FINAL REPORT

I-8 Corridor Profile Study

Arizona/California State Line to Junction I-10

PREPARED FOR ADOT

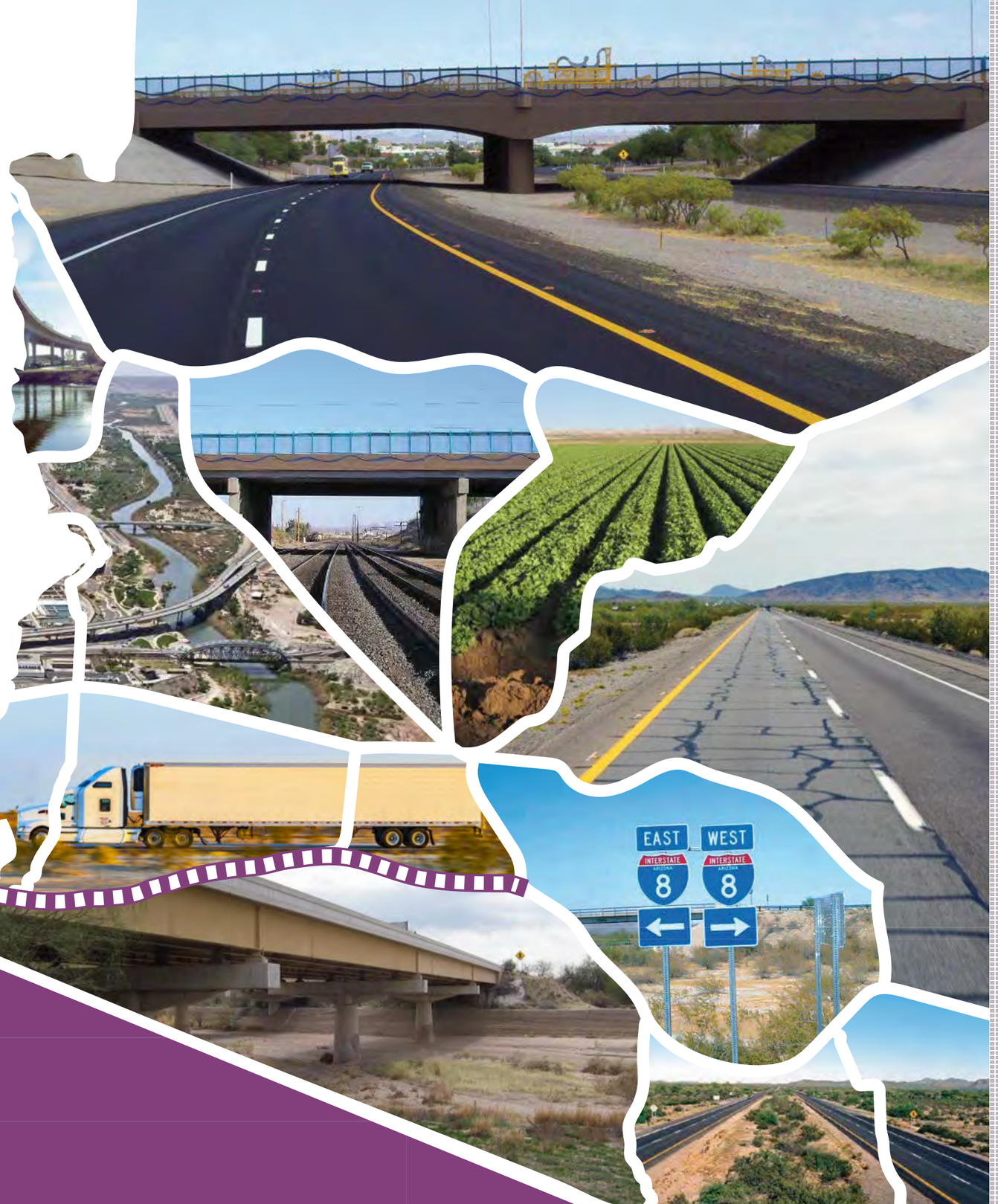
MARCH 2017

ADOT WORK TASK NO.
MPD 042-15

ADOT CONTRACT NO.
11-013154

Prepared by

WSP | PARSONS BRINCKERHOFF



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ACRONYMS & ABBREVIATIONS

AADT	Average Annual Daily Traffic
ABISS	Arizona Bridge Information and Storage System
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
ASLD	Arizona State Land Department
AZTDM	Arizona Travel Demand Model
BLM	Bureau of Land Management
BQAZ	Building a Quality Arizona
CAG	Central Arizona Governments
CCTV	Closed Circuit Television
CPS	Corridor Profile Study
CR	Cracking Rating
DCR	Design Concept Report
DMS	Dynamic Message Sign
EB	Eastbound
FHWA	Federal Highway Administration
FY	Fiscal Year
HCRS	Highway Condition Reporting System
HERE	Real time traffic conditions database produced by American Digital Cartography Inc.
HPMS	Highway Performance Monitoring System
I	Interstate
IRI	International Roughness Index
ITS	Intelligent Transportation System
LCCA	Life-Cycle Cost Analysis
LOS	Level of Service
LPOE	Land Point of Entry
LRTP	Long Range Transportation Plan
MAG	Maricopa Association of Governments
MAP-21	Moving Ahead for Progress in the 21st Century
MP	Milepost
MPD	Multimodal Planning Division
NPV	Net Present Value
OP	Overpass
P2P	Planning to Programming
PA	Project Assessment
PARA	Planning Assistance for Rural Areas
PDI	Pavement Distress Index
PES	Performance Effectiveness Score
PSR	Pavement Serviceability Rating
PTI	Planning Time Index
RTP	Regional Transportation Plan
RWIS	Road Weather Information System
SATS	Small Area Transportation Study
SHSP	Strategic Highway Safety Plan
SOV	Single Occupancy Vehicle
SR	State Route
SWAP	State Wildlife Action Plan
TAC	Technical Advisory Committee
TI	Traffic Interchange
TIP	Transportation Improvement Plan
TPTI	Truck Planning Time Index
TTI	Travel Time Index
TTTI	Truck Travel Time Index
UP	Underpass
UPRR	Union Pacific Railroad
USDOT	United States Department of Transportation
V/C	Volume to Capacity Ratio
VMT	Vehicle-Miles Travelled
VPD	Vehicles Per Day
WB	Westbound
WIM	Weigh-in-Motion
YCAT	Yuma County Area Transit
YMPO	Yuma Metropolitan Planning Organization

EXECUTIVE SUMMARY

INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of Interstate 8 (I-8) between the California Border and the Interstate 10 (I-10) Junction. This study examines key performance measures relative to the I-8 corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT is conducting eleven corridor profile studies within three separate groupings. The I-8 corridor, depicted in **Figure ES-1**, is one of the strategic statewide corridors identified and the subject of this CPS.

Corridor Study Purpose, Goals, and Objectives

The purpose of the CPS is to measure corridor performance to inform the development of strategic solutions that are cost-effective and account for potential risks. It is accomplished by following the process described below:

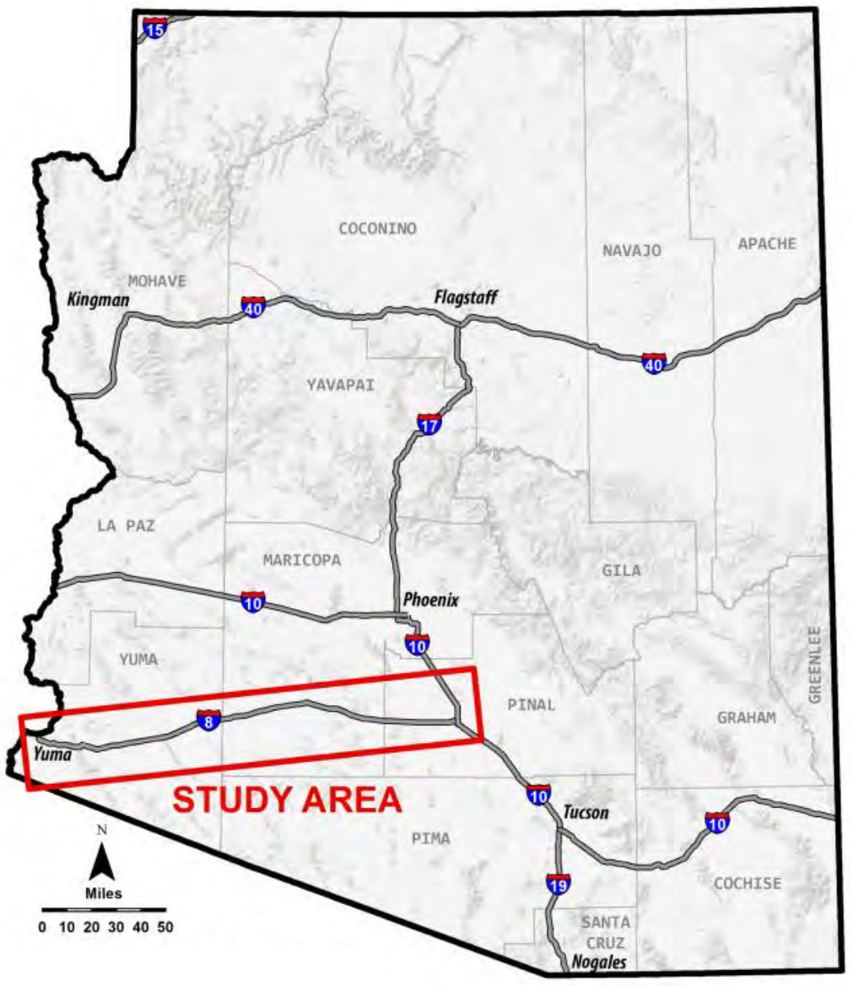
- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the performance measures
- Prioritize solutions for future implementation, accounting for performance effectiveness, and risk analysis findings

The objective of the I-8 CPS is to identify a recommended set of prioritized potential solutions for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process. The I-8 CPS defines solutions and improvements for the corridor that are evaluated and ranked to determine which investments offer the greatest benefit to the corridor in terms of enhancing performance.

The following goals are identified as the outcome of this study:

- Link project decision-making and investments on key corridors to strategic goals
- Develop solutions that address identified corridor needs based on measured performance
- Prioritize improvements that cost-effectively preserve, modernize, and expand transportation infrastructure

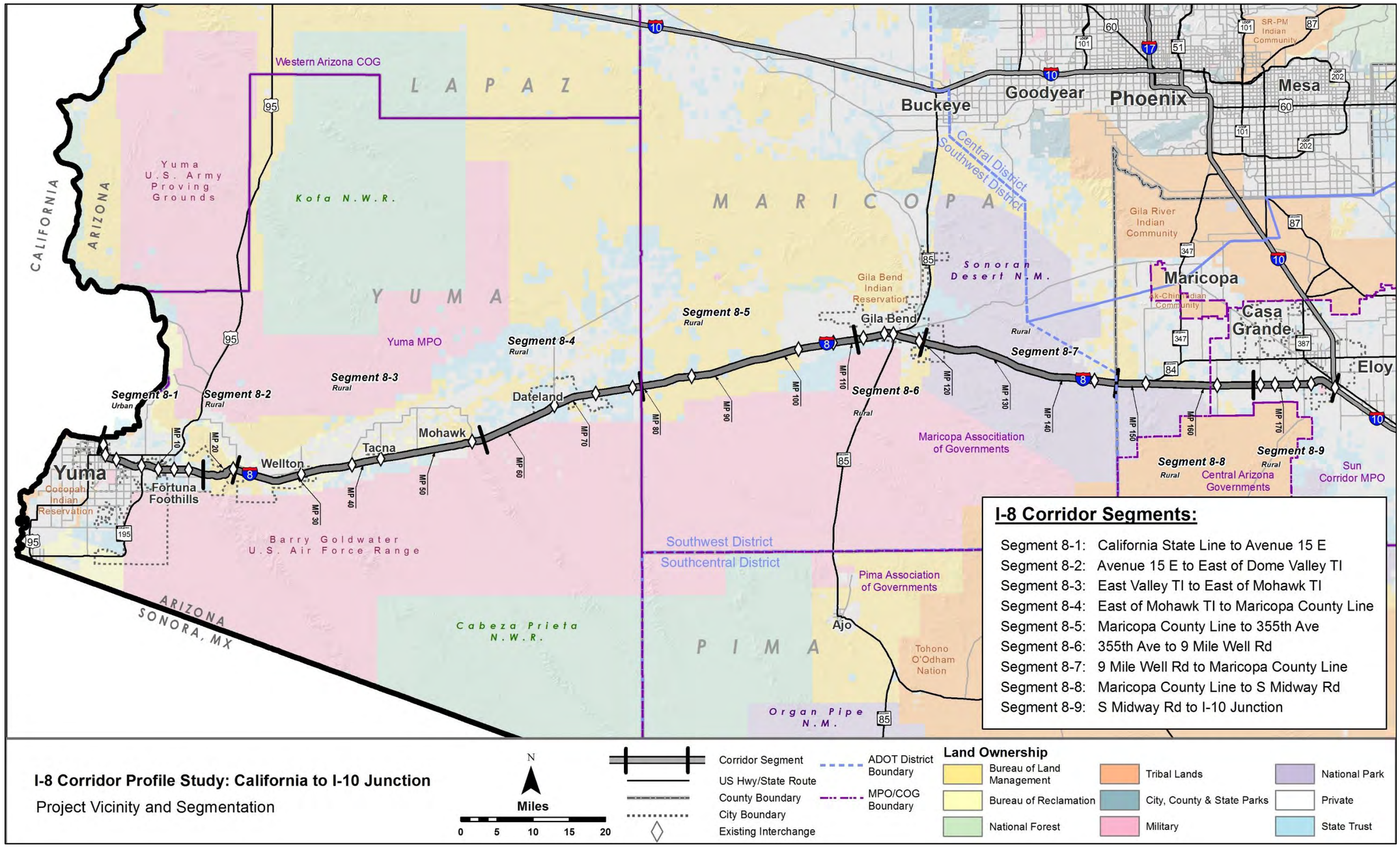
Figure ES-1: Corridor Study Area



Study Location and Corridor Segments

The I-8 CPS utilizes nine planning segments to facilitate analysis and evaluation. The corridor is segmented at logical breaks where the context changes due to differences in characteristics such as terrain, daily traffic volumes, or roadway typical sections. Corridor segments are shown in **Figure ES-2**.

Figure ES-2: Corridor Location and Segments



I-8 Corridor Segments:

Segment 8-1:	California State Line to Avenue 15 E
Segment 8-2:	Avenue 15 E to East of Dome Valley TI
Segment 8-3:	East Valley TI to East of Mohawk TI
Segment 8-4:	East of Mohawk TI to Maricopa County Line
Segment 8-5:	Maricopa County Line to 355th Ave
Segment 8-6:	355th Ave to 9 Mile Well Rd
Segment 8-7:	9 Mile Well Rd to Maricopa County Line
Segment 8-8:	Maricopa County Line to S Midway Rd
Segment 8-9:	S Midway Rd to I-10 Junction

I-8 Corridor Profile Study: California to I-10 Junction

Project Vicinity and Segmentation

N

Miles

0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
Existing Interchange

ADOT District Boundary
MPO/COG Boundary

Land Ownership

Bureau of Land Management
Bureau of Reclamation
National Forest
Tribal Lands
City, County & State Parks
Military
National Park
Private
State Trust

CORRIDOR PERFORMANCE

A series of performance measures are used to assess the I-8 corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

Corridor Performance Framework

This study uses a performance-based process to define baseline corridor performance, diagnose corridor needs, develop corridor solutions, and prioritize strategic corridor investments. In support of this objective, a framework for the performance-based process was developed through a collaborative process involving ADOT and the CPS consultant teams.

Figure ES-3 illustrates the performance framework, which includes a two-tiered system of performance measures (primary and secondary) to evaluate baseline performance.

Figure ES-3: Corridor Profile Performance Framework

The following five performance areas guide the performance-based corridor analyses:

- Pavement
- Bridge
- Mobility
- Safety
- Freight

The performance measures include five primary measures: Pavement Index, Bridge Index, Mobility Index, Safety Index, and Freight Index. Additionally, a set of secondary performance measures provides for a more detailed analysis of corridor performance. **Table ES-1** provides the complete list of primary and secondary performance measures for each of the five performance areas.

