



APPENDIX A15
FLOODPLAIN TECHNICAL MEMORANDUM



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INTRODUCTION AND BACKGROUND

The I-70 West Vail Pass Auxiliary Lanes project is located in Eagle and Summit Counties, with the eastern terminus just east of the Vail Pass Rest Area and the western terminus in the Town of Vail. The project study limits include eastbound (EB) and westbound (WB) I-70 from mile post (MP) 179.5 to MP 191.5. The project location and approximate study area are shown in **Figure 1**.

As part of the initial National Environmental Policy Act (NEPA) analysis, a Tier 1 Environmental Impact Statement (EIS) for the I-70 Mountain Corridor (C-470 to Glenwood Springs) was completed in 2011. This EIS, the *I-70 Mountain Corridor Programmatic Final Environmental Impact Statement* (PEIS), recommended the addition of auxiliary lanes EB and WB on the west side of Vail Pass from MP 180 to MP 190 as part of the Preferred Alternative's Minimum Program of Improvements. The PEIS also identified the potential for an elevated Advanced Guideway System (AGS) for transit along the I-70 corridor, including the West Vail Pass project corridor. A follow-up AGS Feasibility Study in 2014 analyzed potential alignments and costs for an AGS system and determined there were three feasible alignments for future AGS. While AGS is not part of the West Vail Pass Auxiliary Lanes project, the AGS Feasibility Study was used to ensure the project did not preclude the favored alignment of the three, which would be partially within CDOT right-of-way (ROW).

A Tier 2 NEPA analysis is the next step required to move highway improvements forward. The project is following the Colorado Department of Transportation (CDOT) and Federal Highway Administration (FHWA) NEPA process to confirm the needs for improvements to the West Vail Pass, identify a Proposed Action, investigate the anticipated benefits and impacts of the proposed improvements (through an Environmental Assessment), produce conceptual design plans, and make funding, scheduling, and phasing recommendations.

This memorandum serves as a preliminary assessment of the potential impacts of the I-70 West Vail Pass Auxiliary Lanes project (Project) on area floodplains. This portion of I-70 has significant interaction with the Gore Creek watershed. Of the streams in the study area, Zone AE 100-year floodplains have been mapped for Gore Creek and two of its tributaries: Pitkin Creek and Bighorn Creek. The Black Gore Creek floodplain near its confluence with Gore Creek has also been mapped. Because of the extensive interaction between I-70 and these waterways, the potential exists for construction activities and the proposed structures to impact these floodplains.

I-70 FINAL PEIS AND RECORD OF DECISION FLOODPLAIN (TIER 1 ANALYSIS)

Floodplain impacts and mitigation strategies were not included in the I-70 Final PEIS analysis or Record of Decision.



LEGISLATION

The regulations applicable to floodplain evaluations are summarized below.

- National Flood Insurance Act – Enacted in 1968, the National Flood Insurance Act established the National Flood Insurance Program (NFIP) to provide flood insurance for communities that establish floodplain management standards, to identify flood hazard areas, and to establish flood insurance rates for these hazard areas. 44 CFR § 65 provides guidance for communities in providing up-to-date hazard maps.
- National Environmental Policy Act (NEPA) – Enacted in 1970, NEPA requires federal agencies to use a systematic and interdisciplinary decision-making process regarding actions that may affect the quality of the human environment.
- Floodplain Management (Executive Order 11988) – Signed in 1977, Executive Order 11988 states that all federal-aid projects must avoid supporting incompatible floodplain development, minimize the adverse effects of highway actions on floodplains, promote natural floodplain services, and be consistent with the criteria of the National Flood Insurance Program (NFIP).
- Rules and Regulations for Regulatory Floodplains in Colorado (2 CCR 408-1) – These Rules provide uniform standards for regulatory floodplains and activities that may impact regulatory floodplains. The Rules also stipulate the process by which floodplains will be designated and approved by the Colorado Water Conservation Board (CWCB).

