the New Pueblo Freeway

DRAFT

I-25: THE NEW PUEBLO FREEWAY PROJECT

STEM BEACH TO 29th STREET

EVALUATION OF EXISTING CONDITIONS

March 26, 2002

I-25: The New Pueblo Freeway Project

Stem Beach to 29th Street

Evaluation of Existing Conditions

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1. Introduction

This report has been prepared to summarize an initial evaluation of existing conditions along Interstate 25 through Pueblo, Colorado. The corridor study limits are bounded on the south by Stem Beach and on the north by 29th Street. The majority of the project is urban, becoming rural south of the Pueblo City Limits, at Pueblo Boulevard.

Right-of-way along the urban section is typically narrow and confined by several railroad lines to the east and well-established residential neighborhoods to the west. A steel mill and associated tailings/workings are also located near the roadway at the southeastern end of the corridor. Fountain Creek runs southerly along the corridor into the Arkansas River, which is a central historical district for the City of Pueblo.

Posted speed limits along the urban portion of the mainline range from 50 mph to 65 mph. The posted speed limit along the rural section of the mainline is 75 mph. Posted speed limits at the interchange ramps range from 20 mph to 45 mph.

The following sections document the data collection activities, development of evaluation criteria, and initial evaluation of the existing conditions along the corridor.

2. Data Collection

Data has been collected from several sources at the Colorado Department of Transportation. Available as-builts and record drawings were collected from the Engineering Records Unit. A 'Field Log of Structures', dated June 1999, was obtained from the Bridge Management Systems Unit Internet site. Accident data was requested from the Transportation Safety, Traffic Records Unit for the time period from January 1, 1997 through December1 31, 1999.

A field review was conducted by CH2M HILL on August 10 and 11, 2000. Photographs and field observations were collected and documented for the entire corridor. The field review included detailed observation of the interchange ramps and associated intersections.

An aerial photo of the entire length of corridor was flown on June 20, 2000. This aerial photo was provided electronically at both 5-foot pixels and 2-foot pixels in MrSid Viewer format.

3. Evaluation Criteria

Criteria were developed for evaluation of the existing corridor for geometric features, operational features, and overall performance measures. The criteria were used to rate each segment of the corridor as GOOD, FAIR, and POOR. The following sections describe the components of each criterion and the basis of the rating.

Design speed is the maximum safe speed that can be maintained over a section of roadway when conditions are such that the design features of the road govern. The posted speed limits throughout the corridor were noted and design speeds were set at 5 to 10 mph higher depending on road conditions, topography, and user characteristics. The following table summarizes the design speeds used for the mainline:

TABLE 3-1
Posted Speed vs Design Speed

Corridor Segment	Posted Speed (mph)	Design Speed (mph)
1	75	80
2	65	70
3	55	60
4	50	60
5	50	60
6	50	60
7	55	60
8	55	60

3.1 Geometric Features

3.1.1 Horizontal Alignment

The horizontal alignment was evaluated based on information collected from available as-built drawings and field review observations. Evaluation criteria were established according to CDOT's Design Guide for a maximum superelevation rate of 0.08 feet per foot. This superelevation rate applies to rural and urban roadways that are subjected to icing conditions frequently. The following criteria apply to the horizontal curvature of the mainline and the ramps:

TABLE 3-2
Evaluation Criteria for Horizontal Curves

Design Speed (mph)	Rating of Horizontal Curves		
	Good	Fair	Poor
25	Less than 33° 00’	33° 00’	Greater than 33° 00’
30	Less than 22° 45’	22° 45’	Greater than 22° 45’
35	Less than 16° 00’	16° 00’	Greater than 16° 00’
40	Less than 12° 15’	12° 15’	Greater than 12° 15’
45	Less than 9° 15’	9° 15’	Greater than 9° 15’
50	Less than 7° 30’	7° 30’	Greater than 7° 30’
55	Less than 6° 00’	6° 00’	Greater than 6° 00’
60	Less than 4° 45’	4° 45’	Greater than 4° 45’
65	Less than 3° 45’	3° 45’	Greater than 3° 45’
70	Less than 3° 00’	3° 00’	Greater than 3° 00’
80	Less than 2° 15’	2° 15’	Greater than 2° 15’

Reference: CDOT Design Guide Volume I AASHTO Chapters (English Units) 1995

Rating of the horizontal curves is based primarily on review of available as-built drawings and field observations. Criteria for superelevation runout lengths range from 150 feet to 200 feet with 40% of the superelevation achieved within the horizontal curve or in the entire length of spiral if they exist. As-built information for superelevation rates was not available at the time of this report.

3.1.2 Vertical Alignment

The vertical alignment was evaluated based on information collected from available as-built drawings and field review observations. Evaluation criteria were established according to CDOT's Design Guide for level terrain applicable to rural and urban freeways. The mainline as well as the ramps were evaluated.

The vertical alignment was evaluated using a two step procedure. The first criteria used are simply based on the maximum grade. The following criteria were used to evaluate maximum grades throughout the study area:

TABLE 3-3
Evaluation Criteria for Vertical Grades

Design Speed (mph)	Rating		
	Good	Fair	Poor
30	Level to 5%	5% to 7%	Greater than 7%
40	Level to 4%	4% to 6%	Greater than 6%

TABLE 3-3
Evaluation Criteria for Vertical Grades

Design Speed (mph)	Rating		
	Good	Fair	Poor
45	Level to 3%	3% to 5%	Greater than 55
50	Level to 3%	3% to 5%	Greater than 5%
60	Level to 3%	3% to 5%	Greater than 5%
70	Level to 3%	3% to 5%	Greater than 5%
80	Level to 35	3% to 5%	Greater than 5%

Reference: CDOT Design Guide Volume I AASHTO Chapters (English Units) 1995

The second criteria evaluates the 'critical length of grade' defined by AASHTO as 'the maximum length of a designated upgrade on which a loaded truck can operate without an unreasonable reduction in speed'. Accident rates increase as a vehicle's speed deviates from the average speed. These accident rates increase significantly when the speed is reduced by more than 10 mph. The following criteria were used to evaluate the existing vertical grades for a speed reduction of 10 mph:

TABLE 3-4
Evaluation Criteria for Critical Length of Grade

Percent Upgrade	Length of Grade (feet)
2	2500
3	1400
4	1000
5	750
6	600

Reference: AASHTO Green Book, 1990

3.1.3 Stopping Sight Distance

Stopping sight distance is the combined total of the brake reaction distance and the braking distance. This accounts for the time it takes the driver to recognize that a stop is necessary and the time it takes to actually apply the brakes and stop the vehicle. Criteria have been developed based on wet pavement conditions and braking reaction time of 2.5 seconds. The following criteria were used for evaluation of the corridor:

TABLE 3-5
Evaluation Criteria for Stopping Sight Distance

Design Speed (mph)	Rating		
	Good	Fair	Poor
30	Greater than 200 feet	200 feet	Less than 200 feet
40	Greater than 325 feet	275 feet to 325 feet	Less than 275 feet
45	Greater than 400 feet	325 feet to 400 feet	Less than 325 feet
50	Greater than 475 feet	400 feet to 475 feet	Less than 400 feet
60	Greater than 650 feet	525 feet to 650 feet	Less than 525 feet
70	Greater than 850 feet	625 feet to 850 feet	Less than 625 feet
80	Greater than 1,100 feet	950 feet to 1,100 feet	Less than 950 feet

Reference: CDOT Design Guide, Page 3-2

Rating of the stopping sight distance was based on review of available as-built drawings and field observations. The vertical curves were also evaluated for the existing "K" value. This relates the algebraic difference in grade and length of the vertical curve. The rating of the "K" value was based strictly on the available as-built drawings. For the purposes of this report, evaluation of the "K" value is a secondary check of the stopping sight distance noted above.