Table ES-1: Corridor Performance Measures

Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index and cracking	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure and structural evaluation rating	• Bridge Sufficiency • Functionally Obsolete Bridges • Bridge Rating • Bridge Hot Spots
Mobility	**Mobility Index** Based on combination of existing and future daily volume-to-capacity ratios	• Future Congestion • Peak Congestion • Travel Time Reliability • Multimodal Opportunities
Safety	**Safety Index** Based on frequency of fatal and incapacitating injury crashes	• Directional Safety Index • Strategic Highway Safety Plan Emphasis Areas • Crash Unit Types • Safety Hot Spots
Freight	**Freight Index** Based on bi-directional truck planning time index	• Recurring Delay • Non-Recurring Delay • Closure Duration • Bridge Vertical Clearance • Bridge Vertical Clearance Hot Spots

Each of the primary and secondary performance measures identified in the table above is comprised of one or more quantifiable indicators. A three-level scale was developed to standardize the performance scale across the five performance areas, with numerical thresholds specific to each performance measure:

Good/Above Average Performance	Rating is above the identified desirable/average range
Fair/Average Performance	Rating is within the identified desirable/average range
Poor/Below Average Performance	Rating is below the identified desirable/average range

The terms “good”, “fair”, and “poor” apply to the Pavement, Bridge, Mobility, and Freight performance measures, which have defined thresholds. The terms “above average”, “average”, and “below average” apply to the Safety performance measures, which have thresholds referenced to statewide averages.

Corridor Performance Summary

Table ES-2 shows a summary of corridor performance for all primary measures and secondary measure indicators for the I-8 corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure as shown in **Table ES-2**.

All segments on the I-8 corridor are performing in the Fair/Average or Good/Above Average range in each of the performance areas, with the exception of one segment with a Poor rating for pavement performance.

The following general observations were made related to the performance of the I-8 corridor.

- **Pavement Performance:** Pavement performance ranges from Fair to Good throughout the corridor, with the exception of Segment 8-2, which has a Poor rating for the data set analyzed. A pavement preservation project has been completed in this segment subsequent to the data period.

- **Bridge Performance:** A total of 115 bridges were included in the evaluation. Bridge performance is Fair throughout the corridor. Two bridges are considered structurally deficient. These include the Eastbound Colorado River Viaduct (MP 0.01) and the Thornton Road TI Underpass (MP 172.55).

- **Mobility Performance:** Mobility performance is Good throughout the corridor. I-8 is considered to have two operating environments for evaluating Mobility. These include Urban 4-Lane Freeway and Rural 4-Lane Freeway with less than 25,000 ADT. Both the current and future capacity is considered “Good”.

- **Safety Performance:** Safety performance is Above Average except for Segment 8-3 that rates as Average. Examining a five-year time period, there were two fatal crashes and seven incapacitating injury crashes in the urban area. In the rural area, there were 20 fatal crashes and 68 incapacitating injury crashes.

- **Freight Performance:** Freight performance is Good throughout the corridor, except for a Fair rating in the urbanized area of Yuma (Segment 8-1). Segment 8-2 experiences some delay associated with the US Customs Border Patrol Checkpoint.

- **Overall performance** within all five areas evaluated is predominantly “Good” to “Fair”

Table ES-2: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area											
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	% of Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/milepost /year/mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			EB	WB								EB	WB	EB	WB	EB	WB	EB	WB		
8-1[1]	16.30	4.20	4.28	4.30	15.6%	5.69	87.36	6.6%	4	0.44	0.50	0.32	0.31	0.16	0.24	1.09	1.07	1.42	1.39	100%	12.5%
8-2[2]	5.10	2.31	3.87	4.07	60.0%	5.31	91.38	0%	5	0.32	0.36	0.26	0.23	0.12	0.44	1.05	1.00	1.45	1.12	100%	16.0%
8-3[2]	35.10	3.58	3.74	3.79	12.5%	6.32	95.49	40.8%	6	0.17	0.19	0.09	0.09	0.21	0.19	1.08	1.08	1.23	1.25	100%	9.8%
8-4[2]	23.10	3.68	3.87	3.74	23.9%	6.00	94.00	100.0%	6	0.16	0.17	0.11	0.10	0.03	0.04	1.07	1.06	1.22	1.20	100%	9.3%
8-5[2]	30.80	3.41	3.58	3.55	28.3%	5.90	92.15	58.5%	5	0.21	0.25	0.15	0.15	0.05	0.09	1.07	1.07	1.26	1.22	100%	22.5%
8-6[2]	9.60	4.17	4.01	4.03	0.0%	5.79	93.01	43.8%	5	0.16	0.20	0.13	0.12	0.04	0.08	1.11	1.09	1.41	1.26	100%	19.0%
8-7[2]	27.60	4.11	4.16	4.18	5.4%	6.08	92.59	33.9%	6	0.08	0.09	0.09	0.08	0.04	0.05	1.10	1.09	1.27	1.26	100%	16.8%
8-8[2]	18.90	3.55	3.83	3.75	18.4%	5.90	92.35	38.1%	5	0.09	0.11	0.09	0.08	0.02	0.04	1.08	1.09	1.25	1.24	100%	13.8%
8-9[2]	11.50	3.48	3.40	3.54	37.5%	5.67	88.40	44.4%	4	0.14	0.16	0.13	0.10	0.10	0.02	1.07	1.10	1.27	1.33	100%	12.2%
Weighted Corridor Average		3.69	3.85	3.85	18.8%	5.97	92.48	46.3%	5	0.20	0.23	0.15	0.14	0.08	0.13	1.08	1.07	1.31	1.25	100%	14.7%
SCALE																					
Performance Level		Interstate		All						Urban Rural	All	Uninterrupted				All					
Good/Above Average		> 3.75	< 5%	> 6.5	> 80	< 12%	> 6			< 0.71 (Urban) < 0.56 (Rural)	< 0.22	< 1.15	<1.30			> 90%	> 17%				
Fair/Average		3.2 - 3.75	5% - 20%	5.0 - 6.5	50 - 80	12% - 40%	5 – 6			0.71 - 0.89 (Urban) 0.56 - 0.76 (Rural)	0.22 – 0.62	1.15-1.33	1.30-1.50			60% - 90%	11% - 17%				
Poor/Below Average		< 3.2	> 20%	< 5.0	< 50	> 40 %	< 5			> 0.89 (Urban) > 0.76 (Rural)	> 0.62	> 1.33	>1.50			< 60%	< 11%				

[1] Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment
[2] Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

Table ES-2: Corridor Performance Summary by Segment and Performance Measure (continued)

Segment	Segment Length (miles)	Safety Performance Area							Freight Performance Area							
		Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Freight Index	Directional TTI (trucks only)		Directional PTI (trucks only)		Closure Duration (mins/milepost closed/year/mile)		Bridge Vertical Clearance (feet)
			EB	WB						EB	WB	EB	WB	EB	WB	
8-1[1]	16.30	0.23	0.24	0.22	56%	Insufficient Data	Insufficient Data	Insufficient Data	0.71	1.13	1.12	1.40	1.41	28.88	43.90	16.33
8-2[2]	5.10	0.29	0.33	0.25	43%	Insufficient Data	Insufficient Data	Insufficient Data	0.79	1.00	1.06	1.30	1.23	17.23	140.18	16.23
8-3[2]	35.10	0.96	0.95	0.97	59%	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.04	1.04	1.14	1.11	73.08	28.10	16.20
8-4[2]	23.10	0.61	0.44	0.77	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.90	1.03	1.03	1.12	1.11	5.20	7.68	No Up
8-5[2]	30.80	0.59	0.59	0.59	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.04	1.13	1.12	9.07	19.84	No UP
8-6[2]	9.60	0.10	0.06	0.13	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.82	1.06	1.04	1.27	1.17	24.43	21.89	16.63
8-7[2]	27.60	0.68	0.04	1.32	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.03	1.13	1.13	13.25	11.42	16.19
8-8[2]	18.90	0.71	0.74	0.68	33%	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.03	1.13	1.11	6.29	25.18	16.09
8-9[2]	11.50	0.59	0.21	0.98	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.83	1.04	1.06	1.19	1.23	27.01	1.53	15.86
Weighted Corridor Average		0.53	0.40	0.66	48%				0.86	1.04	1.04	1.17	1.16	25.58	23.73	16.06
SCALE																
Performance Level		Urban 4 Lane Freeway Rural 4 Lane Freeway < 25,000 vpd							Uninterrupted			**All**				
Good/Above Average		< 0.79 < 0.73			< 49.1% < 42.8%	< 6.8% < 13.2%	< 9.3% < 5.0%	< 4.8% < 1.7%	> 0.77	< 1.15		< 1.30		< 44.18		> 16.5
Fair/Average		0.79 – 1.21 0.73 – 1.27			49.1% - 59.4% 42.8% - 52.9%	6.8% - 10.9% 13.2% - 17.0%	9.3% - 11.5% 5.0% - 8.5%	4.8% - 10.3% 1.7% - 2.5%	0.67 - 0.77	1.15 -1.33		1.30 -1.50		44.18 -124.86		16.0-16.5
Poor/Below Average		> 1.21 > 1.27			> 59.4% > 52.9%	> 10.9% > 17.0%	> 11.5% > 8.5%	> 10.3% > 2.5%	< 0.67	> 1.33		>1.50		> 124.86		< 16.0

[1] Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment
[2] Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings

"No UP" indicates no underpasses are present in the segment

NEEDS ASSESSMENT

Corridor Description

I-8, an important national transportation corridor, spans between San Diego, California and Casa Grande, Arizona. In Arizona, I-8 originates at the Colorado River in the City of Yuma and extends approximately 178 miles east, passing through Yuma County and the Town of Wellton, across Gila Bend in Maricopa County, and terminating at the I-10 junction southeast of Casa Grande in Pinal County. Much of the I-8 corridor is rural and undeveloped.

The entire length of I-8 in Arizona is the subject of this CPS. More than a highway, the corridor is a multimodal facility that moves people and freight and connects communities. The corridor serves the growing Sun Corridor in central Arizona, supports freight movement (e.g., by transporting produce from the "lettuce capital of the US" near Yuma), and carries visitors west to the commercial and recreation centers in Western Arizona, Southern California and Mexico.

Corridor Objectives

Statewide goals and performance measures were established by the ADOT Long-Range Transportation Plan (LRTP), 2010-2035. Statewide performance goals that are relevant to I-8 performance areas were identified and corridor goals were then formulated for each of the five performance areas that aligned with the overall statewide goals established by the LRTP. Based on stakeholder input, corridor goals, corridor objectives, and performance results, three "emphasis areas" were identified for the I-8 corridor: Mobility, Safety and Freight.

Taking into account the corridor goals and identified emphasis areas, performance objectives were developed for each quantifiable performance measure that identify the desired level of performance based on the performance scale levels for the overall corridor and for each segment of the corridor. For the performance emphasis areas, the corridor-wide weighted average performance objectives are identified with a higher standard than for the other performance areas.

Achieving corridor and segment performance objectives will help ensure that investments are targeted toward improvements that support the safe and efficient movement of travelers on the corridor. Corridor performance is measured against corridor and segment objectives to determine needs – the gap between observed performance and the performance objectives.

Needs Assessment Process

The performance-based needs assessment evaluates the difference between the baseline performance and the performance objectives for each of the five performance areas used to characterize the health of the corridor: Pavement, Bridge, Mobility, Safety, and Freight. The performance-based needs assessment process is illustrated in **Figure ES-4**.

The needs assessment compares baseline corridor performance with performance objectives to provide a starting point for the identification of performance needs. This mathematical comparison results in an initial need rating of None, Low, Medium, or High for each primary and secondary performance measure. An illustrative example of this process is shown in **Figure ES-5**.

The initial level of need for each segment is refined to account for hot spots and recently completed or under construction projects, resulting in a final level of need for each segment. The final levels of need for each primary and secondary performance measure are combined to produce a weighted final need rating for each segment. A detailed review of available data helps identify contributing factors to the need and if there is a high level of historical investment.

Figure ES-4: Needs Assessment Process

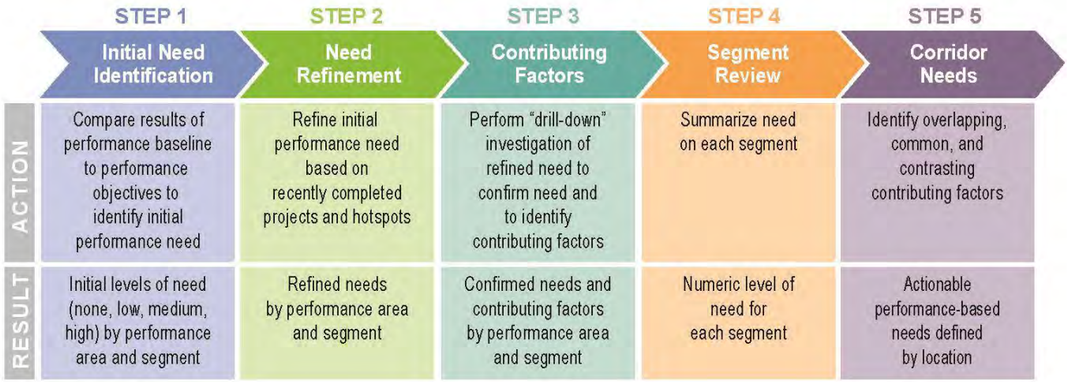


Figure ES-5: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need	Description
6.5	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
	Fair		
5.0	Fair	Low	Middle 1/3 of Fair (5.5-6.0)
	Fair	Medium	Lower 1/3 of Fair and top 1/3 of Poor (4.5-5.5)
	Poor		
	Poor	High	Lower 2/3 of Poor (<4.5)
	Poor		

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Summary of Needs

Table ES-3 provides a summary of needs for each segment across all performance areas, and the average needs for each segment. A weighting factor of 1.5 is applied to the average need scores of the performance areas identified as emphasis areas (Mobility, Safety, and Freight for the I-8 corridor). All nine segments had an overall Low average need. More information on the identified final needs in each performance area is provided as follows.

Pavement Needs

- Overall Final Pavement needs are Low throughout the corridor.
- One Pavement hot spot in Segment 8-1 was addressed, however a hot spot remains from milepost (MP) 0-1, therefore the need was not changed.
- The Pavement hot spot on Segment 8-2 resulting in a High level of need was addressed by a project in 2014.
- Pavement hot spots within Segment 8-9 were identified, but need reduced from Medium to Low due to projects in 2015, addressing all but one hot spot.

Bridge Needs

- A Low Bridge need occurred on six segments, and Medium level of need on three segments (8-2, 8-5, and 8-9).
- Bridge needs (Low, Medium, or High) were identified on 30 of the 115 bridges along the I-8 corridor (26%).
- Eleven bridges have potential repetitive investment issues. Three of these bridges are also hot spots and were candidates for life-cycle cost analysis to evaluate alternative solutions.
- Two bridges have ratings of 4 (Poor condition).
- Thirteen bridges were defined as hot spots since they had ratings of 5 or lower in multiple areas (deck, substructure, or superstructure). A bridge is considered a hot spot when it has a single rating of 4 or lower or multiple ratings of 5.

Mobility Needs

- The Mobility Performance Area is an emphasis area for the I-8 corridor, giving it a heavier weight in the analysis.
- A Low Mobility need was identified on three segments of I-8, the Yuma urbanized area, Telegraph Pass, and Gila Bend; the remaining segments had no Mobility need to meet performance objectives.
- Contributing factors include frequent congestion and overall higher traffic volumes in the urbanized area, the border patrol checkpoint at MP 18 creating eastbound delays, and closures related to incidents/accidents.
- Additionally, I-8 between MP 18 and MP 21 experiences a reduction in shoulder width to accommodate bicycles.

