called focus areas), which represented geographic areas that have similar characteristics. These were frequently used to simplify discussions as design options were developed. The focus areas are described as follows:

- Focus Area 1—Idaho Springs (from Veterans Memorial Tunnels to Exit 239)
- Focus Area 2—From Exit 239 to Dumont
- Focus Area 3—West of Dumont, including Empire Junction, Lawson, and Downieville

Appendix A of this document contains maps showing the different focus areas.

### 2.2 Public and Agency Involvement

Consistent with the I-70 Mountain Corridor Context Sensitive Solutions (CSS) guidance, individuals from local jurisdictions, communities, state and federal agencies, and special interest groups were a part of an 18-member Project Leadership Team (PLT) and a 48-member Technical Team (TT). FHWA and CDOT developed the Proposed Action using input resulting from the CSS process during the 2016 to 2017 Concept Development Process completed in July 2017 (CDOT 2017) and the NEPA process. The PLT, TT, and Issue Task Forces (ITF) all met and provided input regularly throughout the development of the project. Handouts from the TT meetings are included in this document as Appendix B.

Input from the general public was sought at the scoping meeting held in July 2017, the online public meeting held in May and June 2018, through the website, which was available throughout the NEPA process and the in-person public meeting held on September 13, 2018.

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## Section 3. Description of the Proposed Action

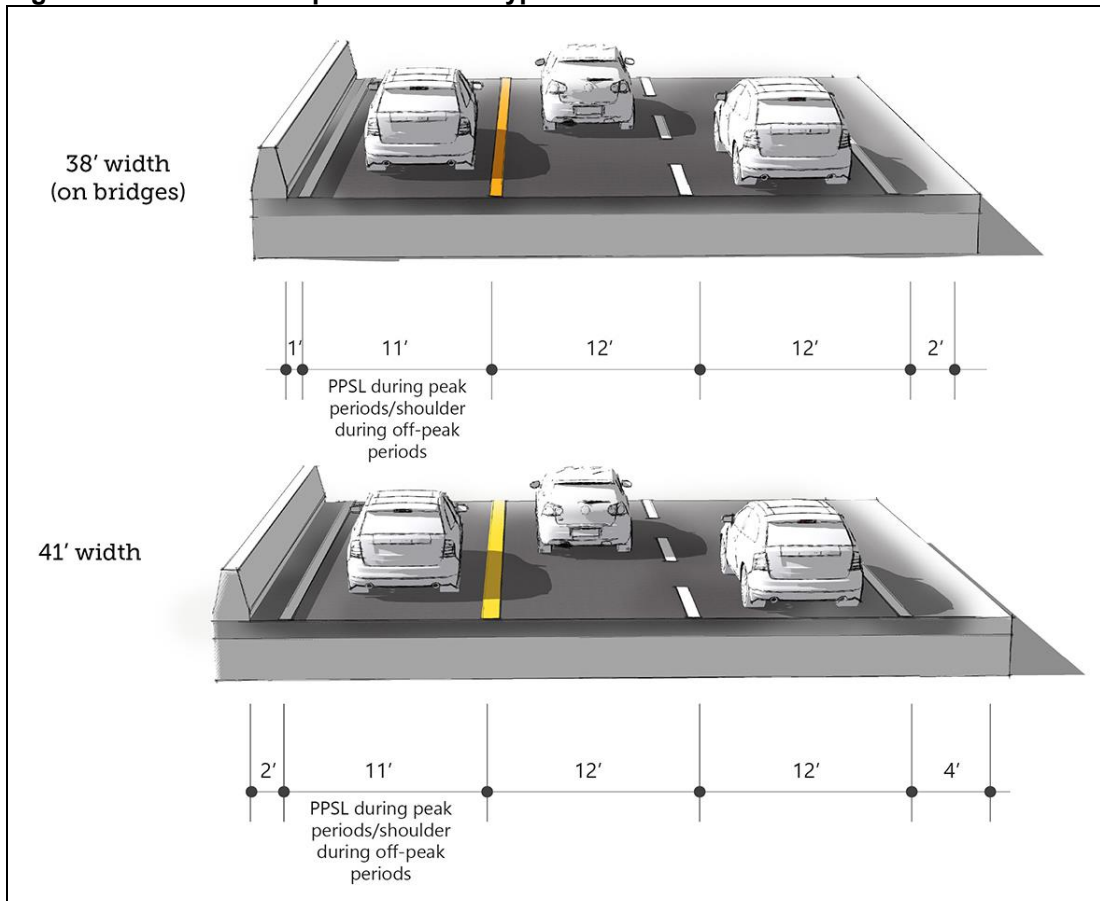
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The WB PPSL project adds an approximate 12-mile tolled PPSL between the Veterans Memorial Tunnels (just west of MP 243) and the US 40/I-70 interchange (MP 232), in the WB direction only. The 11-foot lane is open for vehicles to use only during peak periods. When the lane is not open, it serves as the shoulder of the interstate. Use of the WB PPSL is prohibited for trucks, buses, or any vehicle over 25 feet long. The lane entrance begins approximately 500 feet east of the Veterans Memorial Tunnels portal. Overhead signs showing the lane status and toll rate are located throughout the corridor and at the entrance point.

An ingress/entrance point for traffic coming onto WB I-70 from Idaho Springs is provided approximately 2,500 feet west of Exit 239. An egress point for traffic exiting to Downieville is provided about 4,400 feet east of Exit 235, and an egress point for traffic exiting to US 40 is provided approximately 4,400 feet east of Exit 232.

The WB PPSL ends approximately 1/2 mile west of Exit 232. Figure 2 illustrates the typical cross sections of the Proposed Action.

**Figure 2. WB PPSL Proposed Action Typical Cross Sections**



Source: HDR 2018.

Improvements include:

**I-70 Modifications.** WB I-70 is resurfaced between approximately MP 241.5 and MP 232, and widened in select areas to effectively create three travel lanes during peak periods. The two general purpose lanes remain open and free to all travelers at all times. Drainage enhancements include a storm system for minor and major storm events and water quality facilities. At SH 103, I-70 is slightly realigned to enhance safety and improve drainage.

**SH 103 Interchange Improvements.** Ramp improvements address sight distance problems. The pedestrian sidewalk is improved by adding lighting and a decorative paving buffer adjacent to the existing sidewalk on the SH 103 bridge over I-70. This sidewalk connects to a new sidewalk buffered from 13th Avenue between the interchange ramp and Idaho Street in Idaho Springs.

**Safety Pull-Outs.** A total of seven new safety pull-outs are built—five along WB I-70 and two along eastbound (EB) I-70. One existing safety pull-out on EB I-70 is improved. The intention of these is to provide a space for vehicles to use if they experience a break down and for law enforcement to use.

**Rockfall Mitigation.** Rockfall mitigation measures are added at five locations to reduce the chance of rocks or other debris from falling on travel lanes or shoulders and reduce the potential for crashes and





travel disruptions. Rockfall mitigation measures are included in the WB direction at MP 239, MP 238.4, MP 237.1, and MP 236.4, and in the EB direction at MP 240.3.

**Active Traffic Management.** Dynamic signage informs drivers so the WB PPSL is appropriately used to reduce congestion. This innovative design improves mobility.

**Fiber Optic Upgrades.** Fiber optics are designed to accommodate future emerging technologies for autonomous and connected vehicles, improving driver information and emergency response capabilities.

**Dumont Port-of-Entry Interchange.** Merge area improvements to the Dumont interchange acceleration lane includes restriping of I-70 to reduce merge conflicts between truck traffic and the general-purpose lane traffic.



Dynamic signage

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## Section 4. Which Options Were Considered?

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CDOT has evaluated one Proposed Action—the WB PPSL. A number of options to various design elements of the WB PPSL were evaluated developed and evaluated with stakeholders using the CSS process. These are discussed below.

### 4.1 Roadway Width

#### 4.1.1 Introduction and Existing Conditions

The existing width of I-70 through the study area varies from less than 37 feet to 47 feet, with an average pavement width of 38 feet. In general, the existing roadway section is comprised of a 4-foot-wide inside shoulder, two 12-foot-wide travel lanes, and a 10-foot-wide outside shoulder. The existing widths at the bridges carrying I-70 traffic vary from 38 feet to 39 feet. The widths at the bridges represent the lower range of pavement width for the options evaluated.

#### 4.1.2 Options Evaluated

Five roadway width options were developed and evaluated:

- Existing Pavement (37-foot width minimum)
- Baseline (38-foot to 40-foot width with 2-foot shy distance)
- 38-foot to 41-foot width (with 2-foot shy distance and 1-foot rumble strip buffer)
- 38-foot to 42-foot width (with 2-foot shy distance, 1-foot rumble strip buffer and 12-foot center lane)
- 38-foot to 43-foot width (with 2-foot shy distance, 1-foot rumble strip buffer and three 12-foot lanes)

All five options included the same operational improvements intended to improve safety:

- Variable Speed Limits



- Enforcement—Speed, Lane and Traction Violations
- Winter Operations Plan:
  - > Plowing
  - > Courtesy Patrol
  - > Traffic Incident Management
- Speed Harmonization
- Maintenance
- Education related to the safe use of the PPSL
- Improvements to reduce wildlife/vehicular crashes

Because the WB PPSL is an interim improvement that needs to be consistent with the definition of “expanded use of existing transportation infrastructure” contained in the 2011 ROD, the roadway width options that were analyzed in detail include only those less than 43 feet wide. The 43 feet wide roadway option was determined to be an appropriate width for the upper end of the analysis of options because widening more than this width would require replacement or widening of 14 bridges and reconfiguring interchanges and would have more impacts to residential and business properties, historic properties, wildlife, noise, rock faces and other environmentally sensitive features. The WB PPSL will function safely without replacing or widening bridges or reconstructing interchanges.

#### **Option A: Existing Pavement (38-foot typical/37-foot minimum)**

A 38-foot pavement width option includes a 12-foot inside shoulder/PPSL (1-foot inside shoulder/shy distance plus 11-foot PPSL), two 11-foot general purpose lanes, a rumble strip encroaching on the WB PPSL and adjacent general purpose lane, and a 4-foot outside shoulder. There is a one-mile stretch between MP 237 and MP 238 where the pavement width varies between 37 feet and 38 feet. In those areas, there is a 3-foot to 4-foot outside shoulder.

#### **Option B: Baseline (38-foot to 40-foot with 2-foot shy distance)**

A 40-foot pavement width option includes a 13-foot inside shoulder/PPSL (2-foot inside shoulder/shy distance plus 11-foot PPSL), one 11-foot center general purpose lane, a rumble strip encroaching on the WB PPSL and adjacent general purpose lane, one 12-foot outside general purpose lane, and a 4-foot outside shoulder.

#### **Option C: 38-foot to 41-foot (with 2-foot shy distance and 1-foot rumble strip buffer)**

A 41-foot pavement width option includes a 13-foot inside shoulder/PPSL (2-foot inside shoulder/shy distance plus 11-foot PPSL), a 1-foot rumble strip buffer, one 11-foot center general purpose lane, one 12-foot outside general purpose lane, and a 4-foot outside shoulder.

#### **Option D: 38-foot to 42-foot (with 2-foot shy distance, 1-foot rumble strip buffer and 12-foot center lane)**

A 42-foot pavement width option includes a 13-foot inside shoulder/PPSL (2-foot inside shoulder/shy distance plus 11-foot PPSL), a 1-foot rumble strip buffer, two 12-foot general purpose lanes, and a 4-foot outside shoulder.



### **Option E: 38-foot to 43-foot (with 2-foot shy distance, 1-foot rumble strip buffer and three 12-foot lanes)**

A 43-foot pavement width option equals a 14-foot inside shoulder/PPSL (2-foot inside shoulder/shy distance plus 12-foot WB PPSL), a 1-foot rumble strip buffer, two 12-foot general purpose lanes, and a 4-foot outside shoulder.

#### **4.1.3 Process to Determine Selected Option**

The five options listed above were discussed over multiple TT meetings. TT members favored some options over others, based on a number of considerations, including:

- Nature of interim improvements
- Concerns about the safety record of the Mountain Express Lane to date
- Safety for emergency responders
- Safety for truck operations
- Safety for tourist vehicles, including recreational vehicles
- Noise reduction (vehicles driving over the rumble strip was the biggest concern)
- Desire to incorporate a range of measures to improve safety – not just widening of the shoulders and lanes, but other safety measures as recommended in the Safety Assessment Report (FHU 2017)
- Safety issues that are greater in the WB direction because of a known existing problem area in Idaho Springs associated with crashes into the concrete barrier
- Concerns about the increasing grade in the WB direction causing more speed differential between accelerating vehicles in the PPSL and slower vehicles in the general purpose lanes

CDOT considered feedback from public scoping, input provided on the website and in the online public meeting, and from the Concept Development Process in the development and evaluation of the options, including:

- Concerns about the narrow lane width on the EB PPSL
- Concern that the shoulders provided on the EB PPSL are too narrow.
- Need for better enforcement during PPSL operations
- Desire to widen bridges

The TT, in a meeting on December 13, 2017, recommended that the project team develop and evaluate a range of options from 39 feet to 42 feet, but to incorporate as many safety measures as possible.

Subsequent to this meeting, a decision was made to evaluate options to 43 feet. At the January 10, 2018, TT meeting, a matrix with some preliminary information evaluating these five options was presented and the TT members agreed to provide additional comments at the next TT meeting. Concerns expressed at the January 10 meeting were related to the width needed to safely and quietly accommodate the rumble strip but also a desire to make sure the project still fits within the ROD. The matrix was brought back to the TT meeting on January 24, 2018. Some members of the TT at that meeting agreed with its findings that a slightly wider road option would best meet safety needs while minimizing infrastructure, but others requested input and recommendations from the PLT. The CSS matrix with more detailed information on evaluation criteria for these five options can be found in Appendix C of this document.



The TT was unable to reach consensus on one recommended option; therefore, the evaluation findings were elevated to the PLT for review and discussion. This discussion occurred at a February 12, 2018, PLT meeting. This group discussed the main issues associated with road width, including the importance of following the CSS process, the agreements made in the ROD, ensuring all perspectives are being listened to in the CSS process, not precluding a future Automated Guideway System (AGS), and safety and mobility needs. The group also discussed the need to strive for the narrowest possible width of pavement and to let the context drive the width, rather than applying a blanket width to all areas. As a result of the discussion of these various issues, the PLT recommended that the project staff develop a section that included a 2-foot inside shoulder/shy distance, an 11-foot PPSL and two 12-foot general purpose lanes. When the 4-foot outside shoulder is added to these dimensions, the total section is 41 feet. A rumble strip is added on the striping between the WB PPSL and the inside general purpose lane.

#### 4.1.4 Selected Option

The selected option, as recommended by the PLT, was a modification to Option C: 38-foot to 41-foot (with 2-foot shy distance and 1-foot rumble strip buffer). It was determined to place the rumble strip on the stripe between the WB PPSL and inside general purpose lane so that two 12-foot general purpose lanes could be accommodated. This varies from the EB typical section by having a 2-foot (instead of a 1-foot) inside shoulder and two 12-foot general purpose lanes (instead of one 12-foot general purpose lane), better addressing safety issues, and input by the TT and public. This option best balances the safety needs and the desire to minimize community and environmental impacts.

This is a variable corridor-wide footprint—some areas are wider and some narrower. No widening is necessary for approximately 1,000 linear feet west of the Fall River Road interchange because the existing pavement is already at least 41 feet wide. There are also several stretches within Idaho Springs and east of the Veterans Memorial Tunnels that do not require widening and only require striping.

For constrained areas (over and underneath existing bridges), a 38-foot template was used to avoid disturbance to the bridge piers or additional bridge widening. There are seven constricted areas/bridges throughout the corridor that require a 38-foot width.

## 4.2 Rock Cut vs. Median Wall

### 4.2.1 Introduction and Existing Conditions

Between the west side of Idaho Springs and Dumont (Focus Area 2), the WB lanes are generally bounded by steep mountain conditions on the north and by the EB lanes or a divided median on the south. Rock cuts are included in alignment considerations in order to accommodate the interim improvements and address rockfall hazards adjacent to the roadway. Rock cuts have geological, safety and visual impacts and can extend the duration and overall impact to the traveling public during construction.

### 4.2.2 Options Evaluated

Three alignment options were evaluated:

- Option 1: All widening of WB I-70 occurring toward the outside shoulder (right) (with rock cut where necessary).
- Option 2: Widen toward the median (left) (with median wall where necessary).





- Option 3: Combined widening toward the outside shoulder (right) with widening to the inside toward the median (left) to minimize rock cut impacts. The majority of the median widening includes walls and rock cuts between MP 239 and MP 235 (Figure 3).

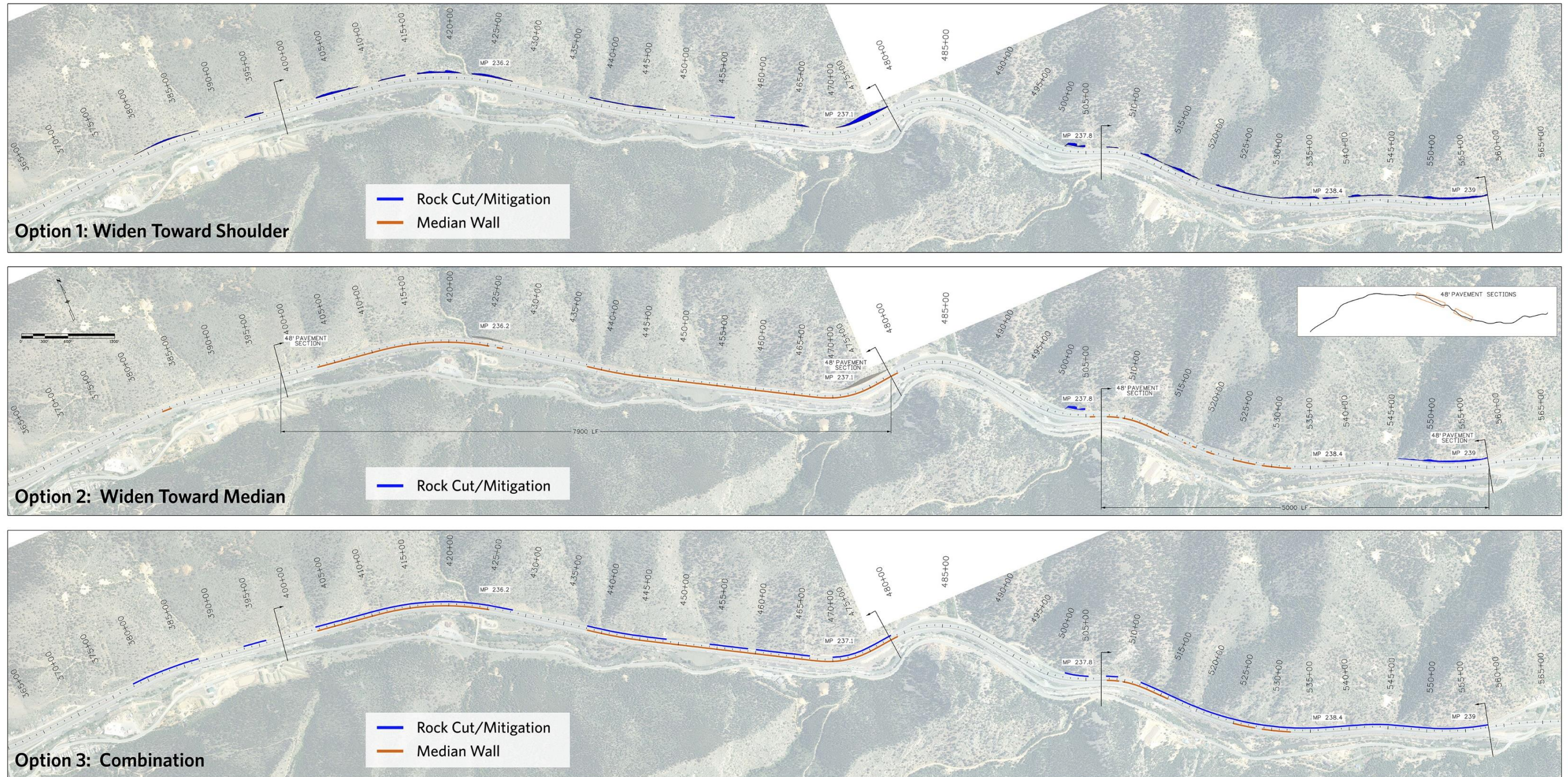
### **Option 1: Widen toward the Outside Shoulder (with Rock Cut where necessary)**

Option 1 adds pavement to the outside (right) to meet the 41-foot roadway width, requiring substantial rock cuts to maintain safety on the roadway. This option considered three typical sections.

- Widen towards the mountain with a roadside ditch and rock cut, offset 16 feet from the edge of pavement. This mimics the clearance to the rock face in the existing condition (i.e., the proposed condition is not worse than the existing condition with respect to rockfall risk). This option most likely requires meshing or fencing for additional rockfall mitigation.
- Widen towards the mountain with a roadside ditch and rock cut, offset 20 feet from the edge of pavement. This is determined to be the minimal width required for a rock cut. This option most likely requires meshing or fencing for additional rockfall mitigation.
- Widen towards the mountain with a roadside ditch and rock cut, offset 20 feet from the edge of pavement with an additional 20-foot bench from the toe of the rock slope to create enough space for construction equipment. This option does not require meshing or fencing for additional rockfall mitigation.



Figure 3. Rock Cut vs. Median Widening Options



Source: HDR 2018

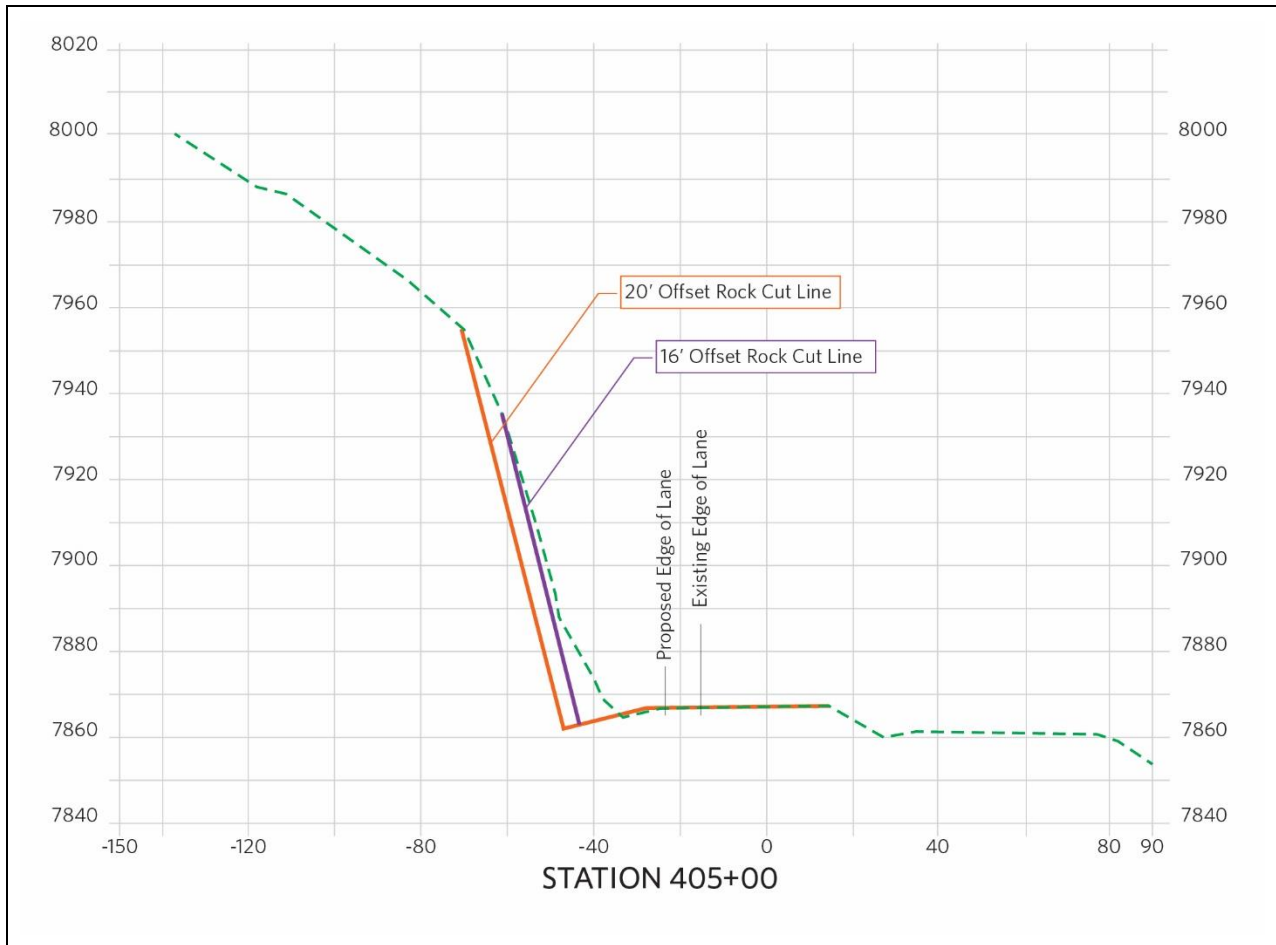




Figure 4 shows the typical section of widening towards the mountain with a 16-foot (purple line) and 20-foot (orange line) offset from the edge of pavement. Figure 5 shows the typical section of widening towards the mountain with a 20-foot offset from the edge of pavement and a 20-foot construction bench (brown line).

Widening toward the mountain requires rock cuts in approximately 15 locations. These rock cuts vary in length up to 700 linear feet and in height up to 160 feet. To complete the WB PPSL by performing all widening completely toward the mountain requires approximately 11,500 linear feet of rock cuts.

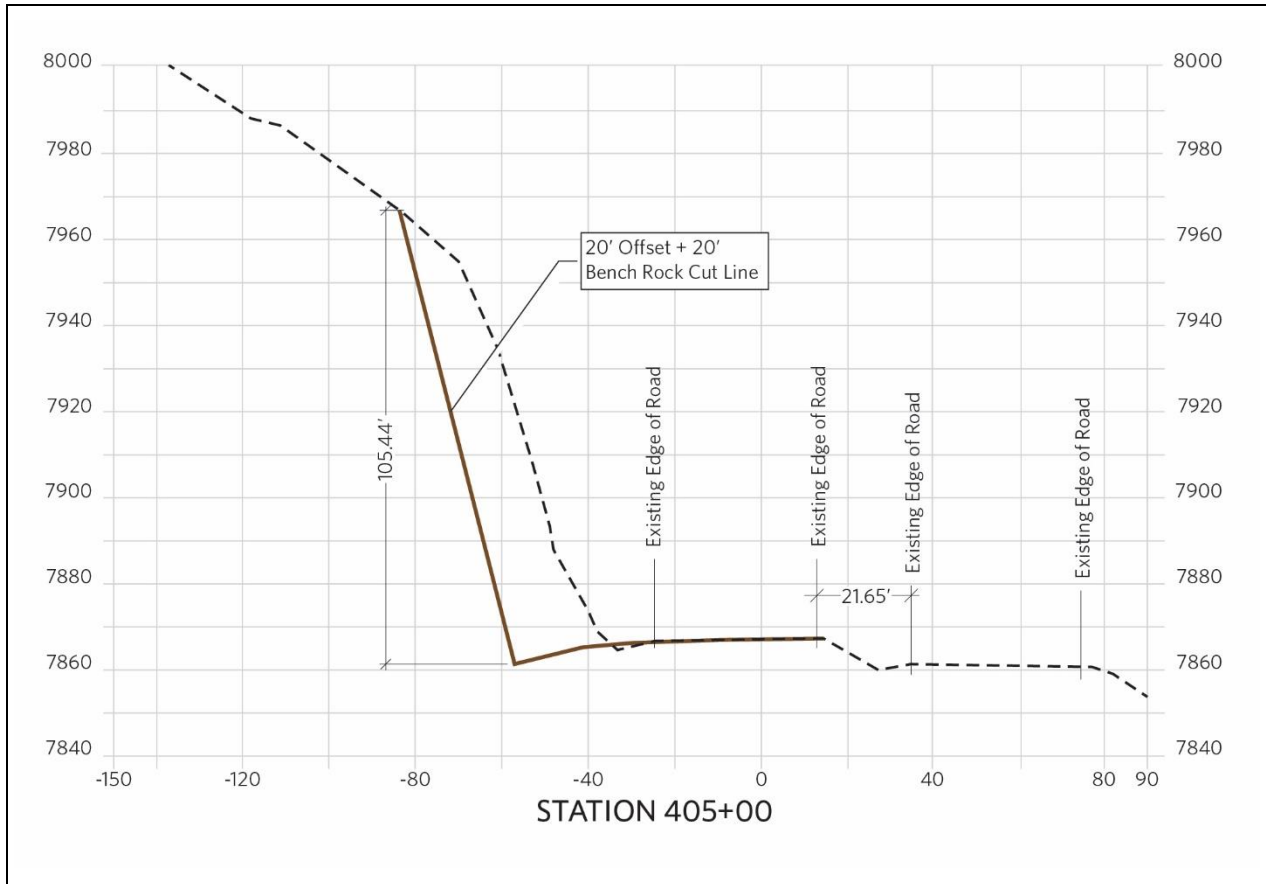
**Figure 4. Option 1 Typical Section—Widen toward the Outside Shoulder (Rock Cut) with 16-foot and 20-foot Offsets from Edge of Pavement**



Source: HDR 2018.