TABLE 3-6
Evaluation Criteria for “K” Value – Vertical Curves

Design Speed (mph)	Rating – Crest / (Sag)		
	Good	Fair	Poor
30	Greater than 30 / (40)	30/(40)	Less than 30/(40)
40	Greater than 80/(70)	60/(60) to 80/(70)	Less than 60/(60)
45	Greater than 120/(90)	80/(70) to 110/(90)	Less than 80/(70)
50	Greater than 160/(110)	110/(90) to 160/(110)	Less than 110/(90)
60	Greater than 310/(160)	190/(120) to 310/(160)	Less than 190/(120)
70	Greater than 540/(220)	290/(150) to 540/(220)	Less than 290/(150)

Reference: CDOT Design Guide, Page 3-2

3.1.4 Cross Sectional Elements

Cross sectional elements encompass a wide variety of components of roadway. Lane widths, shoulder widths, clear zone obstructions, side slopes, and guardrail were the components that apply to this corridor. Field observations were noted for these elements and available as-builts were also referenced. The following criteria were used to evaluate the corridor mainline and ramps:

TABLE 3-7
Evaluation Criteria for Cross Sectional Elements

Rating	Criteria
Good	12-foot wide lane
	10-foot wide outside shoulder
	4-foot wide inside shoulder
	30-foot clear zone free of obstructions
	4:1 foreslopes
	3:1 or flatter backslopes
	Guardrail along slopes steeper than 3:1
Fair	11-foot to 12-foot wide lane
	8-foot wide outside shoulder
	2-foot to 4-foot wide inside shoulder
	30-foot clear zone free of obstructions or equipped with barriers
	3:1 to 4:1 foreslopes
	3:1 backslopes
	Guardrail along slopes steeper than 3:1
Poor	Less than 11-foot wide lane
	Less than 8-foot wide outside shoulder
	Less than 2-foot wide inside shoulder
	Obstructions within the 30-foot clear zone
	Steeper than 3:1 foreslopes
	2:1 or steeper backslopes
	No guardrail or other barriers

Reference: CDOT Design Guide, Chapter 4

3.1.5 Decision Sight Distance

Decision sight distance is a measure of advanced notification to the driver for exits from the roadway, major forks, and lane drops. At these locations, drivers must perceive, decide a course of action, and navigate. Evaluation criteria were developed based on CDOT Design Guides. Rating of the decision sight distance is based primarily on field observations and review of the aerial photographs.

TABLE 3-8
Evaluation Criteria for Decision Sight Distance

Design Speed (mph)	Rating		
	Good	Fair	Poor
30	Greater than 625 feet	450 feet to 625 feet	Less than 450 feet
40	Greater than 825 feet	600 feet to 825 feet	Less than 600 feet
45	Greater than 925 feet	675 feet to 925 feet	Less than 675 feet
50	Greater than 1,025 feet	750 feet to 1,025 feet	Less than 750 feet
60	Greater than 1,275 feet	1,000 feet to 1,275 feet	Less than 1,000 feet
70	Greater than 1,450 feet	1,100 feet to 1,450 feet	Less than 1,100 feet
80	Greater than 1,625 feet	1,200 feet to 1,625 feet	Less than 1,200 feet

Reference: CDOT Design Guide, Page 3-15

3.1.6 Exit and Entrance Ramp Design

Exit and entrance ramp design is evaluated based on two elements: 1). the acceleration or deceleration length of taper available to the driver, and 2). the ramp curvature in the vicinity of the point of merge or diverge. The evaluation criteria are based on AASHTO recommendations. Field observations, review of the aerial photograph and available as-builts were used to develop ratings.

TABLE 3-9
Evaluation Criteria for Exit and Entrance Ramp Design

Criteria	Rating		
	Good	Fair	Poor
Entrance Taper	70:1	70:1 to 50:1	Less than 50:1
Exit Taper	2°	2° to 5°	Greater than 5°
Curvature at Nose	Less than 5° 15'	5° 15' to 9° 15'	Greater than 9° 15'
Acceleration Length (60 mph)	Greater than 910 feet	500 feet to 910 feet	Less than 500 feet
Deceleration Length (60 mph)	Greater than 430 feet	315 feet to 430 feet	Less than 315 feet

Reference: AASHTO, 1990; pages 984, 987, 169, 986, and 991

Exit ramps were also evaluated for isolated locations, single exit design, and exits on curved alignments rather than on tangents.

3.1.7 Ramp Design

Apart from the mainline exit and entrance ramp design, an evaluation was made of the overall condition of the interchange ramps. This evaluation is based on cross sectional elements, horizontal and vertical alignment, and functionality. The criteria are generally based on field observations and items noted during the field review. Limited as-built information was available for the ramps. The ramps are rated as FAIR or POOR based on field conditions noted.

3.2 Operational Features

3.2.1 Route Continuity

Route continuity provides a directional path along and throughout the length of the corridor mainline. A continuous through route does not require the driver of the corridor to change lanes and allows vehicular operation to occur on the left of all other traffic (AASHTO, 1990; page 938). This criterion encompasses proper lane continuity and maintenance of basic number of lanes.

The criteria established for route continuity is based on AASHTO guidelines and evaluation was made based primarily on field observations. The rating does not distinguish between GOOD and FAIR. If the route lacks continuity, it is rated as POOR. Otherwise, it is rated as GOOD.

3.2.2 Lane Balance

Lane balance through and beyond interchanges achieves efficient traffic operations. It is a constant number of lanes assigned to a route for a significant distance. Features of this criteria include adding or deleting one lane at a time, removing basic lanes following significant changes in traffic volumes, and minimizing the number of lane changes at exit and entrance locations (AASHTO, 1990; page 942).

To achieve lane balance at entrance ramps, the number of mainline lanes downstream of the ramp should be one less than the combination of mainline lanes prior to the entrance ramp and the number of lanes on the ramp. At exit ramps, lane balance is achieved when the number of mainline lanes prior to the exit ramp is equal to or one greater than the combination of exit ramp lanes and mainline lanes downstream of the exit ramp. For example, if an auxiliary lane is being dropped at an exit ramp, the exit ramp should have an optional exit lane to allow vehicles traveling in the right-most lane to exit without having to merge into the auxiliary lane.

The criteria established for lane balance is based on AASHTO guidelines and evaluation was made based primarily on field observations. The rating does not distinguish between GOOD and FAIR. If the corridor does not maintain lane balance, it is rated as POOR. Otherwise, it is rated as GOOD.

3.2.3 Ramp Sequence

Ramp sequencing evaluates the distance between successive ramp terminals to allow adequate length for maneuvering and adequate space for signing. The following criteria have been established by AASHTO and evaluation was made based on aerial photographs, field observations, and as-built drawings.

TABLE 3-10
Evaluation Criteria for Ramp Sequencing/Ramp Spacing Distances

Ramp-Pair Combination	Rating		
	Good	Fair	Poor
Entrance to Entrance	1,500 feet	1,000 feet to 1,500 feet	Less than 1,000 feet
Exit to Exit	1,500 feet	1,000 feet to 1,500 feet	Less than 1,000 feet
Exit to Entrance	750 feet	500 feet to 750 feet	Less than 500 feet
Entrance to Exit	3,000 feet	2,000 feet to 3,000 feet	Less than 2,000 feet

Reference: AASHTO, 1990; page 983

3.2.4 Signing

Signing of the roadway is directly related to the geometric design. Effective signing informs, warns, and controls drivers. AASHTO provides recommendations on signing of roadways, based on guidance from the MUTCD.

Criteria for the evaluation of existing signing relates to the following:

1. Signs should be placed on structures, outside the clear zone, or behind traffic barriers required to shield other hazard. If this is not feasible, signs should be on breakaway posts.
2. Information signs indicating the relative location to an exit ramp should be placed at a minimum 1/2 mile from the exit, 1/4 mile from the exit, and at the gore point of the exit.
3. MUTCD has set a limit of 5 message units per single sign and a limit of 4 message units per single sign in pairs.