Safety Needs

- The Safety Performance Area is an emphasis area for the I-8 corridor, giving it a heavier weight in the analysis.
- A Medium Safety need was identified for Segment 8-3, while Low Safety needs were identified in Segments 8-1and 8-9. The remaining segments meet performance objectives.
- No crash hot spots were identified.
- In the urbanized Yuma area, most incidents/accidents were related to collisions with other motor vehicles, high speeds, and running off the road to the right.
- Outside the urbanized area, many incidents/accidents were single vehicle crashes, and involved the vehicle overturning or running off the road to the left. In these cases, contributing factors were typically driver inattention/distraction and high speeds.
- It has been noted that guardrail could be upgraded corridor-wide, with some sections having been upgraded already as part of pavement preservation projects.

Freight Needs

- The Freight Performance Area is an emphasis area for the I-8 corridor, giving it a heavier weight in the analysis.
- Final Freight needs are Low or None throughout the corridor. In general, limits on truck travel and planning times are not significant factors.
- Freight needs are generally concentrated between MP 0-57 and MP 120-178, that is, the area between Yuma and Mohawk, including Telegraph Pass, and the area between Gila Bend and Casa Grande. The needs related to freight mobility were dispersed throughout these two segments, with elevated levels of delay caused by congestion in the Yuma urbanized area, closures related to incidents/accidents, and bridge clearance issues.
- Urban congestion in the Yuma area impacts freight movement, including high volumes of freight traffic passing through and originating in Yuma.
- Six bridges on the I-8 corridor have mainline vertical clearance restrictions, consisting of less than 16.25’ clearance and no ramp around ability.

Overlapping Needs

This section identifies overlapping performance needs on the I-8 corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need. Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided in the following bullets.

- Overlapping Pavement, Freight, and Mobility needs occur in the Yuma urbanized area, milepost 0-16. Many of the issues are due to high traffic volumes and high volumes of trucks. This section also includes hot spot bridges.
- The area of Telegraph Pass, from approximately milepost 18 to 21, has significant grades and therefore suffers from freight and mobility needs related to delay and incidents/accidents associated with the grade. This area also has locations where climbing and passing lanes might improve safety.
- Milepost 21-57 also has Safety, Pavement, and Freight needs. Incidents/accidents and closures in this area, which may be attributable to pavement and guardrail quality, contribute to safety and freight needs.
- Approaching the Casa Grande urbanized area, MP 148 to MP 178 has needs in the Pavement and Freight areas, with bridges having needs as well as height restrictions related to freight. Thornton Road TI (No. 1196, MP 172.55) has both Bridge and Freight needs.

Table ES-3: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)								
	8-1	**8-2**	**8-3**	**8-4**	**8-5**	**8-6**	**8-7**	**8-8**	**8-9**
	MP 0-16.3	**MP 16.3-21.4**	**MP 21.4-56.5**	**MP 56.5-79.6**	**MP 79.6-110.4**	**MP 110.4-120**	**MP 120-147.6**	**MP 147.6-166.5**	**MP 166.5-178**
Pavement	Low	None	Low	Low	Medium	None	None	Low	Low
Bridge	Low	Medium	Low	Low	Medium	Low	Low	Low	Medium
Mobility+	Low	Low	None	None	None	Low	None	None	None
Safety+	Low	None	Medium	None	None	None	Low	None	Low
Freight+	Low	Low	Low	None	None	None	Low	Low	Low
Average Need	**1.00**	**0.77**	**1.00**	**0.31**	**0.62**	**0.38**	**0.62**	**0.54**	**0.92**

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study*

+ Identified as an emphasis area for the I-8 corridor

Average Need Scale	
None*	< 0
Low	0.1-1.0
Medium	1.0-2.0
High	> 2.0

STRATEGIC SOLUTIONS

The principal objective of the CPS is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State's key transportation corridors. One of the first steps in the development of strategic solutions is to identify areas of elevated levels of need as addressing these needs will have the greatest effect on corridor performance. Segments with Medium or High needs and specific locations of hot spots are considered strategic investment areas for which strategic solutions should be developed. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. I-8 strategic investment areas (resulting from the elevated needs) are shown in **Figure ES-6**.

Screening Process

In some cases, needs that are identified do not advance to solutions development and are screened out from further consideration because they have been or will be addressed through other measures including:

- A project is programmed to address this need
- The need is a result of a Pavement or Bridge hot spot that does not show historical investment issues; these hot spots will likely be addressed through other ADOT programming means
- A bridge is not a hot spot but is located within a segment with a Medium or High level of need; this bridge will likely be addressed through current ADOT bridge maintenance and preservation programming processes
- The need is determined to be non-actionable (i.e., cannot be addressed through an ADOT project)
- The conditions/characteristics of the location have changed since the performance data was collected that was used to identify the need

Candidate Solutions

For each elevated need within a strategic investment area that is not screened out, a candidate solution is developed to address the identified need. Each candidate solution is assigned to one of the following three P2P investment categories based on the scope of the solution:

- Preservation
- Modernization
- Expansion

Documented performance needs serve as the foundation for developing candidate solutions for corridor preservation, modernization, and expansion. Candidate solutions are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the I-8 corridor will be considered along with other candidate projects in the ADOT statewide programming process.

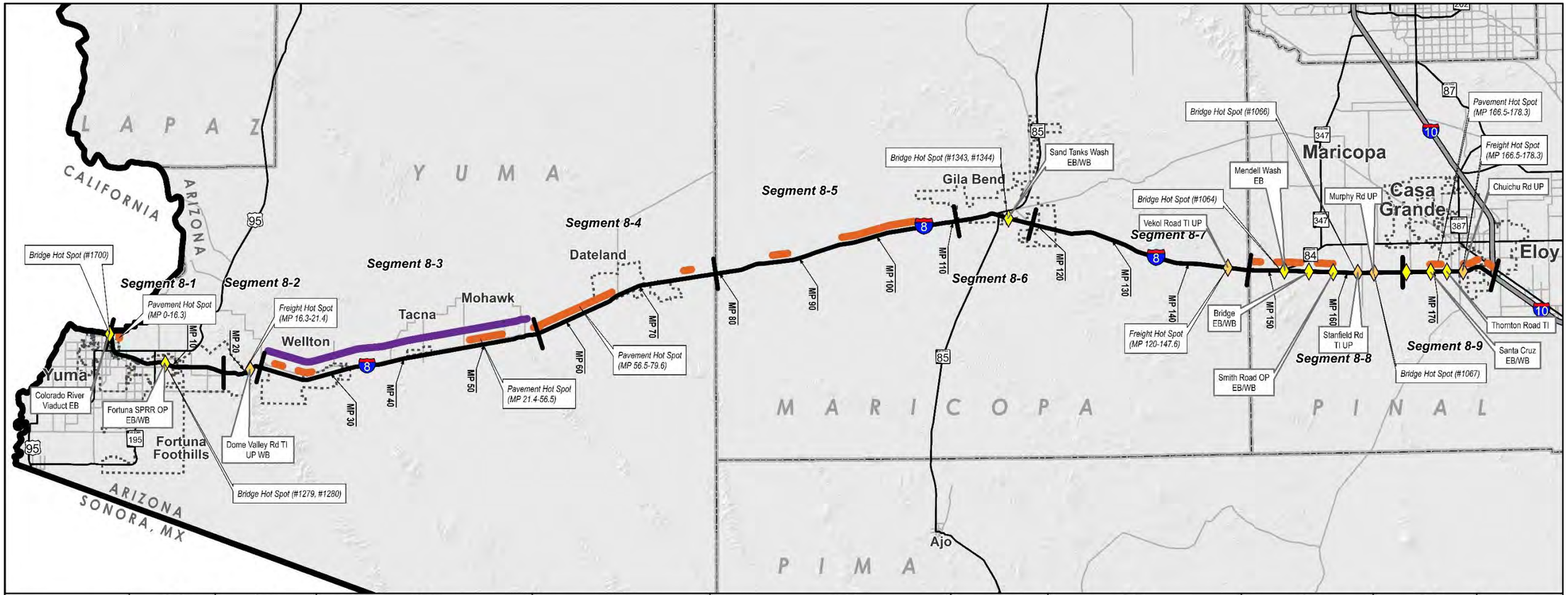
Candidate solutions include some or all of the following characteristics:

- Do not recreate or replace results from normal programming processes
- May include programs or initiatives, areas for further study, and infrastructure projects
- Address elevated levels of need (High or Medium) and hot spots
- Focus on investments in modernization projects (to optimize current infrastructure)
- Address overlapping needs
- Reduce costly repetitive maintenance
- Extend operational life of system and delay expansion
- Leverage programmed projects that can be expanded to address other strategic elements
- Provide measurable benefit

Candidate solutions developed to address an elevated need in the Pavement or Bridge performance areas include two options; rehabilitation or full replacement. These solutions are initially evaluated through a Life-Cycle Cost Analysis (LCCA) to provide insights into the cost-effectiveness of these options so a recommended approach can be identified. Candidate solutions developed to address an elevated need in the Mobility, Safety, or Freight performance areas are advanced directly to the Performance Effectiveness Evaluation. In some cases, there may be multiple solutions identified to address the same area of need.

Candidate solutions that are recommended to expand or modify the scope of an already programmed project are noted and are not advanced to solution evaluation and prioritization. These solutions are directly recommended for programming.

Figure ES-6: Strategic Investment Areas



Performance Area	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	Perfomance Area
	MP 0-16.3	MP 16.3-21.4	MP 21.4-56.5	MP 56.5-79.6	MP 79.6-110.4	MP 110-4-120	MP 120-147.6	MP 147.6-166.5	MP 166.5-178	
Pavement	Hot Spot	-	Hot Spot	Hot Spot	Medium	-	-	Hot Spot	Hot Spot	Pavement
Bridge	Hot Spot	Medium	-	-	Medium	Hot Spot	-	Hot Spot	Medium	Bridge
Mobility+	-	-	-	-	-	-	-	-	-	Mobility+
Safety+	-	-	Medium	-	-	-	-	-	-	Safety+
Freight+	-	Hot Spot	-	-	-	-	Hot Spot	Hot Spot	Hot Spot	Freight+

+ Identified as Emphasis Area for I-8 Corridor

Note: Figure shows strategic investment areas, which are segments with Medium and High levels of need and locations of hotspots. A"-" symbol indicates a segment level of need of Low or None, which is not considered strategic.

I-8 Corridor Profile Study: California to I-10 Junction
Strategic Investment Areas

N
Miles
0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

Performance Area Needs
Pavement
Mobility
Safety
Freight
Bridge
Truck Height Restriction Hot Spot

Level of Need
Low
Medium
High

SOLUTION EVALUATION AND PRIORITIZATION

Candidate solutions are evaluated using the following steps: LCCA (where applicable), Performance Effectiveness Evaluation, Solution Risk Analysis, and Candidate Solution Prioritization. The methodology and approach to this evaluation are shown in **Figure ES-7** and described more fully below.

Life-Cycle Cost Analysis

All Pavement and Bridge candidate solutions have two options: rehabilitation/repair or reconstruction. These options are evaluated through an LCCA to determine the best approach for each location where a Pavement or Bridge solution is recommended. The LCCA eliminates options from further consideration and identify which options should be carried forward for further evaluation.

All Mobility, Safety, and Freight strategic investment areas that result in multiple independent candidate solutions are advanced directly to the Performance Effectiveness Evaluation.

Performance Effectiveness Evaluation

After completing the LCCA process, all remaining candidate solutions are evaluated based on their performance effectiveness. This process includes determining a Performance Effectiveness Score (PES) based on how much each solution impacts the existing performance and needs scores for each segment. This evaluation also includes a Performance Area Risk Analysis to help differentiate between similar solutions based on factors that are not directly addressed in the performance system.

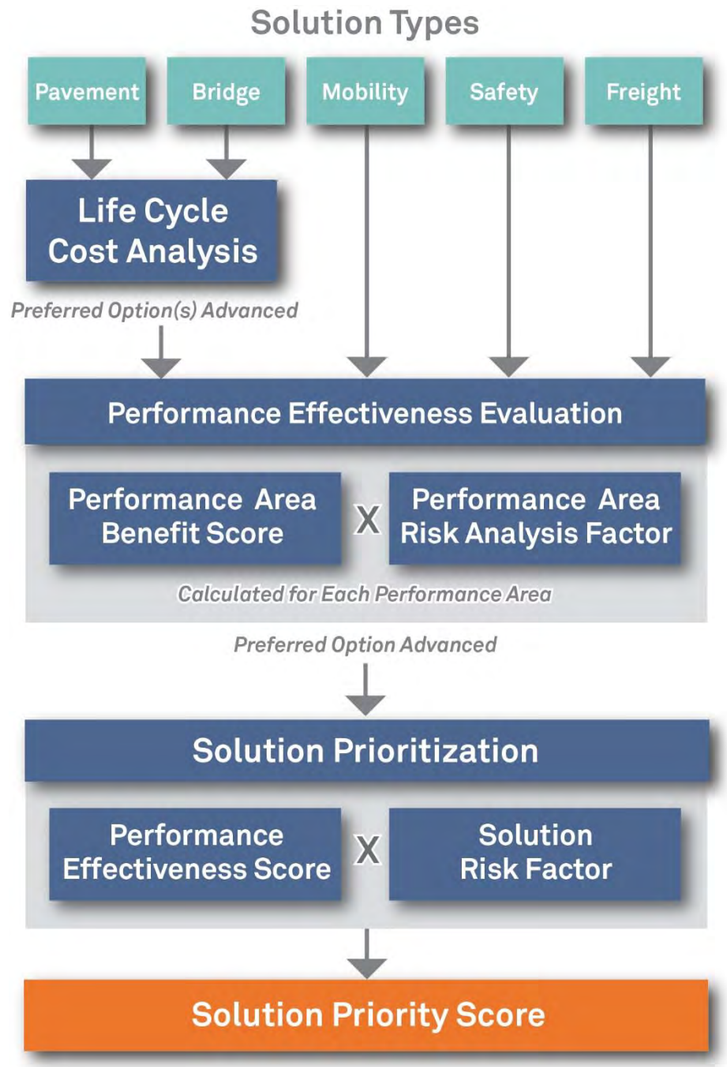
Solution Risk Analysis

All candidate solutions advanced through the Performance Effectiveness Evaluation are also evaluated through a Solution Risk Analysis process. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of the performance failure.

Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score. The candidate solutions are ranked by prioritization score from highest to lowest. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Solutions that address multiple performance areas tend to score higher in this process.

Figure ES-7: Candidate Solution Evaluation Process



SUMMARY OF CORRIDOR RECOMMENDATIONS

Table ES-4 and **Figure ES-8** show the prioritized candidate solutions recommended for the I-8 corridor. These solutions will increase the performance of the I-8 corridor primarily in the Freight Performance Area. Solutions that address multiple performance areas tend to score higher in this process. Other findings include:

- In the context of the eleven corridors assessed in the corridor profile program, the solutions for I-8 do not score high since the need level is Low in all performance areas.
- Candidate Solution 8.9 Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation ranked highest on the corridor due to a reduction in both Freight and Pavement needs at a relatively low cost. Thornton Rd TI UP (#1196) Bridge Vertical Clearance Mitigation also ranked near the top of the corridor list.
- Several sections of I-8 roadway considered pavement hot spots will not be improved by any currently programmed projects. It is anticipated that other preservation programming processes will address these needs in the future.

Other Corridor Recommendations

As part of the investigation of strategic investment areas and candidate solutions, other corridor solutions were also identified that are compatible with the long range vision to support international and inter-regional truck and freight movements:

- Consider a corridor strategy to upgrade all bridges to current standards in anticipation of increased truck/freight traffic over mid to long term.
- Consider corridor-wide ITS solutions to assist truck/freight traffic over the mid to long term.