**Figure 5. Option 1 Typical Section—Widen toward the Outside Shoulder (Rock Cut) with 20-foot Offset from Edge of Pavement with Additional 20-foot Construction Bench**



Source: HDR 2018.

### Option 2: Widen toward Median (with Median Wall where necessary)

The second alignment option holds the typical section at the outside white lane line, which ranges 16 to 30 feet away from the rock face. Widening toward the median reduces the need for rock cuts. Four median walls (up to 6 feet of exposed face of wall) between the EB and WB I-70 lanes are included. This avoids shifting traffic closer to the rock. Option 2 is shown in Figure 6.

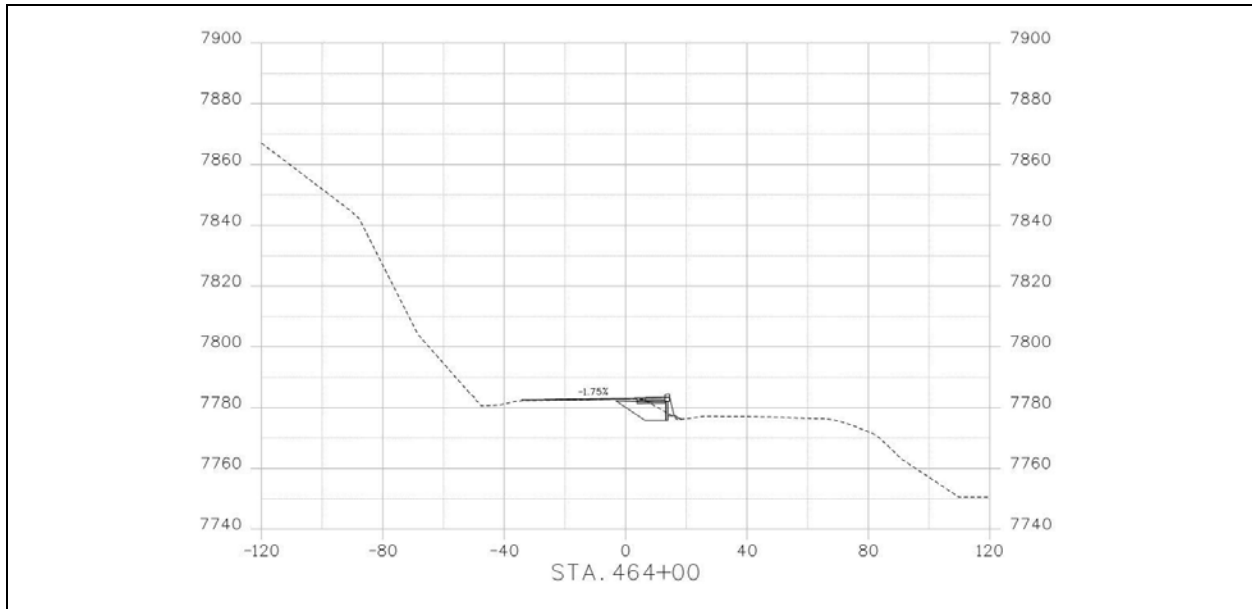
### Option 3: Combination of Median Widening and Rockfall Mitigation

The third alignment option moves traffic closer to the rock face and also requires some median widening. Moving traffic closer to the rock face reduces the clear zone distance and creates a higher rockfall risk. This results in the need for an almost continuous rockfall fence and barrier wall along the shoulder of I-70. Option 3 is shown in Figure 7.



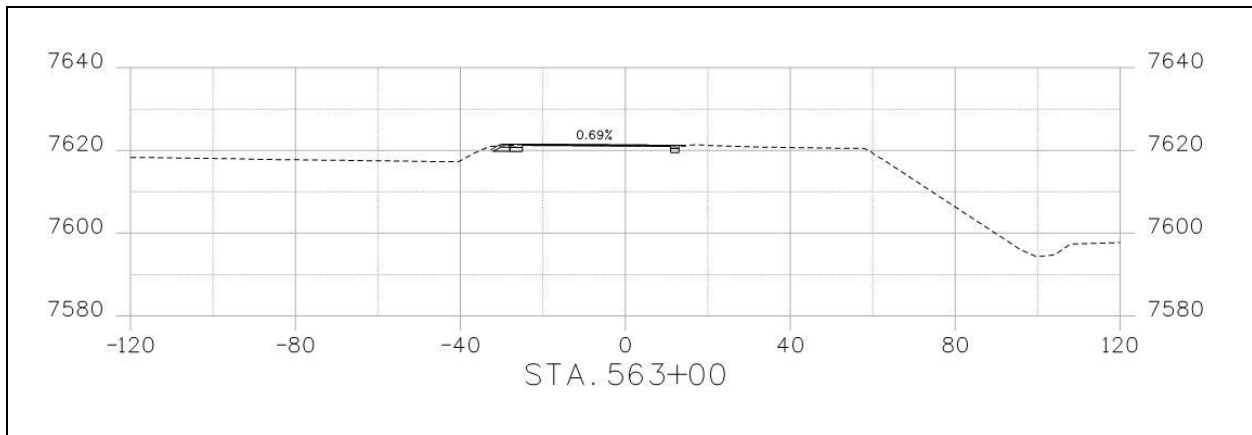


**Figure 6. Option 2 Typical Section—Widen toward Median (with Median Wall where Necessary)**



Source: HDR 2018.

**Figure 7. Option 3 Typical Section—Combination of Median Widening and Rockfall Mitigation**



Source: HDR 2018.

### 4.2.3 Process to Determine Selected Option

First, at the January 24, 2018, meeting, the TT identified site specific evaluation criteria to be used to evaluate the options (mineralized rock, aesthetic impacts, consistency with the interim solution, headlight glare, how much grassy median remains, construction impacts, recreational impacts and uncertainty related to the rock to be removed). At the February 14, 2018, meeting, a matrix and visualizations of the alignment options were presented to the TT for their consideration. The matrix was used to summarize the major advantages and disadvantages of the three options. A copy of this matrix is included in Appendix C of this document.



These options were again discussed at the April 10, 2018, Concept Plan Review meeting.

#### 4.2.4 Selected Option

The Proposed Action includes Option 2, widening primarily toward the median through this stretch of I-70 to avoid increasing the risk of rockfall hazards. The primary reason for recommending Option 2 is because this option is more consistent with the interim definition of the project, there is less visual, floodplain and historic property impacts, reduced risk of rockfall hazards, and less impact to the traveling public and recreational visitors during construction. Additionally, the overall construction cost is less.

Median widening is not consistent with the *I-70 Mountain Corridor Aesthetics Guidance Design Criteria for Engineering* (CDOT 2018), and the locations included in the Proposed Action are subject to a *Median Shift Design Criteria Exception Request* (HDR 2018). This was provided to the TT for information in July 2018 and to the PLT for concurrence in August 2018, and is attached in this document as Appendix D. This design exception for Option 2 was endorsed by the PLT at a meeting on August 29, 2018.

#### 4.2.5 Rock Cuts and Mitigation

In areas where widening to the median is not feasible because of the EB lanes immediately adjacent to the WB lanes or an existing condition that was considered unsafe, five areas of rock cut or rock mitigation were analyzed under the assumption that the project would not increase rockfall hazard to the traveling public beyond what exists today. Rockfall mechanics and hazard potential are a function of rock structure (integrity), height, and slope angle.

Rockfall mitigation methods include:

- Rock face mesh
- Barrier at the roadway
- Fence at the roadway
- Combination of mesh, barrier, and/or fence
- Buttrressing

Five areas of rockfall mitigation or rock cut were considered to accommodate the Proposed Action.

#### Milepost 239—Rockfall Stabilization

Because of the restricted width at the median, and in order to maintain an approximate 20-foot width for access to Hukill Gulch, a rock cut is required at MP 239 regardless of the horizontal alignment options at the WB I-70 Exit 239 on-ramp (Photo 1). This results in a rock cut approximately 1,000 linear feet long with a maximum height of 80 feet. The depth of the rock cut is dependent on the geology of the rock and constructability, and is estimated to be 20 feet deep.



**Photo 1. Exit 239 On-Ramp to Fall River Road**  
Source: Google Earth 2015.

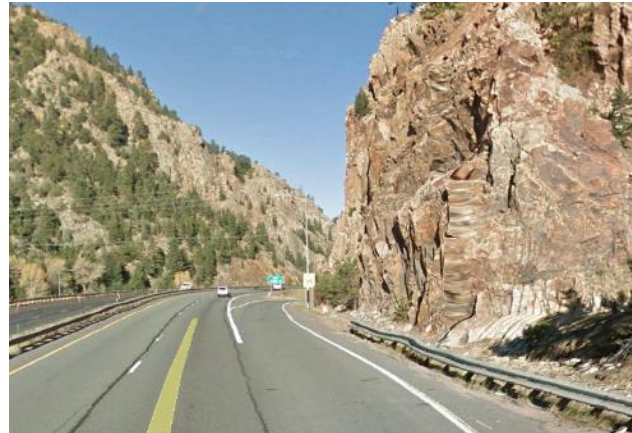
A Value Engineering workshop was conducted in June 2018, and one of the recommendations was to avoid the rock cut completely if feasible. These conclusions were reached:



- It was determined that the informal access to Hukill Gulch is not required. This access is within CDOT right-of-way and is technically not legal.
- Rockfall mitigation is needed. To accommodate the proposed improvements, the access road to/from Hukill Gulch is narrowed. The most constrained width is approximately 8 feet, reducing access for maintenance. Rockfall mitigation is required because the travel lanes move closer to the rock face. The mitigation most likely includes a barrier and meshing.

### Milepost 238—Rock Cut

A rock cut was considered at the WB I-70 Exit 238 off-ramp to Fall River Road at MP 238 (Photo 2). However, existing geologic conditions require removal of a large portion of the mountain, altering the viewshed. To avoid the potential rock cut on the off-ramp, the edge of the travel lane moves farther south away from the face of the rock, reducing rockfall hazard. The rock cut is recommended to be eliminated and no mitigation is required.



**Photo 2. Exit 238 Off-Ramp to Fall River Road**  
Source: Google Earth 2015.

### Milepost 238.4—Rockfall Stabilization

There is an overhanging slab that is 20 feet wide and 2 feet thick near MP 238.4, requiring a rock buttress (Photo 3). A rock buttress is a structure used to stabilize the face of the rock by providing a larger mass at the toe of the rock to create a counterforce that resists failure. The Proposed Action in this location includes a buttress covered by sculpted shotcrete. Sculpted shotcrete is a colored concrete shaped to match the natural geological features surrounding it.

Photo 4 shows an example of a buttress and sculpted shotcrete along the I-70 corridor.



**Photo 3. Rock Stabilization at MP 238.4**  
Source: Google Earth 2015.





**Photo 4. Example of Buttress and Sculpted Shotcrete on I-70 Corridor.**  
Source: Google Earth 2015.

### **MP 237.1—Rockfall Stabilization**

At this location, the existing rock is fractured, making it difficult to cut, and requires stabilization (Photo 5). The Proposed Action in this location includes using rock trimming, bolting and meshing, or small buttress to stabilize the existing rock face. The proposed mesh matches the color of the mesh already installed along the corridor.

### **MP 236.4—Rock Cut and Rockfall Stabilization**

The existing rock face at this location is shattered and weathered, increasing rockfall hazards (Photo 6). The Proposed Action in this location includes barrier and draped mesh to stabilize the rock face.



**Photo 5. Rock Stabilization at MP 237.1**  
Source: Google Earth 2015.



**Photo 6. Rock Cut and Stabilization at MP 236.4**  
Source: Google Earth 2015.





## 4.2.6 Process to Determine Selected Option

Using technical analysis, the design team presented the options discussed above to the TT at the meeting on July 11, 2018. The analysis methodology was described and analysis of different rock fall mitigation techniques was discussed. TT concerns included reducing aesthetic impacts and construction impacts due to rock cut blasting. The TT supported project team recommendations because they reduce construction and aesthetic impacts and reduce rockfall hazards for the traveling public.

## 4.2.7 Selected Option

The improvements identified above were included in the Proposed Action.

## 4.3 Barrier (Guardrail) Types

### 4.3.1 Introduction and Existing Conditions

Throughout the study area, there are several types of guardrail including Type 3, Type 4 with paddles, Type 7, and Type 10 bridge rail. In Focus Area 1, from the Veterans Memorial Tunnels through Idaho Springs, the guardrail generally consists of Type 4 with paddles on the inside and Type 3 on the outside. In Focus Area 2, the guardrail generally consists of Type 3 on the inside with some Type 3 on the outside. For Focus Area 3, the guardrail generally consists of Type 3 on the inside and some Type 3 on the outside. After the Downieville on-ramp, the guardrail on the inside transitions from Type 3 to Type 7 with glare screen.

On the EB PPSL project, new, unpainted steel guardrail was replaced in stretches, interspersed with the existing brown guardrail, resulting in visual inconsistency throughout the corridor.

### 4.3.2 Options Evaluated

Three types of guardrail were considered for barrier replacement:

- Type 3 (Figure 8 and Photo 7)
- Type 9 (formerly Type 7; Figure 9 and Photo 8)
- Type 9 with Glare Screen (formerly Type 7 with glare screen; Figure 10 and Photo 9)
- Type 10 (Figure 11 and Photo 10).

In July 2018, CDOT issued a new detail for Type 9 barrier rail that replaces the previously used Type 7 concrete barrier rail detail. All of the Type 7 barrier rail presented in figures, plans, and meetings prior to July 2018 were changed to the new Type 9 barrier rail. The Type 9 barrier is 2 inches taller than the Type 7 barrier (36 inches versus 34 inches) and has a flat, sloped face instead of a curved sloped face.

Figure 8. Type 3 Guardrail Typical Section

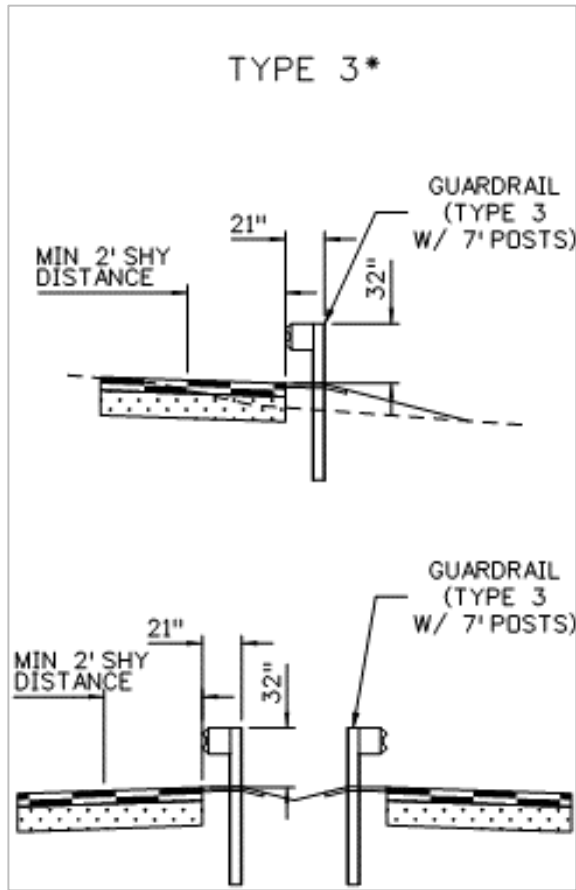
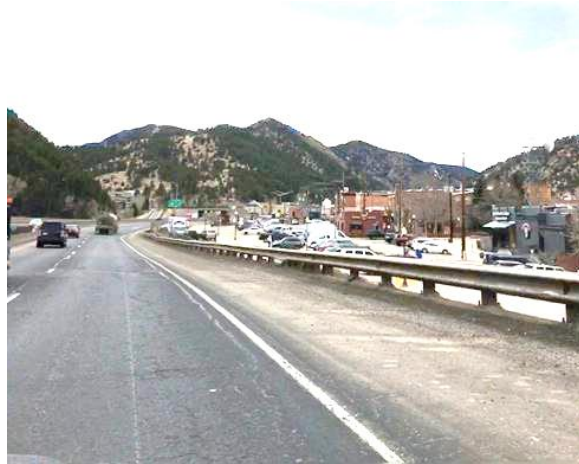
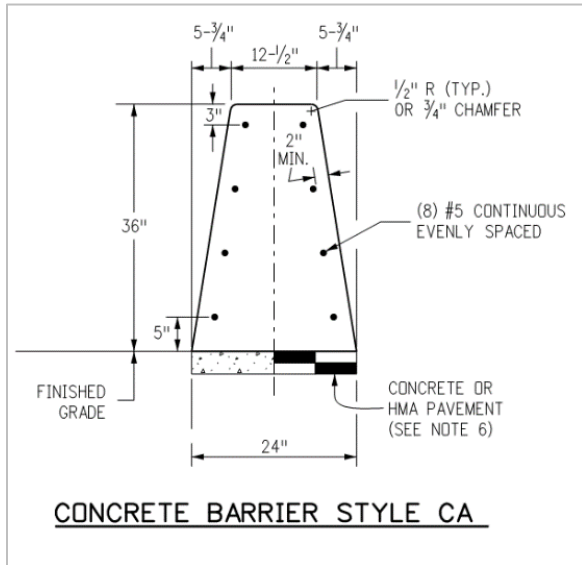


Photo 7. Example of a Type 3 Guardrail

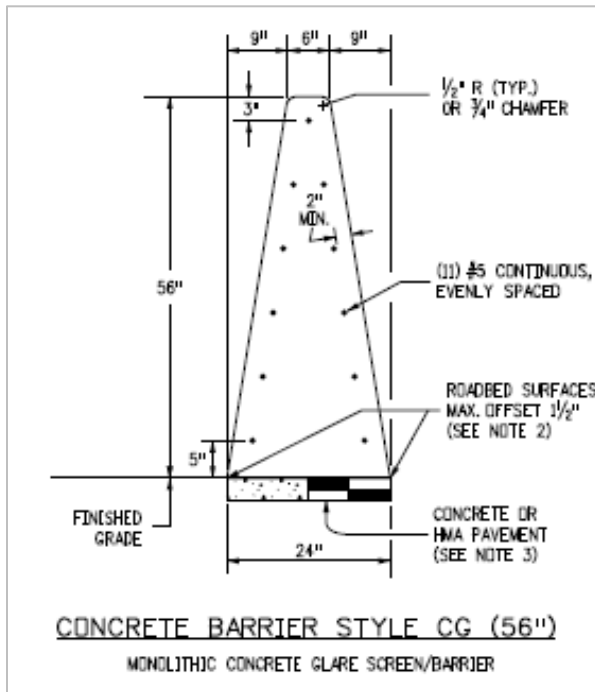


**Figure 9. Type 9 Barrier (formerly Type 7)**



S

**Figure 10. Type 9 Barrier with Glare Screen**



**Photo 8. Example of a Type 7 barrier (to be replaced by Type 9 barrier)**



**Photo 9. Example of a Type 7 barrier with glare screen (to be replaced by Type 9 Barrier with glare screen)**



Figure 11. Type 10 Barrier Rail

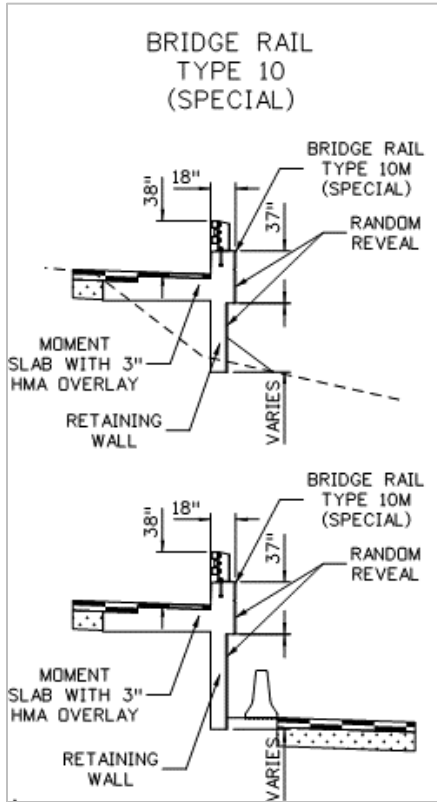


Photo 10. Example of Type 10 Barrier Rail



A Type 9 barrier is a reinforced concrete barrier with a sloped front face. A decorative texture, such as "Random Reveal," can be added to the backside of the Type 9 barrier. The Type 9 barrier is compliant with the American Association of State Highway and Transportation Officials (AASHTO) *Manual for Assessing Safety Hardware* (MASH) (AASHTO 2016) per FHWA requirements. For areas where lights from oncoming traffic could present a safety concern, a glare screen is added to the Type 9 barrier. The concrete glare screen increases the height of the barrier by 20 inches.

A Type 10 barrier is composed of two continuous horizontal steel tubes attached to steel posts. The posts are attached to a concrete anchor slab. The height of this barrier on top of the concrete is 38 inches.

#### 4.3.3 Process to Determine Selected Option by Location

Barrier types were contextually analyzed on a location-by-location basis to balance aesthetics and incidental noise reduction benefits. Other considerations used to evaluate barrier type include hydraulics, maintenance, and snow removal requirements. To improve durability, the use of weathering steel is discouraged.

The type of barrier used in each of the focus areas was presented to the TT and other stakeholders for discussion.



### Focus Area 1

A series of photo renderings showing the three barrier types at four locations in Idaho Springs were presented at the March 28, 2018, Idaho Springs ITF meeting (Figure 12). This information was also provided at the April 10, 2018, ITF meeting and the Concept Plan Review meeting with the TT also held on April 10. Subsequently, a community meeting was held in Idaho Springs on June 4, 2018.

At these meetings, there was extensive discussion regarding application of consistent barrier type to address aesthetics, visual impact, and the incidental noise reduction benefit associated with Type 9 barrier with glare screen. Participants were also concerned about the potential of a higher barrier to block key views of historic buildings such as the Argo Mine and Mill. The renderings prepared illustrated that these views would not be blocked with the Type 7 barrier (now referred to as Type 9 barrier), including the glare screen.

The majority of the participants indicated a preference for the Type 7 barrier (now referred to as Type 9 barrier) with glare screen to be installed for the entire length of Idaho Springs for visual consistency and incidental noise reduction benefits because there are residential land uses throughout the length of Idaho Springs.

As a result, the selected barrier option for Focus Area 1 is Type 9 with glare screen.

### Focus Area 2

Renderings depicting various barrier options for median walls were presented to the TT at the Concept Plan Review meeting on April 10 and on May 23, 2018. This area of the corridor has a split vertical profile, meaning the EB lanes are lower than the WB lanes. Concerns were expressed about visual impacts and headlight glare from opposing traffic in the WB lanes affecting travelers in the EB lanes. Type 9 or Type 10 barrier were evaluated for this Focus Area. Differences in visual impact between the two options are minimal, and the concern of the “strobe” effect with the use of Type 10 barrier resulted in the selection of Type 9 barrier for the median in Focus Area 2.

### Focus Area 3

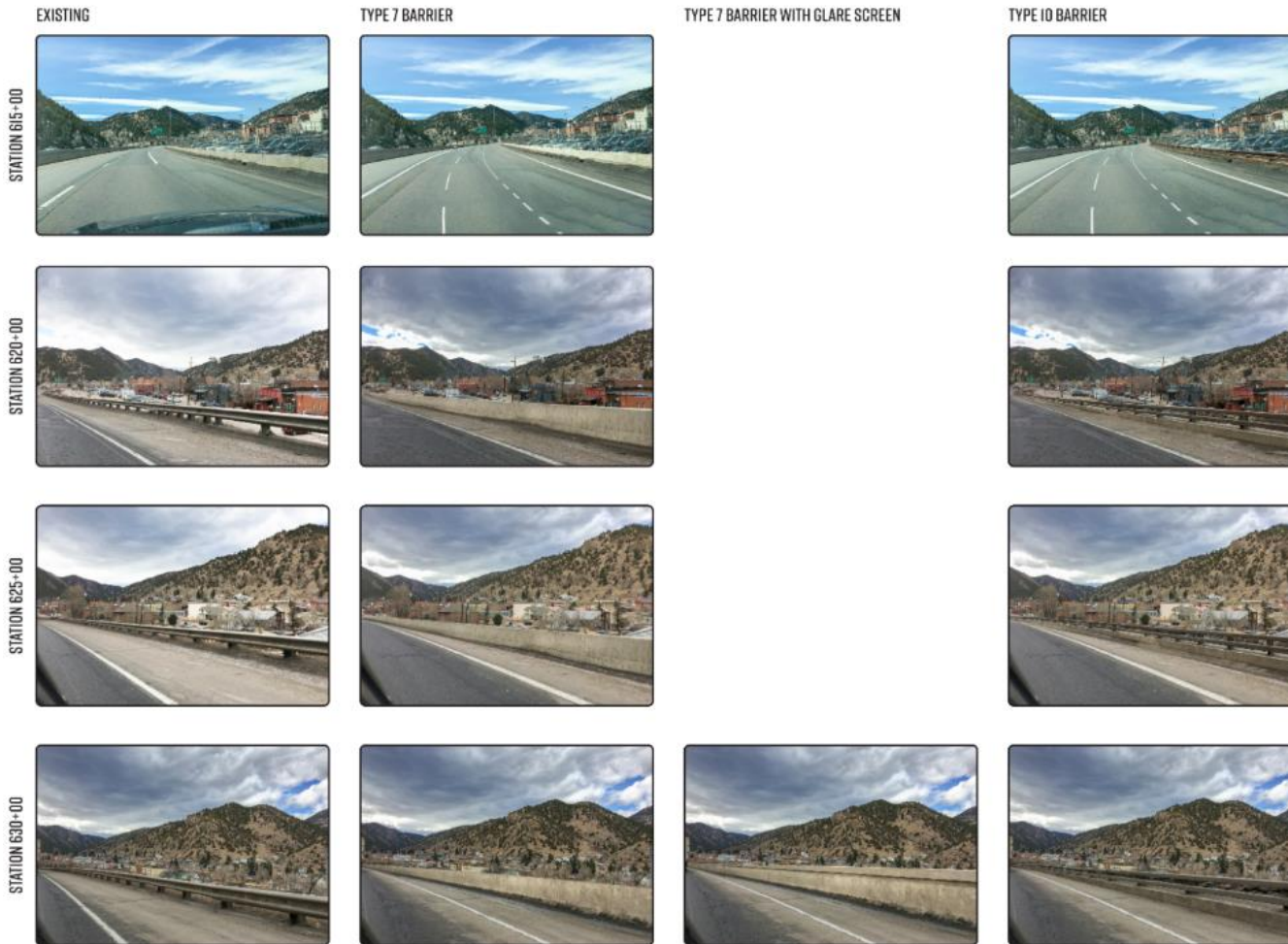
High-level discussions about barrier options for Focus Area 3 were held with the TT at the April 10 and May 23, 2018, meetings. Impacts to existing barrier in this area are mainly to the outside Type 3 barrier. The selected option for Focus Area 3 is to replace in-kind with Type 3 barrier.