Development of a rating system for signing is based primarily on the hazard to the driver. Therefore, if Criteria 1 is not met, it receives a rating of POOR. If either criteria 2 or 3 are not met, it receives a rating of FAIR. If all three criteria are met, it receives a rating of GOOD. Evaluation of the signing is based on field observations and corridor photographs taken during the field visit.

3.3 Performance Measures

3.3.1 Level of Service

The Highway Capacity Manual defines the level of service (LOS) of a roadway as 'a qualitative measure describing operational conditions within a traffic stream, and their

perception by motorists and / or passengers'. The level of service applies to speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Levels of service range from LOS A, characterizing free flow, to LOS F, characterizing forced or breakdown flow.

Criteria for LOS evaluation of a basic freeway segment, weaving section or merge and diverge areas are defined in terms of density. The following tables are based on the Highway Capacity Manual criteria:

TABLE 3-11
Evaluation Criteria for Level of Service on Basic Freeway Segments

		70 mph Design Speed		60 mph Design Speed		
Level of Service	**Maximum Density (pc/mi/ln)**	**Maximum Speed (mph)**	**Maximum Service Flow Rate (pc/h/ln)**	**Maximum Speed (mph)**	**Maximum Service Flow Rate (pc/h/ln)**	**Rating**
A	≤ 11	≤ 70	770	≥ 60	660	Good
B	≤ 18	≤ 70	1,260	≥ 60	1,080	Good
C	≤ 26	≤ 68.2	1,770	≥ 60	1,560	Good
D	≤ 35	≤ 61.5	2,150	≥ 57.6	2,020	Fair
E	≤ 45	≤ 53.3	2,400	≥ 51.1	2,300	Fair
F	> 45	Demand Exceeds Capacity	Highly variable	Demand Exceeds Capacity	Highly variable	Poor

Reference: Highway Capacity Manual, 2000

TABLE 3-12
Evaluation Criteria for Level of Service for Weaving Sections and Merge/Diverge Areas

Level of Service	Density (pc/mi/ln)	Rating
A	≤ 10	Good
B	≤ 20	Good
C	≤ 28	Good
D	≤ 35	Fair
E	> 35	Fair
F	Demand Exceeds Capacity	Poor

Reference: Highway Capacity Manual, 2000

Traffic volumes (ramp and mainline) are key input for the LOS analysis. CDOT provided September 2000 PM peak-hour traffic volumes for most of the ramps in the study corridor. For the ramps where Year 2000 PM peak-hour count data were not available, 1997 PM peak-hour counts were used with the recommended CDOT annualized growth rate (1.3 percent) to approximate Year 2000 volumes. For the mainline, Average Daily Traffic (ADT) volumes were provided by CDOT in several spot locations along the study corridor. PM peak-hour mainline volumes were estimated using a percentage of the ADT volumes (the k-factor) provided by CDOT as a guide. PM peak-hour levels of service for the I-25 mainline, as well as merge and diverge areas, were then calculated using the Highway Capacity Manual software (HCS2000 release 4.1b).

3.3.2 Accident Rates

Accident rates along the corridor have been analyzed to correlate geometric features, signing, ramp locations, and clear zone obstructions to the safety of the roadway. Accidents are typically caused by several elements, not a single one. These are the human element, the vehicle element, and the highway element. A safe highway is one that has been designed so that a driver needs to make only one decision at a time and is not surprised by an unexpected situation where a decision must be made quickly.

For the purposes of this report, 1997, 1998 and 1999 ADT volumes were obtained from CDOT for the mainline. The average ADT volumes were applied to the mainline at locations just north of the northernmost ramp in both directions. It was assumed that traffic flow was split between NB and SB evenly at 50%.

The latest statewide average traffic accident rates for Colorado are for the calendar year 1998. These rates are developed by CDOT based on reported accident data for the mainline, ramps, and crossroads. Accidents on frontage roads are not included in the calculations. Accident rates per million vehicle miles were compiled for the corridor based on accident data collected from January 1, 1997 through December 31, 1999, using the same criteria as CDOT.

The total accidents per million vehicle-miles of travel for the calendar year 1998 along Colorado rural and urban interstates are 1.02 and 2.07, respectively. The roadway between the Stem Beach interchange and the Pueblo Boulevard interchange is considered rural and the remainder of the corridor is urban.

Evaluation criteria were developed based on the most current information available from CDOT at the writing of this report. The baseline for determining the ratings is based on a value of 25 percent of the statewide average. The following table summarizes the criteria used to evaluate individual segments:

TABLE 3-13
Evaluation Criteria for Accident Rates

Classification	Total Accidents per Million Vehicle-Miles of Travel		
	Good	Fair	Poor
Rural	Less than 0.77	0.77 to 1.28	Greater than 1.28

TABLE 3-13
Evaluation Criteria for Accident Rates

Classification	Total Accidents per Million Vehicle-Miles of Travel		
Urban	Less than 1.55	1.55 to 2.59	Greater than 2.59

3.4 Structures

CDOT regularly surveys all bridge structures over 20 feet on and off the state system. Bridge needs are assessed by the FHWA sufficiency rating system. The rating system consists of two parts, a sufficiency rating and integrity. The sufficiency rating is a numerical value between 0 and 100 which is based on the surveyed condition of all the elements of each bridge structure. Bridges receiving a sufficiency rating below 50 are considered the highest priority needs. The next classification, between 50 and 80, represent the second highest priority. The integrity is a method of identifying structurally deficient or functionally obsolete bridges through a rating assignment. Structurally deficient (SD) bridges are those that are in advanced stages of deterioration or are in marginal condition but still function at a minimum level. Also, included in this categorization are bridges that do not have desired load carrying capacities. Functionally obsolete (FO) bridges are those that have acceptable load carrying capacity but impose unacceptable physical restrictions (i.e., narrow width, restricted vertical clearance, limited sight distance, speed reducing curves, or insufficient waterway adequacy). Bridges which do not fall in either the structurally deficient or functionally obsolete categories are classified as neither (NO).

3.5 Traffic Control

Traffic control can consist of signalized intersections, stop signs, or no control.

4. EVALUATION OF EXISTING CORRIDOR

For purposes of this evaluation, the corridor was divided into 7 segments, numbered from south to north:

- Segment 1 - Stem Beach to Pueblo Boulevard
- Segment 2 - Pueblo Boulevard to Indiana Avenue
- Segment 3 - Indiana Avenue to Central Avenue
- Segment 4 - Central Avenue to Abriendo Avenue
- Segment 5 - Abriendo Avenue to Ilex Street
- Segment 6 - Ilex Street to 1st Street
- Segment 7 - 1st Street to US Hwy 50B
- Segment 8 – US Hwy 50B to 29th Street

Each segment includes the southerly interchange and associated ramps and the mainline north to the subsequent interchange ramps. Locations with partial interchanges are included as part of the major segment. Exhibits of each segment have been compiled to summarize the ratings for each evaluation criteria described in the previous section.

4.1 Segment 1 - Stem Beach to Pueblo Boulevard

This segment of the corridor includes NB and SB Interstate 25 from Stem Beach to Pueblo Boulevard. It includes the Stem Beach INTERCHANGE and the two Salt Creek crossings. The Stem Beach interchange is also referred to as County Road 30 and Lime Road.

There is a frontage road to the west of the interstate, which ends at the Stem Beach interchange. A sign at the frontage road indicates the road south of this point has been abandoned by CDOT. There is also a frontage road to the east of the interstate that runs along the steel mill tailings piles. This frontage road also provides access to an industrial park that is under development.

The Stem Beach interchange provides access to an antique store, an abandoned motel, and gas station / small convenience mart to the west and a 2-lane rural road to the east. There is no access to Stem Beach other than that provided to the property owners.

The posted speed limit through this segment is 75 mph, changing to 65 mph at Pueblo Boulevard. The design speed for this segment is 80 mph. Sheets 1, 2, and 3 (of 6) illustrate this segment.