STUDY AREA

The study area encompasses a 12-mile stretch of I-70 approximately between MP 179.5 and 191.5. The Project location and study area is shown in **Figure 1**.

PURPOSE AND NEED

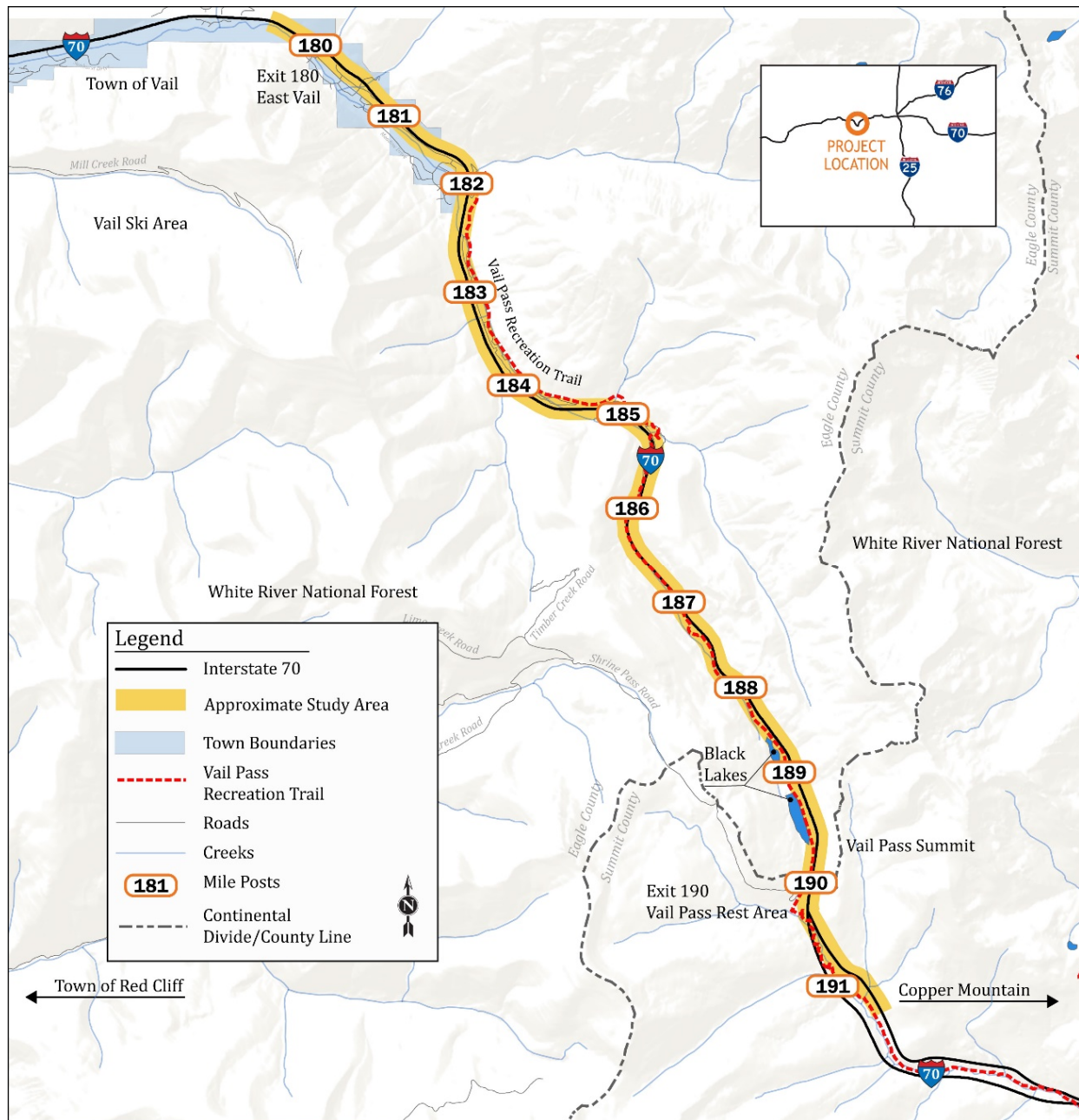
The purpose of the project is to improve safety and operations on EB and WB I-70 on West Vail Pass.