Policy and Initiative Recommendations

In addition to location-specific needs, general corridor and system-wide needs have also been identified through the CPS process. While these needs are more overarching and cannot be individually evaluated through the CPS process, it is important to document them. A list of recommended policies and initiatives was developed for consideration when programming future projects not only on I-8, but across the entire state highway system where conditions are applicable. The following list, which is in no particular order of priority, was derived from the Round 1, Round 2, and Round 3 CPS:

- Install Intelligent Transportation System (ITS) conduit with all new infrastructure projects
- Prepare strategic plans for Closed Circuit Television (CCTV) camera and Road Weather Information System (RWIS) locations statewide
- Leverage power and communication at existing weigh-in-motion (WIM), dynamic messaging signs (DMS), and call box locations to expand ITS applications across the state
- Consider solar power for lighting and ITS where applicable
- Investigate ice formation prediction technology where applicable
- Conduct highway safety manual evaluation for all future programmed projects
- Develop infrastructure maintenance and preservation plans (including schedule and funding) for all pavement and bridge infrastructure replacement or expansion projects
- Develop standardized bridge maintenance procedures so districts can do routine maintenance work
- Review historical ratings and level of previous investment during scoping of pavement and bridge projects; in pavement locations that warrant further investigation, conduct subsurface investigations during project scoping to determine if full replacement is warranted
- For pavement rehabilitation projects, enhance the amount/level of geotechnical investigations to address issues specific to the varying conditions along the project
- Expand programmed and future pavement projects as necessary to include shoulders
- Expand median cable barrier guidelines to account for safety performance
- Install CCTV cameras with all DMS
- In locations with limited communications, use CCTV cameras to provide still images rather than streaming video
- Develop statewide program for pavement replacement
- Install additional continuous permanent count stations along strategic corridors to enhance traffic count data
- When reconstruction or rehabilitation activities will affect existing bridge vertical clearance, the dimension of the new bridge vertical clearance should be a minimum of 16.25 feet where feasible
- All new or reconstructed roadway/shoulder edges adjacent to an unpaved surface should be constructed with a Safety Edge
- Collision data on tribal lands may be incomplete or inconsistent; additional coordination for data on tribal lands is recommended to ensure adequate reflection of safety issues
- Expand data collection devices statewide to measure freight delay
- Evaluate and accommodate potential changes in freight and goods movement trends that may result from improvements and expansions to the state roadway network

Next Steps

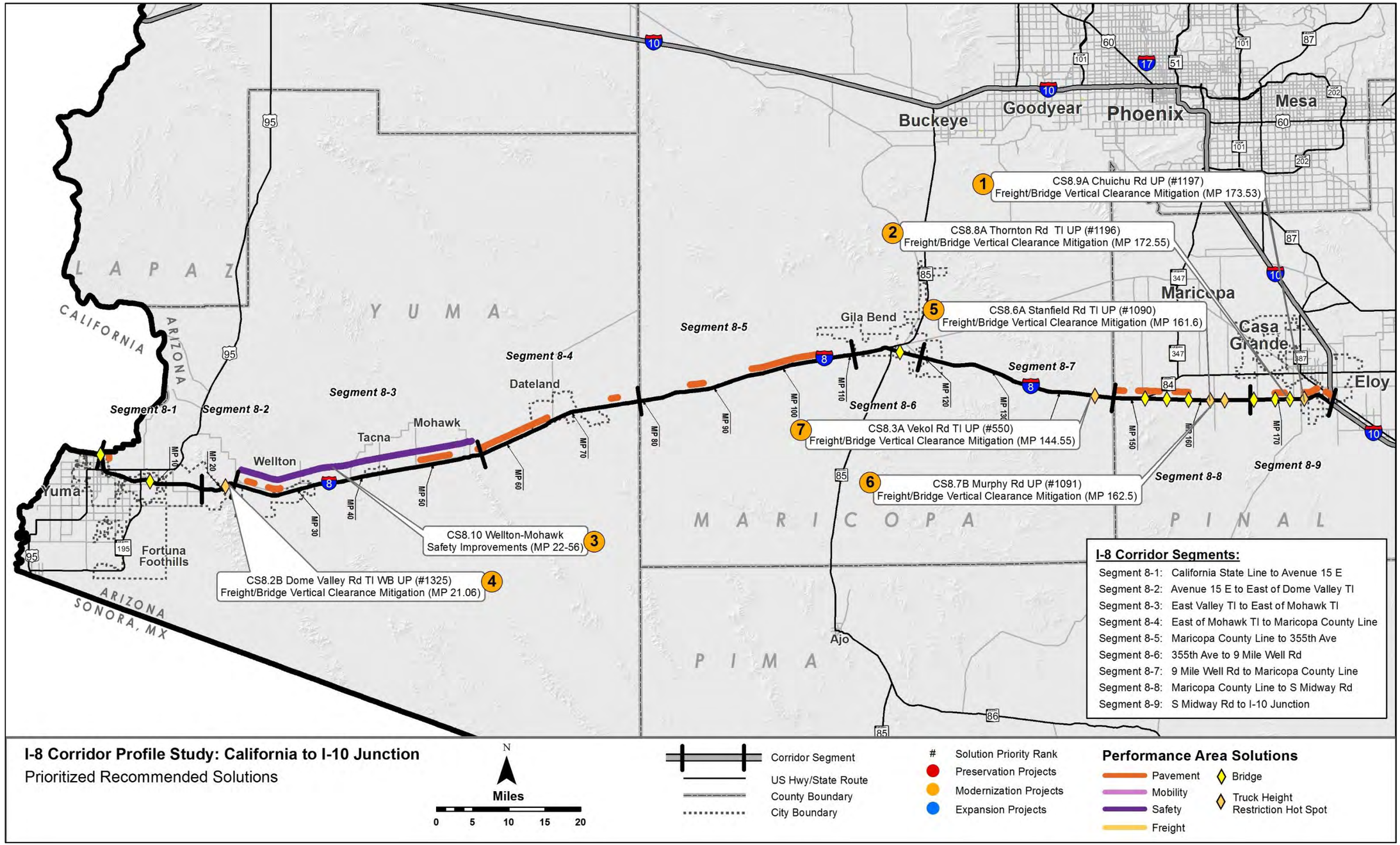
Candidate solutions developed for the I-8 corridor will be considered along with other candidate projects in the ADOT statewide programming process. It is important to note that the candidate solutions are intended to represent strategic solutions to address existing performance needs related to the Pavement, Bridge, Mobility, Safety, and Freight performance areas. Therefore, the strategic solutions are not intended to preclude recommendations related to the ultimate vision for the corridor that may have been defined in the context of prior planning studies and/or design concept reports. Recommendations from such studies are still relevant to addressing the ultimate corridor objectives.

Upon completion of all three CPS rounds, the results will be incorporated into a summary document comparing all corridors that is expected to provide a performance-based review of statewide needs and candidate solutions.

Table ES-4: Prioritized Recommended Solutions

Rank	Candidate Solution #	Option	Candidate Solution Name	Candidate Solution Scope	Estimated Cost ($ million)	Investment Category [P] Preservation [M] Modernization [E]Expansion	Prioritization Score
1	CS8.9	A	Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	$0.9	M	12
		B	*Chuichu Rd UP (#1197)* *Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$2.6*	*M*	*3*
2	CS8.8	A	Thornton Rd TI UP (#1196) Bridge Vertical Clearance Mitigation	Rehabilitate the bridge Re-profile roadway to achieve 16.5 feet vertical clearance	$2.9	M	8
		B	*Thornton Rd TI UP (#1196)* *Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$3.4*	*M*	*3*
3	CS8.10	-	Wellton-Mohawk Safety Improvements	Speed Feedback Signs (EB MP 28, EB MP 40, EB MP 45, EB MP 53.75, WB MP 23, WB MP 31.5, WB MP 44, WB MP 56.5) Install Lighting (WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99)	$2.8	M	8
4	CS8.2	B	Dome Valley Rd TI WB UP (#1325) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	$1.8	M	3
		A	*Dome Valley Rd TI WB UP (#1325)* *Bridge Vertical Clearance Mitigation*	*Re-profile roadway to achieve 16.5 feet vertical clearance*	*$0.3*	*M*	*2*
5	CS8.6	A	Stanfield Rd TI UP (#1090) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	$0.8	M	1
		B	*Stanfield Rd TI UP (#1090)* *Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$2.2*	*M*	*1*
6	CS8.7	A	Murphy Rd UP (#1091) Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	$0.6	M	1
		B	*Murphy Rd UP (#1091)* *Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$2.6*	*M*	*1*
7	CS8.3	B	Vekol Road TI UP (#550) Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	$2.2	M	1
		A	*Vekol Road TI UP (#550)* *Bridge Vertical Clearance Mitigation*	*Re-profile roadway to achieve 16.5 feet vertical clearance*	*$0.6*	*M*	*1*

Figure ES-8: Prioritized Recommended Solutions



1.0 INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of Interstate 8 (I-8) between the California Border in Yuma and the Interstate 10 (I-10) Junction in Casa Grande. The study examines key performance measures relative to the I-8 corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT is conducting eleven CPS within three separate groupings.

The first three studies (**Round 1**) began in Spring 2014, and encompasses:

- I-17: SR 101L to I-40
- I-19: Nogales to I-10
- I-40: California State Line to I-17

The second round (**Round 2**) of studies, initiated in Spring 2015, includes:

- I-8: California State Line to I-10
- I-40: I-17 to the New Mexico State Line
- SR 95: I-8 to I-40

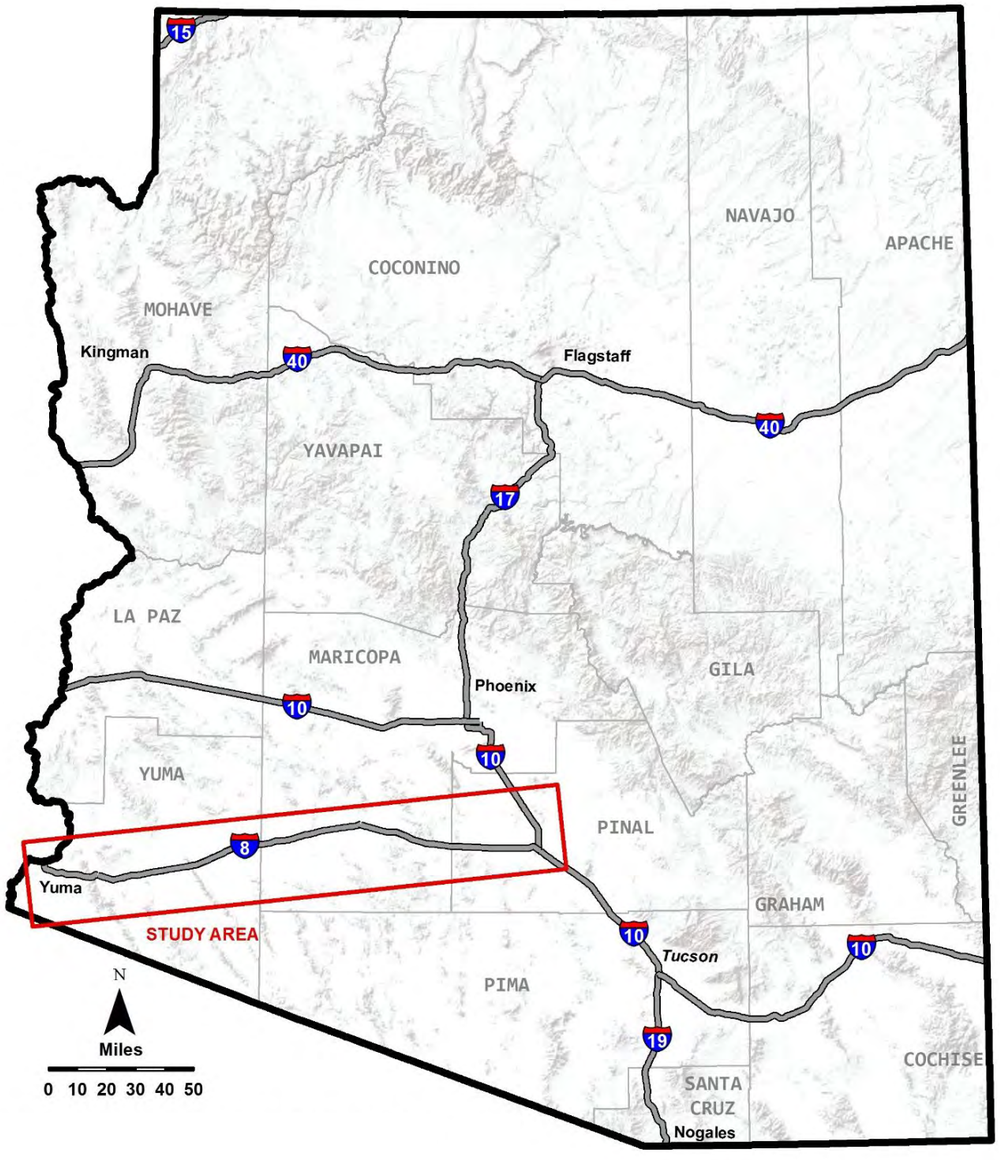
The third round (**Round 3**) of studies, initiated in Fall 2015, includes:

- I-10: California State Line to SR 85 and SR 85: I-10 to I-8
- I-10: SR 202L to the New Mexico State Line
- SR 87/SR 260/SR 377: SR 202L to I-40
- US 60/US 70: SR 79 to US 191 and US 191: US 70 to SR 80
- US 93/US 60: Nevada State Line to SR 303L

The studies under this program assess the overall health, or performance, of the state's strategic highways. The CPS will identify candidate solutions for consideration in the Multimodal Planning Division's (MPD) P2P project prioritization process, providing information to guide corridor-specific project selection and programming decisions.

The I-8 corridor, depicted in **Figure 1,** is one of the strategic statewide corridors identified and the subject of this Round 2 CPS.

Figure 1: Corridor Study Area



1.1 Corridor Study Purpose

The purpose of the CPS is to measure corridor performance to inform the development of strategic solutions that are cost-effective and account for potential risks. It is accomplished by following the process described below:

- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the performance measures
- Prioritize solutions for future implementation, accounting for performance effectiveness and risk analysis findings

1.2 Study Goals and Objectives

The objective of this study is to identify a recommended set of prioritized potential solutions for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process. The I-8 CPS defines solutions and improvements for the corridor that are evaluated and ranked to determine which investments offer the greatest benefit to the corridor in terms of enhancing performance. Corridor benefits can be categorized by the following three investment types:

- Preservation: Activities that protect transportation infrastructure by sustaining asset condition or extending asset service life
- Modernization: Highway improvements that upgrade efficiency, functionality, and safety without adding capacity
- Expansion: Improvements that add transportation capacity through the addition of new facilities and/or services

This study identifies potential actions to improve the performance of the I-8 corridor. Proposed actions are compared based on their likelihood of achieving desired performance levels, life-cycle costs, cost-effectiveness, and risk analysis to produce a prioritized list of solutions that help achieve corridor goals.

The following goals are identified as the desired outcome of this study:

- Link project decision-making and investments on key corridors to strategic goals
- Develop solutions that address identified corridor needs based on measured performance
- Prioritize improvements that cost-effectively preserve, modernize, and expand transportation infrastructure

1.3 Corridor Overview and Location

I-8 is an important national transportation corridor, spanning between San Diego, California and Casa Grande, Arizona. In Arizona, I-8 originates at the Colorado River in the City of Yuma and extends approximately 178 miles east, passing through Yuma County and the Town of Wellton, across Gila Bend in Maricopa County, and terminating at the I-10 junction southeast of Casa Grande in Pinal County. Much of the I-8 corridor is rural and undeveloped.

The entire length of I-8 in Arizona is the subject of this CPS. More than a highway, the corridor is a multimodal facility that moves people and freight and connects communities. The corridor serves the growing Sun Corridor in central Arizona, supports freight movement (e.g., by transporting produce from the “lettuce capital of the US” near Yuma), and carries visitors west to the commercial and recreation centers in San Diego, California.