4.1.1 Geometric Features

The **horizontal alignment** consists of large, sweeping curves joined by long tangential sections resulting in a GOOD rating.

The **vertical alignment** is relatively level except at crossings of Salt Creek resulting in a GOOD rating for the majority of the segment and FAIR for the section that crosses the railroad. The FAIR rating is due to a poor level of driver comfort.

The mainline **stopping sight distance** is rated as GOOD due to the mild vertical grades in this segment.

Cross sectional elements were rated based on field observations. Lane widths are 12-feet, shoulder widths are 8-feet except at bridge crossings, and clear zone widths were adequate with a wide, flat median separating the NB and SB lanes. However, unprotected steep side slopes (on the order of 2:1 to 3:1) were noted during the field review. At the time of the field review, there was no right-of-way fence between the interstate mainline and the frontage road. Guardrail was present at the structures. Due to the steep side slopes, lack of a right-of-way fence on the SB mainline, and narrow shoulders on the overpasses, the overall rating is FAIR.

Decision sight distance is rated as FAIR due to the SB exit taper lane being located near a vertical curve, making it hard to see. The remainder of the segment is rated as GOOD.

The **exit and entrance** rating for the SB mainline is FAIR for the exit ramp due to a short deceleration lane and GOOD for the entrance ramp. The NB exit and entrance ramps both are rated as GOOD due to good merge lane lengths and adequate deceleration length.

The **ramp design** is rated as POOR based on the steep side slopes that are unprotected, and the steep vertical grades.

4.1.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is achieved at all exit and entrances in this segment, therefore it is given a GOOD rating.

Ramp sequence is given a GOOD rating because there is more than adequate distance between interchange ramps.

Signing is generally rated as GOOD but at times is rated FAIR and POOR. The lack of 1/2 mile and 1/4 mile signs prior to the SB Stem Beach exit and NB Pueblo Blvd exit result in the POOR ratings. The FAIR rating is due to the incorrect placement of the SB exit sign in the gore area.

4.1.3 Performance Measures

Level of service for this segment is rated as GOOD. The I-25 mainline and Stem Beach ramps operate at LOS A.

Northbound and southbound **accident rates** for this segment are 0.90 and 0.76, respectively. The northbound segment is rated as FAIR and the southbound segment as GOOD, based on the rural criteria.

4.1.4 Structures

Structures through this segment include the Stem Beach overpass, a railroad crossing, two crossings of Salt Creek, and two CF+I water line crossings. The following table summarizes the structures within this segment. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-1
Summary of Structures within Segment 1

Milepost	Structure Identification	Intersecting Feature	Length of Structure/# of Spans	Sufficiency Rating and Integrity	Year Built / Widened
90.63	L-18-AZ	Stem Beach	249/5	-	1963
92.32	L-18-BY / L-18-BZ	Abandoned Railroad	106/3 106/3	92.7 FO 92.7 FO	1963 1963
92.34	L-18-K	Salt Creek (Service Road)	32/1	90.9 NO	1931
92.76	L-18-BB/ L-18-BC	Salt Creek	63/2 63/2	96.1 NO 94.1 NO	1963 1963
92.84	L-18-J	CF+I Water Lines (Service Road)	84/2	84.9 NO	1931
92.90	L-18-AX / L-18-AY	CF+I Water Lines (Service Road)	185/4 185/4	75.3 FO 75.3 FO	1963 1963

4.1.5 Traffic Control

There are no signalized intersections within this segment. The ramp approaches are controlled by stop signs.

4.2 Segment 2 - Pueblo Boulevard to Indiana Avenue

This segment of the corridor includes NB and SB Interstate 25 from Pueblo Boulevard to Indiana Avenue. It includes the Pueblo Boulevard interchange and the Illinois Street SB exit ramp.

This segment is characterized as being on the fringe of the Pueblo City limits. Residential areas and a 69kV substation are located to the west of the interstate. The steel mill and railroad are located to the east. The Pueblo Boulevard interchange also provides access to a city park located at the southwest quadrant of the interchange.

The Pueblo Boulevard interchange provides access to the south end of Pueblo and an industrial park to the east. Illinois Avenue is an isolated ramp that provides a SB exit to a residential area and the substation.

The posted speed limit is 65 mph from Pueblo Boulevard to the NB exit ramp at Indiana Avenue. The design speed for this segment is 70 mph. Sheets 3 and 4 (of 6) illustrate the limits of this segment.

4.2.1 Geometric Features

The majority of the **horizontal alignment** through this segment is rated as GOOD due to large horizontal curves. The two horizontal curves leading into the Illinois Avenue exit ramp are rated FAIR because of the broken back curves. Based on field observations, there appears to be adequate superelevation runout length between the horizontal curves.

The **vertical alignment** is rated as FAIR on the north side of Pueblo Boulevard. The vertical alignment is rated as GOOD south of Pueblo Boulevard since it is relatively level. As-built information for the Illinois Avenue section was not available. Based on field observations of this area, the vertical alignment is rated as FAIR.

The mainline **stopping sight distance** is rated as GOOD throughout this segment.

Cross sectional elements were rated based on field observations. The overall rating is POOR due to the frequency of utility poles within the clear zone with no breakaway posts or bases. There is also mountable curb from the Illinois exit ramp without adequate distance from the traveled way. Steep cross slopes were noted at the SB and NB Pueblo Boulevard gore points. There is inadequate distance between the traveled way and the 69 kV electrical substation.

Decision sight distance is rated as GOOD at Pueblo Boulevard. It is rated as FAIR at Illinois Avenue due to the exit on a horizontal curve and obstructed view of the exit.

The **exit and entrance** rating for both Pueblo Boulevard and Illinois Avenue are GOOD due to adequate deceleration lengths and merge distances.

The **ramp design** is rated as GOOD at Pueblo Boulevard although the stopping sight distance on the crossroad is limited. The ramp design is rated as POOR at Illinois Avenue due to it being an isolated ramp and has a one-way lane connecting to a two-way striped, paved street with no stop control at the intersection.

4.2.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is achieved at all exit and entrances throughout this segment; therefore it is rated as GOOD.

Ramp sequence is rated as GOOD throughout the segment except for the SB distance between the entrance ramp from Indiana Avenue and the exit ramp to Illinois Avenue. There is only a distance of 2,200 feet, which is less than the required 3,000 feet, resulting in a FAIR rating for this area.

Signing in the area of the Illinois exit ramp is given a rating of POOR due an inadequate number of signs at the exit ramps in both the NB and SB directions. The gore signs at the Pueblo Boulevard exits are located too far away from the exit, which results in a rating of FAIR.

4.2.3 Performance Measures

Level of service for this segment is rated as GOOD. The NB mainline operates at LOS A and the SB mainline operates at LOS B. The southern ramps at Pueblo Boulevard operate at LOS A; the northern ramps operate at LOS B. The Illinois exit operates at LOS B.

Northbound and southbound **accident rates** for this segment between Pueblo Boulevard and Illinois Avenue are 1.84 and 1.47, respectively. Both segments are rated as FAIR based on the urban criteria.

Northbound and southbound **accident rates** for this segment between Illinois Avenue and Indiana Avenue are 0.81 and 0.68, respectively. Both segments are rated as GOOD based on the urban criteria.

Northbound and southbound **accident rates** for this segment between Indiana Avenue and Central Avenue are 1.51 and 1.28, respectively. Both segments are rated as GOOD based on the urban criteria.

4.2.4 Structures

The only structure located within this segment is the Pueblo Boulevard overpass. The following table summarizes the structure information. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-2
Summary of Structures within Segment 2

Milepost	Structure Identification	Intersecting Feature	Length of Structure/# of Spans	Sufficiency Rating and Integrity	Year Built / Widened
94.77	L-18-BA	Pueblo Boulevard (SH 45)	217/4	79.2 NO	1963/1985

4.2.5 Traffic Control

There are no signalized intersections within this segment. The ramp approaches at Pueblo Boulevard are controlled by stop signs. The SB exit ramp at Illinois is at-grade. There is no traffic control at the transition from one-way to two-way operation.