This project is needed to address safety concerns and operational issues due to geometric conditions (steep grades and tight curves) and slow-moving vehicle and passenger vehicle interactions that result in inconsistent and slow travel times along the corridor. The I-70 Mountain Corridor PEIS identified safety and mobility issues on West Vail Pass related to speed differentials due to slow-moving vehicles. (*Mobility is defined as the ability to travel along the I-70 Mountain Corridor safely and efficiently in a reasonable amount of time.*)

- Safety Concerns: A high number of crashes occur along the corridor related to speed, tight curves, narrow roadway area, and inclement weather/poor road conditions. Speed differentials between passenger vehicles and slow-moving vehicles cause erratic lane changes and braking maneuvers resulting in crashes and spin outs. Emergency response is hampered by vehicular speeds and lack of roadway width to provide room for emergency vehicles to pass.
- Operational Issues: The steep grades and resulting speed differentials causes slow and unreliable travel times through the corridor. Tight curves also cause drivers to slow down. The corridor is frequently closed by vehicle incidents, due to lack of width to maintain a

single lane of traffic adjacent to emergency responders, resulting in substantial traffic backups and delays. During winter months, the travel lanes and shoulders are severely impacted by snow accumulation, impacting the overall capacity of the corridor. *(Operations is intended to describe the flow of traffic at desirable speeds given the geometric and prevailing weather conditions.*

Figure 1. Project Location and Study Area



Source: DEA Project Team



No Action Alternative

The No Action Alternative is included as a baseline for comparison to the action alternative. Under the No Action Alternative, only programmed projects that are planned and funded by CDOT or other entities would be completed. Currently, there are no large-scale transportation projects to add safety improvements, operational improvements, vehicular capacity, and multimodal facilities along I-70 within the project area. The No Action Alternative would leave West Vail Pass as it currently is configured and would not provide substantial improvements beyond typical current maintenance (e.g. resurfacing and plowing) activities. The roadway would remain the same, with 2 EB and 2 WB lanes (each 12 feet in width), an inside shoulder typically 4 feet in width, and an outside shoulder typically 10 feet in width.