Figure 12. Renderings of Barrier Options in Idaho Springs (Type 7 (now Type 9))

WESTBOUND PPSL SHOULDER RENDERINGS



Source: THK 2018.

Note: Type 7 barrier to be replaced by Type 9 barrier.



#### 4.3.4 Selected Option

The selected option for Focus Area 1 is Type 9 with glare screen. For Focus Area 2, the selected option is Type 9 (for the median wall.) For Focus Area 3, the selected option is Type 3 barrier.

#### Type 3 and Type 4 with Paddles Barrier throughout the Corridor

Over the course of several TT meetings, there was discussion regarding the “hodgepodge” of barrier types throughout the corridor, and what was installed as part of EB PPSL. Cost estimates completed as part of the evaluation were presented to the TT during the August 8, 2018, meeting. The estimates presented were:

- For barrier that was impacted by the project: 55,100 LF/\$3.5 million
- For remaining WB barrier (inside and outside): 10,800 LF/\$440,000
- For median Type 4 with glare screen: 22,400 LF/\$3.2 million

After this was presented, CDOT and FHWA made the decision to replace all Type 3 barriers on the outside shoulder with new Type 3 barriers, and to replace all Type 4 barriers with paddles through Idaho Springs with Type 9 barriers with glare screen.

### 4.4 Signage

#### 4.4.1 Introduction and Existing Conditions

Currently in the corridor, there are 197 signs totaling 4,615 square feet. Approximately 2,900 square feet of signs were added for EB PPSL. To increase peak capacity and smooth traffic flows in the EB PPSL, CDOT uses Advanced Traffic Management (ATM), including variable speed limits, variable tolls, ramp metering, and use of variable message signs (VMS) to control access to the shoulder lane during peak periods. ATM is also used to close the WB PPSL to traffic in case of an accident so that emergency response vehicles could use the lane. ATM is used during non-peak periods to educate the driving public about the WB PPSL, and to increase the amount of information available to the driver at all times. Stakeholders, including emergency response personnel, agreed that the use of ATM enhances safety in the WB PPSL corridor.

#### 4.4.2 Options Evaluated

The project team evaluated the use of static and dynamic signs. Only some of the signs would be lighted.

#### 4.4.3 Process to Determine Selected Option and Selected Option

Stakeholders expressed a strong desire to minimize the number of signs in the WB PPSL corridor, and especially to minimize additional lighted signs in a relatively dark part of the I-70 Mountain Corridor. The WB PPSL is in use for only a small percentage of overall hours. Residents and users of the corridor prefer not to have large flashing signs present when the lane is not in use. Signage considerations include balancing between safety and the visual impacts to the character of the area.

Existing and proposed signs were presented in the 30% Field Inspection Review (FIR) plans shown to the Technical Team on August 8, 2018, and shown to the PLT on August 29, 2018. The stakeholders agreed with the information presented.



#### 4.4.4 Selected Option

The minimum number of signs needed to meet FHWA safety requirements are used. Use of overhead VMSs minimizes the visual impact of signage in the PPSL corridor and assists with ATM. Static signs are also used to help facilitate traffic operations.

There are 45 proposed signs (static and dynamic) totaling 2,818 square feet. In addition, some of the existing static speed limit signs are being replaced with variable speed limit signs.

### 4.5 Location of Signs

#### 4.5.1 Introduction and Existing Conditions

With the addition of the WB PPSL, additional signs are needed. Currently, there are existing static and dynamic signs on sign structures in the EB direction.

#### 4.5.2 Options Evaluated

Where appropriate, the new signs are considered in the same location as the existing EB PPSL signs. This is to minimize the aesthetic effect to viewsheds. Signs in the wide median locations require a longer arm to be visible from the WB PPSL, and co-location can result in more visual/aesthetic impacts than constructing separate signs.

Each sign is considered individually, and 10 sites are determined where WB PPSL signs can be co-located with EB PPSL signs.

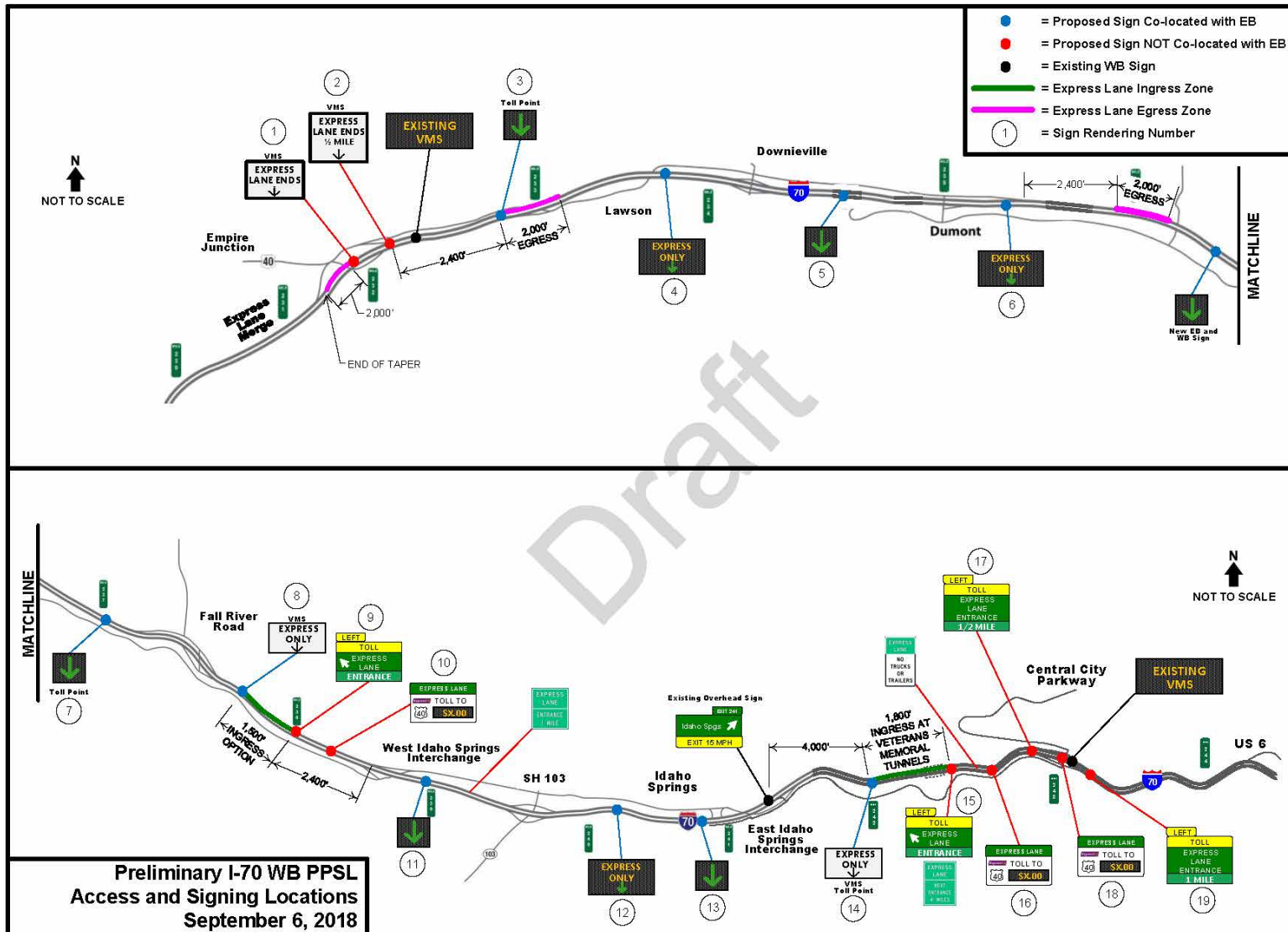
Sites where signs can be co-located were identified, and two options were evaluated: co-locating signs on the same foundation as the existing EB PPSL signs with a new sign structure, or constructing a new foundation and sign structure in the same vicinity of the co-located EB PPSL signs. Co-location of signs on the same foundation is considered individually at each location. Signs in the median concrete barrier are the best candidates for co-location on the same foundation.

#### 4.5.3 Process to Determine Selected Option and Selected Option

Because the signs in the corridor have a number of different types of foundations, each sign is evaluated structurally on an individual basis to determine if the foundation can handle the load of two signs. Existing VMSs are the best candidates to be co-located with proposed "Arrow/X" signs. The proposed signs and their locations are depicted in Figure 13.



Figure 13. Preliminary Access and Signing Locations



Source: APEX 2018.



Table 1 lists locations of signs that are determined feasible for co-location and whether the same foundation can be used.

**Table 1. Proposed Co-located Signs**

Sign Type	Location	Median Type	Ability to use Same Foundation?	Reason if Separate Foundation is Required
Arrow/X"	Egress (between MP 232 and 233)	Grass	YES	
VMS	Lawson (between MP 233 and 234)	Concrete Barrier	NO	Small existing foundation with "Arrow/X" sign
"Arrow/X"	Downieville (between MP 234 and 235)	Grass	YES	
VMS	Dumont (between MP 235 and 236)	Grass	NO	Grade difference between EB and WB
"Arrow/X"	MP 237	Grass	NO	Grade difference between EB and WB
VMS	Optional ingress (near MP 238)	Grass	NO	Grade difference between EB and WB
"Arrow/X"	MP 239	Concrete Barrier	YES	
VMS	Idaho Springs (between MP 240 and 241)	Concrete Barrier	NO	Two VMSs on existing foundation
"Arrow/X"	Idaho Springs (between MP 240 and 241)	Concrete Barrier	YES	
VMS	Veterans Memorial Tunnel ingress (MP 242)	Grass	NO	Grade difference between EB and WB

VMS = variable message sign; MP = milepost; EB = eastbound; WB = westbound

#### 4.5.4 Selected Option

A total of 10 signs are determined feasible for co-location, 6 of which are appropriate to co-locate on the same foundation because of their size (all smaller "Arrow/X" signs) and the similar grade difference between EB I-70 and WB I-70 at those individual locations.

### 4.6 Design of Sign Posts

#### 4.6.1 Introduction and Existing Conditions

Currently, EB overhead signs consist of curved monotube sign structures.

#### 4.6.2 Options Evaluated

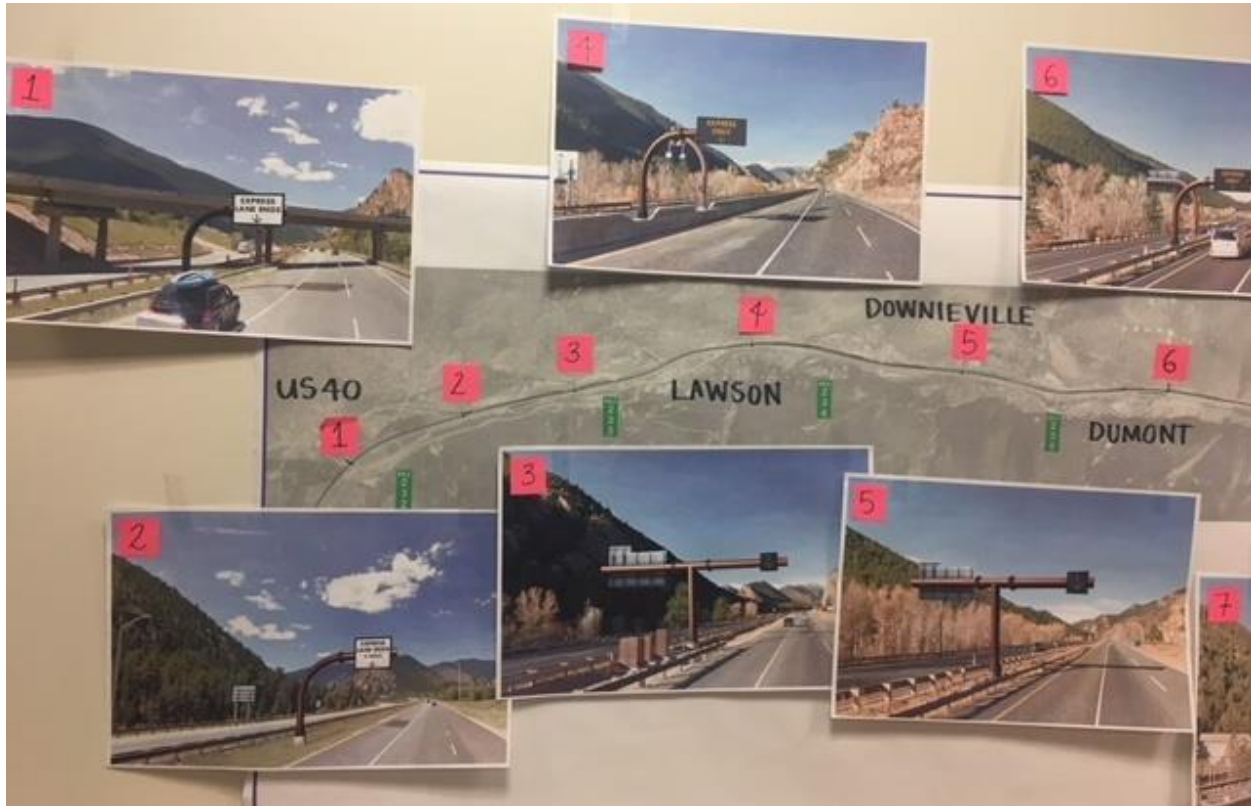
The options evaluated are to continue to use the curved monotube sign structures similar to EB PPSL, or to change out the structure to a T-shape to allow for EB and WB signs to be on the same structure where feasible.



### 4.6.3 Process to Determine Selected Option

Renderings were developed and presented at the March 14, 2018, TT meeting. The TT reviewed renderings for two types of sign posts (T-shaped and curved monotube) for the proposed co-located signs (Figure 14). The TT preferred the monotube because it would reduce visual clutter.

Figure 14. Options for Sign Posts



Source: THK and HDR, March 14, 2018, TT meeting.

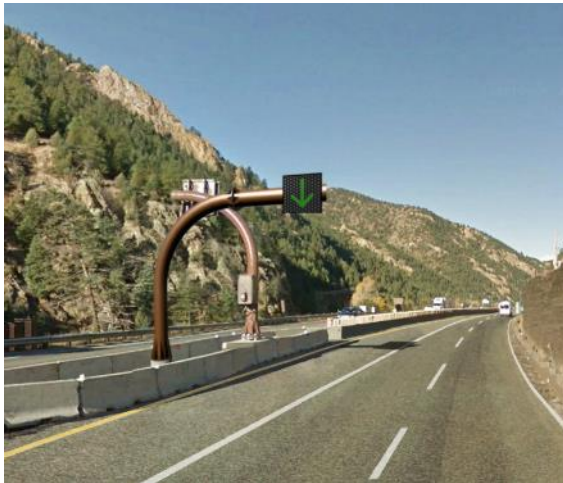
### 4.6.4 Selected Option

The TT agreed to use the existing curved monotube sign post design (Photo 11) over the T-shaped sign post design (Photo 12) for the co-located signs.

## 4.7 Ingress into Peak Period Shoulder Lane

### 4.7.1 Introduction and Existing Conditions

With the introduction of the WB PPSL, options for ingress locations needed to be developed and evaluated, based on analysis of WB PPSL operations and safety.



**Photo 11. Single Curved Monotube Sign Posts**  
Source: THK 2018.



**Photo 12. Co-located T-shaped Sign Post**  
Source: THK 2018.

#### 4.7.2 Options Evaluated

Apex Design modeled several scenarios to optimize the beginning and interim locations for access into (ingress) the WB PPSL. A detailed analysis of these options can be found in the *I-70 Westbound PPSL Entry and Exit Location Analysis Memo* (Apex Design 2018; Appendix E).

Two options were developed and analyzed for ingress (access) into the WB PPSL lane. The Single-Point Access Option provides ingress near the east side of Idaho Springs. Drivers are able to enter the WB PPSL near the Veterans Memorial Tunnels.

The Intermediate Access Option provides an intermediate access point on the west side of Idaho Springs.

**Single-Point Access Option.** Two locations were considered to determine the initial entrance point based on future widening of I-70 at Floyd Hill. The widening at Floyd Hill is expected to commence after the construction of the WB PPSL. The condition with and without the Floyd Hill widening was modeled to determine the location of the ingress. The existing entrance location without the Floyd Hill widening is just east of the Veterans Memorial Tunnels. The proposed entrance location with the Floyd Hill widening is in East Idaho Springs near Exit 241.

**Intermediate Access Option.** A second entrance at an intermediate point at the west end of Idaho Springs was evaluated in the event drivers missed the WB PPSL entrance at the Veterans Memorial Tunnels, if they are starting in Idaho Springs, or if they are stopping in Idaho Springs prior to continuing through the corridor.

#### 4.7.3 Process to Determine Selected Option and Selected Option

Operations analysis was performed for all three options to determine the best location for ingress. This was initially presented at the TT meeting on March 14, 2018. It was presented again at the TT meeting on August 8, 2018. It was also reflected in the 30% FIR plans submittal on June 1, 2018.



#### 4.7.4 Selected Option

Based on operations evaluation, the Proposed Action incorporates the option of locating the WB PPSL ingress just east of the Veterans Memorial Tunnels. The ingress for WB PPSL is moved to approximately 1,000 feet east of the Exit 241 off-ramp gore point after the Floyd Hill widening is completed. After the Floyd Hill widening is completed, three existing signs from east of the tunnels will be relocated to the west of the tunnels on new sign foundations with new sign posts.

The selected ingress location just east of Veterans Memorial Tunnels limits the number of merge points, is the safest option, and requires the least amount of signage.

The Proposed Action also provides an intermediate ingress to the WB PPSL approximately 2,500 feet west of Exit 239 on the west side of Idaho Springs. This ingress point allows travelers leaving Idaho Springs to enter into the WB PPSL.

### 4.8 Egress from Peak Period Shoulder Lane

#### 4.8.1 Introduction and Existing Conditions

With the introduction of the WB PPSL, options for egress locations needed to be considered based on operation analysis.

#### 4.8.2 Options Evaluated

Three options were considered:

- Option 1—Approximately 2,400 feet east of the Exit 232 (US 40) off-ramp gore point.
- Option 2—Approximately 3,400 feet east of the Exit 232 (US 40) off-ramp gore point. This location is further upstream than Option 1 to minimize the impacts of traffic weaving over to the US 40 exit; however, it is located within a horizontal curve on I-70.
- Option 3—Approximately 5,400 feet east of the Exit 232 (US 40) off-ramp gore point. This location is far enough upstream to eliminate the weave; however, it is within the merge area of the Downieville on-ramp.

#### 4.8.3 Process to Determine Selected Option

Operations analysis was performed for all three options to determine the best location for egress. This was initially presented on at the TT meeting on March 14, 2018. It was presented again at the TT meeting on August 8, 2018. It was also reflected in the 30% FIR plans submittal on June 1, 2018.

#### 4.8.4 Selected Option

The recommended option provides an egress to US 40 located approximately 2,400 feet east of the Exit 232 (US 40) off-ramp gore point (Option 1). This location provides the best balance between traffic operations and increased safety for weaving vehicles.

A second intermediate egress point before Downieville for access to Downieville, Dumont, and Lawson was discussed at the TT meeting on August 8, 2018. Based on the analysis, adding an egress to the Downieville-Lawson-Dumont area imparts a minimal level of delay to the WB PPSL and the general purpose lanes. This egress point is also included in the Proposed Action.



## 4.9 Ramp Analysis

### 4.9.1 Introduction and Existing Conditions

There are seven interchanges located within the study area at:

- Colorado Boulevard (Exit 241)
- SH 103 (Exit 240)
- Colorado Boulevard (Exit 239)
- Fall River Road (Exit 238)
- Dumont/County Road (CR) 308 (Exit 235)
- Downieville/CR 308/Truck Weigh Station (Exit 234)
- US 40/Empire Junction (Exit 232)

Not all of the deceleration and acceleration ramp lengths at these interchanges meet current design standards; however, all are impacted to accommodate the WB PPSL (Table 2).

**Table 2. Existing Ramp Conditions**

Interchange	Off-Ramp Meets Standards?	On-Ramp Meets Standards?
Colorado Boulevard (Exit 241)	Yes	No
SH 103 (Exit 240)	Yes	No
Colorado Boulevard (Exit 239)	No	No
Fall River Road (Exit 238)	Yes	Yes
Dumont/CR 308 (Exit 235)	Yes	N/A
Downieville/CR 308 (Exit 234)	Yes	Yes
Weigh Station (Exit 234)	N/A	No
US 40/Empire Junction (Exit 232)	Yes	Yes

### 4.9.2 Options Evaluated

The entrance and exit ramp lengths at eight locations (but only seven interchanges since two occur at one interchange) were evaluated to determine if the existing ramps need to be modified to accommodate the WB PPSL, and if improvements can be made to either improve the existing condition or meet design standards. Modifications considered increasing ramp length and/or changing the ramp geometry.

### 4.9.3 Process to Determine Selected Option

To determine improvements for each ramp the following elements were evaluated:

- Existing ramp length
- Design standard ramp length

Feasible ramp length and the ability to minimize impacts from rock cuts to existing conditions. The existing bridges and structures also constrained the options.





#### 4.9.4 Selected Options

Table 3 lists the recommended options for the ramps that do not meet the minimum design criteria.

**Table 3. Recommended Options for Ramps Not Meeting Minimum Design Criteria**

Interchange	Ramp	Recommended Solution
Colorado Boulevard (Exit 241)	Off	No change
	On	Increase length
SH 103 (Exit 240)	Off	Increase length
	On	Combine into an auxiliary lane with off-ramp for Exit 239
Colorado Boulevard (Exit 239)	Off	Combine into an auxiliary lane with o-ramp for Exit 239
	On	Increase length
Fall River Road (Exit 238)	Off	Increase length
	On	No change
Dumont/CR 308 (Exit 235)	Off	No change
Downieville/CR 308 (Exit 234)	Off	No change
	On	Merge point is shortened by 1,300 linear feet to improve merging with the Port-of-Entry truck weigh station vehicles.
Weigh Station (Exit 234)	On	Increase length
US 40/Empire Junction (Exit 232)	Off	No change
	On	No change

This was presented to the stakeholders in the 30% FIR plans submittal and refined for the 90% plans submittal.

### 4.10 Improvements at Exit 240

#### 4.10.1 Drainage

The existing pavement on EB I-70 between Exit 241 and Exit 240 (SH 103) near MP 240 creates several drainage issues because of the current configuration of the roadway, including ponding on the roadway and inadequate drainage to the median inlets. Reconstruction of this area was considered to correct the vertical profile of EB I-70 and reduce the corresponding drainage issues. The design for the Proposed Action holds the southern edge constant and lowers the pavement up to 2 feet along the median, using a Type 9 median barrier between EB and WB I-70.

The Proposed Action includes pushing the WB I-70 lanes to the north and adding a wider median through this stretch to allow for inlets to be installed in the median shoulder. The Exit 240 EB I-70 on-ramp also is lengthened to provide refuge for cars entering the freeway without impacting Water Wheel Park. This



option requires restriping the parking lot to the north of I-70; however, it does not result in a reduction in the number of parking spaces.

The areas of pavement reconstruction along EB I-70 are shown as green shaded areas in Figure 15.

#### 4.10.2 Traffic Phasing

Reconstruction of this area is dependent on potential construction phasing scenarios that allow for the largest area to be reconstructed with the least impact to EB I-70 traffic operations. Six phasing options were considered and modeled:

- Maintain and shift two general purpose lanes and on-ramp acceleration lane to south of the reconstruction area.
- Maintain one general purpose lane and on-ramp acceleration lane to south of the reconstruction area.
- Split two general purpose lanes into one lane to the north and one lane to the south of the reconstruction area within the existing EB I-70 footprint.
- Split two general purpose lanes into one lane to the north and one lane to the south of the reconstruction area and shift north lane toward existing WB I-70 lanes.
- Close SH 103 EB I-70 on-ramp and maintain and shift two general purpose lanes to the south of reconstruction area into existing on-ramp footprint.
- Add temporary pavement to WB I-70 and shift all four lanes of WB and EB traffic to the WB side of I-70.

Splitting the general purpose lanes around the work zone requires significant advance signing. It also utilizes 16-foot lanes for potential emergency vehicle access, reducing the total area that can be reconstructed.

The Proposed Action likely requires a combination of the options above, including short-term ramp closures of the WB off-ramp and EB on-ramp and lane shifts. Two lanes in each direction are in this traffic phasing scenario.

#### 4.10.3 Sight Distance

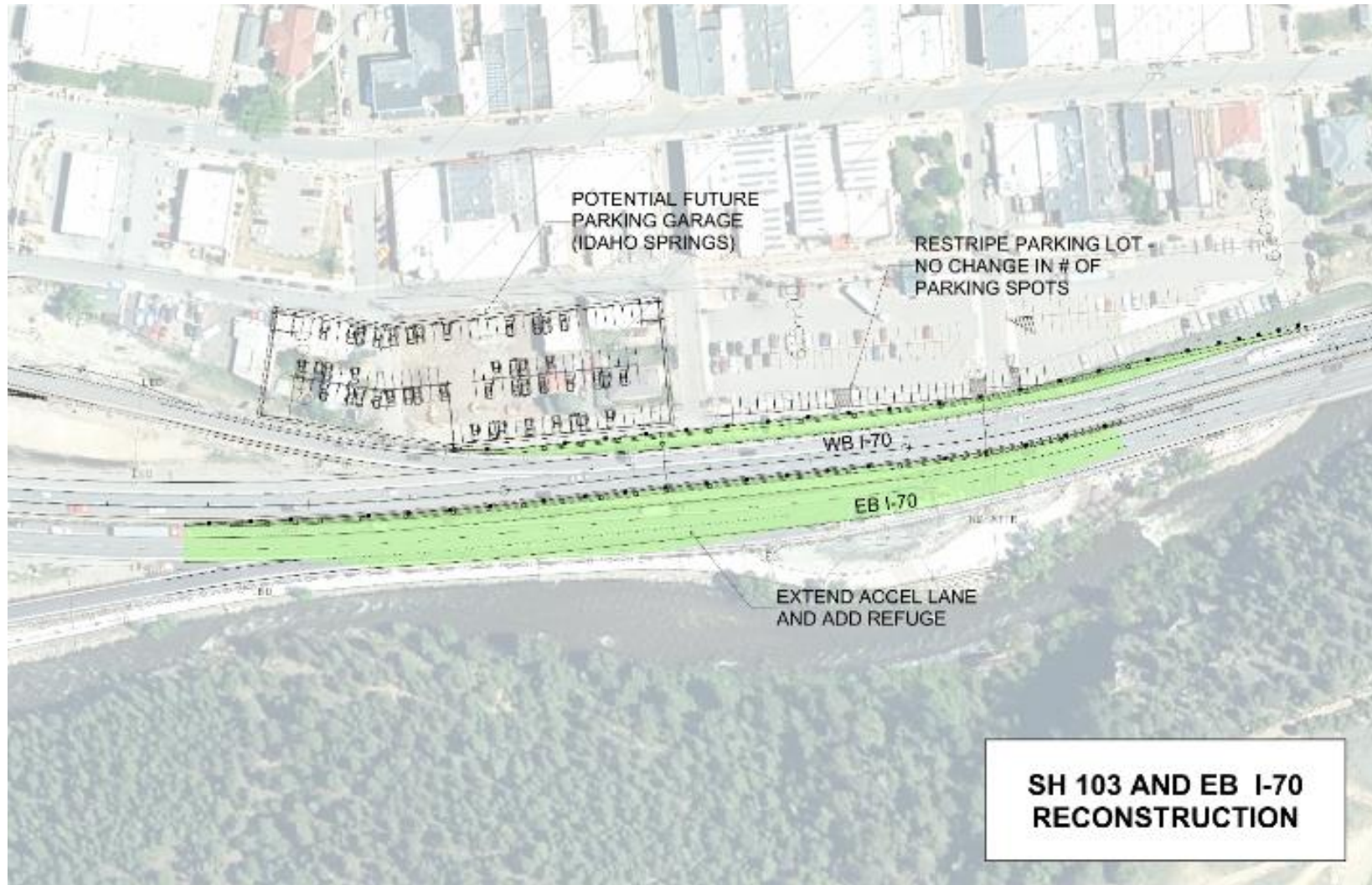
There are several sight distance concerns at the Exit 240 off-ramp.