4.3 Segment 3 - Indiana Avenue to Central Avenue

This segment of the corridor includes NB and SB Interstate 25 from Indiana Avenue to Central Avenue. It includes the Indiana Avenue interchange and the Minnequa Avenue SB exit ramp. This segment of I-25 crosses the Bessemer Ditch, a pedestrian tunnel, and a utility tunnel.

The Indiana Avenue interchange provides access on the west to a Texaco gas station and convenience market and primarily residential neighborhoods. The Centura Hospital (St. Mary Corwin) is also provided access by this interchange to the west. It provides access on the east to the Pepsi Co. plant and the Rocky Mountain Steel Mills.

The posted speed limit through this segment is 55 mph. The design speed for this segment is 60 mph. Sheet 4 (of 6) illustrates the limits of this segment.

4.3.1 Geometric Features

The **horizontal alignment** consists of adequate curves and runout lengths for the superelevation. This segment is rated as GOOD.

Vertical alignment is rated as FAIR through this segment. As-built information for this segment is unavailable at the time of the report and the rating is based solely on field observations.

Stopping sight distance is also rated as FAIR due to the lack of as-built information.

Cross sectional elements were rated as POOR based on field observations. There are severe right-of-way constraints through this segment. Several obstructions are located within the clear zone such as utility poles and light poles at the gore points. Adequate shoulders were observed throughout the majority of this segment, with the exception being narrow shoulders at the north end of the Pepsi plant where the guardrail ends at the barrier wall. The SB mainline is parallel to an alley that backs up to a residential area without adequate clear zone distance.

Decision sight distance is rated as POOR due to the SB exit on a horizontal curve obscuring the view of the ramp. The sign notifying the driver of the exit is also covered with brush. The NB exit is rated as GOOD.

The **exit and entrance** rating for the SB ramps is POOR. The SB exit ramp is an isolated ramp located at Minnequa Avenue. In order to gain access to the SB entrance ramp, the driver must travel through a residential neighborhood to return to the interstate. The NB exit ramp is rated as FAIR due to its location at the end of a horizontal curve. The NB entrance ramp is rated as POOR since it is striped as a two-way road for access to the Pepsi Co. plant and abruptly changes to a one-way entrance to the interstate. Short deceleration lanes were also noted for both exits.

The **ramp design** is rated is POOR as it applies to the conditions noted for exit and entrance design.

4.3.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is achieved at all exit and entrances in this segment, therefore it is given a GOOD rating.

Ramp sequence for the SB exit ramp is given a FAIR rating due to its proximity to the Central Avenue entrance ramp. The NB entrance ramp is given a FAIR rating due to its proximity to the Central Avenue exit ramp. The SB entrance ramp and NB exit ramps are both given FAIR ratings.

Signing for this segment is generally rated as POOR due to the lack of signing for approaching exits as well as the poor location and visibility of the existing signs.

4.3.3 Performance Measures

Level of service for this segment is rated as GOOD. The NB mainline operates at LOS A and the SB mainline operates at LOS B. The Indiana entrance, the Minnequa exit and the Aqua entrance operate at LOS B. The Indiana exit operates at LOS A.

Northbound and southbound **accident rates** for this segment are 1.51 and 1.28, respectively. Both segments are rated as GOOD based on the urban criteria.

4.3.4 Structures

Structures through this segment include the Indiana Avenue overpass, and a crossing of the Bessemer Ditch. The following table summarizes the structures within this segment. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-3
Summary of Structures within Segment 3

Milepost	Structure Identification	Intersecting Feature	Length of Structure/# of Spans	Sufficiency Rating and Integrity	Year Built / Widened
95.90	L-18-M / L-18-W	Indiana Avenue	126/3 126/3	55.0 FO 52.9 FO	1956 1956
96.34	L-18-AS	Bessemer Ditch	22/1	95.1 NO	1957

4.3.5 Traffic Control

There are no signalized intersections within this segment. The ramp approaches are stop-controlled. The adjoining cross streets are not stop-controlled. There are accesses to an adjacent alley and one residential driveway on the SB exit ramp.

4.4 Segment 4 - Central Avenue to Abriendo Avenue

This segment of the corridor includes NB and SB Interstate 25 from Central Avenue to Abriendo Avenue. It includes the Central Avenue interchange.

The Central Avenue interchange provides access to the Minnequa Business District and the State Fairgrounds. The Northern Avenue and Mesa overcrossings, which provide east/west crossings of the interstate, are also included in this segment.

The posted speed limit through this segment is 50 mph. The design speed for this segment is 60 mph. Sheet 4 & 5 (of 6) illustrates the limits of this segment.

4.4.1 Geometric Features

The **horizontal alignment** consists of reversing curves with inadequate superelevation runout length, resulting in a POOR rating.

The **vertical alignment** is given a rating of FAIR. There was no vertical alignment as-built information available at the time of this report. The rating is based solely on the field review and comfort of driving the roadway.

The mainline **stopping sight distance** is rated as FAIR based on the conditions noted in the field.

Cross sectional elements were rated based on field observations and given a rating of POOR. Steep side slopes were noted throughout this segment. There are unprotected bridge piers at Northern Avenue. There is a concrete lined drainage ditch along the SB entrance ramp with inadequate distance from the traveled way.

Decision sight distance is POOR for both NB and SB exit ramps. The NB ramp is hidden by a crest vertical curve and the SB ramp is obscured by steep side slopes.

The **exit and entrance** rating for the NB ramps are POOR. The NB exit ramp is a tangential ramp, which is a possible cause of confusion for the driver. The NB entrance ramp also violates the taper angle. The SB exit and entrance rating is given a rating of FAIR due to short deceleration and acceleration lengths.

The **ramp design** is rated as FAIR due to steep side slopes.

4.4.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is achieved at all exit and entrances in this segment, therefore it is given a GOOD rating.

Ramp sequence is rated as GOOD for all locations except the SB entrance ramp, which is rated as FAIR.

Signing is rated as POOR where an inadequate number of signs exist for the approaching exits.

4.4.3 Performance Measures

Level of service for this segment is rated as GOOD. The NB mainline operates at LOS A south of Central Avenue and LOS B north of Central Avenue. The SB mainline operates at LOS C north of Central Avenue and LOS B south of Central Avenue. The NB Central ramps and the SB Central entrance operate at LOS B. The SB Central exit operates at LOS C.

Northbound and southbound **accident rates** for this segment are 5.79 and 1.43, respectively. The northbound segment is rated as POOR and the southbound segment as GOOD. Both segments are rated based on the urban criteria.

4.4.4 Structures

Structures through this segment include the Central Avenue, Northern Avenue, and Mesa Avenue crossings. The following table summarizes the structures within this segment. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-4
Summary of Structures within Segment 4

Milepost	Structure Identification	Intersecting Feature	Length of Structure/ # of Spans	Sufficiency Rating and Integrity	Year Built / Widened
96.67	L-18-CD	Central Avenue	212/2	99.6 NO	1970
96.81	L-18-AQ	Northern Avenue	298/5	62.0 FO	1957
96.95	L-18-AU	Mesa Avenue	261/5	76.3 FO	1957

4.4.5 Traffic Control

There are no signalized intersections within this segment. The ramp approaches are controlled by stop signs. There are raised median islands at the ramp/crossroad intersections to channelize traffic at the two-way road locations.

4.5 Segment 5 - Abriendo Avenue to Ilex Street

This segment of the corridor includes NB and SB Interstate 25 from Abriendo Avenue to Ilex Street. It includes the Abriendo Avenue interchange. This segment crosses the Arkansas River at its northern boundary. The interchange consists of a directional ramp to the west and a loop ramp for NB entrance.