Proposed Action Alternative

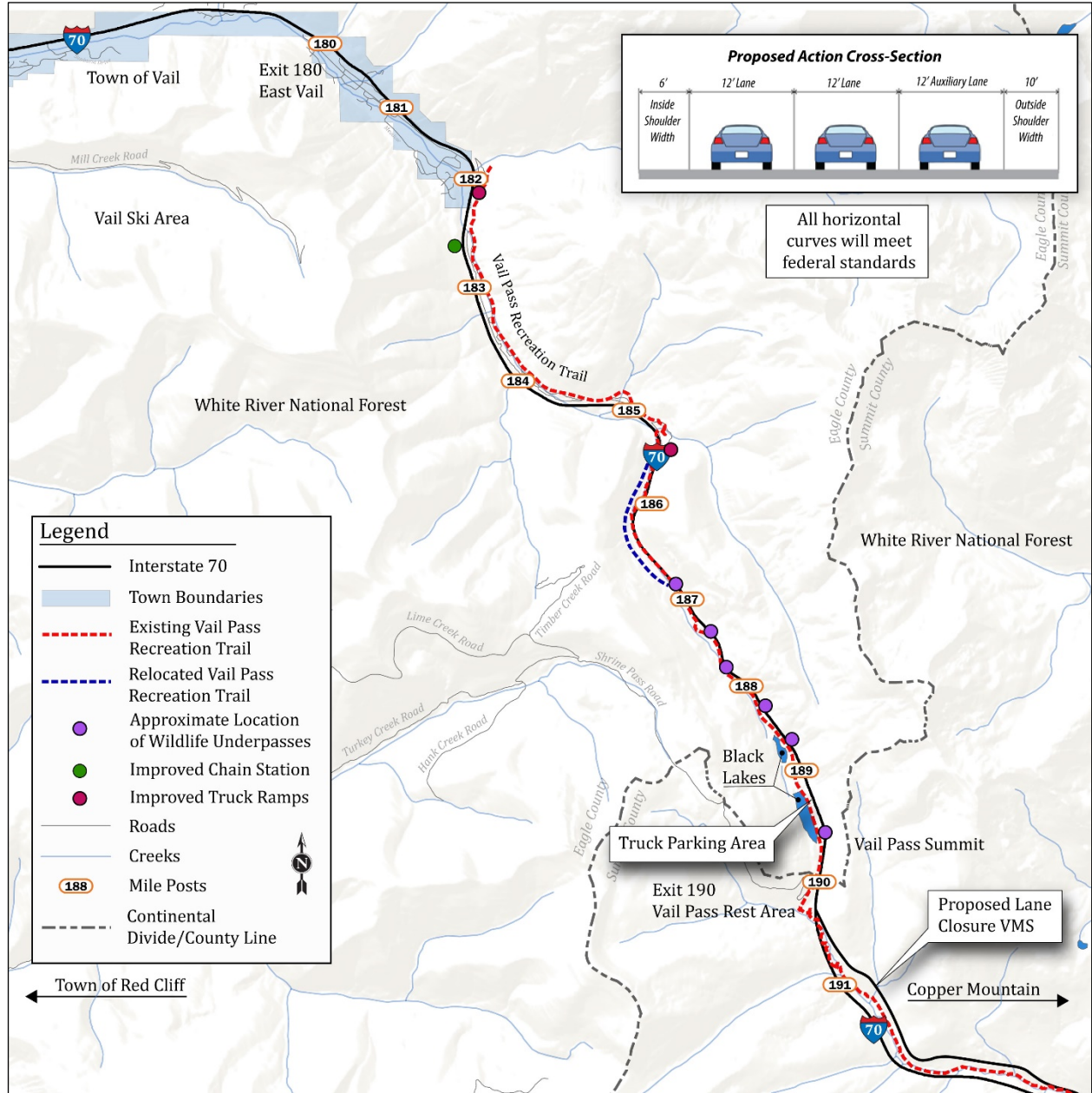
The Proposed Action (**Figure 2**) will add a 12-foot auxiliary lane, both EB and WB, for 10 miles from approximately the East Vail exit (MP 180) to the Vail Pass Rest Area exit (MP 190). Existing lanes will be maintained at 12 feet and the shoulders would be widened to a minimum of 6 feet for inside shoulders and maintained at 10 feet for outside shoulders. All existing curves will be modified as needed to meet current federal design standards.

Intelligent Transportation System (ITS) equipment will also be installed along the I-70 project corridor, consistent with recent study recommendations. Additional variable message signs (VMSs) will be installed at key locations to warn drivers of upcoming curves, grades, and incidents. Additional variable speed limit signs will be installed to manage driver speeds to conditions. Automated lane closure signage will be installed approaching the East Vail exit on EB I-70 and approaching the WB I-70 Vail Pass Rest Area exit to quickly and efficiently close lanes when needed.

Additional elements of the Proposed Action include:

- The Vail Pass Recreation Trail will be directly impacted by the addition of the I-70 auxiliary lane and therefore relocated for approximately two miles from MP 185 to MP 187.
- Existing emergency truck ramps, located at approximately MP 182.2 and 185.5, will be upgraded to current design standards.
- Six wildlife underpasses and wildlife fencing will be constructed throughout the corridor.
- Additional capacity will be added to the existing commercial truck parking area at the top of Vail Pass.
- Widened shoulders (minimum of eight feet of additional width beyond the 10' shoulder) at multiple locations to accommodate emergency pull-offs, emergency truck parking, and staging for tow trucks.
- Improved median emergency turnaround locations to accommodate emergency and maintenance vehicle turnaround maneuvers.
- Improved chain station located at approximately MP 182.5 with additional parking, signage, lighting, and separation from the I-70 mainline.
- Avalanche protection located at approximately MP 186.