On SH 103, both the EB I-70 and WB I-70 off-ramps have severe sight distance issues caused by a change during construction to the wall and barrier locations, as well as deviation in the striping from what was originally designed as part of the EB PPSL project. The barrier-mounted fence further reduces sight distance. Modification to the railing and walls was considered to address the sight distance concerns.

The Proposed Action incorporates the recommended option to modify the existing striping and build raised, mountable bulb outs at the intersections with the off-ramps. The striping on SH 103 is modified to create a smaller median/turn lane more consistent with standard striping (from 20 feet wide to 14 feet wide) to push the traffic to the east. This creates more sight distance for those exiting on the WB I-70 off-ramp, and also creates more of a buffer for pedestrians crossing the SH 103 bridge. The stop bars and crosswalk bars are moved further up the ramps to create additional sight distance.



Figure 15. EB I-70 Reconstruction



Source: HDR 2018

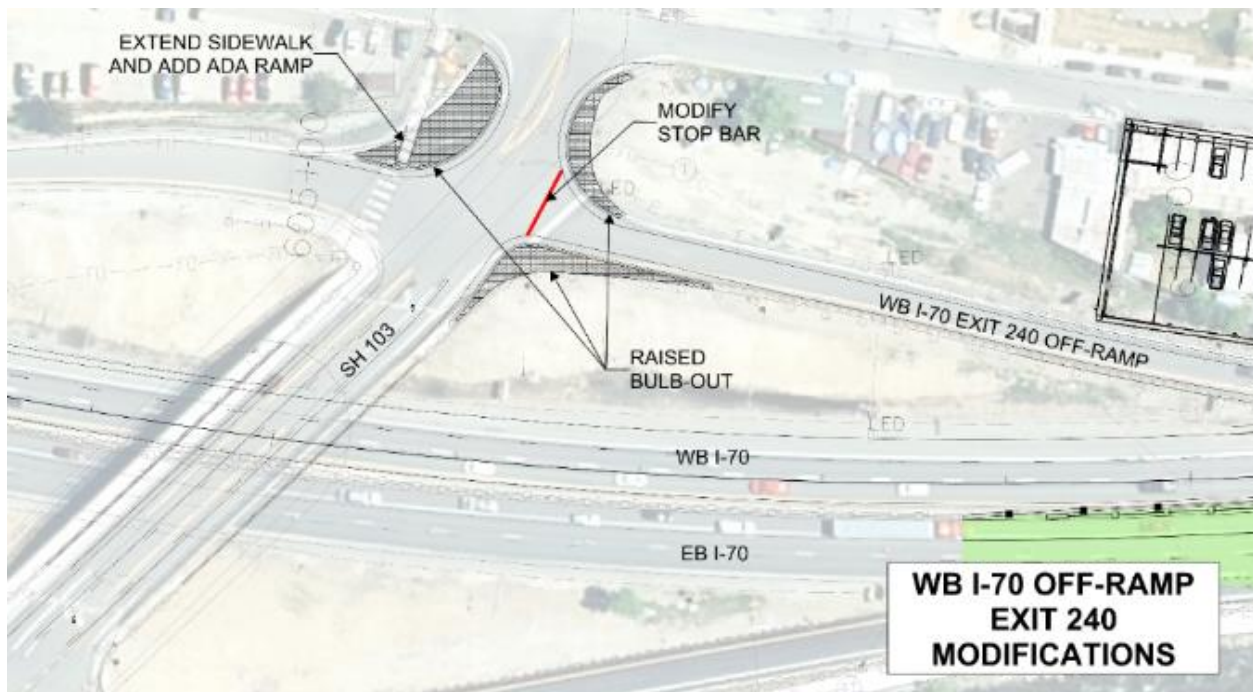


In addition to striping modifications, raised, mountable bulb outs are added to force traffic to stay within the modified striped areas. The bulb outs are mountable to allow trucks to make the same turning movements as the existing configuration. These bulb outs require extending the sidewalks and rebuilding curb ramps that are compliant with the Americans with Disabilities Act. The modified configuration of the off-ramp intersections provides additional pedestrian safety because the crossing distance is reduced.

Figure 16 and Figure 17 illustrate Exit 240 modifications at the WB I-70 and EB I-70 off-ramps, respectively.

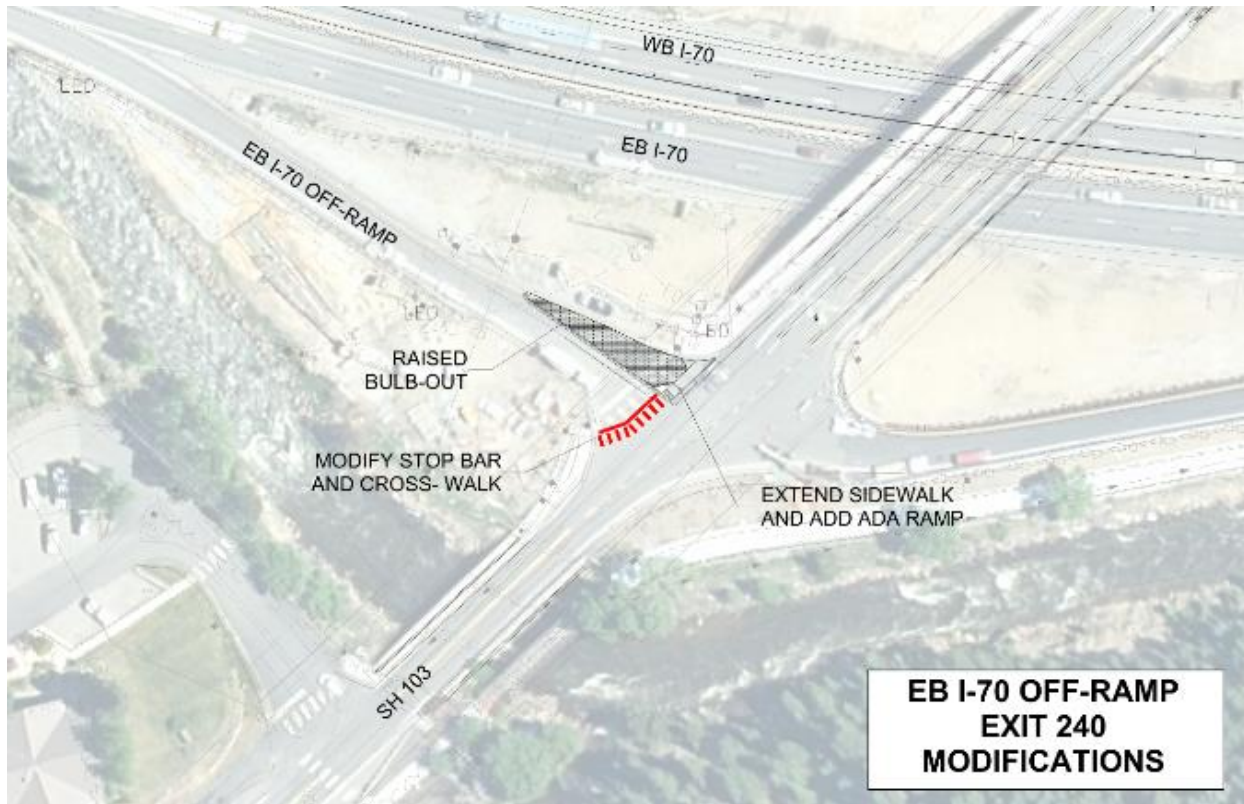
These were presented at the March 28, 2018, Focus Area 1 ITF meeting. It was refined and presented at the April 10, 2018, ITF meeting.

**Figure 16. Exit 240 Modifications at WB I-70 Off-Ramp**



Source: HDR 2018.

Figure 17. Exit 240 Modifications at EB I-70 Off-Ramp



Source: HDR 2018.

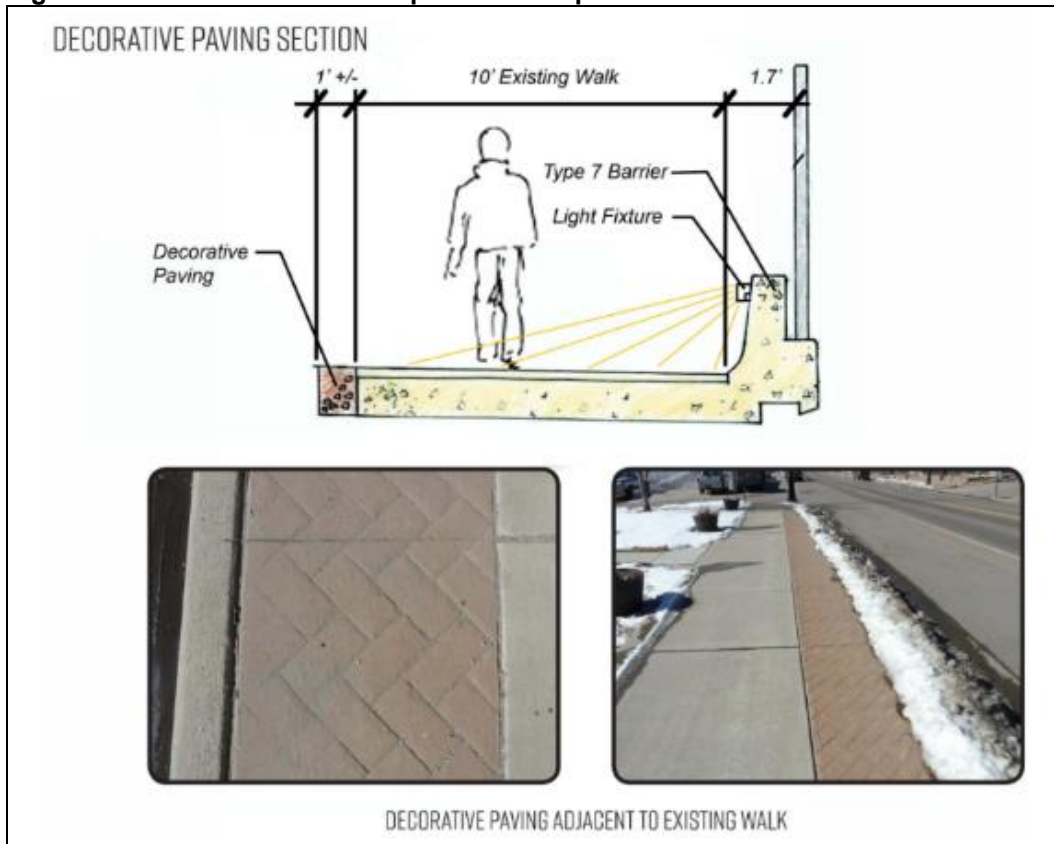
## 4.11 Pedestrian Improvements

At the request of the Idaho Springs ITF at the March 28, 2018, meeting, the design team considered adding minor pedestrian improvements to the existing Exit 240/SH 103 bridge. These improvements include barrier separation options of the existing sidewalk and pedestrian lighting to increase safety and pedestrian usability.

Concrete or decorative bollards between the sidewalk and travel lane were considered. However, the weight and consequential point loading on the bridge were determined to be excessive, potentially resulting in bridge collapse and caused the team to consider other options.

The Proposed Action includes a decorative stamped concrete buffer (12 inches in width) poured directly against the existing sidewalk (Figure 18). The existing curb-and-gutter is removed and rebuilt between the concrete buffer and the travel lane. The SH 103 bridge is restriped to improve sight distance and push traffic farther away from the sidewalk.

**Figure 18. SH 103 Pedestrian Improvement Options**



Source: THK 2018.

## 4.12 Improvements at Exit 241

### 4.12.1 Sight Distance

For the EB I-70 off-ramp at this exit, the sight distance at the top of the ramp is substandard due to the combination of the existing ramp geometrics and the bridge railing. The vehicles at the top of the ramp are stopped at a skew and further back on the ramp so drivers cannot see past the existing bridge railing.

### 4.12.2 Process to Determine Selected Option

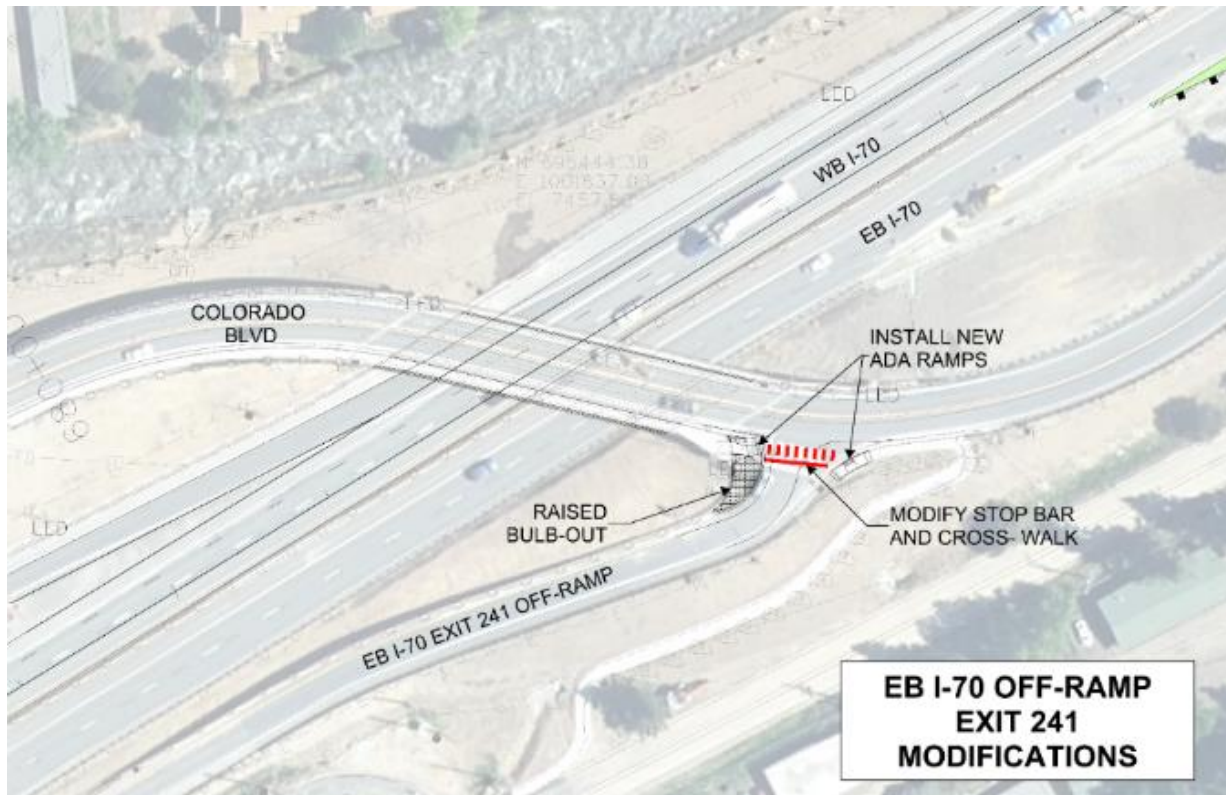
At the April 10, 2018, Focus Area 1 ITF meeting, improvements needed at Exit 241 were discussed, and the ITF and TT were both supportive of options that improve pedestrian safety.

### 4.12.3 Selected Option

The recommended options for the three off-ramps at Exit 241 are depicted in Figure 19.



Figure 19. Exit 241 Modifications at EB I-70 Off-Ramp



Source: HDR 2018.

## 4.13 Noise Wall Reset at Idaho Springs

### 4.13.1 Introduction and Existing Conditions

The existing pavement width on the west side of Idaho Springs is an average of 38 feet. There is an existing noise wall on the outside shoulder of WB I-70 that is on a right-hand horizontal curve. The existing Type 3 guardrail does not have sufficient room behind the guardrail (design standard is at least 3 feet) to meet current design standards. There is an approximately 10-foot outside shoulder in this area.

### 4.13.2 Options Evaluated

Three options were evaluated regarding the existing noise wall. The first considered constructing the WB PPSL without resetting the sound wall, which results in reduced sight distance, causing safety issues. The second was to reset a portion of the noise wall in a location that would also allow improved improve sight distance. The third option was to move the noise wall north far enough to fully meet the sight distance standards.

### 4.13.3 Process to Determine Selected Option and Selected Option

Because of the need to improve the sight distance, the three options were evaluated using safety, noise reduction benefits and impacts to Miner Street as evaluation criteria. These options were discussed in





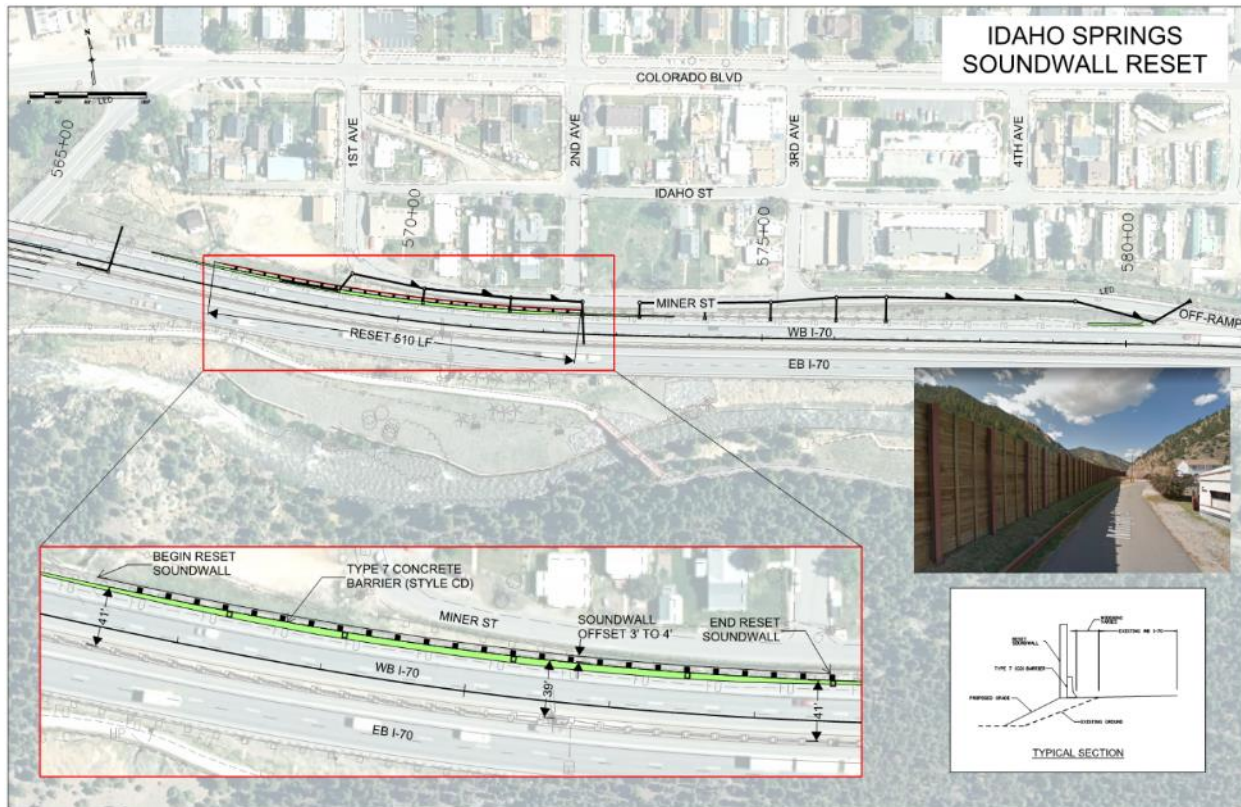
several TT meetings and input was sought through that mechanism. These options were also presented in the Concept Plans and the 30% FIR plans.

#### 4.13.4 Selected Option

The analysis resulted in a recommendation to reset the existing noise wall back 3 feet to 4 feet from its existing location for approximately a lineal distance of 500 feet (Figure 20). This accommodates the wider WB I-70 section needed to construct the WB PPSL, as well as provides better sight distance on the curve. The sight distance does not meet standard in this area. However, to achieve standards, the noise wall would need to be reset into Miner Street, resulting in substantial impacts to traffic on Miner Street and to driveway access to and from Miner Street.

The existing Type 3 guardrail is replaced with a concrete Type 9 barrier.

Figure 20. Noise Wall Reset at West End of Idaho Springs



Source: HDR 2018.

### 4.14 Water Quality Treatment

#### 4.14.1 Introduction and Existing Conditions

The project is within the area defined in the I-70 Clear Creek Corridor *Sediment Control Action Plan* (SCAP), dated September 2013. There are existing sediment basins and sediment inlets within the corridor as shown in Figure 18. This project does not fall within the CDOT Municipal Separate Storm Sewer System Boundary, and water quality treatment based on the Municipal Separate Storm Sewer System (MS4) permit is not required.



#### 4.14.2 Options Evaluated

The project team examined options for inlet traps and open sediment basins to address water quality. Opportunities to incorporate open sediment basins were explored. Potential locations for open sediment basins are identified based on locations of sediment basins in the SCAP, and the physical capability to grade a basin given the existing and proposed conditions. Visual aesthetics, wildlife concerns, and total treated area are also considered in the analysis.

The SCAP was initially reviewed and analyzed as a guideline of potential sediment control locations. The SCAP identifies inlet sediment traps, sediment basins, and tributary sediment basins as treatment measures. CDOT Maintenance has expressed that the inlet sediment traps that were installed as a part of the EB PPSL project are not maintained and should not be used on the WB PPSL project. It was also decided that the treatment locations focus on treating roadway runoff, rather than off-site runoff. A further analysis of SCAP-located inlet traps and sediment basins continued into the preliminary design phase. Existing conditions and roadway runoff patterns were evaluated to locate 10 sediment basin locations based on the above direction from CDOT.

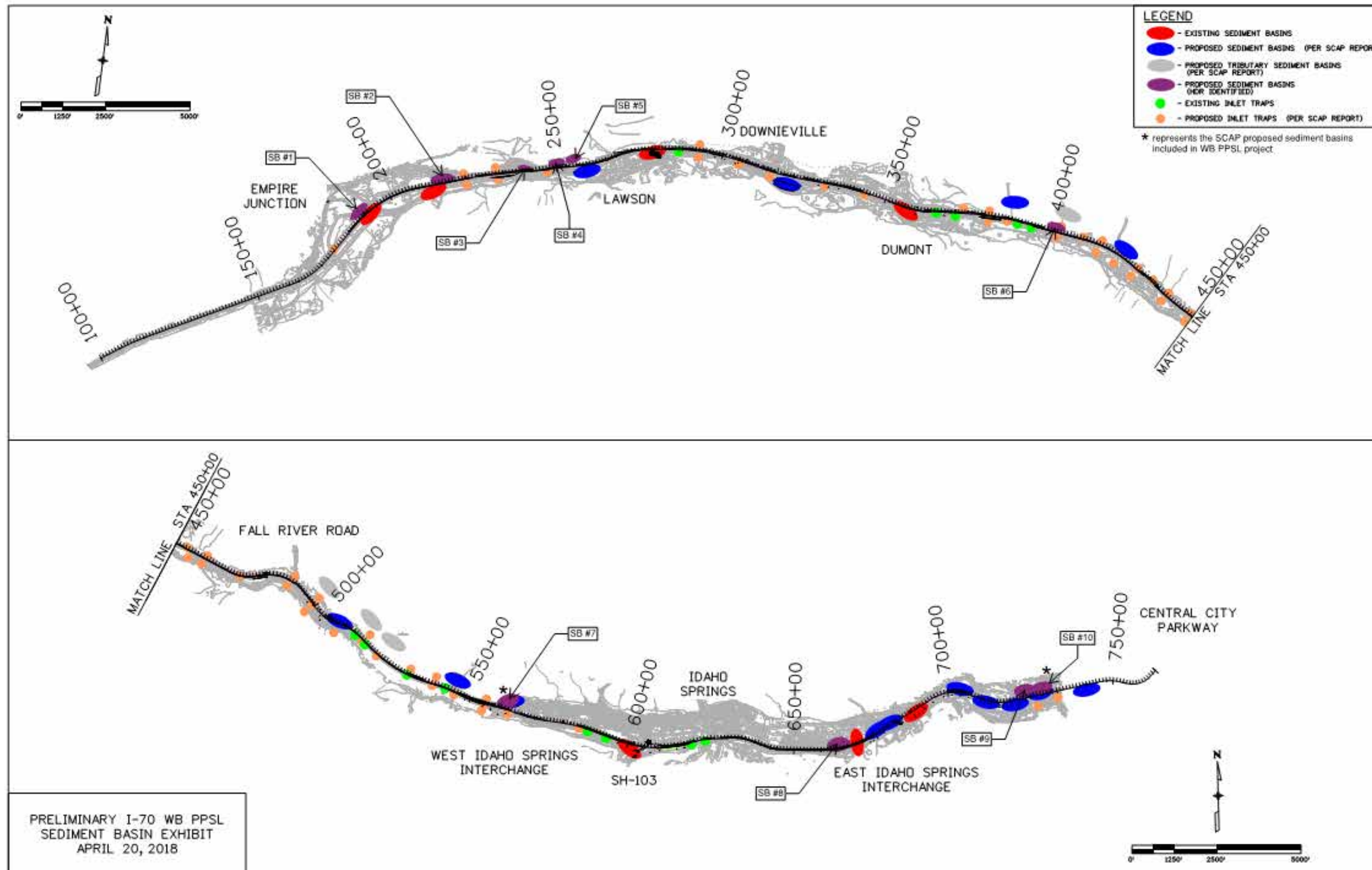
The project team team also looked at replacing the SCAP-proposed inlet traps with sediment basins because of maintenance concerns. Maintenance of inlet traps requires a vacuum truck, which is not effective at high altitudes and consistent clean-out is challenging.

HDR, in conjunction with CDOT Water Quality, Hydrology and Hydraulics, and Maintenance staff, recommended the following:

- Where feasible, proposed WB PPSL sediment basins are located in the areas identified in the SCAP. There are sediment basins identified in the SCAP that are not feasible as they are conceptually located in areas requiring significant rock cut to install, or where it is challenging to achieve positive drainage.
- Some WB PPSL sediment basins are proposed in lieu of the SCAP-proposed inlet traps.
- The remainder of the proposed sediment basins for the WB PPSL project are sited to maximize and/or balance runoff capture, natural drainage patterns, constructability, and long-term maintenance.
- The Proposed Tributary Sediment Basins (per SCAP report) that addressed off-site flow are not included as part of the WB PPSL project. The WB PPSL project is considered interim and off-site flows are addressed as part of the Maximum Program of Improvements in the ROD.
- Eliminated sediment basin if rock cut was required.

Below is a high-level explanation of the methodology and approach for each sediment basin for the Proposed Sediment Basins (HDR-identified). The proposed basins are depicted in Figure 21.

Figure 21. Preliminary Sediment Basin Exhibit



Source: HDR, 2018.



### 4.14.3 Process to Determine Selected Option

The process used to determine the selected option included:

- Initially, a presentation to the TT at the May 23, 2018 meeting, which discussed the SCAP contents and various options for water quality ponds. The TT at this meeting provided information on issues specific criteria to be used to evaluate water quality ponds and sediment basins, including aesthetic impacts, wildlife impacts and off-site major issue areas.
- A Water Quality ITF was convened to discuss the options. At this meeting, agreement was reached on the three sediment basins to be included in the Proposed Action. Analysis of the ten possible sediment basins is included below.