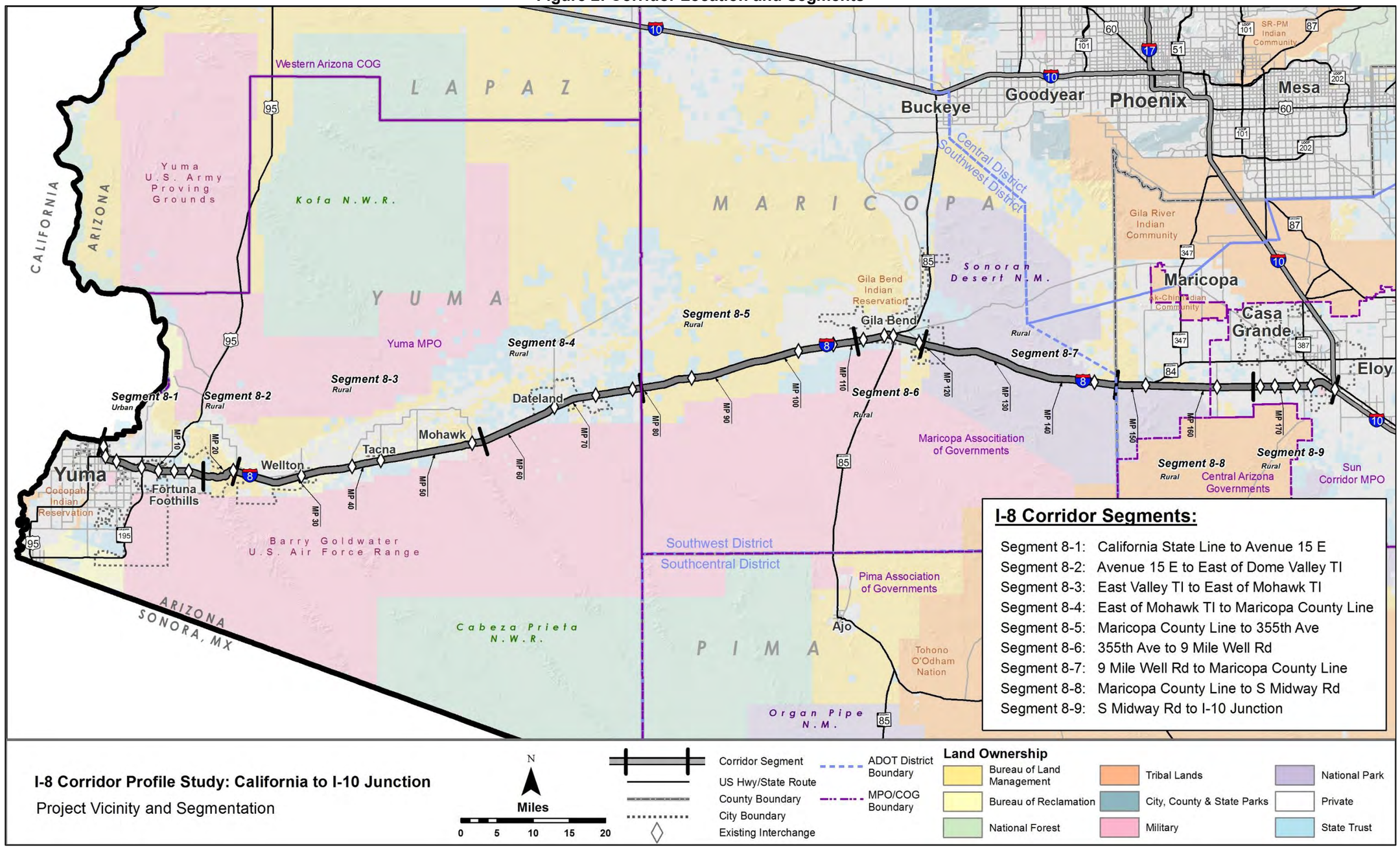
1.4 Corridor Segments

The I-8 corridor is divided into nine planning segments for analysis and evaluation. These planning segments allow the corridor to be analyzed at a detailed level so that location-specific needs can be readily identified and compared to other segments on this or other corridors. Segmentation by similar characteristics (e.g., urban/rural surroundings, road width, traffic volumes) allowed the analysis to highlight anomalies or instances of poor performance within the context of each segment. The corridor is segmented at logical breaks where context changes such as terrain, daily traffic volumes, or roadway typical section indicate. Additional segment breaks may occur at major intersections or junctions, where the corridor transitions from rural to urban environments, other similar operating environments, maintenance sections, and at jurisdictional changes. Corridor segments are described in **Table 1** and are shown in **Figure 2**.

Table 1: I-8 Corridor Segments

Segment #	Begin	End	Approx. Begin Milepost	Approx. End Milepost	Approx. Length (miles)	Typical Through Lanes (EB,WB)	2014 (2035) Average Annual Daily Traffic Volume (vpd)	Character Description
8-1	California State Line	Avenue 15 E	0.0	16.3	16.3	2, 2	28,925 (39,297)	This segment starts at the California Border, traversing the urban area of Yuma and including seven traffic interchanges (TIs) for access. Within the limits, I-8 was constructed on new alignment away from old US 80, now Business 8 (B-8). At Avenue 9E, I-8 returns to the old US 80 alignment utilizing parallel frontage roads. Avenue15E serves as the Yuma city limit, with significant changes in terrain, level of development and traffic volumes.
8-2	Avenue 15 E	East of Dome Valley TI	16.3	21.4	5.1	2, 2	12,848 (16,032)	I-8 crosses through the mountainous terrain of Telegraph Pass, utilizing the old US 80 alignment. The US Border Patrol Station is also located in this section. One TI is located within Segment 8-2.
8-3	East of Dome Valley TI	East of Mohawk TI	21.4	56.5	35.1	2, 2	9,671 (11,673)	I-8 was constructed on a new alignment within this rural segment. Four TIs provide access to the local communities. The terrain is uniform except for the easternmost mile where Mohawk Pass allows a small mountain range to be crossed. There is little fluctuation in traffic numbers across this segment.
8-4	East of Mohawk TI	Maricopa County Line	56.5	79.6	23.1	2, 2	10,719 (13,266)	This segment is considered a rural operating environment and terminates at the Yuma County/Maricopa County line, which is also the break point between the Yuma Metropolitan Planning Organization (YMPO) and Maricopa Association of Governments (MAG). Beginning at the Mohawk TI, I-8 utilizes old US 80 as the eastbound roadway. Additionally, the county line has generally been used as a project limit. Two TIs are inclusive.
8-5	Maricopa County Line	355th Avenue	79.6	110.4	30.8	2, 2	13,265 (18,978)	This segment starts at the county line and ends at approximately the western limits of Gila Bend. This segment is differentiated by jurisdiction rather than any changes in terrain or traffic. Four TIs provide local access.
8-6	355th Avenue	9 Mile Well Road	110.4	120	9.6	2, 2	6,455 (11,959)	I-8 crosses the Gila Bend area between East and West TIs with a total of 4 TIs serving the area. The mainline roadway is on new alignment. Traffic numbers in this segment increase due to the B-8 and SR 85 junctions.
8-7	9 Mile Well Road	Maricopa County Line	120	147.6	27.6	2, 2	5,238 (6,942)	This segment runs from east Gila Bend to the Maricopa / Pinal County Line. One TI falls within the limits of Segment 8-7.
8-8	Maricopa County Line	S Midway Road	147.6	166.5	18.9	2, 2	5,497 (8,230)	This segment is defined by jurisdiction. Midway Road is assumed to be the western limits of Casa Grande development. The jurisdictional boundary between MAG and the Sun Corridor Metropolitan Planning Organization (SCMPO) occurs within this segment at approximately MP 160. Two TIs provide local access.
8-9	S Midway Road	Interstate 10	166.5	178	11.5	2, 2	8,599 (11,731)	This segment is defined as entering into the greater Casa Grande area. This segment terminates at the junction with I-10 and includes 5 TIs.

Figure 2: Corridor Location and Segments



I-8 Corridor Segments:

- Segment 8-1: California State Line to Avenue 15 E
- Segment 8-2: Avenue 15 E to East of Dome Valley TI
- Segment 8-3: East Valley TI to East of Mohawk TI
- Segment 8-4: East of Mohawk TI to Maricopa County Line
- Segment 8-5: Maricopa County Line to 355th Ave
- Segment 8-6: 355th Ave to 9 Mile Well Rd
- Segment 8-7: 9 Mile Well Rd to Maricopa County Line
- Segment 8-8: Maricopa County Line to S Midway Rd
- Segment 8-9: S Midway Rd to I-10 Junction

I-8 Corridor Profile Study: California to I-10 Junction

Project Vicinity and Segmentation

N

Miles

0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
Existing Interchange

ADOT District Boundary
MPO/COG Boundary

Land Ownership

- Bureau of Land Management
- Bureau of Reclamation
- National Forest
- Tribal Lands
- City, County & State Parks
- Military
- National Park
- Private
- State Trust

1.5 Corridor Characteristics

The I-8 corridor provides movement for significant freight and recreation needs within Arizona. It serves intrastate, interstate and international commerce linking the agriculturally rich Yuma area with California to the west and all points east. I-8 is a key link in the regional, statewide and national freight network, collecting and distributing goods between Mexico, the west coast, and ports throughout the United States. It also serves as a major connection to recreational opportunities in Western Arizona, Southern California and Mexico.

National Context

I-8 is part of the National Highway System, traversing 345 miles between San Diego, California and Casa Grande, Arizona. It is designated as a national intercity truck route, a hazardous material route, and Key Commerce Corridor within Arizona, connecting west coast ports with Gulf coast ports and eastern markets. This route provides a more direct connection between I-10 east of Casa Grande and San Diego than following I-10 to Los Angeles. Within southern California, I-8 provides connectivity with access to I-5 and I-15, the Port of San Diego and the local military bases. It also runs parallel to the Barry M. Goldwater Air Force Range Complex, the nation's third largest military reservation, covering approximately 1.7 million acres and used primarily for flight training.

Regional Connectivity

I-8 connects to US 95 and SR 195 in the Yuma area, SR 85 in Gila Bend, SR 84 just south of Maricopa which then connects to SR 347, and I-10 in Casa Grande. This connectivity provides regional access to major freight generators in southern and central Arizona with southern California and Mexico. Regional access is also provided for recreational opportunities along the Colorado River and in Southern California.

Commercial Truck Traffic

I-8 serves as a trade route for agricultural products grown in Yuma and the Gila River Valley, as well as for other statewide commerce needs, by providing access to west coast ports, Gulf Coast ports, and eastern markets. A concentration of major agricultural facilities is located in the Yuma area between Avenue 3E and Araby Road. Major distribution centers, such as Walmart, are also located in the Casa Grande area. The high volume of truck traffic on Avenue 3E and Araby Road creates congestion on the southern legs of these intersections. According to ADOT's HPMS Location Report for 2014, the average daily commercial truck volumes along the corridor range from 1,100 – 5,400, with the higher frequencies closer to Yuma. One reason for the higher volume of commercial trucks near Yuma is the proximity to the San Luis Border Crossing. In addition, the Union Pacific Railroad (UPRR) also runs parallel to I-8 for much of the corridor, providing a major freight connection. Potential freight switching opportunities exist in both the Yuma and Casa Grande areas, providing an interface between rail freight, truck freight, and distribution centers.

The San Luis Border Crossing is located less than 25 miles south of Yuma via US 95. In 2014, this crossing was the third busiest in Arizona in terms of total number of loaded truck containers, accounting for approximately 8% of all such truck crossings within the State. The San Luis Border Crossing was also the second busiest crossing for personal vehicles and total pedestrians, accounting for 36% of all personal vehicle crossings (Bureau of Transportation Statistics, 2015). The San Luis Land Port of Entry (LPOE) serves US 95, I-8, SR 195 and Mexico Federal Highway 2. The LPOE consists of two facilities. The primary check point includes six general lanes and two SENTRI Lanes. An additional 80-acre commercial vehicle check point was recently constructed five miles east of the original port of entry and is designed to process 150 trucks per day with the potential to expand to 650 trucks by 2030. Five other border crossings between California and Arizona are also accessible from I-8. Due to its location near the U.S. and Mexico Border, I-8 has a significant impact on the national and regional scale.

One permanent border checkpoint is located just east of Avenue 15E. Another checkpoint that is occasionally used is located just west of the Yuma/Maricopa county line. Both locations require all vehicles to stop for inspection, creating delay with commercial truck traffic.

One weigh-in-motion (WIM) station is located on I-8 just east of the California State Line. A WIM station allows for commercial truck traffic to utilize the scales but with reduced delay. There are four additional weigh-in-motion traffic counters installed along the interstate corridor.

Commuter Traffic

Commuter traffic on I-8 occurs mostly within the urbanized areas of Yuma and Casa Grande, which are the primary economic centers along the corridor. According to ADOT's most recent data, traffic volumes range from approximately 28,000 vehicles per day in the Yuma area to approximately 7,000 vehicles per day in the Casa Grande area. Within the Yuma area, the commuter traffic generally occurs between downtown Yuma and Fortuna Foothills, which lies entirely within Segment 8-1 of this CPS.

According to the 2013 American Community Survey data from the US Census Bureau, 77% of the workforce in the Yuma region relies on a private vehicle to get to work, 82% of the workforce in the Gila Bend region relies on a private vehicle to get to work, and 80% of the workforce in the Casa Grande region relies on a private vehicle to get to work. The average commute travel time for commuters from small rural communities along I-8, such as Wellton, is 20-25 minutes. The smaller communities along I-8 have a high percentage of workers commuting to larger cities, such as Yuma or Casa Grande.

Additionally, there is a significant amount of military related uses in the Yuma region, with the Barry M. Goldwater Air Force Range Complex and the Marine Corps Air Station in the vicinity.

Recreation and Tourism

I-8 provides access to recreational opportunities along the Colorado River and in Southern California. Many recreational users travel I-8 to access the sand dunes just west of Yuma and the Colorado River in several areas along US/SR 95. This creates a mix of vehicles types on I-8, as many recreational vehicles with trailers use the route.

The Sonoran Desert National Monument is also located in the I-8 corridor between Gila Bend and Casa Grande. Motorists utilize I-8 to access SR 85 when traveling south to Organ Pipe National Monument and the border crossing with Mexico at Lukeville, which provides access to the Mexican port city of Puerto Peñasco.

Multimodal Uses

Freight Rail

The UPRR operates the historic Sunset Route connecting Los Angeles California to El Paso Texas. A major platform is located in Yuma, a legendary railroad town, and the railroad travels through Casa Grande. Nearly two-thirds of the Sunset Route is double-tracked to support the growing freight demand in the Southwest region. Moreover, the Sunset Route is a key corridor for North American railroads, carrying about 20 percent of all railroad traffic.

Passenger Rail

Amtrak operates one platform from Yuma. The Sunset Limited Route travels between Louisiana and California, with three trains departing weekly. The Texas Eagle Route, which runs from Chicago to San Antonio, can also be accessed from the Sunset Limited Route.

Bicycles/Pedestrians

Bicycles are permitted to use the shoulders along I-8, which are generally 10 feet wide, although several bridges have a width is less than 4 feet. Pedestrians are prohibited on this route.

Bus/Transit

The largest regional public transportation service provider along the I-8 corridor is the Yuma County Intergovernmental Public Transportation Authority with the Yuma County Area Transit (YCAT). YCAT provides nine fixed routes, a vanpool open to any commuter group in the county, an on-call demand service for individuals living with a disability, and a nighttime shuttle specifically serving colleges in the area. YCAT services connect Yuma to San Luis in the south and to the Town of Wellton to the west via I-8. YCAT also provides connections to and from the Greyhound stops in Yuma.

Greyhound operates two stops in Yuma, one along Castle Done Avenue at the Yuma Palms Regional Center and the other just east at 14th Avenue. These stops service Greyhound Route 580, between El Paso and Los Angeles. The route has additional stops in Gila Bend and Casa Grande.

Aviation

Municipal airports along the corridor are located in Eloy and Gila Bend, with a larger airport located in Yuma, just south of I-8. The predominant use of the Eloy Airfield is for skydiving and regional crop dusting. The Gila Bend Airport has no permanently located aircraft and approximately ten operations per day. The Yuma International Airport is used for military aviation, commercial travel, and medical transport, as well as for general aviation purposes. The Yuma International Airport is currently served by one commercial airline, American Airlines, and provides up to six round-trip flights daily between Yuma and Phoenix Sky Harbor Airport (PHX).

Land Ownership, Land Uses and Jurisdictions

As shown **Table 2**, I-8 crosses multiple jurisdictions and land holdings throughout Yuma, Maricopa, and Pinal Counties. A majority of the land west of Gila Bend is a checkerboard of private and State Trust land, with some Bureau of Land Management (BLM) ownership. East of Gila Bend, the corridor is predominantly National Park land until just west of Casa Grande, where it again traverses a checkerboard of private and State Trust land. In the vicinity of the corridor, but not immediately adjacent to I-8, there are significant military and tribal lands. Much of the military, tribal, and national parks lands are open space. Occurrences where these areas have been utilized by drug traffickers and smugglers have been noted, which can cause abrupt crossings of I-8 at unmarked locations.