Figure 2. I-70 West Vail Pass Auxiliary Lanes Proposed Action Alternative



Source: DEA Project Team



METHODOLOGY

The data used for this preliminary evaluation included conceptual design plans from CDOT and Flood Insurance Rate Map (FIRM) panels from FEMA. FEMA 100-year floodplains from FIRM panels 08037C0493D, 08037C0494D, and 08037C0682D were mapped alongside the study area and evaluated alongside CDOT construction plans to determine potential impacts of the Project on the 100-year floodplains. The results of this analysis are detailed in subsequent sections.

No modeling has been completed at this time, only a desktop review of effective floodplains and their associated information was gathered and reviewed. Once design begins, hydraulic modeling will be performed as part of the design process.

EXISTING CONDITIONS

Within the project area, Black Gore Creek flows in the northwest direction along I-70 from MP 190 to MP 182, where it meets Gore Creek, which flows along I-70 for the remainder of the highway indicated for improvements. Pitkin Creek and Bighorn Creek flow in the southwest direction, joining Gore Creek after flowing through culverts on I-70. I-70 interacts with significant portions of the Gore Creek stream network along the stretch indicated for improvements.

Zone AE 100-year floodplains have been mapped for Gore Creek, Pitkin Creek, Bighorn Creek, and a 20-foot reach of Black Gore Creek near its confluence with Gore Creek (see **Figure 3**). Of these streams, Gore Creek is the only stream that contains a floodway. **Table 1** summarizes the location of these waterways relative to I-70 and the FEMA FIRM panels.

Table 1. Impacted Waterways with Effective Floodplains

CREEK	FIRM PANEL	FLOODPLAIN	INTERACTION WITH I-70
Gore Creek	08037C0493D 08037C0494D 08037C0682D	Zone AE (with floodway)	Adjacent to MP 179.5 – 182.0 Existing bridge at MP 181.7
Black Gore Creek	08037C0494D 08037C0682D	Zone AE (without floodway)	Adjacent to MP 182.0 – 182.25
Pitkin Creek	08037C0493D	Zone AE (without floodway)	Culvert near MP 180.1
Bighorn Creek	08037C0493D	Zone AE (without floodway)	Culvert near MP 180.5