#### **Sediment Basin #1**

This sediment basin is located southwest of the US 40 bridge from the EB I-70 off-ramp at Exit 232 at approximately MP 231.6 (approximately Station 188+00). This basin is located at the end of a larger roadside ditch section where it is anticipated that grading can be completed to capture runoff from approximately 0.85 acre of pavement. Sediment Basin #1 is included in the Proposed Action because it provides water quality benefits with minimal impact to wildlife and corridor aesthetics.

#### **Sediment Basin #2**

This sediment basin is intended to replace the WB inlet trap identified in the SCAP at approximate Station 223+00. The grade of the road changes in superelevation just upstream of the SCAP-located inlet trap, which is not an effective location to treat roadway runoff. The basin is generally located in the gore point of the interchange, prior to the superelevation reversal in the roadway. This location provides space to grade a volume to treat the 0.39 acre of pavement runoff that drains to it. There is also space for installation and maintenance of the facility. Sediment Basin #2 was eliminated because of wildlife crossing and aesthetic concerns at this location.

#### **Sediment Basin #3**

This sediment basin is located at approximately MP 232.7 (approximately Station 240+00). The purpose of this basin is to replace the WB inlet trap identified in the SCAP at approximate Station 232+50. Where the inlet trap is identified, the space is constrained between I-70 and the frontage road. There is an understanding that this location has wildlife concerns. This sediment basin is generally located around Station 240+00 and would collect about 0.90 acres of pavement runoff plus any bypass flow from the upstream inlet. This one will be included in the Proposed Action, as it provides water quality benefit with minimal impact to wildlife and corridor aesthetics.

#### **Sediment Basin #4**

This sediment basin is located at approximately MP 232.9 (approximately Station 249+00), just upstream of an existing storm crossing under I-70. It captures runoff from about 0.70 acre of impervious area. Sediment Basin #4 is included in the Proposed Action because it provides water quality benefit with minimal impact to wildlife and corridor aesthetics.





### **Sediment Basin #5**

This sediment basin is generally located around Station 252+00. It collects approximately 0.15 acre of runoff from I-70. The basin design needs to be refined to understand the impact on the existing green open space. Sediment Basin #5 was eliminated because it would provide minimal treatment.

### **Sediment Basin #6**

This proposed sediment basin meets SCAP report recommendation for location. However, the type of best management practice was changed from an inlet trap to a sediment basin. The basin is approximately located at Station 401+00 and captures about 1.27 acre of pavement runoff. Sediment Basin #6 was eliminated because of visual impacts.

### **Sediment Basin #7**

This proposed sediment basin meets the SCAP report recommendation for location and type of best management practice. This basin is not located efficiently to capture runoff from I-70, and only 0.08 acre of pavement runoff is anticipated to drain to this basin. Sediment Basin #7 was eliminated because there is an existing basin in the area that does not capture large amounts of sediment, and also because of its close proximity to Big 5 Mine.

### **Sediment Basin #8**

This basin is located at approximately Station 664+00 and anticipated to capture approximately 0.53 acre of roadway runoff. Sediment Basin #8 was eliminated because of wildlife concerns and its close proximity to the sediment basin at Exit 241.

### **Sediment Basin #9**

This sediment basin is generally located at Station 726+00 and captures approximately 0.32 acre of pavement runoff. Sediment Basin #9 was eliminated because of wildlife concerns.

### **Sediment Basin #10**

This sediment basin is generally located at Station 728+00 and captures approximately 0.11 acre of pavement runoff. This proposed sediment basin meets SCAP report recommendation for location and type of best management practice. Sediment Basin #10 was eliminated because of wildlife concerns.

## **4.14.4 Selected Option**

Based on discussions with stakeholders and the TT, the Proposed Action incorporates three sediment basins: Sediment Basin #1, Sediment Basin #3, and Sediment Basin #4.

## **4.14.5 Other Water Quality Issues**

During the TT meetings, other water quality concerns were brought up that need to be addressed, including:

- The existing Lawson sediment basin does not operate because flows are blocked from entering the pond. It was determined through the Stream and Wetland Ecological Enhancement Program (SWEEP) ITF that the existing basin needs to be revised to address the deficient existing condition. To address the current deficiencies, the Lawson sediment basin is being completely redesigned.



- There are observed drainage issues at Fall River Road near Hoosac Gulch. The Proposed Action is to sawcut the existing pavement from the existing roadside inlet to the informal area. The roadside ditch is thus better defined and the informal parking area is re-graded to allow for ponding.

### 4.15 Safety Toolbox

A safety toolbox was developed by the project team and discussed with the TT in several meetings. Various options to improve safety were identified. These 17 safety measures considered during the design process are listed in Table 4.

Evaluation criteria used to evaluate their inclusion in the Proposed Action included consistency with corridor context (for instance, heavily lighting the area would not be consistent with the residential use and use by wildlife), consistency with the definition of the project as interim, and consistency with the type of improvement allowed in the ROD.

Table 4 includes the results of the analysis of these options. When an element of the safety toolbox is recommended for inclusion, a check mark indicates the particular focus area where it is implemented. When a safety toolbox element was considered but determined to not respond to the evaluation criteria listed above, an “X” is placed in the table.

The focus areas are described as follows and shown in the figures in Appendix A of this document:

- Focus Area 1—Idaho Springs (from Veterans Memorial Tunnels to Exit 239)
- Focus Area 2—From Exit 239 to Dumont
- Focus Area 3—West of Dumont, including Empire Junction, Lawson, and Downieville

**Table 4: Safety Toolbox Implementation**

Measure	Focus Area 1	Focus Area 2	Focus Area 3
Lane width (to standards)	✓	✓	✓
Outside shoulder width (to standards)	X	X	X
Inside shoulder/shy width (to standards)	X	✓	✓
Lighting	✓	X	X
Pull-outs	✓	✓	✓
Rumble strips	✓	✓	✓
Clear zones/unpaved hardened shoulder	X	X	X
ITS: VMS, DSRC, ramp meters	✓	✓	✓
Acceleration and deceleration lengths	✓	✓	✓
Ramp terminal design	✓	✓	✓
Vehicle/wildlife collision mitigation	X	✓	✓
Signage	✓	✓	✓
Variable speed limits	X	X	X
Enforcement—speed and lane violation	✓	✓	✓



**Table 4: Safety Toolbox Implementation**

Measure	Focus Area 1	Focus Area 2	Focus Area 3
Education	✓	✓	✓
Winter operations	✓	✓	✓
Speed harmonization	X	X	X

ITS = Intelligent Transportation System

VMS = variable message sign

DSRC = dedicated short-range communications

### 4.16 Alignment Shift

Two options in Focus Area 1 were developed in the vicinity of MP 241 to 240, near Soda Creek Road. One option was to widen toward the north, which requires building a new retaining wall to replace the existing bin wall. The second option was to shift both the WB and the EB lanes to the south, to avoid impacting the existing bin wall and the slope below it.

The process used to evaluate these options included gathering underground geotechnical information regarding the stability of the earthen slope below the existing bin wall. This geotechnical information indicated that the slope is very unstable and if disturbed, could result in property damage below the bin wall. This information was presented to the TT at the September 12, 2018, meeting. Their only concern was to avoid cutting into the rock face adjacent to the EB lanes.

The selected option is to shift both the WB and EB lanes to the south to avoid impacting the unstable slope to the north of I-70. Even though the existing barrier along the shoulder in the location would not need to be disturbed, the decision was also made to replace it with a Type 9 barrier and glare screen, so it is consistent with the other barrier in Focus Area 1. Rockfall mitigation is required and consists of barrier and mesh.

### 4.17 Pavement Width between Exit 240 and Exit 239

Two options were evaluated in Focus Area 1 to relative to the width of pavement between Exit 240 and Exit 239. One option was to include the acceleration lane from Exit 240, end it around MP 239.3 and have a 300-foot section where the pavement is not widened before the deceleration lane for Exit 239 begins.

The second option is to connect these two lanes into an auxiliary lane that connects Exit 240 to Exit 239.

The process used to evaluate these options included discussions with the TT at the September 12, 2018, meeting. The TT was supportive of the auxiliary lane because of improved safety, but was also concerned about possible effect to a historic archaeological site thought to be in this area. After discussions that no excavation is needed, which could affect archaeological or historic archaeological properties, the TT concurred with this option.



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## Section 5. References

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Appendix A.

## Focus Areas



# FOCUS AREA 1 — IDAHO SPRINGS



as of September 13, 2018

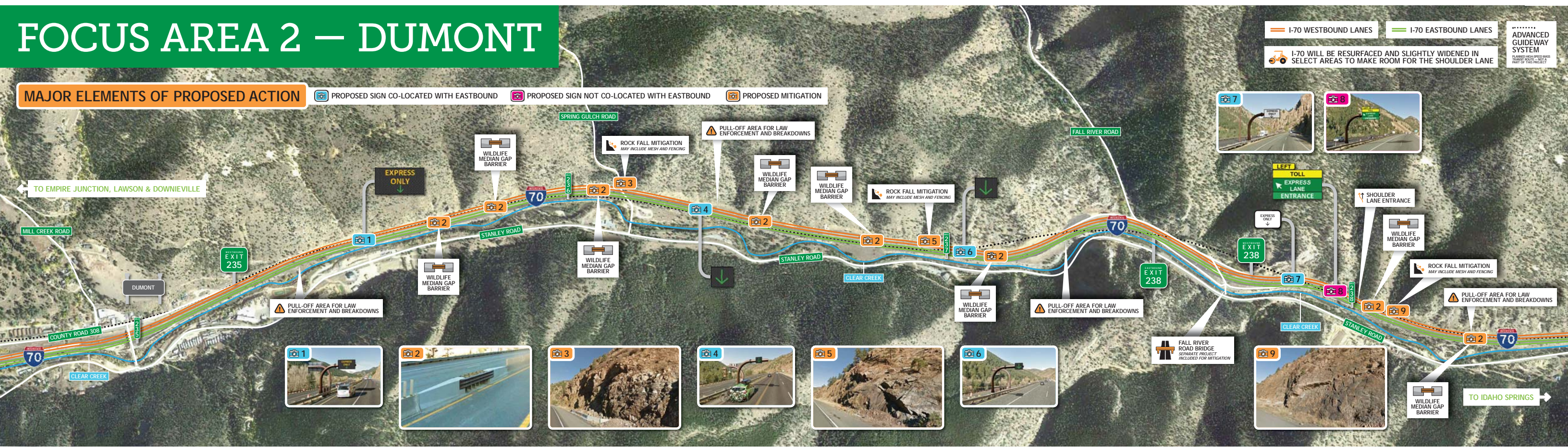


# FOCUS AREA 2 — DUMONT

## MAJOR ELEMENTS OF PROPOSED ACTION

- PROPOSED SIGN CO-LOCATED WITH EASTBOUND
- PROPOSED SIGN NOT CO-LOCATED WITH EASTBOUND
- PROPOSED MITIGATION

- I-70 WESTBOUND LANES
- I-70 EASTBOUND LANES
- I-70 WILL BE RESURFACED AND SLIGHTLY WIDENED IN SELECT AREAS TO MAKE ROOM FOR THE SHOULDER LANE
- ADVANCED GUIDEWAY SYSTEM



I-70 WESTBOUND PEAK PERIOD SHOULDER LANE PROJECT  
A TYPICAL FORWARD

as of September 13, 2018

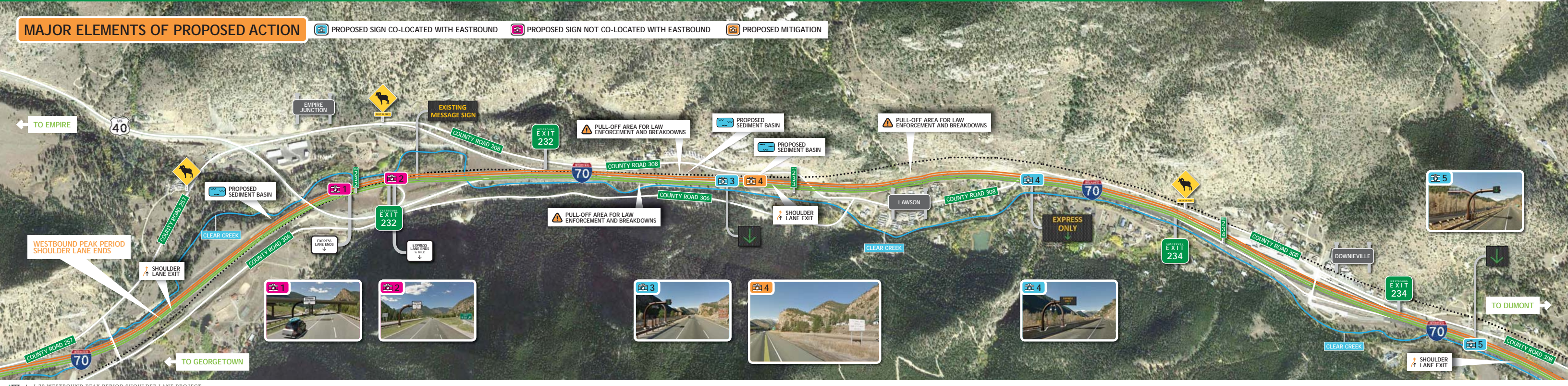


# FOCUS AREA 3 — EMPIRE JUNCTION, LAWSON & DOWNIEVILLE

— I-70 WESTBOUND LANES    — I-70 EASTBOUND LANES     ADVANCED GUIDEWAY SYSTEM  
🚧 I-70 WILL BE RESURFACED AND SLIGHTLY WIDENED IN SELECT AREAS TO MAKE ROOM FOR THE SHOULDER LANE

**MAJOR ELEMENTS OF PROPOSED ACTION**

- 📷 PROPOSED SIGN CO-LOCATED WITH EASTBOUND
- 📷 PROPOSED SIGN NOT CO-LOCATED WITH EASTBOUND
- 📷 PROPOSED MITIGATION



I-70 WESTBOUND PEAK PERIOD SHOULDER LANE PROJECT  
A PATH FORWARD

**as of September 13, 2018**





Appendix B.

## Technical Team Handouts



## Meeting Summary

### Technical Team #6

October 25, 2017 | CDOT Offices - Golden

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#### Introductions and Overview

Jonathan Bartsch, CDR Associates, opened the meeting with a brief overview of the WB I-70 PPSL process to date. The TT decided to start the meeting by focusing on “listening and understanding” each other to help identify opportunities and barriers to consensus. Jonathan then turned the meeting over to Randy Wheelock, Clear Creek County Commissioner, who explained on behalf of Clear Creek County (CCC) that the county feels as the process is pushing to a wider road section.

Margaret Bowes (I-70 Coalition) provided edits to the Oct 11, 2017 TT Meeting Summary. This updated version has been placed in the [Shared Project Google Drive](#) in the Technical Team Folder | Oct 11 TT Meeting.

#### CCC's Concerns

CCC handed out a document with a write up of the County's concerns. An image of the document can be seen in **Appendix A** of this Meeting Summary. The TT took a few minutes to read the document and then proceeded with a discussion around CCC's concerns about the WB I-70 PPSL process to date:

**Randy Wheelock and Becky Almon (Clear Creek County) articulated the following concerns:**

- General roadway striping options are without regard for the context of the area.
- During the Concept Development Process, CCC was under the impression that we had “gotten passed all of this.” CCC believes that the CDP confirmed that the alternatives would stay within the existing infrastructure based on the ROD.
- CCC views putting forth the possibilities of three 12-foot lanes starts to fit within a definition of adding capacity to the highway, which is not an allowable improvement in the ROD.
- In the CDP agreed to a foot by foot analysis of the highway to find a temporary, interim solution – examining foot by foot to see what was necessary.

- **Carol Kruse (USFS)** confirmed that this was also her understanding. Coming out of CDP, we would use the existing footprint with a foot by foot review.
- It seems like we are already wedging the project into a wider footprint. CCC does not want wider lanes everywhere.
- CCC does not support a *de facto* 6 lane solution without high quality.
- It seems that there is a “wider is better” argument at the TT meetings.
- When we talk about existing infrastructure from the ROD, CCC is interpreting this as the pavement and how you use that pavement. Should define what existing infrastructure means.
- Safety is a consideration for CCC.
- Striping – when CCC hears striping, we think additional capacity and this is outside of the ROD
- We need to define capacity and mobility.
- The ROD stated that in this segment, no highway capacity improvement projects were going to proceed unless triggers met. We should not be designing and implementing a highway improvement project. We need to stick with components outlined in the ROD before looking at highway capacity improvements.
- At the last meeting (Oct. 11), it looked like we were going beyond existing pavement.
- CCC doesn’t want to have discussions about width – this goes beyond the ROD. We need to talk about project elements first.

**Margaret Bowes asked:** How have we deviated from this already -- I thought this is what we were doing now?

**Randy Wheelock responded:** the discussion of three 12 foot lanes undermines the process of starting with the “existing pavement.”

- **Margaret Bowes noted:** at the last meeting, the spirit of discussion was to put things out there that we would consider – some of these might fall off. This is part of considering all stakeholder needs and input as CSS requires.
- **Becky Almon notes:** CSS requires us to look at a range of alternatives. CDP already did this process. We do not want to continue to throw out a range of alternatives. We have agreed to start at the existing pavement.
- **Randy concludes:** CCC interprets “existing infrastructure” as the pavement -- 36-39 feet. We want it to fit into this.

**CDOT and HDR mentioned** the need for safety on the highway if the WBPPSL is built. What has changed since the CDP is that new safety data is available that shows the EB PPSL project for the first six months had a noticeably higher incidence of crashes. **Becky Almon responded:** if the only safe highway is 4 feet on either side, then CCC doesn’t want it.

**Carol Kruse agreed** that minimal pavement addition is important.

**Stephen Harelson noted:** The CSS process also requires that we look at the needs of all stakeholders. Public comments have indicated that some people feel that EB PPSL is too narrow. Others have pointed out that the center barrier is too close. While we are considering the road – we need to think about different options to help us get to context related solutions. The plan is to take the individual components (i.e. width of each lane, buffer, etc) into the footprint and then go into a foot by foot analysis.

We would use global widths – i.e. this is what 39’ looks like, this is what 42’ looks like – and look at each option so we could determine what the design decisions look like. For example, we would ask: “is it worth it to have a 2-foot shy distance and then have a bigger rock cut? When there isn’t a rockwall, maybe we can have a luxurious 2 feet shy distance.”

**Becky Almon responded** that this was different than how CCC believes EBPPSL was approached. In EB, our recollection is that we looked at existing infrastructure and asked if we could fit PPSL. We didn’t start with striping.

**Stephen Harelson responded:** The CSS process needs to be responsive to public comment and the TT concerns. We need to look at menu of options. These are design decisions and design options. There are things we can do aside from wider asphalt – i.e. 2 foot shy, 11 PPSL, 12, 12, 1 foot paved, 6 foot gravel. Not saying that that is where we want to go, but we need to build discussions.

**Becky Almon:** It is important to note that we cannot take public comment on a new design alternative that falls outside of the ROD. There are constraints around what we can consider with the public. We all agreed that this is not a highway improvement project.

**Gina McAfee, HDR, notes:** This is not a project that adds capacity. The ROD was s a Tier 1 process that included public involvement. Public involvement is also required during Tier 2. We included public involvement on all of the Tier 2 projects (Twin Tunnels, EB PPSL, etc.)

**Becky Almon reiterates:** CCC wants assurance that the public comments considered in design options will be within the bounds of ROD constraints.

**Kevin Shanks, THK Assoc.:** We need to figure out how context impacts this project. It’s hard for people to think about context (both foot by foot and corridor wide). There are rockfall issues in some locations – significant closures due to rockfall, this is foot by foot. Let’s work together to understand context. Listen to everyone’s issues and take them for face value.



**Randy Wheelock:** The red tile in the room is the width of the highway. CCC wants to talk about design options, not about road width. We want to remain in the existing footprint. I am here to represent 39' for the County.

**Neil Ogden:** FHWA would like to look at a 12' lane and so they threw it out on the table for consideration. We need to understand why or why not 12' lane and what are the safety considerations involved.

**Margaret Bowes:** The CSS is very helpful and allows us to understand the concerns as related to the community values. This TT has a responsibility to consider other core values. It is too early in the process to draw lines in the sand. Different stakeholders need to throw out different ideas. When we go through core values exercise, many of these options will fall off. But we need to go through them. This is important. I trust in the process.

**Tracy Sakaguchi:** I trust in the process. There are a lot of safety problems. Tradeoffs will need to be made, e.g. sight distance. I trust that what we end up with will be the safest corridor that we can design.

**Agreement:** From this conversation, the group agreed to examine further the below issues:

**Process Questions:**

1. How does this connect to CDP
2. CSS process and tradeoffs

**Definitions:**

1. Capacity
2. Mobility
3. Infrastructure
4. Interim
5. Context

**Design Considerations:**

1. Pavement – amount of pavement and width of pavement.
2. Speed differential
3. Interim Project – how does this impact design. There is a definition in the MOU. Carol Kruse asked if this MOU definition reflects the intent of the Collaborative Effort?

**How are we going to move forward?**

**The group took a break. During the break, Jonathan Bartsch asked them to consider “what can we do to move this process forward?”**

**Neil Ogden:**

- 1) Keep this at the TT level for now
- 2) Start at 38 feet because that’s the narrowest width the corridor currently has available (at bridges).
- 4) Go through an exercise at 38’, 39’, 40’, 41’, 42’ and go foot by foot looking at different elements for design options.

**Stephen Harelson:**

Using different widths would help to weigh tradeoffs – buffers, shy, shoulder – is it worth giving up shoulder, shy distance – look at areas via context to see where we need to give and take. Menu of choices.

**Becky Almon:**

- 1) Would like to see an impact analysis on corridor before talking about different widths.

**Steve Long, HDR Assoc.:**

We can do a sensitivity analysis on the different options. Need to see how different design options weigh with rock cut, sight distance, safety.

**Margaret Bowes:**

Would like to look at multiple options so if there are questions later, we can confidently say that “we considered it – and it was or was not deemed to be the best option.” I would rather have a wide range of design options so that we go through an objective, evaluation process. I like Neil’s suggestion of looking at a range of options and want to stay within the ROD.

**Randy Wheelock:**

CCC’s letter implies that the ROD is like the Bible – we would like to talk about exact words, but it is open to interpretation. I like Neil’s approach of starting at 38’ but 42’ gives us a ton of heartburn. We need to look at everything that is within the ROD. We understand there will be pullouts, interchanges, etc.

**Carol Kruse:**

The point of this project is to increase the number of cars that can get up the road safely. We are trying to address the bottle necks. If you plan for anything more than a 38' pavement, you will have a bottleneck at every bridge – right?

There was a rich discussion about roadway geometry that resulted in an understanding of how the road could narrow to 38' for bridges without creating a traffic bottleneck at bridges. The key is that the length of the narrow section across the bridge is not long enough to cause congestion. One goal is to ensure that lane widths are consistent through the corridor, which is possible over bridges, but there likely would be no shoulders and very small shy distances for the narrow sections. This is the case on the EB PPSL as well.

**Randy Wheelock:**

**Need to go back to CCC and talk about the following items:**

- 1) Overall process and whether we think it's important to discussing width at this time
- 2) Theoretical approach of how to address this design concept process
- 3) Definitions of infrastructure and interim

**Agreement:** The TT agreed to go through a mapping and foot by foot exercise at the next TT meeting to look at design elements.

## **Crash Analysis**

**David Swenka (CDOT Traffic and Safety Engineering Branch Headquarters)** presented a safety/crash analysis (attached and in Gdrive). David mentioned that the standard for inside shoulders is 4-12 feet for full build out depending on facility type. In restricted conditions, a minimum of two foot shy/shoulder can be considered. There are exceptions for limited areas.

**Crash Analysis highlights:**

- A simple analysis was conducted on the specific striping options that were suggested at the last Tech Team meeting.
- Sections 3 and 4 both with a two foot inside shy distance seemed to perform the best.
- No data looking at buffer – non-quantifiable effect. Based on express lanes and EBPPSL, there are a lot of compliance issues with EBPPSL and GP lanes. People are going to change lanes and there is no room for enforcement in these corridors – this causes a lot of turbulence that can cause crashes. At this point, no data to show better option.

**Margaret** – is the shy distance always paved? Answer: On left it will be paved area, on the right, it is more of a variable, based on context.

**Shy distance definition clarification:** When there is no barrier, it is not shy distance, it is a shoulder. There can be grassy section for shy distance (guardrail is in the grass)

## Alignment Exercise

**Tyler Brady and Adam Parks (CDOT)** brought out maps and cross-sectional sketches (attached and in GDrive) and led the group through an alignment exercise. The sketches assume a pavement width similar to what was built on Eastbound PPSL. The focus of the exercise was to look at whether the alignment should be shifted into the median or stay in the same location based on the context in various areas. Adam noted that this is just an informational exercise – no decisions will be made yet. We are just looking at some of the impacts to the corridor. We plan to run these through the evaluation matrices. Note that shifting into the median is a violation of the I-70 Mountain Corridor Design Criteria; however, for the EB PPSL and Twin Tunnels projects we moved into median because the TT went through evaluation between median vs. creek, and the TT wrote up a variance to submit to the PLT for their approval.

**Area A: Idaho Springs** (Context: median already filled with pavement)

Option 1: Right (Alignment shifted North) – retaining wall with concrete barrier. Because the median is already filled in with pavement, there are no other alignment options in Area A.

**Area B: Between Idaho Springs and Fall River Road** (Context: Rock face on right side)

Option 1: Right (Alignment shifted North) – some rock cuts required, keep left side existing steel guardrail

Option 2: Center (Compromise between Right and Left options) – Style CE concrete barrier added on left side acting as a low-cost short retaining wall. Reduces rock cut and pavement on right side.

Option 3: Left (Alignment shifted South) – Least rock cuts, with a new retaining wall in median. Most physical impact to median and significant traffic impacts during construction.

Area B summary:

- Moving forward all three options will be added to an evaluation matrix.
- All options remain bifurcated – (one side is higher than the other).



- Steel Guardrail is preferable to concrete barrier from an environmental and aesthetic standpoint.
- Rockfall mitigation: this is an overarching issue. Mitigating rockfall is needed regardless of option selected. Rock cut as shown is for errant vehicle clear-zone requirements.

**Area C: Fall River Road curve to Dumont** (Context: Rock face closest to road here)

Option 1: Right (Alignment shifted North) – most rock cut required, keep left side existing steel guardrail

Option 2: Center (Compromise between Right and Left options) Style CE concrete barrier added on left side acting as a low-cost short retaining wall. Reduces rock cut and pavement on right side.

Option 3: Left (Alignment shifted South) – Least rock cuts, with a new retaining wall in median. Most physical impact to median and significant traffic impacts during construction.

**Area D: Dumont**

**Option 1:** Right (Alignment shifted North) – embankment and pavement

**Option 2:** Left (Alignment shifted South) – shift steel guardrail left, add embankment and pavement

**Area E: Lawson**

**Option 1.** Right (Alignment shifted North) – embankment and pavement

**Option 2:** Left (Alignment shifted South) – embankment and pavement

**Area F: Empire**

**Option 1:** Right (Alignment shifted North) – Style CE concrete barrier added to retain embankment and pavement

**Option 2:** Left (Alignment shifted South) – embankment and pavement

**ACTION:** Technical Team to develop Issue Specific Criteria to help evaluate options.

**ACTION:** THK/CDR to add Aesthetic Guidance and Engineering criteria to GDrive

**Final Thoughts**

**Randy Wheelock:** To react substantively and collaboratively, we need more time to review materials. We are exhausted from responding so quickly. It would be great to get handouts in advance of meetings (more than the Friday night before the Wednesday meeting) and come to the meeting with thoughts, suggestions and comments. It is hard to look at new information for the first time at the meeting.

**Kevin Shanks:** We will commit to continually checking in and modifying this process.

## Actions and Agreements

**ACTION:** Technical Team to develop Issue Specific Criteria to help evaluate options.

**ACTION:** THK/CDR to add Aesthetic Guidance and Engineering criteria to GDrive

**ACTION:** CDR to add alignment maps and David Swenka's crash/safety report to GDrive

**Agreement:** The group agreed to examine further the below issues:

### Process Questions:

1. How does this connect to CDP
2. CSS process and tradeoffs

### Definitions:

1. Capacity
2. Mobility
3. Infrastructure
4. Interim
5. Context

### Design Considerations:

1. Pavement – amount of pavement and width of pavement.
2. Speed differential
3. Interim Project – how does this impact design.