Population Centers

The major population centers within the I-8 corridor are centered around the urbanized areas of Yuma and Casa Grande. **Table 2** provides a summary of the US Census population and the state growth forecasts for the communities along I-8. The urbanized area of Yuma is experiencing growth trending to the east, along the I-8 corridor, with increases in the Fortuna Foothills area and beyond into the Wellton region. The small community of Gila Bend is at a major transportation junction and expects sevenfold growth by 2040. Casa Grande serves as a major transportation hub at the junction of I-10 and I-8, and is an important center to Pinal County. It is currently experiencing significant growth in both population and employment opportunities, particularly focused in commercial and industrial development.

Major Traffic Generators

Within the Yuma and Casa Grande areas, major traffic generators are related to freight, including agricultural and industrial traffic, as well as some military-related traffic in the Yuma area. Outside of the study area, major traffic generators are the southern California ports and the San Luis Border Crossing, which generate significant freight traffic on I-8. Additionally, recreational opportunities along the Colorado River, both near Yuma and further north to Parker, generate traffic on I-8.

Table 2: Current and Future Population

Community	2010 Population	2014 Population	Projected 2040 Population	% Change 2010 – 2040	Total Growth
Yuma County	**195,751**	**210,500**	**333,943**	**41%**	**138,192**
Yuma	93,064	96,327	144,302	36%	51,238
Fortuna Foothills	26,265	27,407	36,393	28%	10,128
Wellton	2,882	3,067	5,479	47%	2,597
Tacna	602	610	649	7%	47
Maricopa County	**3,817,117**	**3,990,011**	**6,174,940**	**38%**	**2,357,823**
Gila Bend	1,900	2,000	14,500	87%	12,600
Pinal County	**376,369**	**403,526**	**934,939**	**60%**	**558,570**
Casa Grande	48,664	51,329	106,668	54%	58,004
Eloy	16,657	19,245	72,206	77%	55,549

Source: U.S. Census, Arizona Department of Administration – Employment and Population Statistics

Tribes

Tribal land within the vicinity of the I-8 corridor includes the Tohono O'Odham Nation and the Gila Bend Indian Reservation.

Wildlife Linkages

The Arizona State Wildlife Action Plan (SWAP) provides a 10-year vision for the entire state, identifying wildlife and habitats in need of conservation, insight regarding the stressors to those resources, and suggestive actions that can be taken to alleviate those stressors. Using the Habimap Tool that creates an interactive database of the information included in the SWAP, the following wildlife considerations were identified in relation to the I-8 corridor:

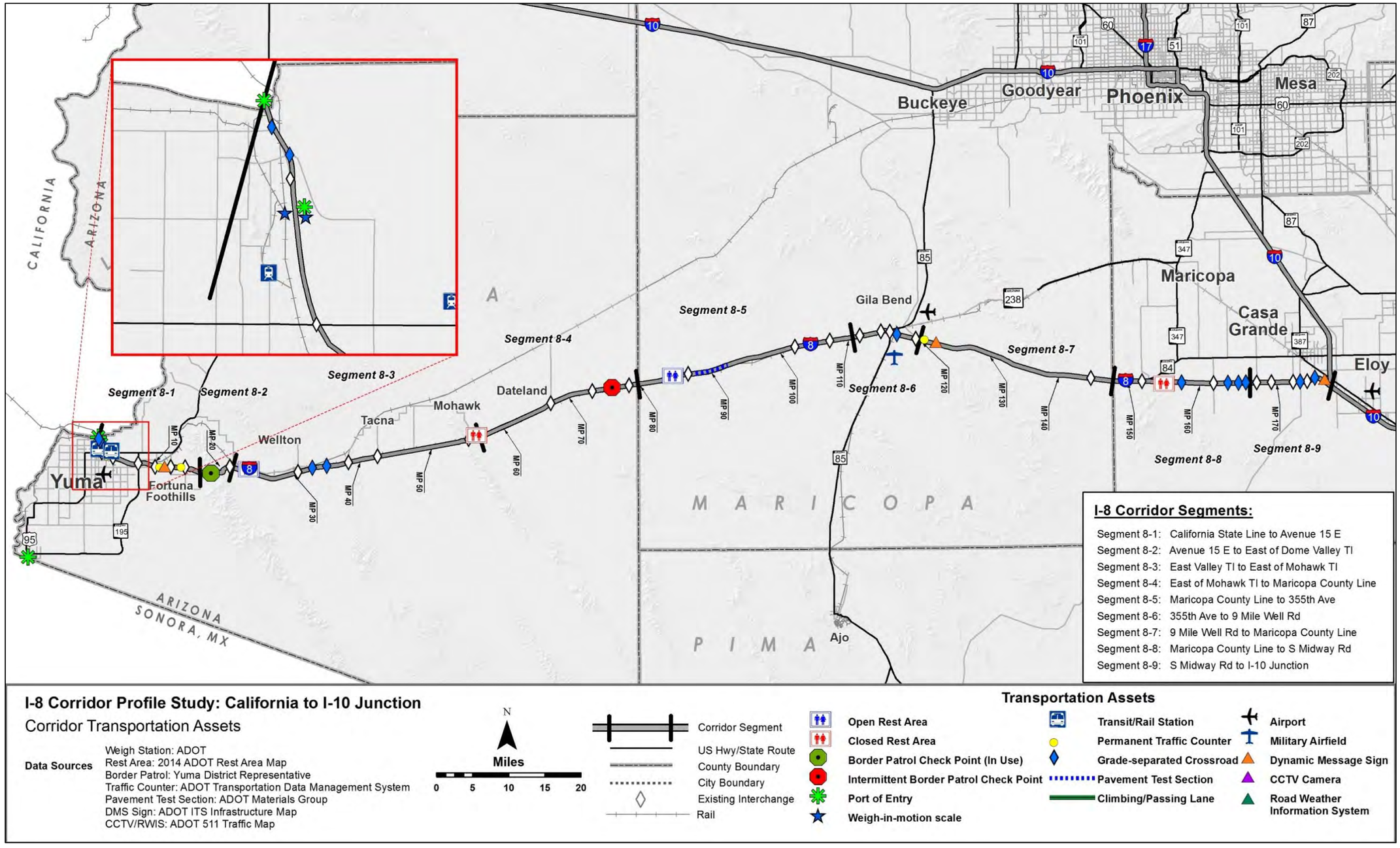
- Wildlife waters exist to the north and south of I-8 between SR 84 and Gila Bend.
- I-8 travels through allotments/pastures from just east of SR 84 to Gila Bend, and periodically from west of Gila Bend to east of Dateland. This roughly corresponds to the area controlled by the BLM.
- Some State Land holdings are present, primarily from just east of Gila Bend to Wellton.
- Arizona Wildlife Linkages – potential linkage zones exist along I-8 between MP 39 and MP 100 (Linkage No. 72), as well as crossing I-8 in the vicinity of MP 8-MP 9 (Linkage No. 70). Habitat fracture zones are identified from the California border to MP 18 (with the exception of MP 8-MP 9), MP 21-MP 39, MP 100-MP 120 and MP 150 to I-10.
- Species and Habitat Conservation Guide – indicates sensitive habitats in the vicinity of South Maricopa Mountains Wilderness, just north of I-8 to the east of Gila Bend, and along the Gila River in the vicinity of Wellton and Tacna.
- Species of greatest conservation need are identified in the vicinity of SR 84 and the Sonoran Desert National Monument.
- A moderate level of "species of economic and recreational importance" are identified along I-8 to the north from Casa Grande to the riparian area west of Gila Bend.

Corridor Assets

Corridor transportation assets are summarized in **Figure 3.** The majority of assets are located along the more densely populated portions of the corridor through Yuma and Casa Grande areas. There are two ports of entry, two weigh-in-motion scales and two transit/rail stations in Yuma, all of which are assets not provided elsewhere along the corridor. Additionally, near the eastern section of the corridor, beginning around MP 160 and continuing to I-10, is one DMS, five grade-separated crossroads and five existing interchanges. This area has a higher concentration of grade-separated crossroads and existing interchanges than any other along the corridor.

The portion of the corridor between Yuma/Fortuna Foothills and MP 160 is generally more rural and the existing assets are predominately grade-separated crossroads and existing interchanges. This stretch of corridor, which is roughly 140 miles, includes one open rest area, two Border Patrol check points, one permanent traffic counter and one DMS. There is also a pavement test section along the eastbound and westbound lanes between MP 88 and MP 92.5.

Figure 3: Corridor Assets



1.6 Corridor Stakeholders and Input Process

A Technical Advisory Committee (TAC) was created with representatives from key stakeholders. TAC meetings were held at key milestones to present results and obtain feedback. In addition, several meetings were also conducted with key stakeholders between October 2015 and October 2016 to present the results and obtain feedback.

Key stakeholders for this study include:

- Yuma Metropolitan Planning Organization (YMPO)
- Sun Corridor Metropolitan Planning Organization (SCMPO)
- Central Arizona Governments (CAG)
- ADOT Southwest District
- ADOT South Central District
- ADOT Technical Groups
- Arizona Game and Fish Department (AGFD)
- Arizona State Land Department (ASLD)
- Federal Highway Administration (FHWA)

Several Working Papers were developed during the course of the CPS. The Working Papers were provided to the TAC for review and comment.

1.7 Prior Studies and Recommendations

This section provides a summary of previous studies and plans and their recommendations that are relevant to the I-8 CPS.

Framework and Statewide Studies

- ADOT 5 Year Transportation Facilities Construction Program 2016 - 2020
- ADOT Statewide Bicycle and Pedestrian Plan Update
- ADOT Climbing and Passing Lane Prioritization Study
- Arizona Key Commerce Corridors
- Arizona Multimodal Freight Analysis Study
- Arizona Port of Entry Study
- Arizona Roadway Departure Safety Implementation Plan
- Arizona State Airport System Plan
- Arizona State Rail Plan
- Arizona Statewide Dynamic Message Master Plan
- Arizona Statewide Rail Framework Study
- Arizona Statewide Rest Area Study
- Arizona Statewide Travel Demand Model (AZTDM)
- Arizona Wildlife Action Plan / Arizona Wildlife Linkages Assessment
- Building a Quality Arizona (BQAZ)
- Bureau of Land Management Travel Management Plan
- What Moves You Arizona? Long-Range Transportation Plan 2010-2035

Regional Planning Studies

- ADOT I-8 Multi Modal Corridor Profile
- ADOT Interstate 11 (I-11) Southern Arizona Future Connectivity Corridor Feasibility Assessment Report
- Arizona – Sonora Border Master Plan
- CAG Regional Transportation Plan (RTP)
- Casa Grande Downtown Circulation Study
- Casa Grande General Plan 2020
- City of Yuma Transportation Master Plan
- FHWA Bi-National Border Transportation Infrastructure Needs Study
- MAG 2035 RTP
- MAG I-8 and I-10/Hidden Valley Transportation Framework Study
- MAG Freight Transportation Framework Plan
- Pinal County Regionally Significant Routes for Safety and Mobility Study
- Pinal County Transit Feasibility Study
- Pinal County Comprehensive Plan
- Pinal County Open Space and Trails Master Plan
- SCMPO 2016 – 2035 Draft RTP
- Short Range Transit Plan
- YMPO RTP (2014-2033)
- Yuma County Rail Corridor Study

Planning Assistance for Rural Areas (PARA) and Small Area Transportation Studies (SATS)

- ADOT Yuma Expressway Study
- ADOT YMPO Transportation Needs for the Foothills and Mesa Del Sol Areas
- Casa Grande SATS
- Pinal County SATS
- Pinal County Transit Element Report
- Southern Pinal County Regional Corridor Study
- Southern Pinal/Northern Pima Corridor Definition Study
- Wellton Transportation Long-Range Plan PARA
- Yuma Regional Transit Study PARA

Design Concept Reports (DCR) and Project Assessments (PA)

- I-10 Jct. I-8 to Tangerine Road DCR
- SR 85 Gila Bend TI DCR
- I-8 at MP 17 Telegraph Pass PA
- I-10 Val Vista – Jct. I-8 PA
- I-8 Araby Road TI DCR
- I-8 Henness Road TI DCR

Table 3: Corridor Recommendations from Previous Studies

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization[M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N)?	
1	0.5	0.5	0	I-8, WB Off Ramp & Giss Parkway (Intersection Improvements)		√		FY17	H8619 01C	Y	ADOT 5 Year Program 2016 - 2020
2	1	1	.5	I-8 Port of Entry facility improvements	√	√				N	AZ Ports of Entry Study
3	2	2	0	Addition of eastbound DMS at CA state line		√				N	Arizona Statewide Dynamic Message Master Plan
4	2	12	10	I-8 Widening, 16th Street to Fortuna (6 lanes)			√	Buildout		N	City of Yuma Transportation Master Plan
5	7	7	0	I-8, Araby Road TI Reconstruction (Roundabouts)		√		FY17	H8102 01C	Y	ADOT 5 Year Program 2016 - 2020
6	7.6	7.6	0	New east-west freeway in Yuma, connecting to I-8			√			N	BQAZ
7	16.2	16.2	0	I-8, Ave 15E (New TI)			√	Buildout		N	Transportation Needs for the Foothills & Mesa Del Sol Areas
8	18	20	2	Addition of eastbound climbing lane			√	Low priority (Tier 3)		N	ADOT Climbing and Passing lane Prioritization Study
9	20	35	15	I-8 Widening (6 lanes)			√	2033		N	Wellton Transportation Long Range Plan
10	21	29	8	I-8, Dome Valley – Wellton (Pavement Preservation)	√			FY16	H8697 01C	Y	ADOT 5 Year Program 2016 - 2020
11	27	27	0	I-8, Ave 25E (New TI)			√	2033		N	Wellton Transportation Long Range Plan
12	30	30	0	I-8, Ave 29E (Reconstruct TI)		√		2033		N	Wellton Transportation Long Range Plan
13	33	33	0	I-8, Ave 31E (New TI)			√	2033		N	Wellton Transportation Long Range Plan
14	36	36	0	Addition of eastbound DMS at S Ave 36 E		√				N	Arizona Statewide Dynamic Message Master Plan
15	36	36	0	Addition of westbound DMS at S Ave 36 E		√				N	Arizona Statewide Dynamic Message Master Plan
16	56	56	0	I-8, Mohawk Rest Area (Rehabilitation)	√	√		FY16	H8707 01C	Y	ADOT 5 Year Program 2016-2020
17	56			Mohawk Rest Area Rehab		√			H8707 01C	Y	Arizona Statewide Rest Area Study
18	84			Sentinel Rest Area Roof and Structure Fixes		√				N	Arizona Statewide Rest Area Study
19	96	106	10	I-8, MP 96 to Paloma Road (Pavement Preservation)	√			FY19	H8922 01C	Y	ADOT 5 Year Program 2016 - 2020
20	115	115	0	Addition of eastbound DMS at SR-85		√				N	Arizona Statewide Dynamic Message Master Plan
21	116	178	62	Widen I-8 from 4 to 6 lanes			√			N	Key Commerce Corridors
22	117	117	0	Upgrade of I-8/SR-85 interchange (to accommodate SR-85 freeway)			√	Beyond 2035		N	Maricopa Association of Governments (MAG) 2035 RTP
23	117	117	0	Upgrade of I-8/SR-85 interchange (to accommodate SR-85 freeway upgrade)			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
24	124			I-8 Accelerate/Decelerate Lane with Cattleguard and sign (southbound)		√				N	Bureau of Land Management Travel Management Plan and EA
25	126	126	0	I-8, Bender Wash (Drainage Improvements)		√		FY16	H8449 01C	Y	ADOT 5 Year Program 2016 - 2020
26	128			I-8 Accelerate/Decelerate Lane with Cattleguard and sign (northbound) (MP 128)		√				N	Bureau of Land Management Travel Management Plan and EA