Abriendo Avenue runs along the crest of the town of Pueblo, south of the freight yard. This interchange provides access to the Pueblo Community College, the State Fairgrounds, and several residential communities. There is a historical riverwalk project underway along the Original Arkansas River route.

The posted speed limit along the mainline is 50 mph. The design speed for this segment is 60 mph. Exhibit 5 illustrates the limits of this segment.

4.5.1 Geometric Features

The **horizontal alignment** is characterized by sharp, back-to-back curves resulting in a rating of POOR. Based on field observations, there is inadequate superelevation runout length provided between the curves as well.

Vertical alignment is rated as POOR based on field observations and comfort of driving the roadway. Limited as-built information was available for review at the time of this report.

Stopping sight distance is rated as POOR based on field observations.

Cross sectional elements were rated as POOR based on field observations. There are steep side slopes approaching the NB exit ramp. Shoulder width is too narrow at the Arkansas River crossing. There is a light pole located at both the NB exit ramp and SB entrance gore points which encroaches on the clear zone. Shoulder widths along the SB mainline are too narrow and there is a concrete ditch along the roadside at the SB entrance ramp. Right-of-way is limited through this segment with established residential neighborhoods on the hillside along the interstate.

Decision sight distance is rated POOR for both SB and NB exit ramps. They are both located on sharp horizontal curves, which obscures the vision of the driver.

The **exit and entrance** rating for this interchange is POOR due to short taper lengths. The SB entrance ramp also provides access to a business within the length of the ramp.

The **ramp design** is rated FAIR due to adequate lane and shoulder widths, and gradual side slopes.

4.5.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is not achieved where the auxiliary lane drops. This location is rated as POOR and the rest of the segment is rated as GOOD.

Ramp sequence is rated as POOR due to the close proximity of the Abriendo and Ilex interchanges.

Signing is rated as FAIR where there is a completeness of the number of signs, but poor spacing. POOR ratings were given to areas that lacked appropriate signing for approaching exit ramps.

4.5.3 Performance Measures

Level of service for this segment is rated as GOOD. The NB mainline operates at LOS B. The SB mainline operates at LOS B north of Abriendo Avenue and LOS C south of Abriendo Avenue. The NB Abriendo ramps and the SB Abriendo exit operate at LOS B. The SB Abriendo entrance operates at LOS C.

Northbound and southbound **accident rates** for this segment are 3.03 and 3.48, respectively. Both segments were rated as POOR based on the urban criteria.

4.5.4 Structures

Structures through this segment include the Abriendo Avenue crossing, a railroad and Arkansas River crossing, and the US 50 crossing. The following table summarizes the structures within this segment. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-5
Summary of Structures within Segment 5

Milepost	Structure Identification	Intersecting Feature	Length of Structure/ # of Spans	Sufficiency Rating and Integrity	Year Built / Widened
97.45	L-18-AV	Abriendo Avenue	206/4	90.5 FO	1958
97.53	L-18-AW	DRGW Railroad	184/4	---	1958
97.59	K-18-AJ	Arkansas River	335/2	76.5 NO	1958
97.69	K-18-AX / K-18-AY	US 50	240/4 240/4	61.2 FO 61.2 FO	1958 1958

4.5.5 Traffic Control

There are no signalized intersections within this segment. The ramps are directional and are not stop-controlled.

4.6 Segment 6 - Ilex Street to 1st Street

This segment of the corridor includes NB and SB Interstate 25 from Ilex Street to 1st Street. It includes the Ilex Street interchange.

The Ilex Street interchange services a portion of Pueblo that is isolated from the rest of town by the railroad, the freight yard, and the Arkansas River. Ilex Street provides access to Runyon State Wildlife Area, Runyon Field, a truck stop, gas station, and a future outdoor amphitheater.

The posted speed limit along the mainline is 50 mph. The design speed for this segment is 60 mph. Sheet 5 (of 6) illustrates the limits of this segment.

4.6.1 Geometric Features

Horizontal alignment is rated as POOR through this segment due to inadequate curves with insufficient runout length for the superelevation.

Vertical alignment is rated as POOR based on steep vertical grades.

Stopping sight distance is rated as POOR throughout this segment.

Cross sectional elements were rated as POOR based on field observations. Shoulder widths are inadequate through much of this segment.

Decision sight distance is rated as POOR. The SB exit ramp is hidden by guardrail and is difficult to see. The NB exit ramp is located at a crest vertical curve, which also hinders the driver's sight.

The **exit and entrance** rating for both the SB and NB is POOR. The SB exit ramp is short and has a short deceleration lane located on a sharp horizontal curve. The NB exit ramp is short and does not provide adequate deceleration length. Both entrance ramps have short merge lanes. The NB entrance ramp is located on a steep vertical grade, making acceleration by large trucks in this area difficult.

The **ramp design** is rated as POOR largely due to the sharp horizontal curves and vertical grades that have to be maneuvered by the large truck volumes in this area.

4.6.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is achieved at all exit and entrances in this segment, therefore it is given a GOOD rating.

Ramp sequence for the southern ramps is given a POOR rating due to the proximity to the Abriendo Avenue interchange. The northern ramps are given a FAIR rating based on the distance of the ramps from the 1st Street interchange.

Signing is rated as POOR along SB I-25 in the area of the Ilex Street interchange due to missing signs for the exits. In the NB direction, the segment is rated as GOOD.

4.6.3 Performance Measures

Level of service for this segment is rated as FAIR for the SB mainline north of Ilex Street and the SB Ilex exit. The rest of the segment is rated as GOOD. The NB mainline operates at LOS B south of Ilex Street and LOS C north of Ilex Street. The SB mainline operates at LOS D north of Ilex Street, LOS C between the Ilex ramps and LOS B south of Ilex Street. The NB Ilex ramps and the SB Ilex entrance operate at LOS B. The SB Ilex exit operates at LOS D.

Northbound and southbound **accident rates** for this segment are 2.58 and 5.16, respectively. The northbound segment is rated as FAIR and the southbound segment as POOR. Both segments are rated based on the urban criteria.

4.6.4 Structures

Structures through this segment include three railroad crossings. The following table summarizes the structures within this segment. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-6
Summary of Structures within Segment 6

Milepost	Structure Identification	Intersecting Feature	Length of Structure/ # of Spans	Sufficiency Rating and Integrity	Year Built / Widened
97.91	K-18-CK / K-18-CL	NP Railroad / Ilex Street / Bennet Street	1,075/13 1,075/14	52.6 NO 39.3 NO	1959 1959
98.23	K-18-CI / K-18-CJ	Service Road / ATSF Railroad	917 / 13 972/13	67.7 NO 68.7 NO	1959 1959

4.6.5 Traffic Control

There are no signalized intersections within this segment. The ramp approaches are controlled by stop signs.

4.7 Segment 7 - 1st Street to US Hwy 50B

This segment of the freeway includes NB and SB Interstate 25 from 1st Street to US Hwy 50B. It includes the 1st Street interchange, the SB 6th Street exit ramp, the NB 5th Street entrance ramp and the 13th Street interchange.

This segment is bounded on the east by Fountain Creek and on the west by commercial businesses and residential neighborhoods. The SB exit ramp at 6th Street provides access to several car dealerships and Midtown Shopping Center. The crossings at 4th Street and 8th Street provide east-west crossing of the interstate. 1st Street provides access to the Pueblo Children's Museum, the Convention Center, and the downtown area that is currently being renovated. 13th Street provides access to Mineral Palace Park located at the northwest quadrant of the 13th Street interchange.

The posted speed limit along the mainline is 55 mph. The design speed for this segment is 60 mph. Exhibits 5 and 6 illustrate the limits of this segment.

4.7.1 Geometric Features

The **horizontal alignment**, in the area of 13th Street, is characterized by reversing curves that provide inadequate superelevation runout length. This results in a POOR rating for majority of this segment.