**Agreement:** The TT agreed to go through a context mapping and foot by foot exercise at the next TT meeting to look at design elements.

## Attendees

Carol Kruse (USFS); Randy Wheelock, Becky Almon (Clear Creek County); Tracy Sakaguchi (CMCA); Margaret Bowes (I-70 Coalition); Steve Long, Gina McAfee, Chau Nguyen (HDR);

Kevin Shanks, Julie Gamec (THK); Tyler Brady, Bobby VanHorn, Kevin Brown, , Stephen Harelson, David Swenka, Neil Ogden, Vanessa Henderson, Adam Parks, (CDOT); Jonathan Bartsch and Taber Ward (CDR)

## Appendix A

October 24, 2017

Clear Creek County

### WB-PPSL Technical Team Process Concerns

- 1) Due to deviations from the outcome of the Westbound I-70 Concept Development Process revealed in the last two WB-PPSL Tech Team meetings, we are at an impasse and may need to refer the conversation back to the project PLT as the appropriate venue within which to resolve the question below.
- 2) Before we can proceed with any more planning exercises, we need to decide whether we can proceed with WB using the minimal footprint from the EB project (which won awards from FHWA) and which was recommended in the Final Report of the Westbound I-70 Concept Development Process (i.e., existing infrastructure with foot by foot review of context to determine appropriate level of improvements) as our base guideline. That (modified, but at the same width) would be a 1' shy distance, 11' shoulder lane, 12' left general purpose lane, 11' right general purpose lane, and varying outside shoulder reaching 4' where possible, but smaller where not possible, such as in Idaho Springs. It would also include safety pullouts where possible.
- 3) PPSL is CDOT's idea. Although we support the idea, as a temporary solution, of operational improvements to reduce congestion and increase the safety of the existing infrastructure, it is not vital to CCC that WB-PPSL happens. We can wait until the Maximum program and we can do it with a full CSS and NEPA process for a full innovative solution.
- 4) We based our decision to support EB-PPSL on the understanding of the ROD that we had with CDOT and FHWA that the EB-PPSL was ROD compliant. Our understanding was also that a WB-PPSL would be of the same scope as the EB project as a temporary solution, which simply made operational improvements to the existing infrastructure.
- 5) Some "alternatives" forwarded in our last two meetings go well outside what was decided as the outcome of the Concept Development Process, well outside the precedent of the EB-PPSL, and suggest significant infrastructure expansion.
- 6) As such, they hold the physical potential to approximate the capacity and function of a maximum solution, which abandons the very heart of the ROD. For Clear Creek County, that means:
  - a) A complete and comprehensive feasibility analysis of AGS is accomplished.
  - b) That if feasibility of AGS is proven, it is built,
  - c) That a Maximum highway may be considered only after the "specific highway improvements" are completed.
  - d) And of course, that any Maximum highway project must be done through a CSS-based NEPA process.

- 7) The process currently underway uses CAT-EX to effectively remodel its way to a second-class maximum solution and removes the incentive for FHWA and CDOT to revisit those requirements in the reasonably near future. By agreeing, Clear Creek would be giving away its future.
- 8) Bottom line: Do we have a project, which stays within what is for the majority of the project, the existing maximum infrastructure of 39', staying within the same scope as the EB-PPSL and staying within the recommendation from the Concept Development Process that is acceptable to all parties? If the answer is not yes, then the question must be referred to a reconvened PLT before expending more time and money in Tech Team meetings.



April 30, 2018. Clear Creek County

## WBPPSL Assurances

1. Compatibility with the ROD: A preliminary opinion is being sought from the FHWA as to the concept plans compatibility with the ROD as a non-infrastructure project fitting in the “expanded use of existing infrastructure/operational improvement” categories. Vanessa Henderson met with Stephanie Gibson, FHWA Environmental Lead, and Shaun Cutting, Project Delivery Director Region 1 at which they indicated they believed the current concept plans were in compliance. FHWA is not making an official statement at this time. A final FHWA decision is not permitted until the CATEX is complete. Clear Creek County will corroborate the understanding with FHWA and has requested a direct written documentation of the conversation from Shaun Cutting.
2. CATEX inclusions: The CATEX for the WBPPSL will contain a mutually agreed upon definition of “interim”, a limitation of the use of the lane, an acknowledgement that this project cannot and will not function as, or be converted to, the maximum program of improvements, a commitment to future visioning of the maximum build out for this road section with Clear Creek County and other stakeholders in addition to a restated commitment to the CSS process and Aesthetic Guidelines. The CATEX will contain the connected projects that are committed to in the ROD or are mitigations for impacts. These include:
  - a. Frontage road: The completion of the construction CR 314 to Idaho Springs.
  - b. Greenway: Correction of the surfacing of the Greenway from the Game Check Park east to Hidden Valley, design and construction of the connection of the Greenway from the Game Check Station to the Idaho Springs trail, and a feasibility study for the Greenway on the north of the interstate, or south of the interstate but north of the creek, from Downieville to Lawson.
  - c. Construction of a bridge at Fall River as an advance mitigation for the EB and WB PPSL restriction of multi modal circulation.
3. Concept of Operations: Operations discussions, from concept of operations through the operations plan and the terms of the agreement implementing it, will be open to participation by stakeholders including HPTE and Clear Creek County prior to the adoption of the MOU between FHWA and CDOT.
4. Quality of construction: The quality of the project depends on the choice of contractor and the detail of the specifications. CDOT is seeking a special delivery method for WBPPSL referred to as a SEP-14 which would allow a merit qualification in the selection of a contractor rather than relying solely on the lowest responsible bid. The FHWA, TT and PLT representatives should support the request for the SEP — 14. Regardless of the contracting technique, the specifications for the project will include a mutually agreed upon communications plan, a commitment to the PLT/TT process throughout the construction, a commitment to the Aesthetic Guidelines, and adherence to agreed upon visual impact modifications and drainage features. The TT will be permitted to review and comment on the specifications.

Recommendations for consideration for inclusion are:

1. Meet with the construction PLT monthly for the duration of the project.
2. To extent possible, schedule blasting and major closures during off season.
3. Require and implement a communications plan for residents and traveling public.
4. Require and implement a communications plan for local businesses and the school district.
5. Require an advertising program that supports local business through the construction phase.
6. Gain concurrence on replacement of all median features from the west end of Idaho Springs to Empire Junction to upgrade and create visual consistency.
7. Gain concurrence on drainage structures style and placement.
8. Adhere to approved color in, not on, concrete.



**RESOLUTION R-17-14**

**RESOLUTION ADOPTING CLEAR CREEK COUNTY 1-70 MOUNTAIN CORRIDOR VISIONING TASK FORCE 4  
RECOMMENDATIONS FOR WESTBOUND IMPROVEMENTS FROM EMPIRE JUNCTION TO THE  
EISENHOWER/JOHNSON MEMORIAL TUNNELS**

**WHEREAS**, in 2014 the Clear Creek County Board of County Commissioners ("Board") and relevant County staff, in association with community stakeholders and following a public outreach process, developed the Clear Creek County Vision for the I-70 Mountain Corridor, an evaluation system incorporating the values of the County and strategies for future development ("Evaluation System") ; and

**WHEREAS**, improvements to I-70 between Empire Junction and the Eisenhower/Johnson Memorial Tunnels are presently limited to the actions specifically identified in the I-70 Mountain Corridor Record of Decision (ROD) and the CDOT, Clear Creek County and Idaho Springs Memorandum of Understanding (MOU) dated January 16, 2014. These improvements include a redesign of the Empire Junction and a westbound auxiliary lane from Bakerville to EJMT; and

**WHEREAS**, the Board appointed a Task Force to develop recommendations for the improvements to westbound I-70 between Empire Junction and the Eisenhower/Johnson Memorial Tunnels, using the Evaluation System, because of the imminence of CDOT undertaking concept and design development; and

**WHEREAS**, the Task Force has presented recommendations based on the Evaluation System to the Board with respect to the improvements to westbound I-70 between Empire Junction and the Eisenhower/Johnson Memorial Tunnels, attached hereto as Exhibit A and incorporated herein by this reference ("Task Force 4 Recommendations"); and

**WHEREAS**, Clear Creek County is a prominent stakeholder in the planning and implementation of improvements to the transportation system in the I-70 Mountain Corridor; and

**WHEREAS**, it is valuable that the other stakeholders, CDOT and the public are acquainted with and certain about the positions the Board has taken on various aspects of the I-70 Mountain Corridor development; and

**WHEREAS**, the Board accepts the recommendation of the Task Force.

**NOW, THEREFORE BE IT RESOLVED**, the Clear Creek County Board of  
County Commissioners hereby approves the Task Force 4 Recommendations, Exhibit A  
hereto.

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ADOPTED, this 17th day of January, 2017, at a regularly scheduled meeting of the Clear Creek Board of County Commissioners.

Timothy J. Mauck, Chairman

Randall P. Wheelock, Commissioner

Sean C. Wood, Commissioner

ATTEST:

Deputy Clerk and Recorder

Approved as to form:

Robert W. Loeffler, County Attorney





## EXHIBIT A TO RESOLUTION R-17-14

### CLEAR CREEK COUNTY I-70 MOUNTAIN CORRIDOR VISIONING

#### TASK FORCE 4: EMPIRE JUNCTION TO EISENHOWER/JOHNSON MEMORIAL TUNNELS RECOMMENDATIONS

**Paramount:** The resolution contains recommendations for Colorado Department of Transportation (CDOT) future projects on I-70 from Empire Junction to the Eisenhower/Johnson Memorial Tunnels (EJMT). Future projects in this area are presently limited to the actions specifically identified in the I-70 Mountain Corridor Record of Decision (ROD) and the CDOT, Clear Creek County and Idaho Springs Memorandum of Understanding (MOU) dated January 16, 2014. These improvements include a redesign of the Empire Junction and a westbound auxiliary lane from Bakerville to EJMT. Recommendations for actions beyond that limitation are expressions of Clear Creek County's overall concerns and are not an endorsement of further projects. Short-term solutions should not be implemented without a long-term plan, nor general purpose lanes added prior to the construction of an additional bore at the EJMT. This resolution was prepared in cooperation with the Towns of Empire, Silver Plume and Georgetown.

All corridor activities should consider parcels in the I-70 ROW that are owned by the County or other governmental entities. A map of the parcels belonging to the County is attached.

**Outstanding commitments:** Any further actions on I-70 must include honoring, and not deferring, the commitments, including but not limited to, all environmental mitigations agreed upon by CDOT (1) to Clear Creek County in the Intergovernmental Agreement (IGA) between CDOT and Clear Creek County dated June 24, 2012, as amended by Contract Amendment #1 executed by the State on September 25, 2013, with respect to Frontage Road projects and Twin Tunnels Projects; and, (2) to Clear Creek County and the City of Idaho Springs and the Colorado Department of Transportation in the Memorandum of Understanding (MOU) dated January 16, 2014.

#### **Issues:**

##### **Empire Junction to Georgetown Lake**

**Overall:** The Empire Junction is the convergence of Highway 40, Interstate 70 and surrounding frontage roads. It is a key area in the Clear Creek County Master Plan and included in the three-mile plans of both the Towns of Empire and Georgetown. It is acknowledged in the Context Sensitive Solutions guidance as an area of Special Interest and a unique green space with outstanding vistas toward the north and west. Keeping as much green as possible within the central areas of the existing interchange is a goal. The physical junction of Highway 40 and Interstate 70 is an irregular interchange which intersects the frontage roads. To facilitate long range planning and provide shorter term safety improvements a concept plan for a future Interstate Interchange Approval Package should be undertaken as soon as possible

**Safety:** Realign the intersection of CR 308 and the WB exit of I-70. Realign the EB intersection with US 40 and the access to the State shop.



To mitigate blowing sand or snow, and to reduce ice build-up, place snow barriers at Georgetown flats.

Maintain access to Georgetown during the implementation of any traffic management techniques considered for westbound traffic.

**CDOT properties including the Wolcott Placer:** It is assumed that CDOT maintenance facilities will remain.

Remove the ammunition storage and repurpose the ammunition building. Do not place additional CDOT facilities in the area, particularly not a port of entry or truck holding area.

Retain the ROW in the gore between I-70 and WB exit as open space.

Protect and preserve wetlands.

**Greenway:** As a total redesign of the interchange does not appear to be imminent, plan a Greenway design through the present interchange configuration and include the Greenway in future Interchange Approval Package.

In the interim, connect the Greenway to the Empire Trail and determine whether the Greenway or the Empire Trail will go over or under I-70.

**Recreation:** Maintain fishing and creek access between the Junction and Georgetown Lake. Do not channelize the creek. Enhancements should be made wherever opportunities occur.

**Aesthetics:** Preserve the view of Douglas Mountain, a key westbound viewscape in Clear Creek County.

Limit signage and visual clutter.

Consider open space a priority.

Retain as much green space as possible within the center of the interchange.

**Economics:** It is anticipated that economic development will occur mainly to the north toward Empire and not in the center of the interchange.

**Historic asset preservation:** The Colorado & Southern railroad passed through this area. Preserve the railroad right-of-way wherever possible.

The Empire Junction Station, a documented historic structure, is intact in situ and owned by a private party. The historic structure should be incorporated in the Interchange Approval Package.

**Wildlife:** Immediately to the north of the interchange on Highway 40 is a major big horn sheep





crossing for the northern herd that ranges from Silver Plume to Fall River. A wildlife bridge is needed at the base of Highway 40. Other animals are also present.

**Noise:** Noise is a major issue at Rocky Mountain Village. Investigate and mitigate noise from the vantage point of the camp.

### **Georgetown Silver Plume National Historic Landmark District**

**Overall:** The boundaries of the National Historic Landmark (NHL) District include the entire towns of Georgetown and Silver Plume, History Colorado’s Georgetown Loop Historic Mining and Railroad Park® and the mountains that surround these entities to the USFS boundaries. An issue of highest importance is that the alignment of the Georgetown Loop Railroad® not be compromised by any proposed solution or construction activities. The entire cultural landscape is considered as contributing to the District. All actions must be reviewed in accord with the 106 Programmatic Agreement and the sections of the National Historic Preservation Act (NHPA) that pertain specifically to NHLs. The Area of Potential Effect (APE) established in the 106 Programmatic Agreement extends to the surrounding ridgelines.

Any actions in the District must employ highly inventive design to assist in rectifying some of the damage done to the NHL during the initial construction of the highway and to achieve a context sensitive design. Concepts such as a bypass tunnel and a cut and cover in Silver Plume may be viable alternatives that would result in improvements relating to noise, safety, community connectivity and traffic congestion – ultimately reducing the need for a complicated larger footprint. Because human activity has added such complexity, an in-depth study of the natural geology as modified by road- building, mining, creek relocations and other human activity is needed.

**Safety:** No frontage road exists between Georgetown and Silver Plume. The current bike path serves as the emergency route. Maintenance of this emergency access must be a priority for basic emergency preparedness.

Employ a technological “Road X” solution to automatically manage occupancy in the westbound chain-up at 228 and link chain up stations in a coherent system.

Use an infrared warning system for brake overheating on eastbound trucks.

Continue work on rockfall mitigation under the existing 106 agreement.

**Noise:** Interstate noise is a major issue in the NHL. It significantly deteriorates the visitor and resident experience in the District. Tire noise and truck brakes are the primary sources of noise.

Employ noise reduction techniques in pavement surface and highway configuration.

Investigate noise mitigations for the Georgetown-Silver Plume hill.

Replace the deteriorated noise wall in Silver Plume.

**Water quality:** Stabilizing the fill slope in Georgetown requires slope to appropriately handle drainage from both highway and mountainside. Implement the SCAP. Dredge the Georgetown lagoon to remove highway sediment. Enhance the creek wherever possible.

**Greenway:** The Greenway heading west through the NHL comes through Georgetown on Argentine Street from the dam through the roundabout to Loop Drive, through the Georgetown Loop® Parking lot, beside the Interstate to Silver Plume and then through Silver Plume on Old Highway 6 (Water Street). The Greenway serves as the only emergency access to Silver Plume other than I-70.

Clear Creek County has completed a study of alternative routes for the Greenway through the Georgetown Loop Historic Mining and Railroad Park®. These alternatives proved to be not financially or environmentally feasible due to railroad crossing, steep grades, extensive structural walls and safety concerns and are considered an inappropriate use and detrimental to the interpretation of the park. The Greenway must remain adjacent to the Interstate between Georgetown and Silver Plume. For safety reasons, the section around the Silver Plume acceleration ramp and the section from above the Georgetown Loop® parking lot to Loop Drive should be adjusted. These sections must be jointly planned with CDOT and local stakeholders and local jurisdictions. The current connection through the Georgetown Loop's® parking lot sets up conflicts between bicyclists, pedestrians and autos that will only intensify as visitation and use increase.

CDOT cooperation is required for Greenway construction through Georgetown as it impacts the Interstate fill slope.

**Aesthetics:** Innovative designs should be considered to minimize the visual impact of the Interstate on the NHL. Follow aesthetic guidelines and dark sky regulations. Allow only minimal signage through the NHL.

**Viewscapes:** Retain westbound view of Georgetown. Retain the view of the mines on the north side of Silver Plume.

**Historic assets:** Over 500 structures and sites are recorded as contributing to the NHL. These contributing assets are not only in the municipalities and Loop District, but scattered throughout the mountainsides. Preserving the context is vital to these sites. The context itself is a contributing element to the District. As indicated in the 106 Agreement, the Area of Potential Effect (APE) in this NHL is ridgeline to ridgeline. Special attention is called for in addressing both direct and indirect impacts within the (APE).

**Maintenance:** The condition of the overlook is atrocious. If proper maintenance cannot be managed, it should be contracted out. Both the Georgetown Loop® Railroad and the Georgetown Trust have offered to subcontract this service.

Sanitary facilities are imperative on overlook and chain stations.

Fix the drainage from the north side of the interstate in Silver Plume. It is causing ponding behind the homes on Water Street. Fix the pond.





**Signage:** Signs should be kept to a minimum and signs and lighting should be “dark sky” fixtures.

Place overhead VMS signs outside the NHL boundaries.

Enhance the operations without negative visual impact.

### West of Silver Plume to EJMT

**Overall:** West of Silver Plume is the first forested mountain environment on the Interstate. It is the first section of I-70 over and on USFS lands. The interstate is on an easement from the USFS which permits current footprint. The 1997 Revised Forest Plan notes “Interstate 70 is a significant access route through the area, with very high traffic volumes. I-70 maintenance and use creates significant impacts to the surrounding area, including wildlife impediments, vehicular noise, excess sediment, air pollutants and trash.” The USFS management strategies include protection of the scenic quality of the area and providing viewing opportunities of the natural landscape, and emphasizes protection of soil and water quality and wildlife habitat. All actions in this area should coincide with these management strategies. The USFS representatives participated in this visioning process.

**Safety:** Medians should be maintained for traffic safety, visual appearance, wildlife protection and visibility in oncoming traffic.

Take appropriate protection measures with fencing, overpass or underpass to minimize the frequent wildlife - vehicle encounters.

Silver Valley Road between Silver Plume and Bakerville is frequently used as an Interstate bypass /frontage road. It is also being used as a regular heavy truck commercial route. It bisects a residential area and needs traffic calming speed modifications.

Employ a technological “Road X” solution to automatically operate occupancy in the westbound chain-ups at 221 and 219, and link chain up stations in a coherent system.

**Greenway:** The Greenway from Silver Plume to Bakerville is planned as a separated bikeway adjacent to Hwy 6 - a CDOT, but not I-70, ROW. From that point, the Greenway proceeds on the completed Bakerville to Loveland Trail (BLT).

**Recreation:** Consider the impact of increased access on the recreational use in the USFS lands. At this time, USFS support facilities are not able to accommodate a use increase. Address mitigation for such an increase of vehicular traffic.

**Aesthetics:** It is an important viewscape toward the Continental Divide with Grays, Torreys, and Bethel mountains on the sides.

The USFS Scenic designation should be respected through use of agreed upon engineering criteria, aesthetic guidelines, dark sky lighting, minimal signage, blended colors and maintaining medians.



**Wildlife:** The Herman Gulch is a major Linkage Inference Zone. It is the most used lynx crossing in the state. A wildlife bridge and fencing for all animals is needed in the Herman Gulch area.

Maintaining a dark environment is critical to wildlife.

**Water quality:** The interstate is, in many places, directly adjacent to Clear Creek, wetlands and fens. Fully implement the SCAP to mitigate the dying trees, the altered chemistry in fens and sedimentation choking vegetation.

The Town of Silver Plume municipal water is drawn from constructed underground chambers on both sides of, and possibly under, I-70. These collection chambers need to be identified and protected as any changes to I-70 are considered.

**Lighting:** Lighting should be limited and dark sky when used. In-pavement lighting is effective in this area.

**Signage:** Signage should be very limited and full overhead Variable Message Signs (VMS) not permitted. Unless necessary for immediate information, VMS signs should remain dark.

**Tunnel expansion:** For safety reasons, complete a tunnel bore prior to expansion of general purpose lanes. Maintain the agreement with Loveland Basin to tunnel to the north for a new bore.

**CITY OF IDAHO SPRINGS**  
**County of Clear Creek, Colorado**

**Resolution No. 23, Series 2016**

**A RESOLUTION ADOPTING THE RECOMMENDATIONS OF THE INTERSTATE-70  
VISIONING TASK FORCE FOR THE CITY OF IDAHO SPRINGS**

**WHEREAS**, the City Council for the City of Idaho Springs (“City Council”) and relevant City staff, in association with community stakeholders, developed the Interstate 70 (“I-70”) Visioning for the City of Idaho Springs; and,

**WHEREAS**, improvements to I-70 in the City of Idaho Springs are currently permitted as non-infrastructure improvements in the Memorandum of Understanding between Clear Creek County, City of Idaho Springs and the Colorado Department of Transportation (CDOT) dated January 16, 2014; and,

**WHEREAS**, the City Council appointed an I-70 Visioning Task Force to develop recommendations for the improvements to westbound I-70 within the City of Idaho Springs because of the imminence of CDOT undertaking concept and design development; and

**WHEREAS**, the Task Force presented recommendations to the City Council with respect to I-70 improvements within the City, attached hereto as Exhibit A and incorporated here by this reference (“Final recommendations for presentation to Idaho Springs City Council”), including recommendations for future CDOT projects along I-70 from mile marker 243 to mile marker 239; and,

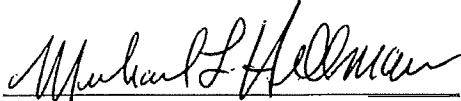
**WHEREAS**, the City of Idaho Springs is a prominent stakeholder in the planning and implementation of improvements to the transportation system in the I-70 Mountain Corridor, including the planned transit center at Exit 240 in the City; and

**WHEREAS**, it is valuable that the other stakeholders, CDOT and the public are acquainted with and certain about the positions of the City Council on various aspects of the I-70 Mountain Corridor development; and

**WHEREAS**, the City Council accepts the recommendations of the Task Force; and

**NOW THEREFORE, BE IT RESOLVED**, that the City Council of the City of Idaho Springs hereby approves the I-70 Visioning Task Force Recommendations for the City of Idaho Springs as contained and attached hereto in Exhibit A.

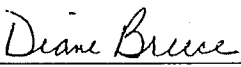
**RESOLVED, APPROVED, and ADOPTED** this 5th day of December, 2016.

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Michael Hillman, Mayor

ATTEST:

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Diane Breece, City Clerk

## **EXHIBIT A**

### **I-70 Visioning Task Force Idaho Springs**

**January 26, 2016 – May 11, 2016**

#### **Executive Summary**

City of Idaho Springs Mayor Michael Hillman, having participated in the local stakeholder visioning processes for portions of the I-70 corridor in unincorporated Clear Creek County, desired to have the Idaho Springs vision for I-70 through the City reviewed and updated. Using the process developed by THK, CH2M Hill and Atkins in 2014, Cindy Neely and Jo Ann Sorensen led a group of Idaho Springs citizens and business owners through the process of identifying issues, impacts and opportunities. The group discussions were guided by the values of the community and the community's vision for its future.

Three meetings were held from January through April 2016, and the group completed final edits to the list of recommendations in May 2016. Attached is a copy of the recommendations that are in two categories – one for municipal planning actions, and the second for inclusion in a resolution proposed for adoption by the City Council. The resolution will provide guidance to the Colorado Department of Transportation and future City leaders as highway projects that will have an impact on the City are proposed.



**I-70 Visioning Task Force Idaho Springs**

**May 11, 2016**

**Final recommendations for presentation to Idaho Springs City Council**

**Recommendations to Idaho Springs City Council for municipal planning actions to assist in coordinating with Interstate development**

1. Develop a City-wide signage plan to thematically identify City gateways at all exits. An example may be the stone sign off the 240 exit in front of the Kum and Go. Develop a consistent directional and coordinated informational signage program throughout the City for pathways and major sites.
2. Develop a City-wide pedestrian and recreational pathway plan incorporating the Greenway to connect all areas of the City including areas to the south of the Interstate between exits 241 and 240.
3. Work with the Clear Creek School District and potential partners such as CDOT and USFS to find alternative locations for the school bus lot to facilitate use of that area for a multi-modal transit center and additional parking.
4. Consider, and seek private resources for, a shuttle system for special events and summer activities in coordination with the Clear Creek County transit plan.

## I-70 Visioning Task Force Idaho Springs

May 11, 2016

### Final recommendations for presentation to Idaho Springs City Council

**Recommendations for a resolution for future CDOT projects along I-70 from MM 243 (Hidden Valley) to MM239 (west end of Idaho Springs):** Future projects in this area are presently limited to the actions specifically identified in the Record of Decision and Intergovernmental Agreement between CDOT, Clear Creek County and Idaho Springs. Recommendations for any actions beyond that limitation are expressions of Idaho Springs' overall concerns and are not an official endorsement of further projects.

#### Overall

1. Past commitments, specifically the Phase II, Exhibit A of the Twin Tunnel Agreement of June 2012, which includes finishing work on CR 314/East Idaho Springs Road and a separated bike path along CR 314/East Idaho Springs Road or an alternate route from MP 243 to MP 241, must be completed before, or in conjunction with, any additional capacity improvements (i.e., the addition of a new travel lane) to westbound I-70 between Floyd Hill and Idaho Springs. In keeping with the January 16, 2014 IGA between Clear Creek County, Idaho Springs and CDOT, westbound Peak Period Shoulder Lane must use existing infrastructure and must not exceed the agreed upon dimensional width for the Eastbound Peak Period Shoulder Lane.
2. As future projects along the corridor are planned and constructed, the City desires that westbound mainline work on I-70 through Idaho Springs be completed before mainline work between Floyd Hill and the Veterans Memorial Tunnels. The City does not want to experience three lanes of interstate traffic being diverted to Colorado Boulevard, as would likely occur if westbound widening from Floyd Hill is accomplished first.
3. The legal status of the Interstate Right of Way through the City should be examined.
4. The Context Sensitive Solutions process as implemented through Project Leadership Teams must remain active through all phases of a project. Construction schedules, traffic control management plans, lane rental, hours of operation, haul routes and staging areas must be developed with municipal and stakeholder input and a plan for economic and travel impact mitigation developed. Mitigations, incentives and penalties should be considered.
5. CDOT shall develop a standard, special specification that requires a public communication plan targeting both locals and travelers in partnership with the City for any project affecting Idaho Springs. Reliable, timely and clear communication must be emphasized. Both CDOT and their contractors must commit to full implementation of the plan.
6. A jointly developed aesthetic theme and messaging should be developed to create an image of Idaho Springs for the traveling public. The aesthetic theme should begin at Hidden Valley and carry throughout all exits
7. Messaging must be consistent on both Interstate and municipal signing. Example: Colorado Boulevard rather than Business I-70. Interstate structures throughout Idaho Springs are worn, dirty and unattractive. Guardrail and jersey barriers must be cleaned and/or replaced with designs that may be well maintained.