HYDROLOGY

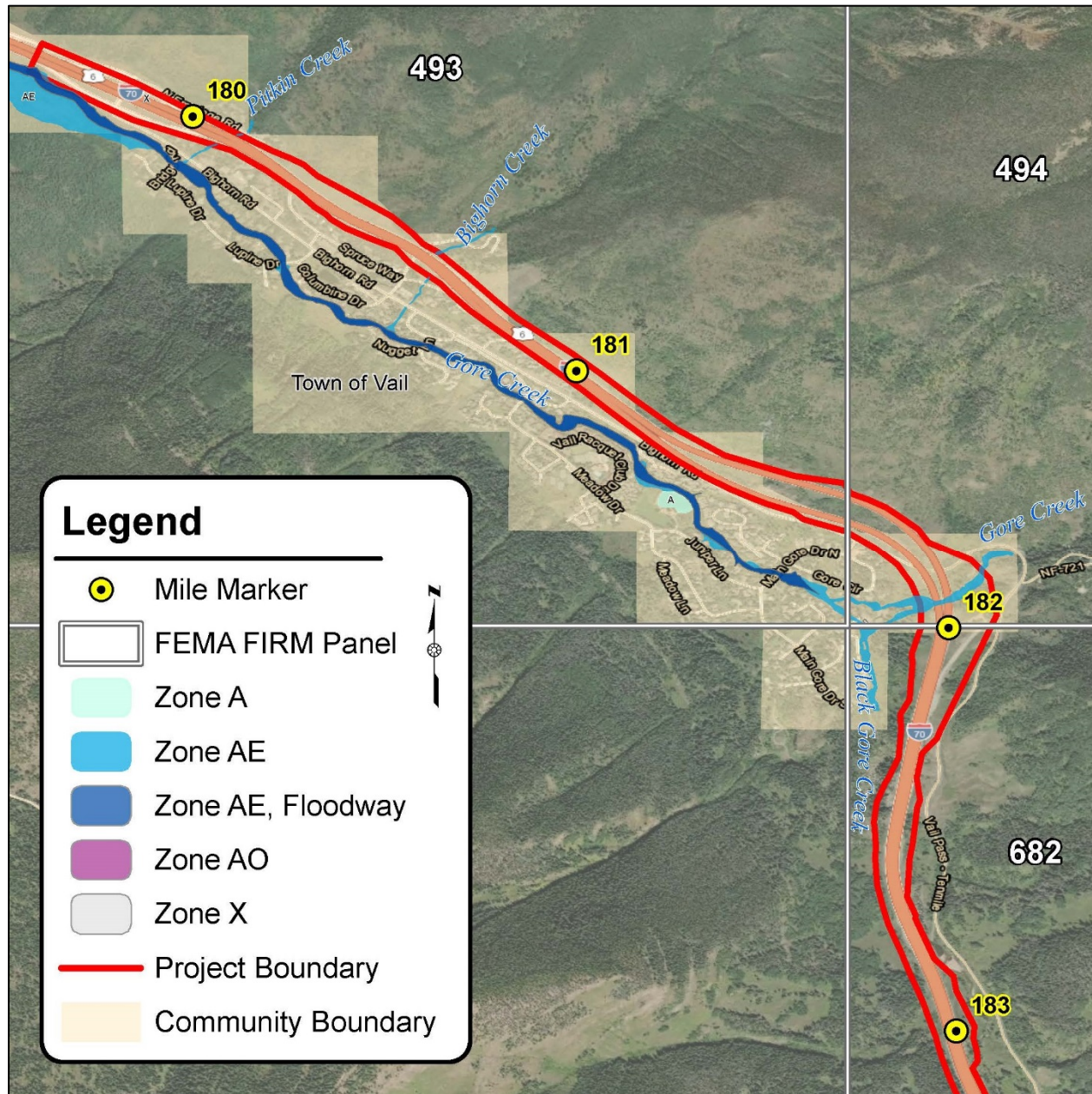
Effective hydrology for Gore Creek was developed using annual peak flow data from 9 stream gages within the Gore Creek Basin and developing a regional study using gages from nearby basins. These results were then used to develop regression equations for other ungauged tributaries along the Gore Creek Mainstem including Black Gore Creek, Pitkin Creek, and Bighorn Creek. Effective flows for these 4 tributaries are presented in **Table 2**.



Table 2. Effective Flows

CREEK	LOCATION	DRAINAGE AREA (SQ. MI.)	PEAK DISCHARGES (CFS) ANNUAL CHANCE			
			10% 10-YEAR	2% 50-YEAR	1% 100-YEAR	0.2% 500-YEAR
Gore Creek	Upstream of Booth Creek	48.0	1,230	1,530	1,670	1,850
Gore Creek	Upstream of Pitkin Creek	40.3	1,080	1,350	1,470	1,640
Gore Creek	Upstream of Bighorn Creek	35.7	990	1,240	1,350	1,500
Black Gore Creek	Near Mouth	20.7	440	590	640	770
Pitkin Creek	Near Mouth	5.3	180	260	290	380
Bighorn Creek	Near Mouth	4.5	180	250	280	340

Figure 3. FEMA 100-year Floodplains in Study Area



Source: FEMA

IMPACTS

NO ACTION ALTERNATIVE

As described above, the No Action Alternative would leave West Vail Pass as it currently is configured and would not provide substantial improvements to the roadway beyond current maintenance activities. The safety and mobility issues caused by steep grades, tight curves, and narrow shoulders on the existing roadway would not be addressed. No impacts to floodplains would result from this alternative.