The **vertical alignment** is rated as POOR due to steep vertical grades throughout the segment and poor driver comfortability.

Stopping sight distance at the vertical curves is rated as POOR.

Cross sectional elements were rated based on field observations. Both the NB and SB mainline receive a rating of POOR due to steep side slopes, and clear zone obstructions. Shoulder widths through the majority of this segment are inadequate. Additionally, the area

between 13th Street and US Hwy 50B contains auxiliary lanes. Since the auxiliary lanes are well utilized, this area should be considered a six-lane freeway section (three lanes in each direction). Therefore, a 10-foot wide inside shoulder should be provided in this area. Various drainage features were noted during the field review indicating that runoff drains from the NB lanes through the median barrier into the SB lanes. Several catch basins were noted along the west side of the SB lanes.

Decision sight distance is rated as GOOD for the NB exit ramps at 1st Street and 13th Street. It is rated as POOR at the SB exit ramps at 1st Street, 6th Street, and 13th Street. Trees obstruct the view at 1st Street, and the 13th Street exit is located on a vertical curve.

All **exit and entrance** ramp designs are given a rating of POOR. 1st Street has short merge lanes; 6th Street is an isolated exit ramp; 5th Street is an isolated entrance ramp; and 13th Street provides exits that can only go west. The driver must use local streets to access either 8th Street or 4th Street to cross the interstate and Fountain Creek to get to the east.

The **ramp design** at 1st Street is rated as POOR due to a lack of stopping sight distance and steep vertical grades. The 6th Street exit ramp and the 13th Street ramps are rated as FAIR. The 6th Street ramp has mountable curb along its length. The 13th Street ramps have narrow shoulders.

4.7.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is not achieved at the 13th Street exit ramps or the 6th Street exit ramp, resulting in a rating of POOR. In the SB direction, the auxiliary lane from US Hwy 50B is dropped/trapped at the 13th Street exit and the auxiliary lane from 13th Street is dropped/trapped at the 6th Street exit. In the NB direction, the auxiliary lane from the 5th Street entrance ramp is dropped/trapped at the 13th Street exit.

Ramp sequence is rated as POOR between the SB entrance ramp from 13th Street and the exit ramp to 6th Street due to their close proximity. The Bradford Street NB entrance ramp is also rated as POOR due to close proximity to the entrance at 1st Street. The northern ramps at 13th Street are rated as POOR in the NB direction and FAIR in the SB direction based on the distance of the ramps from the US Hwy 50B interchange. The remainder of the segment is rated as GOOD.

Signing is given a rating of GOOD throughout the segment. The only exception is at the NB entrance ramp from 1st Street where there are an inadequate number of signs.

4.7.3 Performance Measures

Level of service for this segment is rated as FAIR for the SB 1st Street exit, the NB mainline north of 13th Street and the SB mainline between the 13th Street ramps, between the 6th Street exit and the 1st Street entrance and south of 1st Street. The rest of the segment is rated as GOOD.

The NB mainline operates at LOS C south of 1st Street, LOS B between the 1st Street ramps, LOS C between the 1st Street entrance and 13th Street, and LOS D north of 13th Street. The

SB mainline operates at LOS D north of 13th Street, LOS C between the 13th Street ramps, LOS D between the 13th Street entrance and the 6th Street exit, LOS C between 6th Street and 1st Street, and LOS D south of 1st Street. The SB 13th Street exit operates at LOS B and the SB 1st Street exit operates at LOS D. The rest of the ramps in this segment operate at LOS C.

Northbound and southbound **accident rates** for this segment between 1st Street and 5th Street are 2.61 and 2.61, respectively. Both segments were rated as POOR based on the urban criteria.

Northbound and southbound **accident rates** for this segment between 5th Street and 13th Street are 3.36 and 1.68, respectively. The northbound segment is rated as POOR and the southbound segment as FAIR. Both segments are rated based on the urban criteria.

Northbound and southbound **accident rates** for this segment between 13th Street and US Hwy 50B are 0.97 and 1.50, respectively. Both segments were rated as GOOD based on the urban criteria.

4.7.4 Structures

Structures through this segment include the 1st Street, 4th Street, 5th Avenue, 8th Street, and 13th Street crossings. The following table summarizes the structures within this segment. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-7
Summary of Structures within Segment 7

Milepost	Structure Identification	Intersecting Feature	Length of Structure/ # of Spans	Sufficiency Rating and Integrity	Year Built / Widened
98.55	K-18-CN / K-18-CO	1st Street	156/4 156/4	61.9 FO 61.9 FO	1959 1959
98.74	K-18-CR	SH 96 (4th Street)	166/4	71.7 FO	1959 / 1990
98.81	K-18-CT	5th Avenue	155/4	72.9 FO	1959 / 1991
99.01	K-18-BV	8th Street	1,196/17	78.1 FO	1928 / 1991
99.33	K-18-EN	13th Street	140/3	91.8 FO	1975

4.7.5 Traffic Control

The only signalized intersection within this segment is at 1st Street. The 13th Street ramp transition approaches are controlled by stop signs. The 6th Street exit ramp is one-way to two-way operation at Santa Fe, which is not a stop-controlled intersection. Valley gutters cross the intersection at 1st Street.

4.8 Segment 8 – US Hwy 50B to 29th Street

This segment of the freeway includes NB and SB Interstate 25 from US Hwy 50B to 29th Street. It includes the US Hwy 50B interchange and the 29th Street interchange.

This segment is bounded on the east by Fountain Creek and on the west by commercial businesses and residential neighborhoods. The US Hwy 50B interchange provides access to the Pueblo Memorial Airport. 29th Street provides access to the Pueblo Mall and residential developments, west of I-25.

The posted speed limit along the mainline is 55 mph. The design speed for this segment is 60 mph. Exhibit 6 illustrates the limits of this segment.

4.8.1 Geometric Features

The **horizontal alignment** is characterized by several short reversing curves and a long horizontal curve at 29th Street that provide adequate superelevation runout length. This results in a GOOD rating for this segment.

The **vertical alignment** is rated as GOOD in the area between US Hwy 50B and 29th Street since it is relatively level. Limited as-built information was available between US Hwy 50B and 29th Street; therefore, the rating is based solely on field observation. As-built information was available for the vertical curve at 29th Street. This segment is given a rating of FAIR based on the vertical grades.

Stopping sight distance at the vertical curve at 29th Street is rated as POOR based on the "K" value. The rest of the segment is rated as GOOD.

Cross sectional elements were rated based on field observations. Both the NB and SB mainline receive a rating of FAIR. For a portion of the area between US Hwy 50B and 29th Street there was no guardrail or barrier between the interstate mainlines. Additionally, the area between US Hwy 50B and 29th Street contains auxiliary lanes. Since the auxiliary lanes are well utilized, this area should be considered a six-lane freeway section (three lanes in each direction). Therefore, a 10-foot wide inside shoulder should be provided in this area.

Decision sight distance is rated as FAIR for the SB exit ramp at US Hwy 50B. It is rated as GOOD at the SB exit at 29th Street and the NB exit ramps at US Hwy 50B and 29th Street.

All **exit and entrance** ramp designs at 29th Street are given a rating of GOOD. The NB entrance from US Hwy 50B is rated as GOOD due to the downhill grade and the tangential alignment and the SB US Hwy 50B exit is rated as FAIR due to the curvature at the nose of the gore. The US Hwy 50B NB exit and SB entrance are rated as POOR due to the tangential NB exit and the ramp curvature being carried past the gore nose for the SB entrance.

The **ramp design** at US Hwy 50B is rated as POOR for both NB and SB due to the tight horizontal curves, narrow ramp width for the SB exit and the tangential NB exit. Additionally, the NB US Hwy 50B exit ramp splits to allow access to the frontage road shortly after the ramp exits the mainline. The split in the ramp does not provide adequate separation from the mainline for decision sight distance or to allow appropriate signing for the driver. The ramp design at 29th Street is rated as GOOD for both NB and SB due to the long ramp lengths, good horizontal and vertical design, and the protected steep side slopes.