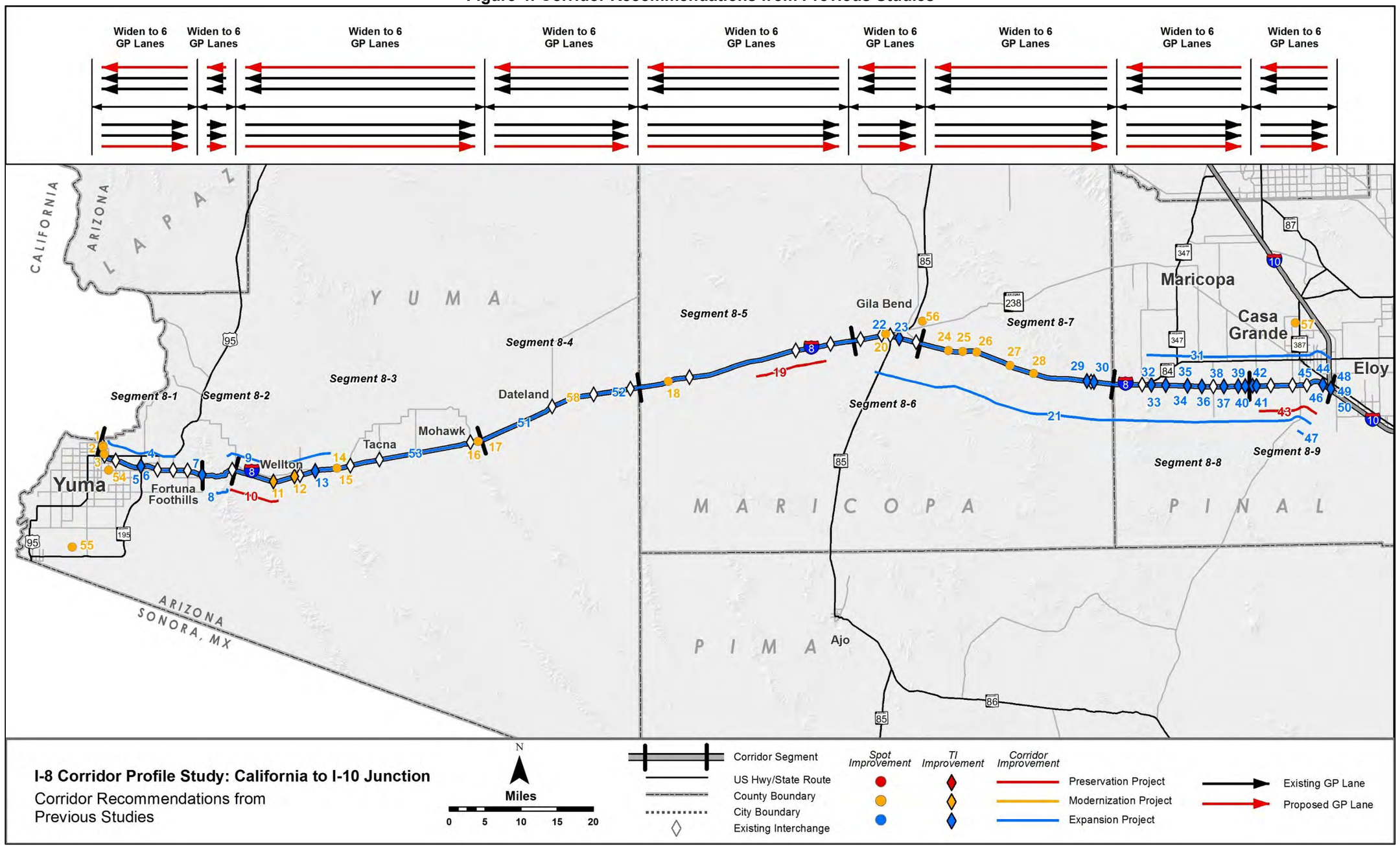
Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization[M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N)?	
27	133			I-8 Accelerate/Decelerate Lane with Cattleguard and sign (northbound)		√				N	Bureau of Land Management Travel Management Plan and EA
28	136.5			I-8 Accelerate/Decelerate Lane with Cattleguard and Sign		√				N	Bureau of Land Management Travel Management Plan and EA
29	144	144	0	Addition of I-8 interchange at Veko Valley Rd			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
30	145	145	0	Addition of freeway to freeway interchange (to accommodate SR-303L freeway upgrade)			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
31	152	178	26	I-8, widening from SR-347 to I-10 (6 lanes)			√	2030		N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
32	153	153	0	Addition of I-8 interchange at Ratson Rd			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
33	155	155	0	Addition of I-8 interchange at Green Rd			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
34	158	158	0	Addition of I-8 interchange at John Wayne Pkwy (proposed)			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
35	158			Permit for Smith Road under I-8 Overpass (northbound and southbound)		√				N	Bureau of Land Management Travel Management Plan and EA
36	160	160	0	Addition of I-8 interchange at Fuqua Rd			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
37	163	163	0	Addition of I-8 interchange at Anderson Rd			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
38	163	163	.5	New interchange at I-8/Anderson			√			N	Casa Grande SATS/GP
39	165	165	.5	New interchange at I-8/Indian Valley			√			N	Casa Grande GP
40	166	166	0	Addition of I-8 interchange at Russell Rd			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
41	167	167	.5	New system interchange at I-8/Montgomery			√			N	Casa Grande SATS/GP
42	167.5	167.5	0	Addition of freeway to freeway interchange (to accommodate SR-303L freeway upgrade)			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
43	169.5	178	8.5	Pavement preservation from Bianco Rd to I-10	√			2016		N	Sun Corridor MPO Draft Listing of Projects
44	177	177	.5	New interchange of I-8/Henness			√			N	Casa Grande SATS/GP
45	177	177	0	Addition of I-8 interchange at Henness Rd			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
46	177	177	0	Addition of I-8 interchange at Henness Rd			√	2020		N	Sun Corridor MPO Draft Listing of Projects
47	177	178	1	South frontage road from Henness to Cox Rd			√	2030		N	Sun Corridor MPO Draft Listing of Projects
48	178	178	0	Upgrade of I-8/I-10 interchange			√			N	ADOT I-10 Corridor Study, Junction I-8 to Tangerine Rd DCR
49	178	178	0	I-8/I-10 System Interchange		√				N	ADOT Key Commerce Corridors

Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization[M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N)?	
50	178	178	0	Upgrade of I-8/I-10 interchange			√			N	MAG I-8/I-10 Hidden Valley Transportation Framework Study
51				Widen interstate highways to six lanes in rural Arizona			√			N	BQAZ
52	1	115	115	Intercity bus along I-8 from Gila Bend to Yuma. (2050)			√			N	BQAZ
53	1	115	115	Passenger rail along existing rail line from Gila Bend to Yuma (2050)			√			N	BQAZ
54				Yuma International Airport	√	√	√	FY17-FY20		N	ADOT 5 Year Program 2016 - 2020
55				Yuma Rolle Airfield	√			FY17		N	ADOT 5 Year Program 2016 - 2020
56				Gila Bend Municipal Airport	√	√	√	FY16-FY20		N	ADOT 5 Year Program 2016 - 2020
57				Casa Grande Municipal Airport	√	√	√	FY16-FY20		N	ADOT 5 Year Program 2016 - 2020
58	0	79	79	Various recommendations for improving safety associated with roadway departure incidents		√				N	Arizona Roadway Departure Safety Implementation Plan

Figure 4: Corridor Recommendations from Previous Studies



2.0 CORRIDOR PERFORMANCE

This chapter describes the evaluation of the existing performance of the I-8 corridor. A series of performance measures are used to assess the corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

2.1 Corridor Performance Framework

This study uses a performance-based process to define baseline corridor performance, diagnose corridor needs, develop corridor solutions, and prioritize strategic corridor investments. In support of this objective, a framework for the performance-based process was developed through a collaborative process involving ADOT and the CPS consultant teams.

Figure 5 illustrates the performance framework, which includes a two-tiered system of performance measures (primary and secondary) to evaluate baseline performance. The primary measures in each of five performance areas are used to define the overall health of the corridor, while the secondary measures identify locations that warrant further diagnostic investigation to delineate needs. Needs are defined as the difference between baseline corridor performance and established performance objectives.

Figure 5: Corridor Profile Performance Framework

The following five performance areas guide the performance-based corridor analyses:

- Pavement
- Bridge
- Mobility
- Safety
- Freight

These performance areas reflect national performance goals stated in Moving Ahead for Progress in the 21st Century (MAP-21):

- Safety: To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
- Infrastructure Condition: To maintain the highway infrastructure asset system in a state of good repair
- Congestion Reduction: To achieve a significant reduction in congestion on the National Highway System
- System Reliability: To improve the efficiency of the surface transportation system
- Freight Movement and Economic Vitality: To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
- Environmental Sustainability: To enhance the performance of the transportation system while protecting and enhancing the natural environment
- Reduced Project Delivery Delays: To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion

The MAP-21 performance goals were considered in the development of ADOT's P2P process, which integrates transportation planning with capital improvement programming and project delivery. Since the P2P program requires the preparation of annual transportation system performance reports using the five performance areas adopted for the CPS, consistency is achieved in the performance measures used for various ADOT analysis processes.

The performance measures include five primary measures: Pavement Index, Bridge Index, Mobility Index, Safety Index, and Freight Index. Additionally, a set of secondary performance measures provides for a more detailed analysis of corridor performance.

Each of the primary and secondary performance measures is comprised of one or more quantifiable indicators. A three-level scale was developed to standardize the performance scale across the five performance areas, with numerical thresholds specific to each performance measure:

Good/Above Average Performance	Rating is above the identified desirable/average range
Fair/Average Performance	Rating is within the identified desirable/average range
Poor/Below Average Performance	Rating is below the identified desirable/average range

Table 4 provides the complete list of primary and secondary performance measures for each of the five performance areas.

Table 4: Corridor Performance Measures

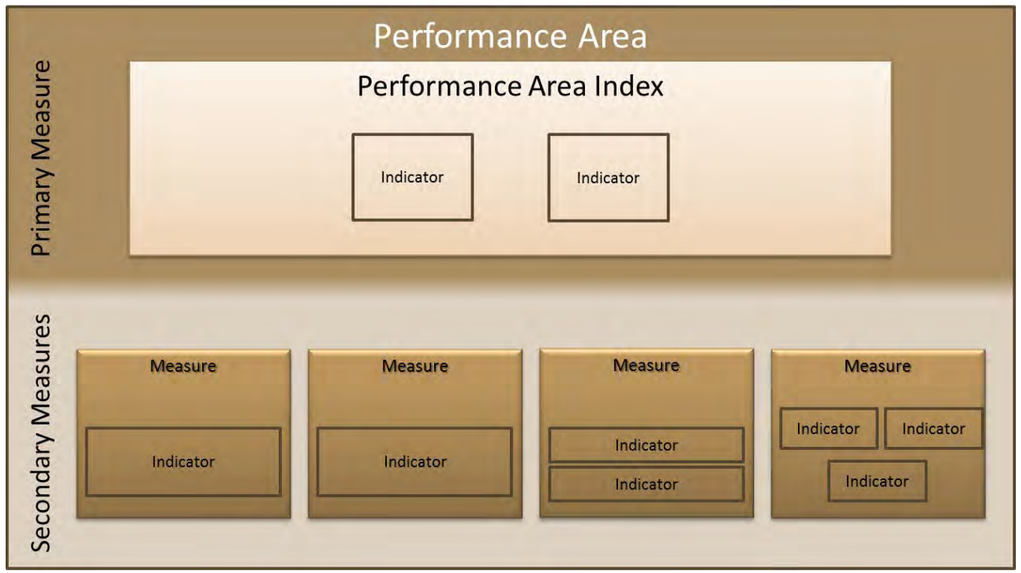
Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index and cracking	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure and structural evaluation rating	• Bridge Sufficiency • Functionally Obsolete Bridges • Bridge Rating • Bridge Hot Spots
Mobility	**Mobility Index** Based on combination of existing and future daily volume-to-capacity ratios	• Future Congestion • Peak Congestion • Travel Time Reliability • Multimodal Opportunities
Safety	**Safety Index** Based on frequency of fatal and incapacitating injury crashes	• Directional Safety Index • Strategic Highway Safety Plan Emphasis Areas • Crash Unit Types • Safety Hot Spots
Freight	**Freight Index** Based on bi-directional truck planning time index	• Recurring Delay • Non-Recurring Delay • Closure Duration • Bridge Vertical Clearance • Bridge Vertical Clearance Hot Spots

The general template for each performance area is illustrated in **Figure 6**.

The guidelines for performance measure development are:

- Indicators and performance measures for each performance area should be developed for relatively homogeneous corridor segments
- Performance measures for each performance area should be tiered, consisting of primary measure(s) and secondary measure(s)
- Primary and secondary measures should assist in identifying those corridor segments that warrant in-depth diagnostic analyses to identify performance-based needs and a range of corrective actions known as solution sets
- One or more primary performance measures should be used to develop a Performance Index to communicate the overall health of a corridor and its segments for each performance area; the Performance Index should be a single numerical index that is quantifiable, repeatable, scalable, and capable of being mapped; primary performance measures should be transformed into a Performance Index using mathematical or statistical methods to combine one or more data fields from an available ADOT database
- One or more secondary performance measure indicators should be used to provide additional details to define corridor locations that warrant further diagnostic analysis; secondary performance measures may include the individual indicators used to calculate the Performance Index and/or “hot spot” features

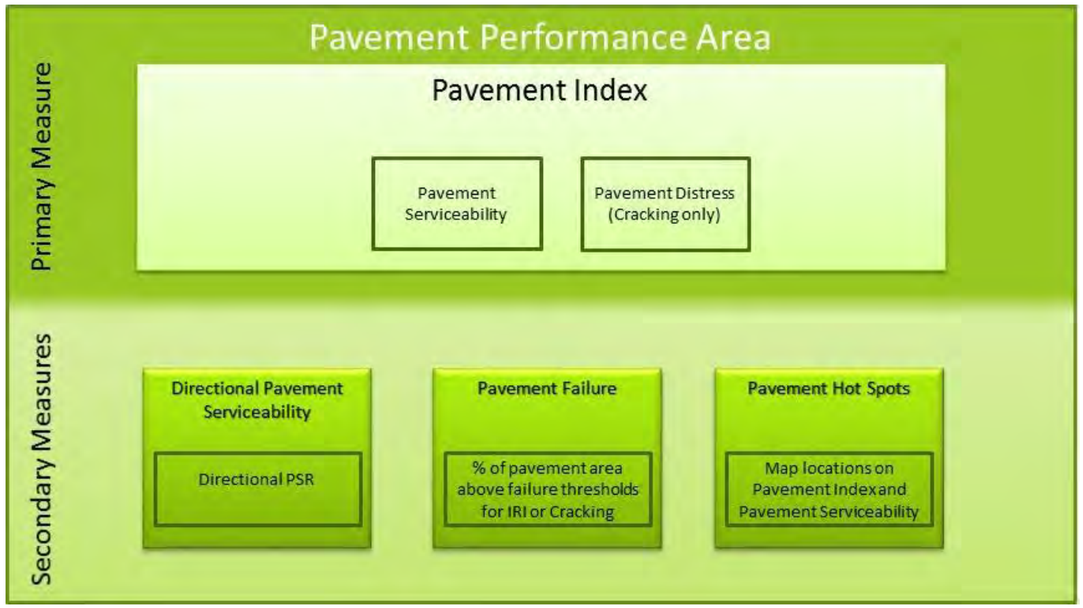
Figure 6: Performance Area Template



2.3 Pavement Performance Area

The Pavement performance area consists of a primary measure (Pavement Index) and three secondary measures, as shown in **Figure 7**. These measures assess the condition of the existing pavement along the I-8 corridor. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 7: Pavement Performance Measures



Primary Pavement Index

The Pavement Index is calculated using two pavement condition ratings: the Pavement Serviceability Rating (PSR) and the Pavement Distress Index (PDI).

The PSR is extracted from the International Roughness Index (IRI), a measurement of pavement roughness based on field-measured longitudinal roadway profiles. The PDI is extracted from the Cracking Rating (CR), a field-measured sample from each mile of highway.