PROPOSED ACTION ALTERNATIVE

Currently identified limits of construction intersect the 100-year floodplain of Gore Creek in only one location as shown in **Figure 2**; however, the limits of construction also intersect the 100-year floodplains of two tributaries of Gore Creek. Culverts located at MP 179.8 and MP 180.4 allow the passage of Pitkin Creek and Bighorn Creek, respectively. As designated in the FIRM panels, both culverts contain the 100-year flood discharge. Curve modification has been proposed at the location of the Bighorn Creek culvert, which would move the road slightly northward. This would require the existing culvert to be extended in the same direction or replaced. The final proposed improvement at this location is yet to be determined. Aquatic wildlife at these locations will be addressed as outlined in the Biological Assessment and Biological Evaluation completed for this project.

Curve modifications have also been proposed for the bridge over Gore Creek at MP 181.7 and the bridge over Black Gore Creek at MP 185.2. This bridge at MP 181.7 would be realigned to the southwest of the current location, bringing the new bridge closer to the confluence of Gore Creek and Black Gore Creek. Black Gore Creek is located adjacent to the bridge at MP 185.2. The proposed realignment of this bridge would bring the EB lanes closer to the creek and the WB lanes farther from the creek. The bridges over Black Gore Creek at MP 182.3 and MP 184.3 will be replaced with wider structures and a different pier configuration. Recreation trail bridges are proposed near MP 186 and 186.3.

Additional impervious area is being added as part of the Project, which may increase localized runoff during rainstorms. Based on language in the Eagle County Flood Insurance Study (FIS), rainfall peaks in this area are of very small magnitude when compared to the snowmelt driven peaks. Because of this, the Project's increase in impervious area would not impact the potential peak 100-year flows due to the primary mechanism of these flows being snowmelt from areas higher in the basin.

MITIGATION MEASURES AND BEST MANAGEMENT STRATEGIES

Table 3 details the mitigation commitments. The Project will be designed in a manner to seek a No-Rise Certification for all floodplains. Pier locations and bridge widths will be adjusted as feasible to reduce the hydraulic impact to the floodplain. If conflicts arise where a No-Rise is not achievable, a Conditional Letter of Map Revision (CLOMR) will be submitted to document and seek approval for any rise that does occur. Once the Project is completed, a Letter of Map Revision (LOMR) would be submitted to formally adjust the regulatory floodplain.



Table 3. Resource Mitigation Measures

CONTEXT			
Zone AE 100-year floodplains have been mapped for Gore Creek, Pitkin Creek, Bighorn Creek, and a 20-foot reach of Black Gore Creek near its confluence with Gore Creek. Gore Creek is the only stream that contains a floodway.			
IMPACT TYPE	NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE	MITIGATION
Floodplain Base Flood Elevation Changes	<p>Permanent Impacts: None</p>	<p>Permanent Impacts: Base flood elevations would rise or be lowered and/or flood risk in adjacent parcels would increase.</p> <p>Temporary Impacts: Construction materials may reduce floodplain conveyance.</p>	<p>Permanent: Project will be designed to seek a No-Rise Certification by ensuring adequate structure openings and pier locations where feasible. If not feasible, Conditional Letter of Map Revision (CLOMR)/Letter of Map Revision (LOMR) process will be followed to comply with federal regulation.</p> <p>Temporary: Construction materials will not be stored in the floodplain, and construction activities will be limited within the floodplain as feasible to reduce the potential impacts to the floodplain. A construction stormwater and a floodplain permit will be obtained from the county if determined necessary.</p>



PERMITS

Permits related to floodplains that may be required for the Project include, but are not limited to the following:

- Floodplain Development Permit (Eagle County)
- No Rise-Certification (Eagle County)
- Conditional Letter of Map Revision (CLOMR) (FEMA)
- Letter of Map Revision (LOMR) (FEMA)



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FEMA, 2007. "Flood Insurance Study, Eagle County, Colorado and Incorporated Areas."

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