4.8.2 Operational Features

Lane and route continuity is maintained throughout this segment, therefore it is given a GOOD rating.

Lane balance is not achieved at the US Hwy 50B exits resulting in a rating of POOR. In the NB direction, the auxiliary lane from 13th Street is dropped/trapped at the US Hwy 50B exit. In the SB direction, the auxiliary lane from 29th Street is dropped/trapped at the US Hwy 50B exit. Lane balance is achieved in the NB direction between US Hwy 50B and 29th Street, resulting in a rating of GOOD.

Ramp sequence is rated as FAIR in the SB direction between the US Hwy 50B ramps and for both of the northern ramps at US Hwy 50B based on the distance of the ramps from the 29th Street interchange. The remainder of the segment is rated as GOOD.

Signing is given a rating of POOR throughout the segment due to the lack of appropriate signs and the exit only off-ramps were not appropriately addressed.

4.8.3 Performance Measures

Level of service for this segment is rated as FAIR for the NB mainline south of US Hwy 50B and the SB mainline between 29th Street and US Hwy 50B and between the US Hwy 50B ramps. The rest of the segment is rated as GOOD.

The NB mainline operates at LOS D south of US Hwy 50B and LOS C between US Hwy 50B and 29th Street. The SB mainline operates at LOS C north of 29th Street, LOS E between 29th Street and US Hwy 50B, LOS D between the US Hwy 50B ramps, and LOS C south of US Hwy 50B. The SB US Hwy 50B entrance and the SB 29th Street exit operate at LOS B. The NB 29th Street exit operates at LOS A. The rest of the ramps in this segment operate at LOS C.

Northbound and southbound **accident rates** for this segment between US Hwy 50B and 29th Street are 4.90 and 4.27, respectively. Both segments were rated as POOR based on the urban criteria.

4.8.4 Structures

Structures through this segment include the US Hwy 50B and 29th Street crossings. The following table summarizes the structures within this segment. The sufficiency rating reflects the existing bridge and material conditions with regard to deterioration and loss of section.

TABLE 4-8
Summary of Structures within Segment 8

Milepost	Structure Identification	Intersecting Feature	Length of Structure/ # of Spans	Sufficiency Rating and Integrity	Year Built / Widened

TABLE 4-8
Summary of Structures within Segment 8

Milepost	Structure Identification	Intersecting Feature	Length of Structure/ # of Spans	Sufficiency Rating and Integrity	Year Built / Widened
99.95	K-18-J	US Hwy 50B	206/4	66.1 NO	1958
100.68	K-18-EA/ K-18-EB	29th Street	155/4 155/4	66.9 FO 66.9 FO	1960 1960

4.8.5 Traffic Control

The signalized intersections within this segment are along 29th Street at the junctions with the SB ramps and the NB ramps. The ramps at US Hwy 50B are directional and are not stop-controlled.

5. Evaluation Summary

This report summarizes the findings of an evaluation of existing conditions along Interstate 25 through Pueblo, Colorado. The corridor can generally be divided at Pueblo Boulevard into a rural section and an urban section.

Evaluation of the roadway through the rural section primarily reveals steep side slopes along the wide median, but otherwise adequate geometric and operational features. Narrow shoulders widths were observed at a few of the structure crossings.

Evaluation of the roadway through the urban section reveals conditions that are to be expected within a small town that has experienced growth and is continuing to grow. These conditions include narrow right-of-way between established residential neighborhoods and a large railroad system used for the steel mill. This narrow right-of-way results in utility poles, light poles, fences, and other obstructions within the safe clear zone of the roadway.

Sharp horizontal curves and reversing horizontal curves are common through the urban section resulting in slower running speeds. Narrow shoulders at structure crossings were observed. Steep cross slopes at the gore areas were noted in several locations.

Ramp design was generally observed to be substandard throughout the urban section. Three isolated ramps and two tangential ramps are currently part of this interstate system.

The PM peak-hour level of service analysis reveals generally good operations for the study corridor, with most mainline segments and ramps operating at LOS C or better. Mainline operation degrades to LOS D in the vicinity of downtown, where higher traffic volumes are present. The only segment that operates at LOS E is SB between 29th Street and US Hwy 50B, which is caused by high traffic volume and the friction of the weaving vehicles in this segment.

The majority of the northbound roadway is rated as good to fair for accident rates. The segments between Central Avenue and Ilex Street, 1st Street to 13th Street and US Hwy 50B to 29th Street are rated as poor. Each of the southbound roadway segments are rated as good or fair except the segments between 29th Street and US Hwy 50B, and 5th Street and Abriendo Avenue, where it is rated as poor. The higher than average accident rate between Central Avenue and Ilex Street can generally be attributed to the poor horizontal and vertical alignments in this area. The other areas with poor accident ratings are located in the downtown area and the adjacent built-up urban neighborhoods, which have higher traffic volumes and more congestion.

6. References

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CDOT, 1999. *Field Log of Structures*, June 1999. Prepared by CDOT Bridge Management Systems Unit.

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Existing Conditions Technical Memorandum Addendum

New Pueblo Freeway

CDOT Project No. IM 0251-156

Project Control No. 12831

Colorado Department of Transportation

Revised June 2011

In some cases, information in this Environmental Technical Report may have been refined or updated as preparation of the DEIS advanced. In such cases, the information and conclusions presented in the DEIS supersede all previous background material included in this Technical Report.

Purpose of Amendment

The purpose of this amendment is to update the bridge structure inventory for Functionally Obsolete and Structurally Deficient Bridges within the study area for the New Pueblo Freeway project. The original analysis of the bridges in the study area was documented by the CDOT Bridge Management Systems Unit in June of 1999. Since that time, the structurally deficient bridges have continued to deteriorate. This Amendment updates the information presented in the *I-25: The New Pueblo Freeway Project Stem Beach to 29th Street Evaluation of Existing Conditions*, New Pueblo Freeway, dated March 2002.

EXHIBIT 1-3

I-25 Pueblo Structure Inventory for Functionally Obsolete and Structurally Deficient Bridges

Location (Milepost)	Structure Number	Intersection Feature	Year Built	Year Widened	Sufficiency Rating	Integrity
100.682	K-18-EB	29th Street	1960		67.5	Functionally Obsolete
100.681	K-18-EA	29th Street	1960		72.1	Functionally Obsolete
99.007	K-18-BV	8th Street	1928	1991	61.6	Functionally Obsolete
98.785	K-18-CT	5th Street	1959	1991	70.0	Functionally Obsolete
98.525	K-18-CO	1st Street	1959		62.3	Functionally Obsolete
98.524	K-18-CN	1st Street	1959		62.3	Functionally Obsolete
97.889	**K-18-CL**	**Ilex Street**	**1959**		**36.9**	**Structurally Deficient**
97.888	K-18-CK	Ilex Street	1959		38.0	Functionally Obsolete
97.671	K-18-AY	US 50B	1958		60.5	Functionally Obsolete
97.670	K-18-AX	US 50B	1958		49.7	Functionally Obsolete
97.426	L-18-AV	Eldorado Street (Abriendo Avenue)	1958		91.0	Functionally Obsolete
96.926	**L-18-AU**	**Mesa Avenue**	**1957**		**64.7**	**Structurally Deficient**
96.788	**L-18-AQ**	**Northern Avenue**	**1957**		**39.0**	**Structurally Deficient**
95.882	L-18-W	Indiana Avenue	1956		46.8	Functionally Obsolete
95.880	**L-18-M**	**Indiana Avenue**	**1956**		**26.6**	**Structurally Deficient**

Source: Ronat, Kelly. (CH2M HILL). 2010. Personal Communication with CDOT. May.

I-25 = Interstate 25 US 50B = United States Highway 50B