8. Natural areas adjacent to the highway must be landscaped.
9. Baseline air quality measurements must be established through Idaho Springs, as residences, parks and schools are adjacent to the interstate. Air quality and particulate matter must be monitored before, during and after construction.
10. Idaho Springs was the site of numerous mining and milling operations in the 19<sup>th</sup> and early 20<sup>th</sup> centuries. A master drainage study including the provisions of the Clear Water Act should be undertaken prior to construction.
11. A reevaluation of traffic regulatory signs on the interstate should be undertaken to reflect the new traffic patterns associated with the Peak Period Shoulder Lane.

**Specific to MM 243 – 241**

1. The westbound chain down area for Floyd Hill should be located at the base of the hill as recommended in the Clear Creek County Resolution regarding improvements from Floyd Hill to Twin Tunnels, not between 243 and 241.
2. Signage at the west end of Hidden Valley exit should welcome westbound travelers to Idaho Springs. Signage at the westbound exit of Exit 243 should indicate the connection to CR 314/East Idaho Springs Road and the Greenway toward Game Check Park.
3. A wildlife viewing station might be appropriate in the Game Check Station area.

**Specific to MM 241 – 240**

1. Connectivity between the commercial centers of Idaho Springs and the Ballpark/Events Center is crucial. The new bridge at Exit 241 was built to accommodate the interstate and barely accommodates pedestrians. It does not provide the needed vital connection between two essential sections of the City. A local bridge to accommodate pedestrian, bicycle and recreational traffic should be placed to the west of the exit bridge.
2. The frontage road surface leading to the ballfields south of the Interstate must be cleared and cleaned up.
3. A parking structure in keeping with the aesthetic of the community should be constructed at Exit 240 in coordination with the interstate. The structure should use existing space and retain development space. It should be planned in consideration of future multi modal transit options, including a transit center.
4. Discourage through truck traffic on Colorado Boulevard.

**Specific to MM 240 -239 (west end of Idaho Springs)**

1. Any increased capacity on the Interstate will increase the noise and air quality concerns in this residential area. The current sound wall is deteriorating badly and must be replaced. A new sound wall should be placed from the west end of the football field to the west end of town. This wall will assist in addressing previous damage created by the original construction of the

Interstate which resulted in housing in close proximity to the Interstate. The sound wall should be coordinated with the City of Idaho Springs.

2. Appropriate signage should be placed to control those exiting both EB and WB at MM 239 as it is frequently used by rafting companies. Consider a stop sign at the end of the westbound 239 exit ramp.
3. The rafting staging area at the base of the 239 exit is insufficient and creates a traffic hazard. It should be expanded.



**Contact Group Name:**

**I-70 Visioning Task Force Idaho Springs**

**Members:**

Andy Marsh	admin@idahospringsco.com
Bill Macy	valodya@prolynx.com
Bill Mehrer	cubbymehrer@gmail.com
Cindy Neely (Facilitator)	ccneely@yahoo.com
Dan Ebert	danmebert@gmail.com
Doug Potter	potter71doug@gmail.com
Erin McCartney	erinmcc17@gmail.com
Jason Siegel	jsiegel0224@gmail.com
JoAnn Sorensen (Facilitator)	jsorensen@co.clear-creek.co.us
John Bordoni	pw@idahospringsco.com
John Muscatell	johnmuscatell@aol.com
Michael Hillman	mayor@idahospringsco.com
Mitch Houston	mitch.houston@ccsdrel.org
Nancy Johnson	njohnson.historicidahosprings@gmail.com
Phyllis Adams	montanepros@juno.com

### **Documents Used by the Task Force**

Idaho Springs 3 Mile Area Plan - July 2008

Idaho Springs Area of Special Attention Report - May 2010

Idaho Springs Assets and Opportunities Map - January 2014

Idaho Springs Comprehensive Plan – July 2008

I-70 Mountain Corridor Programmatic Environmental Impact Statement Record of Decision – June 2011

I-70 West Transportation Needs Assessment – April 1988

Intergovernmental Agreement between the Colorado Department of Transportation and Clear Creek County – June 2012

Memorandum of Understanding between Clear Creek County, the City of Idaho Springs and the Colorado Department of Transportation – January 2015

Photo collections of locations that are valued and need protection or improvement – January 2014



Appendix C.

## Roadway Width CSS Matrix

ID	Criteria	Focus Area 1 - Idaho Springs				
		Options Ranking				
		A: Existing Pavement (37' Min.) + Operational Improvements*	B: Baseline (38' - 40' with 2' shy distance)*	C: 38' - 41' (with 2' shy distance and 1' rumble strip buffer)*	D: 38'-42' (with 2' shy distance, 1' rumble strip buffer and 12' center lane)*	E: 38'-43' (with 2' shy distance, 1' rumble strip buffer and three 12' lanes)*
<b>Evaluation Criteria</b> <b>HOW DOES THE ALTERNATIVE...</b>						
1	Accommodates safety during peak times?	5 substandard cross-sectional design elements (1' shy distance to barrier, shoulder lane 11', rumble strip encroaching on lanes, GP lane width only 11', RT shoulder only 4ft) Compounding all issues results in least forgiveness of driver error.	4 substandard cross-sectional design elements (shoulder lane 11', rumble strip encroaching on lanes, GP lane width only 11', RT shoulder only 4ft) Compounding all issues results in less forgiveness of driver error.	3 substandard cross-sectional design elements (shoulder lane 11', center GP lane width only 11', RT shoulder only 4ft)	2 substandard cross-sectional design elements (shoulder lane 11', RT shoulder only 4ft)	1 substandard cross-sectional design element (RT shoulder only 4ft)
2	Maintain safety during non peak times?	3 substandard cross-sectional design elements (rumble strip encroaching on lane, GP lane width only 11', RT shoulder only 4ft) Compounding all issues results in least forgiveness of driver error.	3 substandard cross-sectional design elements (rumble strip encroaching on lane, GP lane width only 11', RT shoulder only 4ft) Compounding all issues results in least forgiveness of driver error.	2 substandard cross-sectional design elements (GP lane width only 11', RT shoulder only 4ft)	1 substandard cross-sectional design element (RT shoulder only 4ft)	1 substandard cross-sectional design element (RT shoulder only 4ft)
3	Improve local and regional mobility and reliability	narrowest space increases frequency of accidents and reduces reliability	narrow space with reliability similar to Eastbound performance	additional space increases mobility and reliability	additional space increases mobility and reliability	additional space increases mobility and reliability
4	Minimize the effort required to maintain the option?	Not a differentiator				
5	Create infrastructure investments that are reasonable to construct and provide the best value for their life cycle, function and purpose?	Least new project elements. Least responsive to Purpose and Need.	Additional investment resulting in increased benefit	Additional investment resulting in increased benefit	Additional investment resulting in increased benefit	Additional investment resulting in increased benefit
6	Create opportunities to "correct past damage"?	No opportunities	Opportunities for sight line and drainage improvements.	Opportunities for sight line and drainage improvements.	Opportunities for sight line and drainage improvements.	Opportunities for sight line and drainage improvements.
7	Provide access and protect opportunities for enhancements to tourist destinations, community facilities, interstate commerce and also limit disproportionate effects to the community?	Not a differentiator (criteria needs clarification)				
8	Protect or enhances recreational opportunities?	11' GP lane is less comfortable for recreational vehicles. Rumble strip encroaches on lane.	11' GP lane is less comfortable for recreational vehicles. Rumble strip encroaches on lane.	11' GP lane is less comfortable for recreational vehicles. Adds buffer.	12' center lane is more comfortable for recreational vehicles.	All 12' lanes are most comfortable for recreational vehicles.
9	Protect wildlife needs?	No additional barriers	3000 LF of retaining wall above town	3000 LF of retaining wall above town	3000 LF of retaining wall above town	3000 LF of retaining wall above town
10	Protect natural features and Clear Creek?	No drainage or water quality improvements	Drainage and water quality improvements	Drainage and water quality improvements	Drainage and water quality improvements	Drainage and water quality improvements
11	Address noise and air quality?	No noise reduction benefit.	Incidental noise reduction benefit	Incidental noise reduction benefit	Incidental noise reduction benefit	Incidental noise reduction benefit
12	Meet CDOT and industry standards?	Highest number of design exceptions	High number of design exceptions	High number of design exceptions	Lower number of design exceptions	Least number of design exceptions
13	Meet the I-70 Mountain Corridor Design Criteria and Aesthetic Guidance?	No opportunity for Aesthetic improvements.	Opportunity for Aesthetic improvements.	Opportunity for Aesthetic improvements.	Opportunity for Aesthetic improvements.	Opportunity for Aesthetic improvements.
14	Preserve opportunities for the AGS and the ultimate preferred alternative?	Not a differentiator				
15	Incorporate sustainability by using locally available materials and environmentally-friendly processes?	Not a differentiator				
16	Meet the needs of the present without compromising the future?	Not a differentiator. None of the options affect the future determination of an ultimate I-70 or AGS location.				
17	Protect the defining historical elements of Clear Creek County? <b>ADD AVG. &amp; MAX. HEIGHT OF WALLS</b>	No new retaining walls - signage required	Retaining walls above town with average height = ____, signage required	Retaining walls above town with average height = ____, signage required	Retaining walls above town with average height = ____, signage required	Retaining walls above town with average height = ____, signage required
18	Provide opportunities for Partnership?	No potential for partnerships	Potential for partnerships	Potential for partnerships	Potential for partnerships	Potential for partnerships



19	Meets measures of success? (ROD, MOU, purpose and need, and local visioning)	ROD: Not a differentiator MOU: Not a differentiator Visioning: Inconsistent being only operational Purpose and Need: Least responsive to Purpose and Need.	ROD: Not a differentiator MOU: Not a differentiator Visioning: Somewhat consistent Purpose and Need: Somewhat responsive to Purpose and Need.	ROD: Not a differentiator MOU: Not a differentiator Visioning: Somewhat consistent Purpose and Need: More responsive to Purpose and Need.	ROD: Not a differentiator MOU: Not a differentiator Visioning: Somewhat consistent Purpose and Need: More responsive to Purpose and Need.	ROD: Not a differentiator MOU: Not a differentiator Visioning: Somewhat consistent Purpose and Need: Most responsive to Purpose and Need.
<b>ID</b>	<b>Criteria</b>				<b>Options Ranking</b>	
		<b>A: Existing Conditions</b>	<b>B: Baseline (38' - 40')</b>	<b>C: (38' -41')</b>	<b>D: (38'-42')</b>	<b>E: (38'-43')</b>
<i>Iss</i>						
<i>H</i>						
	Utilize existing pavement (amount of additional pavement)?	no increase in pavement area	2.2% increase in pavement area	2.5% increase in pavement area	2.9% increase in pavement area	3.6% increase in pavement area
	Impact to existing bridges?	No bridges impacted.	No bridges impacted.	No bridges impacted.	No bridges impacted.	No bridges impacted, greatest width taper at bridges
	Impact to snow removal?	Not a differentiator				
	Avoids GP vehicles driving on the rumble strip?	Rumble strip width encroaches into 11' GP and shoulder lanes	Rumble strip width encroaches into 11' GP and shoulder lanes	Rumble strip is along edge of 11' GP lane	Rumble strip is along edge of 12' GP lane	Rumble strip is along edge of 12' GP lane



Appendix D.

## Median Shift Design Criteria Exception Request (HDR 2018)



## MEDIAN SHIFT ALIGNMENT DESIGN EXCEPTION REQUEST

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August 31, 2018

### PURPOSE AND RECOMMENDATION

The intent of this document is to provide information about the process and rationale for a Design Exception that would allow portions of the Westbound I-70 Peak Period Shoulder Lane to occupy sections of the existing median in nine locations between Idaho Springs and Empire Junction in the I-70 highway corridor. Most of the median shift alignment would occur west of Idaho Springs, from Exit 239 to Exit 235 (Focus Area 2). Some median shift alignments would also occur in the Dumont, Downieville, Lawson, and Empire Junction areas (Focus Area 3).

Specifics elements related to this design exception request include:

- Number of locations: **Nine**
- Number of locations that require a median wall: **Four**
- Total approximate length of project corridor: **57,000 lineal feet**
- Total approximate length of median shift: **22,000 lineal feet**
- Percentage of total median area with median widening: **14%**
- Percentage of remaining median in widened areas: **74%**
- Existing median width in widened areas: **Varies from 14 feet to 21.5 feet**
- Width of median that remains in widened areas: **Varies from 13.7 feet to 19.4 feet**
- Total approximate length of rock or slope cut that is avoided: **15,000 lineal feet**

A detailed table of all 9 median widening locations can be found in Attachment A of this document.

This design exception is referred to as the median shift alignment and is an exception to the February 2011 *I-70 Mountain Corridor Context Sensitive Solutions Engineering Design Criteria*<sup>1</sup> to preserve the existing median width. The request is specific to the nine locations in Attachment A given the interim nature of these improvements and the need to maintain maximum flexibility for future transportation alignments in this area.

### PROCESS

The I-70 Mountain Corridor Design Criteria were developed in recognition of the special characteristics of the I-70 Mountain Corridor. As described in the March 2011 *Downieville, Lawson, Dumont and Empire Junction - Area of Special Attention Report*<sup>2</sup>, seven Engineering Design Criteria were developed to guide I-70 Mountain Corridor planning and design to

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<sup>1</sup> <https://www.codot.gov/projects/contextsensitivesolutions/docs/aesthetics/engineering-design-criteria-and-illustration>.

<sup>2</sup> <https://www.codot.gov/projects/contextsensitivesolutions/docs/aesthetics/areas-of-special-attention/dld-and-empire-jct-asa.pdf>



“enhance safety, mobility and sustainability while reducing maintenance through design and engineering.”

The *Area of Special Attention Report* also indicates that the designer is able to determine which criteria may require an exception from the Engineering Design Criteria and why. “If the designer determines that any of the Engineering Design Criteria would not be met in the design process, the designer must present the justification for a design exception to the Project Leadership Team (PLT) for review, discussion, and agreement. The *Area of Special Attention Report* anticipates that design challenges may create situations in which the impact of meeting the criteria would be challenging—and allows for a design exception to be requested and granted by the PLT.

The project team has prepared information for and discussed the median shift concept with the Technical Team at the following meetings:

- January 10, 2018 Technical Team meeting #10: Described the trade-offs with median vs. mountain alignments for Focus Area 2.
- January 24, 2018 Technical Team meeting #11: Reviewed Focus Area 2 map again; identified Issue Specific Criteria to be used for the Focus Area 2 Evaluation Matrix.
- February 14, 2018 Technical Team meeting #12: Reviewed the Focus Area 2 Evaluation Matrix of median vs. mountain alignment options. The Technical Team gave approval of the matrix at this meeting. Attachment B of this document contains this matrix for Focus Area 2.
- March 14, 2018 Technical Team meeting #13: Discussed findings of Focus Area 2 median vs. mountain analysis and its applicability to Focus Area 3.
- April 10, 2018 Design Concept Workshop: Illustrated the various options in cross-section. Discussed the implications of each in terms of rock cutting, median encroachment, compatibility with interim definition, and visual impact. The Technical Team agreed at this meeting that the median shift alignment makes the most sense.
- May 14, 2018 Technical Team meeting #14: The Technical Team members agreed to move forward with the Concept Design Plans as presented, which include the median shift.
- July 11, 2018 Technical Team meeting #16: The Technical Team members were provided a copy of this memo for their review prior to this meeting. Primary findings from this memo were discussed and input was sought. The Technical Team members agreed to provide the memo to the Project Leadership Team.

## RATIONALE

The relevant design criterion that is the subject of this paper is “The three alignments (eastbound, westbound and Advanced Guideway System) will maintain no less than the existing





median width or create a clear zone that does not require a guardrail or barrier” (*I-70 Mountain Corridor CSS Engineering Design Criteria*, pg. 5).

Between the west end of Idaho Springs and Empire Junction (milepost 235 through milepost 239), two designs were developed:

**Design Option 1:** The first option met the design criterion described above by keeping the existing inside edge of pavement (on the median side) the same, pushing the existing alignment toward the mountain. This required approximately three miles of rock cut or encroachment on the Clear Creek floodplain (at Empire Junction).

**Design Option 2:** The second design option held the existing outside (right) lane line to avoid shifting the traffic any closer to the rock and the westbound lanes shifted into portions of the existing median. In four of the nine locations, walls would be required for the shift towards the median.

## DESIGN EXCEPTION JUSTIFICATION

The design team asserts that a modification to this alignment to encroach on part of the median will improve upon the mountain alignment design by directly addressing the nine justification criteria provided in the *Area of Special Attention Report*.

### Complementing surrounding physical characteristics

The median shift alignment allows the project to maintain the existing topography of the mountainside north of the interstate. It avoids large and potentially unstable rock and cuts. It avoids encroachment on the Clear Creek floodplain in the vicinity of US 40 at the Empire Junction interchange.

### Enhancing safety

The median shift alignment and the shift to the mountain side are both safe. This assumes the shift to the mountain side includes rock cutting and rock fall mitigation. Without that mitigation, the shift to the mountain side is more likely to result in danger to motorists.

### Increasing capacity

The project is an interim operational improvement. Capacity of the highway is the same for both design options.

### Reducing costs

The median shift alignment is significantly less expensive than the mountain shift in both budget and schedule. The median walls can be constructed with less impact to the traveling public than widening to the mountain. The median wall construction does not require temporary shoring and reduces overall project costs and schedule. The required blasting for the mountain shift would take years to construct, cause numerous closures along I-70, and cost tens of millions of dollars in both blasting and continued mobilization on the corridor during construction.



### Protecting the environment

The median shift alignment does not impact natural mountain sides, including to mineralized rock which if affected, could negatively impact water quality. It has some impacts to wildlife movement but these are minimized because the majority of the median is still available for wildlife refuge. It has fewer impacts to noise and air quality during construction because of the substantially reduced need to conduct blasting activities. It has fewer impacts to the Clear Creek floodplain in the Empire Junction Interchange area. It also has fewer impacts to access to the neighborhood living up North Spring Gulch road and fewer impacts to tourism and the rafting industry because it does not require as many closures during construction for rock blasting activities. Finally, the median shift alignment requires less rockfall mitigation which may have impacts to raptors.

### Preserving historic and scenic elements

The median shift alignment reduces the likelihood of negative impact to mining features and mining shafts located in the mountain. A median barrier with approved aesthetic treatments has less of a visual impact than a tall rock/slope cut. The alignment that moves into the mountain also requires more rockfall mitigation, which is a visual impact due to likely netting, fencing, walls and/or bolting treatments.

### Interfacing with multiple modes of transportation

The median shift alignment is more compatible with an interim project. It does not preclude or predetermine the Maximum Program of Improvements or other locally planned projects, which include multiple modes of transportation (Advanced Guideway System (AGS), additional highway capacity, and Greenway). Median improvements are more easily removed. Rock cuts cannot be replaced in the future.

### Utilizing new technology or innovative approaches

Utilizing new technology or innovative approaches is the same for either alignment shift.

### Doing the right thing

The median shift alignment is more consistent with the interim Peak Period Should Lane definition because the median improvements are more easily removed in the future to accommodate ultimate multi-modal improvements.

## DESIGN CRITERIA REMARKS

The median shift alignment also addresses the design criteria remarks provided in the *Area of Special Attention Report* by:

1. Preserving enough of the median for snow removal and maintenance
2. Preventing headlight glare either through the independent vertical alignment between the eastbound and westbound lanes (the existing situation) or the median wall with barrier as appropriate



3. Separating eastbound and westbound alignments adapts to topographic conditions

## AGREEMENT

All members on the Technical Team agreed at their May 14, and July 11, 2018 Technical Team meetings to the Concept Design Plan's alignment as presented, which included the median shift in these nine locations. The median shift alleviates extensive rock cutting, is consistent with an interim definition for the project, has fewer impacts to the traveling public during construction, and has fewer visual and aesthetic impacts. Opportunities to lower the height of the median barrier and reduce the amount of encroachment in the median are being implemented where feasible. At this point in time, the average height of the median wall (including the barrier rail) does not exceed 7.4 feet and in most locations is substantially lower than that. Each location has been evaluated based on its context and impacts specific to that location.

The Project Leadership Team has been provided with this documentation (by email dated August 24, 2018.)

The Project Leadership Team reviewed this at their August 29, 2018, meeting and approved of this design exception request.



**WB I-70 Peak Period  
Shoulder Lane**

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**Attachment A:  
WB PPSL Median Shift Locations Table**





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WB I-70 Median Widening									Average Width of...			Wall & Anchor Slab							Reason for moving into median			
Start Station	End Station	Milepost Start	Milepost End	General Location	Total Length (LF)	Widened Area (with Sawcut) (SF)	Widened Area - Pavement (SF)	Existing Median Area (SF)	Widening (FT)	Existing Median (FT)	Remaining Median (FT)	Percentage of Median	Wall Type	Length (LF)	Area Wall - Total Panel and Coping Area (SF)	Average Height (Total Panel and Coping) (FT)	Average Height with Barrier (Total) (FT)	Area Wall - Exposed Face (SF)		Average Height (Exposed) (FT)	Average Height with Barrier (Exposed) (FT)	
<b>MEDIAN WIDENING AREA #1</b>																						
189+89	225+10	231.8	232.5	West of Lawson	3,521	15,281	11,760	75,746	3.3	21.5	18.2	16%									Roadway geometrics (US 40 bridge); Avoid impacts to Clear Creek	
<b>MEDIAN WIDENING AREA #2</b>																						
241+34	248+01	232.8	232.9	Lawson	667	1,804	1,137	14,087	1.7	21.1	19.4	8%									Roadway geometrics (CR 308 bridge)	
<b>MEDIAN WIDENING AREA #3</b>																						
296+23	300+40	233.8	233.9	Downieville	417	906	489	5,826	1.2	14.0	12.8	8%									Ramp widening	
<b>MEDIAN WIDENING AREA #4</b>																						
339+00	344+90	234.6	234.7	Dumont	590	1,733	1,143	10,209	1.9	17.3	15.4	11%									Widening on both sides of I-70 (median and shoulder)	
<b>MEDIAN WIDENING AREA #5</b>																						
348+35	363+80	234.8	235.1	Dumont	1,545	4,794	3,249	25,970	2.1	16.8	14.7	13%									Roadway geometrics under bridge (widen on both sides of I-70 due to bridge piers)	
<b>MEDIAN WIDENING AREA #6</b>																						
378+41	386+00	235.4	235.5	Exit 235	759	3,887	3,128	16,302	4.1	21.5	17.4	19%									Avoid widening towards rocks (outside shoulder) - Avoid rock cut	
379+20	379+94												Anchor Slab	74	295.00	4	6.83	102.50	1.4	4.23		
379+94	384+80												MSE Wall	486	2,690	5.5	8.33	1,496	3.1	5.93		
384+80	385+80												Anchor Slab	100	398	4	6.83	155	1.6	4.43		
<b>MEDIAN WIDENING AREA #7</b>																						
394+98	431+02	235.7	236.4	N. Spring Gulch Rd	3,604	29,821	26,217	77,143	7.3	21.4	14.1	34%									Avoid widening towards rocks (outside shoulder) - Avoid rock cut	
395+00	399+00												Anchor Slab	400	1,611	4	6.83	365	0.9	3.73		
399+00	428+50												MSE Wall	2,950	20,174	6.8	9.63	13,165	4.5	7.33		
428+50	431+00												Anchor Slab	250	1,007	4	6.83	584	2.3	5.13		
<b>MEDIAN WIDENING AREA #8</b>																						
435+50	487+84	236.5	237.4	to Fall River Road	5,234	43,323	38,089	109,653	7.3	21.0	13.7	35%									Avoid widening towards rocks (outside shoulder) - Avoid rock cut; Roadway geometrics around curve	
435+60	435+88												Anchor Slab	28	112.5	4	6.83	10.5	0.4	3.23		
435+88	483+13												MSE Wall	4,725	34,037	7.2	10.03	21,658	4.6	7.43		
483+13	487+00												Anchor Slab	387	1,547	4	6.83	1,086	2.8	5.63		
<b>MEDIAN WIDENING AREA #9</b>																						
500+46	555+10	237.7	238.7	West Idaho Springs	5,464	34,850	29,386	112,019	5.4	20.5	15.1	26%									Avoid widening towards rocks (outside shoulder) - Avoid rock cut	
502+25	503+80												Anchor Slab	155	622	4	6.83	274	1.8	4.63		
503+80	536+00												MSE Wall	3,220	18,531	5.8	8.63	11,791	3.7	6.53		
536+00	539+90												Anchor Slab	390	1,556	4	6.83	1,157	3	5.83		
<b>TOTAL</b>					<b>21,801</b>	<b>136,399</b>	<b>114,598</b>	<b>446,955</b>							<b>13,165</b>							

Percentage Widened into Median in Widened Areas 26%  
Percentage Widened into Median of Total Median Areas 14%

Assumptions:

"Widened Area - Pavement" is widened area from edge of existing pavement to edge of proposed pavement or face of wall (where applies)

Average Height of Wall (Total) is exposed face of wall or anchor slab from finished grade to top of wall coping

"Average Height with Barrier (Total)" is exposed face of wall or anchor slab from finished grade to top of Type 7 barrier (34" height)

Existing Median Width is measured from edge of EB asphalt to edge of existing WB asphalt

Remaining Median Width is measured from edge of EB asphalt to edge of proposed WB asphalt or face of wall (where applies)

Legend:

FT – foot

LF – linear foot

SF – square foot

MSE Wall – Mechanically stabilized earth wall consisting of alternating layers of granular backfill and linear soil reinforcing strips attached to a precast concrete facing; Used for walls over 3-feet in height

Anchor Slab – Structural slab made of concrete and reinforcing steel used to retain soil and support concrete barrier; Used for walls under 3-feet in height



## **Attachment B: Focus Area 2 with Recommendation**



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Approved by the Technical Team on 2/14/2018

Focus Area 2: Mountain vs. Median			
ID	Criteria	Option A: Mountain Impacts: Rock blasting and Install Rockfall Mitigation	Option B: Median Impacts: Construct Retaining Wall in I-70 Median to Avoid Rock Issues
Evaluation Criteria HOW DOES THE OPTION...			
1	Accommodates safety during peak times?	Not a differentiator.	
2	Maintain safety during non-peak times (PPSL closed)?	Not a differentiator.	
3	Improve local and regional mobility and reliability?	Not a differentiator.	
4	Minimize the effort required to maintain the option?	Additional use and maintenance potential of rock fall toolbox items (i.e., fences, netting, bolts, walls, unknown new condition, etc.). Potentially additional rockfall clean-up. Potential to be most costly and requires most time.	Less maintenance for retaining wall and median barrier. Potential to be least costly and requires least amount of time.
5	Create infrastructure investments that are reasonable to construct and provide the best value for their life cycle, function and purpose?	Big effort for an interim solution. Interim rock cut may or may not be sufficient for the maximum program.	More appropriate response to an interim project. Does not preclude or predetermine maximum program. Median improvements are more easily removed.
6	Create opportunities to "correct past damage" to the community?	More impact to the corridor.	Less impact to the corridor. Assumes reasonable consideration of wildlife and aesthetics.
7	Provide access and protect opportunities for enhancements to tourist destinations, community facilities, interstate commerce and also limit disproportionate effects to the community?	More impacts during construction (potential for EB and WB lane closures, and 2 lane closures, especially at North Spring Gulch and access to Philadelphia Mills recreation site, less potential for night time construction). Longer construction timeline. No long term operational differences.	Less impacts during construction (single lane closures, no closure to access under I-70 at Spring Gulch, more potential for night time construction). Shorter construction timeline. No long term operational differences.
8	Protect or enhances recreational opportunities?	Temporary construction impacts (i.e., blasting may close rafting). No long term recreational impacts.	No short or long term recreational impacts.
9	Protect wildlife needs?	May create some new wildlife barriers. Blasting operations may be negative for wildlife. Rockfall netting may be hazardous for birds. Coordinate with ALIVE.	May create new wildlife barriers in the median. Minimizes refuge areas. Coordinate with ALIVE.
10	Protect natural features and Clear Creek?	Impact to natural mountain sides. Potential exposure of mineralized rock may negatively impact water quality.	Minimal impact to natural features.
11	Address noise and air quality?	Construction blasting impacts including noise and dust.	Construction noise impacts.
12	Meet CDOT and industry standards?	Not a differentiator.	
13	Meet the I-70 Mountain Corridor Design Criteria and Aesthetic Guidance?	Can meet Design Criteria and Aesthetic Guidance.	Does not meet Design Criteria or Aesthetic Guidance. Exception required.
14	Preserve opportunities for the AGS and the ultimate preferred alternative?	Not a differentiator.	
15	Incorporate sustainability by using locally available materials and environmentally-friendly processes?	Not a differentiator.	
16	Meet the needs of the present without compromising the future?	Most impact to the valley. Blasting removes rock that can not be replaced.	Less impact to the valley. Changes are reversible.



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17	Protect the defining historical elements of Clear Creek County?	More impacts to mining sites. May include visible mining shafts.	Less impacts. May have mining features under median.
18	Provide opportunities for Partnership?	Not a differentiator.	
19	Meets measures of success? (ROD, MOU, purpose and need, and local visioning)	Not a differentiator. WHAT IS PLT GUIDANCE??	
Focus Area 2: Mountain vs. Median			
Fair Better Best			
ID	Criteria	Option A: Mountain Impacts: Rock blasting and Install Rockfall Mitigation	Option B: Median Impacts: Construct Retaining Wall in I-70 Median to Avoid Rock Issues
<i>Issue Specific Criteria</i>			
<i>HOW DOES THE OPTION...</i>			
1	Is the viewshed affected?	Slightly more rockfall mitigation toolbox usage will have visual impacts.	Up to 60% of Focus Area 2 could have a median wall (worst case). Exposed wall heights have a maximum height 6' plus a barrier. Barrier does not have to be solid.
2	Effect of headlight glare?	Not a differentiator.	
3	Will median width remain?	No change	Existing median is 20-22' wide, widening may impact up to 10'.
4	Will existing rock cuts be modified?	20' horizontal, and 50-100' vertical rock cuts would be expected in multiple locations in Focus Area 2. Rock stability is unpredictable and is a significant technical challenge. Exit 239 and Exit 238 rock cut is not a differentiator.	Exit 239 and Exit 238 rock cut is not a differentiator.
<b>RECOMMENDATION</b>			
<i>TT Recommendation</i>		<p><i>In general, widening to the median is recommended to avoid rock cutting. It is more consistent with an interim definition for the project, has fewer impacts to the traveling public and fewer visual impacts. Opportunities to lower the height of the median barrier and reduce the amount of encroachment in the median will be explored. During design, each specific location will be evaluated based on context and impacts specific to that location. Any locations that are determined favorable to shift into the median will be presented to the PLT for their review as this would be a variance from the I-70 design criteria.</i></p>	



Appendix E.

## I-70 Westbound PPSL Entry and Exit Location Analysis Memo (Apex Design 2018)



# memo

## APEX DESIGN, PC

**TO:** Adam Parks, CDOT, Chau Nguyen and Terrance Powers, HDR

**FROM:** Jeff Ream, PE, PTOE and Sam Moss, PE, Apex Design

**DATE:** February 14, 2018

**RE:** I-70 Westbound PPSL Entry and Exit Location Analysis

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This memo summarizes the analysis and results of the VISSIM modeling that was used to optimize the beginning, ending and interim ingress and egress locations for the I-70 Westbound Peak Period Shoulder Lane (WB PPSL). The analysis was conducted using VISSIM Version 9.

### Scenario Overview

The I-70 WB PPSL is scheduled to be open in 2019 and operate until 2035 as a temporary congestion mitigation tool for the I-70 corridor from Idaho Springs to Empire. At the time of opening, the major bottleneck along I-70 WB will be the lane reduction from 3-lanes to 2-lanes at the top of Floyd Hill to the east of the project. A project to add capacity to this area is currently underway but will not be completed when the WB PPSL begins operations. This evaluation considered the following lane access points:

- Entrance Location without Floyd Hill Widening
- Entrance Location with Floyd Hill Widening
- Ingress Point for Idaho Springs Traffic
- Egress Point for US 40-bound Traffic
- Lane Terminus Location.

The entrance location, interim ingress/egress locations and lane termination location were analyzed using VISSIM to determine the operational impacts of the various access points. These operational impacts were then considered in conjunction with the existing signing, roadway geometry and other project requirements to identify optimal locations for each point.

### Entrance Location without Floyd Hill Widening

The initial entrance location of the PPSL is at the Veterans Memorial Tunnels at the east end of the project limits. This location takes advantage of the extra roadway width through the tunnels that was created by the Veterans Memorial Tunnels widening project. Furthermore, the VISSIM analysis of this location indicated that, without any improvements to Floyd Hill, an entrance at this location was more effective at reducing congestion through the study area than if the entrance was located further to the west.

The PPSL entrance area would begin east of the tunnel where the pavement currently widens, and the formal lane entrance would begin on the west side of the tunnels in the vicinity of the EB PPSL toll point.

### Entrance Location with Floyd Hill Widening

Once the Floyd Hill project has been constructed, I-70 will have three through lanes leading into the PPSL study area (note that this assumes the Floyd Hill Project will construct a full-time 3<sup>rd</sup> lane and not a PPSL), and there is a compelling reason move the entrance from the Veterans Memorial Tunnels further west to the vicinity of Exit 241 so that the three lane section is maintained into Idaho Springs.

# memo

The relocated entrance locations evaluated included:

- Option 1 - Approximately 2,700 feet west of the Exit 241 (East Idaho Springs) on ramp. This location would allow traffic entering I-70 from the Exit 241 on ramp to access the PPSL.
- Option 2 - Between the Exit 241 (East Idaho Springs) off ramp and on ramp. Since this location is upstream of the Exit 241 on-ramp, traffic from Exit 241 would not have access to the PPSL entrance.
- Option 3 - Approximately 1,000 feet east of the Exit 241 (East Idaho Springs) off ramp gore point, in the vicinity of the existing sign bridge for Exit 241.

Figure 1 shows the three entrance options evaluated.

**Figure 1: Post-Floyd Hill Entrance Location Options**



## Evaluation Results

Table 1 shows the results of the relocated entrance evaluation. Each location was evaluated for vehicle flow, average vehicle delay, and maximum queue length. As the table indicates, Option 2 and Option 3 both provide the same operational conditions; both have very little delay and neither results in queuing in the adjacent GP lanes. However, Option 3 provides an opportunity to repurposing one of the initial entrance sign locations, while Option 2 would require all new sign locations.

**Table 1: Entrance Location Evaluation Results**

Scenario	Volume (vehicles)	Average Delay (Seconds)	Maximum Queue Length (Feet)
Option 1 - West of the Exit 241 on ramp	4006	5.78	168
Option 2 - Between the Exit 241 on ramp and off ramp	4172	4.97	0
Option 3 - East of the Exit 241 off ramp	4169	5.02	0

**Recommendation:** Once the Floyd Hill widening project is complete, relocate the WB PPSL entrance to approximately 1,000 feet east of the Exit 241 off ramp gore point, in the vicinity of the existing sign bridge for Exit 241 (Option 3). The area between the initial entrance and the relocated entrance can be skip-striped to form an ingress/egress area that allows GP lane traffic to enter the lane and ML traffic destined to Idaho Springs to exit.

### Idaho Springs Ingress Location

A 2,000 foot long ingress area for traffic entering I-70 from the Idaho Springs area was evaluated for its cross-weaving effects on the I-70 mainline. The entrance locations (as measured from the beginning of the ingress area) evaluated were:

- Option 1 - Approximately 1,700 feet west of the Exit 240 on ramp gore point (SH 103 interchange). This location is downstream of the busiest of the three Idaho Springs interchanges. The entry area is between the Exit 239 on ramp and off ramp
- Option 2 - Approximately 2,500 feet west of the Exit 239 on ramp gore point (West Idaho Springs interchange). This location is west of all three Idaho Springs interchanges and allows any traffic entering I-70 from Idaho Springs to access the freeway without any backtracking through town.
- Option 3 - Approximately 2,000 feet west of the Exit 238 on ramp gore point (Fall River Road interchange). This location is also west of all three Idaho Springs interchanges and is in a straighter section of roadway than the west of Exit 239 alternative.

Figure 2 shows the three ingress options evaluated.



**Figure 2: Idaho Springs Ingress Location Options**



### Evaluation Results

Table 2 shows the results of the Idaho Springs Ingress evaluation. The evaluation includes traffic conditions with the Floyd Hill widening complete, to present a more conservative assessment. As the table indicates, all three of the scenarios impart generally the same minimal level of delay to the adjacent GP lanes, with no queuing under all three options. Option 2 and Option 3 both allow traffic from all three Idaho Springs interchanges to access the ML. However, Option 3 is downstream of the Fall River toll point (which is co-located with the EB PPSL toll point), so any vehicle entering the ML at that location and then exiting to US 40 would not pass under a toll point and thus not be charged.

**Table 2: Idaho Springs Ingress Location Evaluation Results**

Scenario	Volume (vehicles)	Average Delay (Seconds)	Maximum Queue Length (Feet)
Option 1 - 1,700 feet west of Exit 240 on ramp	4094	6.27	0
Option 2 - 2,500 feet west of Exit 239 on ramp	4134	6.51	0
Option 3 - 2,000 feet west of Exit 238 on ramp	4105	7.39	0

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**Recommendation:** Provide an ingress to I-70 that is located approximately 2,500 feet west of Exit 239, the West Idaho Springs Interchange (Option 2). This location does not impart any significant delay to either GP lane traffic or ML traffic, allows vehicles entering I-70 from all of Idaho Springs to access the ML without backtracking through town, and ensures that all vehicles entering the ML from Idaho Springs pass through at least one toll point.

## US 40 Egress Location

A 2,000 foot long egress area to US 40 was evaluated for its cross-weaving effects on both the US 40 exit and the Downieville weigh station. If the egress is too close to the US 40 off ramp, traffic might not have enough time to change lanes and access the off ramp causing them to slow down or stop in order to get over. If the egress location is too close to the Downieville on ramp and weigh station ramp, traffic exiting the PPSL might conflict with the merging traffic from the on ramp causing congestion. The entrance locations (as measured from the end of the exit area) evaluated were:

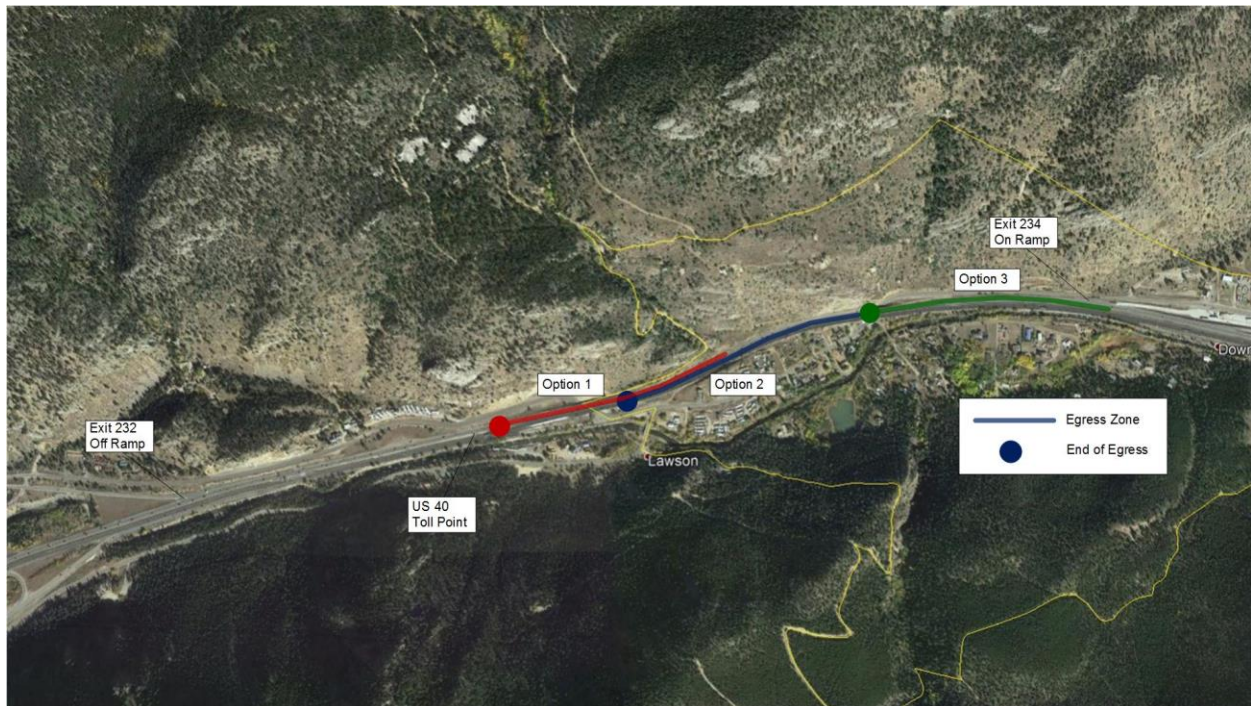
- Option 1 - Approximately 2,400 feet east of the Exit 232 (US 40) off ramp gore point.
- Option 2 - Approximately 3,400 feet east of the Exit 232 (US 40) off ramp gore point. This location is further upstream than the above to minimize the impacts of traffic weaving over to the US 40 exit, but is located within a horizontal curve on I-70.
- Option 3 - Approximately 5,400 feet east of the Exit 232 (US 40) off ramp gore point. This location is far enough upstream to eliminate the weave, but is located within the merge area of the Downieville on ramp.

It should be noted that all three egress locations would be located upstream of the western-most toll point for the facility, which is co-located with the EB PPSL entrance toll point. This should not be an issue, however, because the facility will have single-rate tolling (i.e., all vehicles will be charged a single rate to use the lane, regardless of whether they enter the lane at the beginning or at Idaho Springs), and all ML vehicles will have travelled through the entrance toll point and the Fall River toll point prior to reaching the US 40 egress.

Figure 3 shows the three egress options evaluated.



**Figure 3: US 40 Egress Location Options**



### Evaluation Results

Table 3 shows the results of the US 40 egress evaluation. The evaluation includes traffic conditions with the Floyd Hill widening complete, to present a more conservative assessment. As the table indicates, all three of the scenarios impart delay and queuing in the adjacent GP lanes, but Option 1 and Option 2 operate significantly better than Option 3. While Option 2 shows slightly shorter queues than Option 1, the horizontal curve within the egress area creates sight distance concerns for vehicles exiting the lane (these effects cannot be measured in VISSIM) that could potentially compromise safety at that egress point.

**Table 3: US 40 Egress Location Evaluation Results**

Scenario	Volume (vehicles)	Average Delay (Seconds)	Maximum Queue Length (Feet)
Option 1 - 2,400 feet east of the off ramp	4110	19.09	448
Option 2 - 3,400 feet east of the off ramp	4110	23.67	244
Option 3 - 5,400 feet east of the off ramp	4107	33.75	1608

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**Recommendation:** Provide an egress to US 40 that is located approximately 2,400 feet east of the Exit 232 (US 40) off-ramp gore point (Option 1). This location provides the best balance between traffic operations and safety for weaving vehicles. It should be noted that this location will result in some delay and queuing in the GP lanes. To fully eliminate mainline delay and queuing created by ML traffic bound for US 40, a grade-separated egress to US 40 directly from the ML would be required.

## PPSL Terminus Location

A 2,000 foot long merge area at the end of the WB PPSL was evaluated for its effect on I-70 mainline traffic at the egress location, as well as possible effects on Exit 232 (US 40) interchange traffic. The planned ML exit would be located west of the US 40 off ramp, so ML traffic is merging into a lower GP traffic volume (i.e., US 40-bound traffic will have already departed from the GP lanes at the exit point). There is approximately 1.4 miles between the US 40 off ramp and on ramp, which allows for a wide range of potential end locations. Three separate final egress locations were evaluated and are listed below:

- Option 1 - The termination point was located so that the merging area for the Exit 232 (US 40) on ramp and the end of the merging area for the PPSL terminations aligned (i.e., furthest point west in the area between the US 40 off ramp and on ramp).
- Option 2 - In the area between two horizontal curves, with the end of the merging area located approximately 2,200 feet to the east of the Exit 232 (US 40) on ramp gore point (i.e., close to the mid-point of the area between the US 40 off ramp and on ramp).
- Option 3 - In the straight area to the west of the Exit 232 (US 40) off ramp with the beginning of the merge area located approximately 400 feet to the west of the US 40 off ramp gore point (i.e., at the east end of the area between the US 40 off ramp and on ramp).

Figure 4 shows the three lane terminus options evaluated.

**Figure 4: PPSL Terminus Location Options**



### Evaluation Results

Table 4 shows the results of the lane terminus evaluation. The evaluation includes traffic conditions with the Floyd Hill widening complete, to present a more conservative assessment. As with the US 40 egress, all three scenarios impart some delay and queuing to the GP lanes, but the impacts are relatively minor. Of the three, the terminus located between the horizontal curves had the lowest delay and shortest queue length. The location furthest west operated well enough, but creates a situation where traffic is merging into the GP lanes on both sides of the roadway, which is not ideal. The location furthest east also operated well, but any event that might cause an unusual delay at that point, such as a crash or stalled vehicle, would cause a queue to extend into the US 40 off ramp area. Therefore, the recommended location for the termination is between the horizontal curves.

**Table 4: PPSL Termination Location Evaluation Results**

Scenario	Volume (vehicles)	Average Delay (Seconds)	Maximum Queue Length (Feet)
Option 1 – Adjacent to US 40 on ramp	3554	9.60	97
Option 2 – Between US 40 off-ramp and on-ramp	3435	7.10	22
Option 3 – West of US 40 off-ramp	3442	6.43	93



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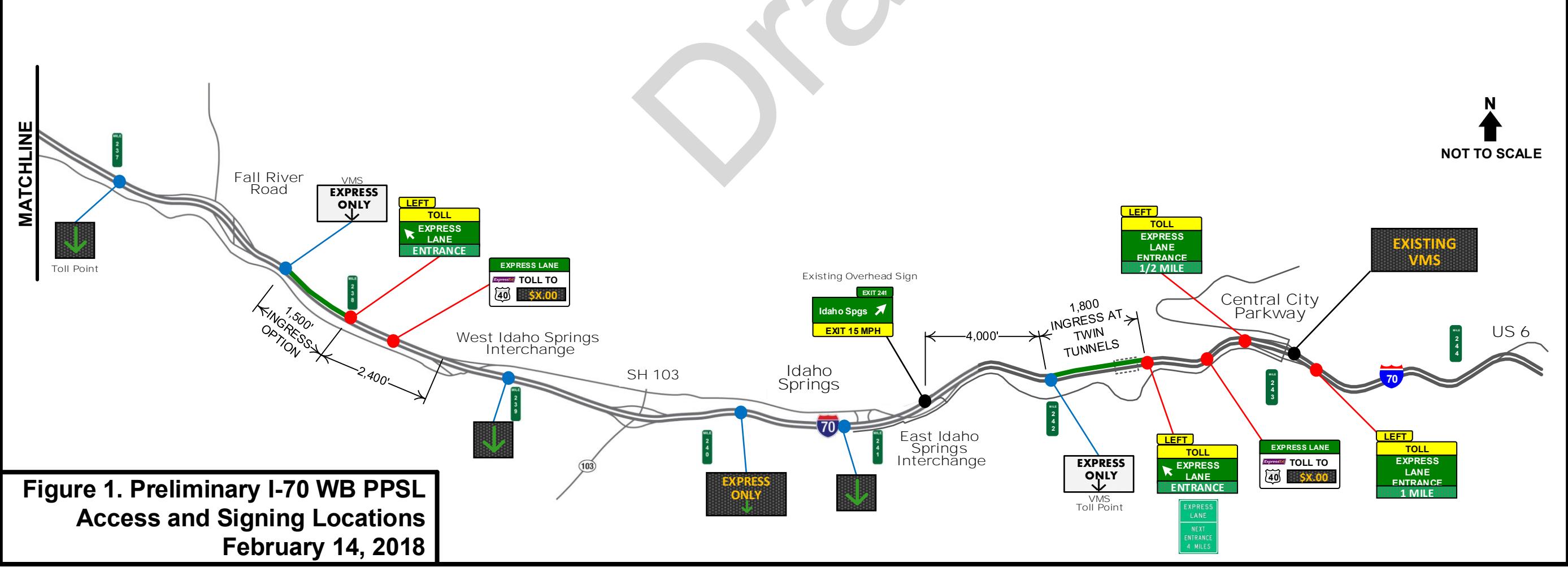
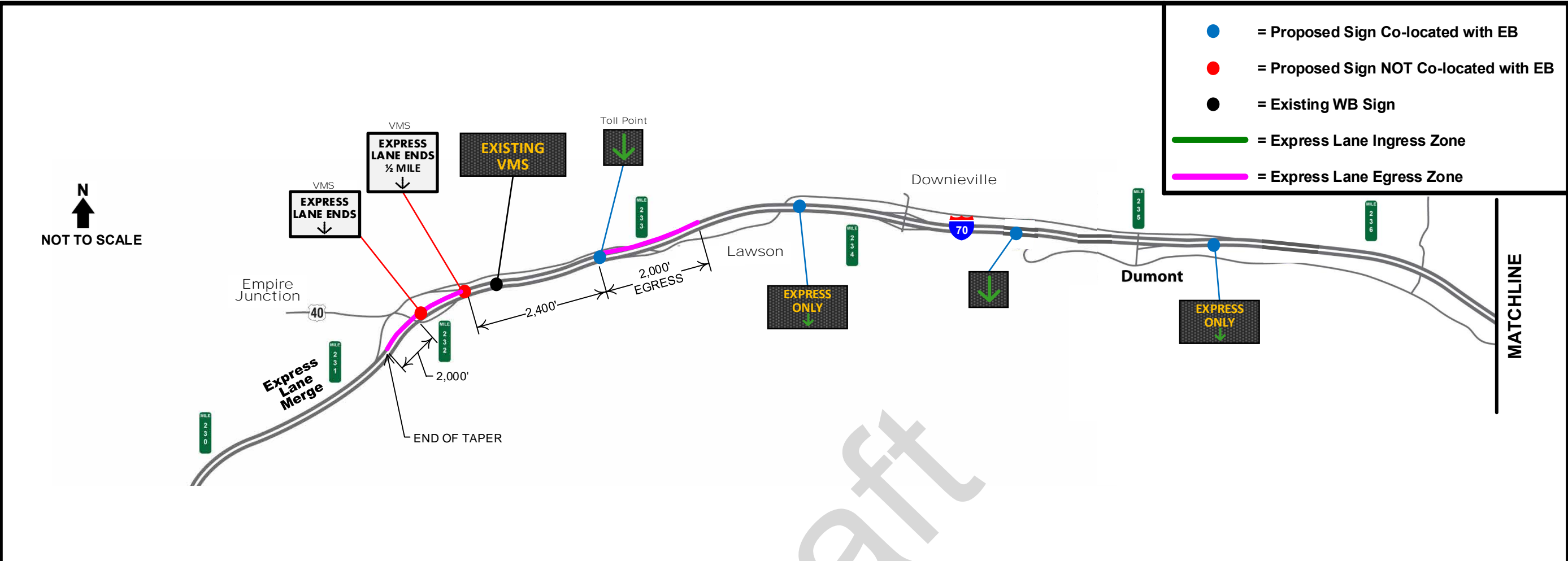
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**Recommendation:** Terminate the lane so that the end of the merging area is approximately 2,200 feet east of the US 40 on ramp (Option 2). This location results in the least amount of queuing in the GP lanes and does not create any vehicle or queuing conflicts with either the Exit 232 on ramp or off ramp.

The attached figures shows the recommended access locations, along with the overhead signing that would be provided at each. Figure 1 shows the access and signage on the day of opening, with no improvements to Floyd Hill. Figure 2 shows the revised entrance and signing after the Floyd Hill widening project is complete. As indicated in Figure 2, to accommodate the Floyd Hill widening, the three static entrance signs with VMS inserts would be removed, two new VMS signs and structures would be installed, and the toll point would be moved to the end of the new entrance area (co-located with the new VMS sign).

DRAFT

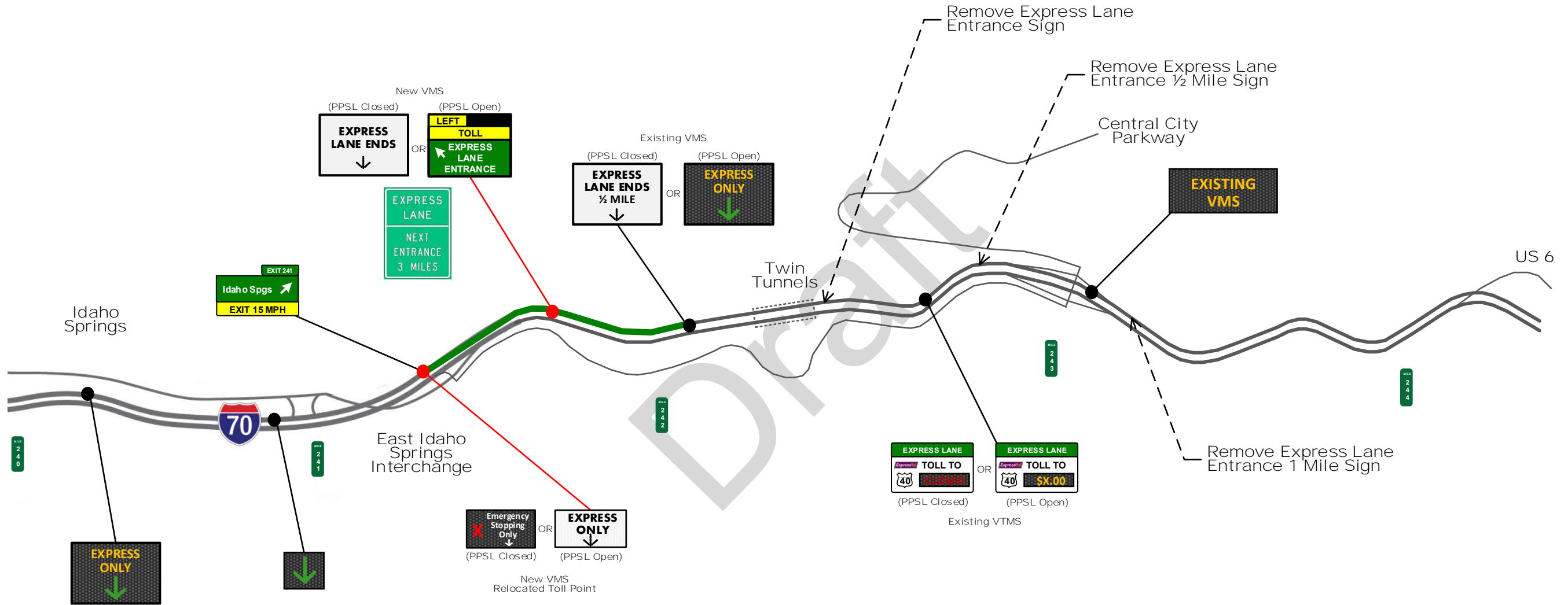
- = Proposed Sign Co-located with EB
- = Proposed Sign NOT Co-located with EB
- = Existing WB Sign
- = Express Lane Ingress Zone
- = Express Lane Egress Zone



**Figure 1. Preliminary I-70 WB PPSL Access and Signing Locations February 14, 2018**



- New WB PPSL Sign and location
- WB PPSL Sign and location to remain
- - - - WB PPSL Sign and location to be removed
- Express Lane Ingress Zone



NOT TO SCALE

**Figure 2. Preliminary I-70 WB PPSL Entrance Configuration with Floyd Hill Widening February 14, 2018**