Both the PSR and PDI use a 0 to 5 scale with 0 representing the lowest performance and 5 representing the highest. The Pavement Index for each segment is a weighted average of the directional ratings based on the number of travel lanes. Therefore, the condition of a section with more travel lanes will have a greater influence on the resulting segment Pavement Index than the condition of a section with fewer travel lanes.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Pavement performance area, the relevant operating environments are designated as interstate and non-interstate segments. For the I-8 corridor, all segments are considered the interstate operating environment.

Secondary Pavement Measures

Three secondary measures provide an in-depth evaluation of the different characteristics of pavement performance.

Directional Pavement Serviceability

- Weighted average (based on number of lanes) of the PSR for the pavement in each direction of travel

Pavement Failure

- Percentage of pavement area rated above failure thresholds for IRI or Cracking

Pavement Hot Spots

- A Pavement “hot spot” exists where a given one-mile section of roadway rates as being in “poor” condition
- Highlights problem areas that may be under-represented in a segment average; this measure is recorded and mapped, but not included in the Pavement performance area rating calculations

Pavement Performance Results

The Pavement Index provides a high-level assessment of the pavement condition for the corridor and for each segment. The three secondary measures provide more detailed information to assess pavement performance.

Based on the results of the analysis, the following pavement conditions were observed on I-8:

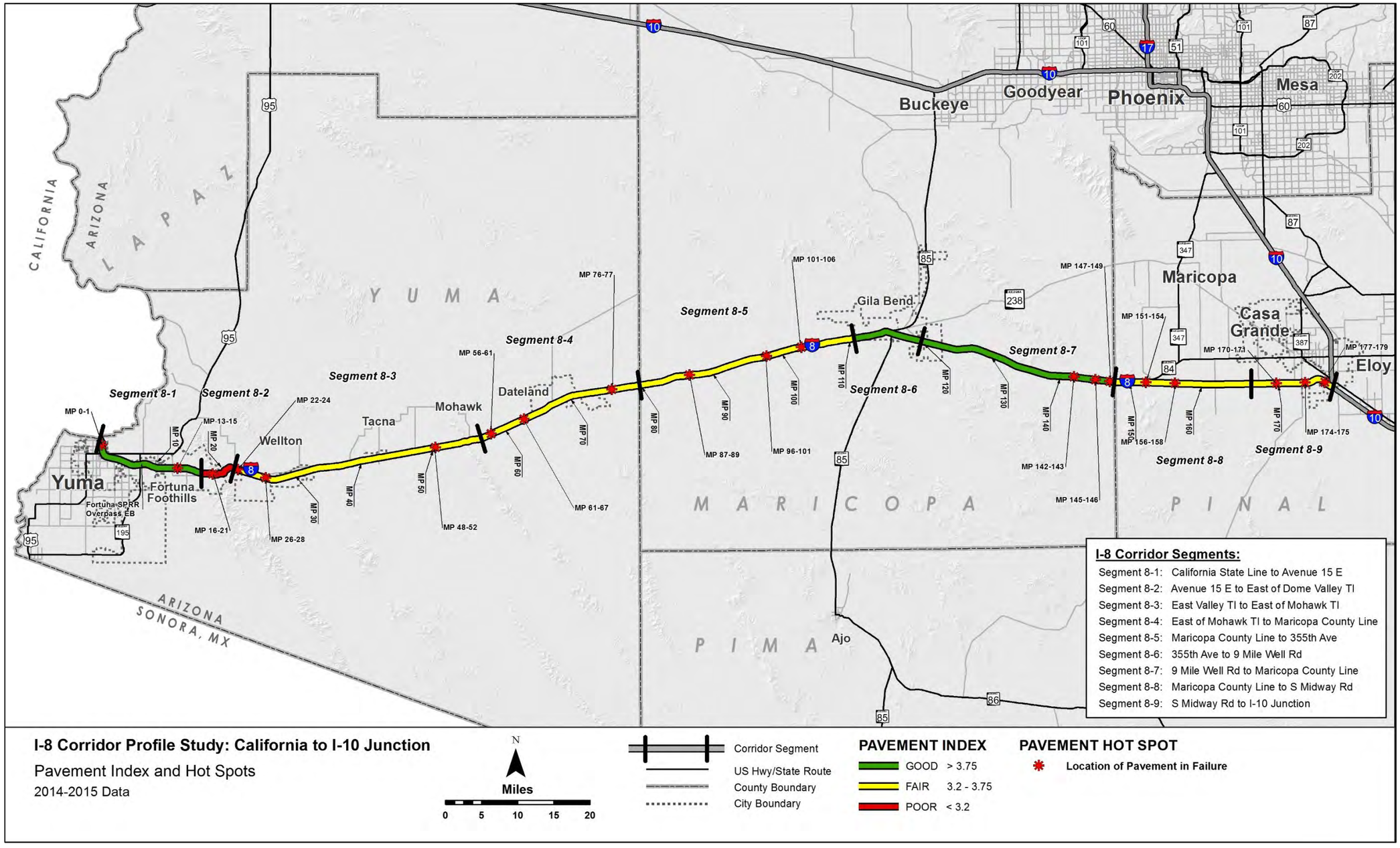
- The I-8 Pavement Performance Index, comprised of the primary measures PSR and PDI, ranges from "Good" to "Poor" throughout the corridor. Approximately 119.7 miles of 178.3 miles rates as "Fair" performance (67% of corridor). The highest performing area is Segment 8-1 in Yuma, which rates as "Good" (4.20 out of 5). The lowest performing area is Segment 8-2 traversing the Telegraph Pass, which rates as "Poor" (2.31 out of 5) for this dataset.
- The Directional Pavement Serviceability Rating ranges in performance from "Good" to "Fair". The condition difference between the Pavement Index rating and the Directional PSR rating is attributed to the exclusion of the cracking rating (PDI). Cracking is most prevalent in Segment 8-2, which caused the Directional PSR to be "Good" even though the Index for this segment is "Poor". Overall, the PSR per segment yields similar results of "Good" and "Fair" in both directions of travel. Examination of the data between mileposts (MP), however, shows the westbound PSR as "Poor" from MP 57 to MP 66 and from MP 97 to MP 106.
- The Pavement Failure evaluation assesses the percentage of lane miles considered in failure throughout the corridor. Four segments exceed the threshold of 20%, indicating worse than average performance. These include Segment 8-2 (60.0%), Segment 8-4 (23.9%), Segment 8-5 (28.3%), and Segment 8-9 (37.5%).

Table 5 summarizes the Pavement performance results for the I-8 corridor. **Figure 8** illustrates the primary Pavement Index performance and locations of pavement hot spots along the I-8 corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 5: Pavement Performance

Segment	Length (miles)	Pavement Index	Directional PSR		% Area Failure
			EB	WB	
8-1	16.30	4.20	4.28	4.30	15.6%
8-2	5.10	2.31	3.87	4.07	60.0%
8-3	35.10	3.58	3.74	3.79	12.5%
8-4	23.10	3.68	3.87	3.74	23.9%
8-5	30.80	3.41	3.58	3.55	28.3%
8-6	9.60	4.17	4.01	4.03	0.0%
8-7	27.60	4.11	4.16	4.18	5.4%
8-8	18.90	3.55	3.83	3.75	18.4%
8-9	11.50	3.48	3.40	3.54	37.5%
Weighted Corridor Average		3.69	3.85	3.85	18.8%
SCALE					
Interstate					
Good		> 3.75			< 5%
Fair		3.2 - 3.75			5% - 20%
Poor		< 3.2			> 20%

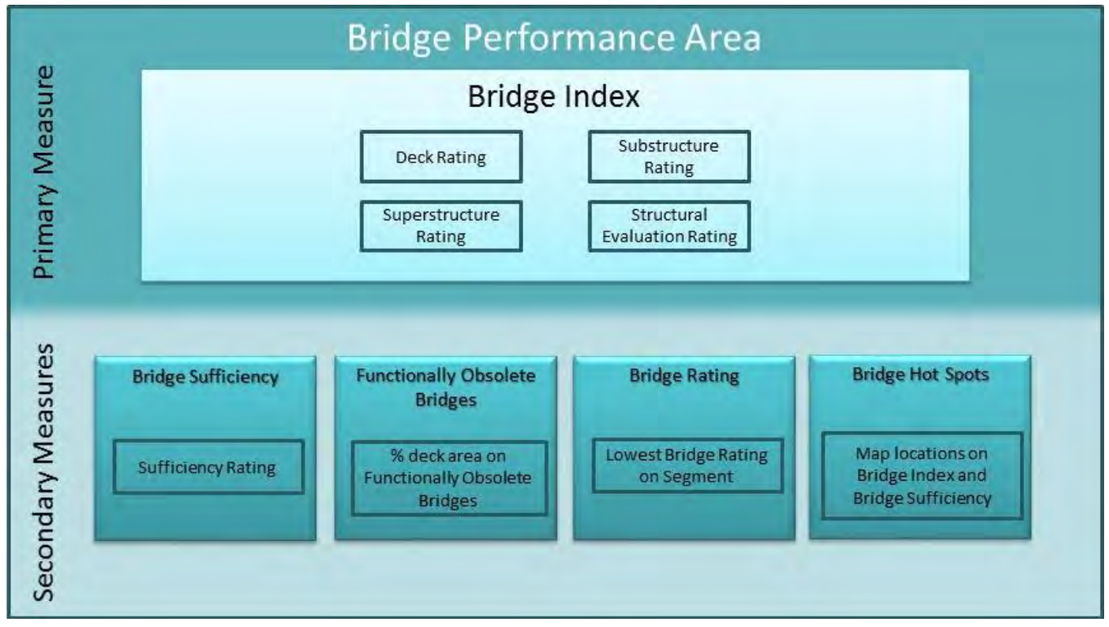
Figure 8: Pavement Performance



2.4 Bridge Performance Area

The Bridge performance area consists of a primary measure (Bridge Index) and four secondary measures, as shown in **Figure 9**. These measures assess the condition of the existing bridges along the I-8 corridor. Only bridges that carry mainline traffic or bridges that cross the mainline are included in the calculation. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 9: Bridge Performance Measures



Primary Bridge Index

The Bridge Index is calculated based on the use of four different bridge condition ratings from the ADOT Bridge Database, also known as the Arizona Bridge Information and Storage System (ABISS). The four ratings are the Deck Rating, Substructure Rating, Superstructure Rating, and Structural Evaluation Rating. These ratings are based on inspection reports and establish the structural adequacy of each bridge. The performance of each individual bridge is established by using the lowest of these four ratings. The use of these ratings, and the use of the lowest rating, is consistent with the approach used by the ADOT Bridge Group to assess the need for bridge rehabilitation. The Bridge Index is calculated as a weighted average for each segment based on deck area.

Secondary Bridge Measures

Four secondary measures provide an in-depth evaluation of the characteristics of each bridge:

Bridge Sufficiency

- Multipart rating includes structural adequacy and safety factors as well as functional aspects such as traffic volume and length of detour
- Rates the structural and functional sufficiency of each bridge on a 100-point scale

Functionally Obsolete Bridges

- Percentage of total deck area in a segment that is on functionally obsolete bridges
- Identifies bridges that no longer meet standards for current traffic volumes, lane width, shoulder width, or bridge rails
- A bridge that is functionally obsolete may still be structurally sound

Bridge Rating

- The lowest rating of the four bridge condition ratings (substructure, superstructure, deck, and structural evaluation) on each segment
- Identifies lowest performing evaluation factor on each bridge

Bridge Hot Spots

- A Bridge “hot spot” is identified where a given bridge has a bridge rating of 4 or lower or multiple ratings of 5 between the deck, superstructure, and substructure ratings
- Identifies particularly low-performing bridges or those that may decline to low performance in the immediate future

Bridge Performance Results

The Bridge Index provides a top-level assessment of the structural condition of bridges on the I-8 corridor, and for each corridor segment. The three secondary measures provide more detailed information to assess the bridge condition for each segment. Overall, based on the Bridge Index, all segments show "fair" performance.

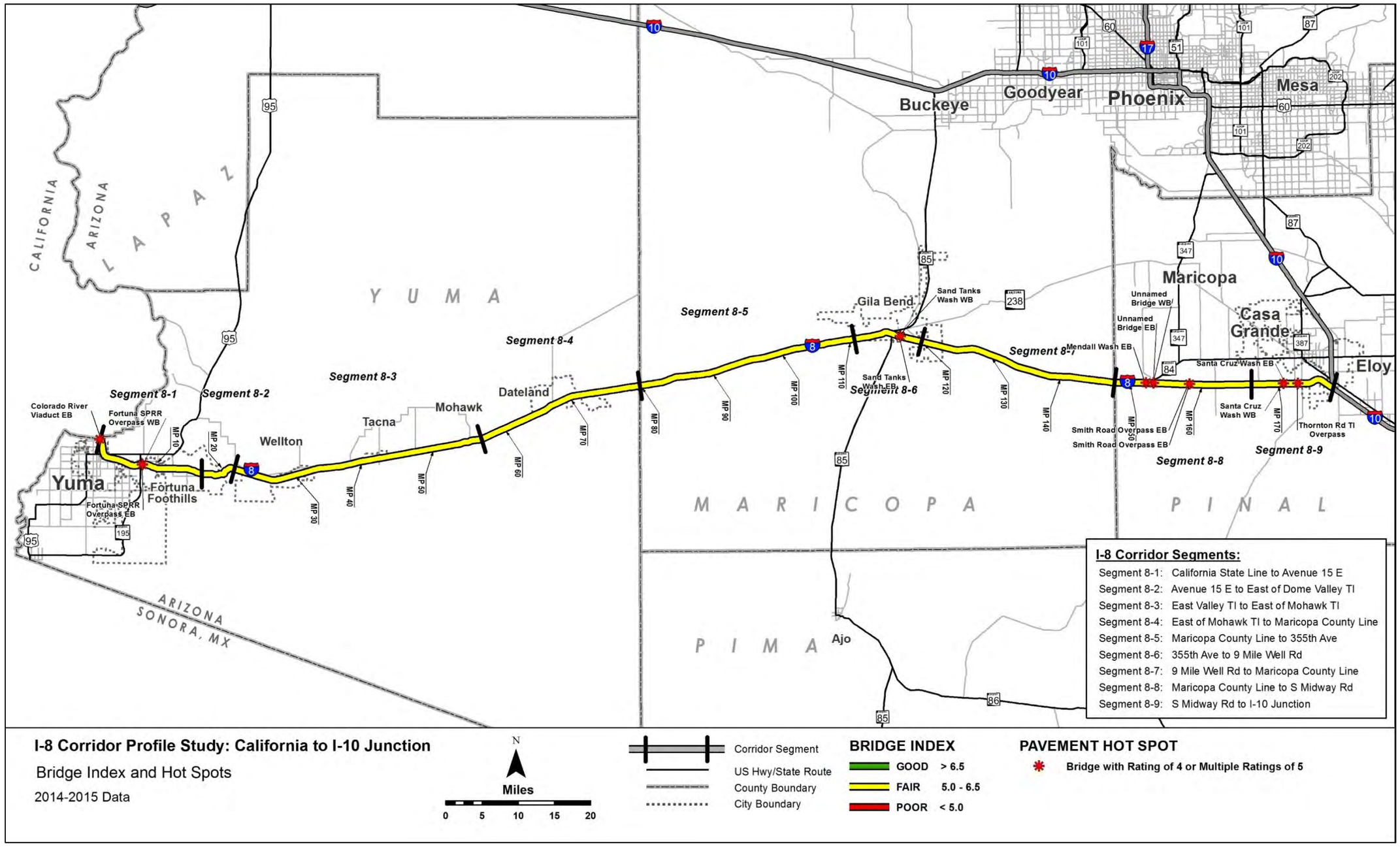
- Every segment on I-8 falls within the "Fair" performance rating for the Bridge Index, which consists of the deck, substructure, superstructure, and structural ratings. The ratings ranged from 5.31 to 6.32 out of 9.
- All segments have a "Good" performance for the Bridge Sufficiency rating, with weighted average values ranging from 87.36 to 95.49 out of 100. The weighted average Sufficiency Rating for the corridor is 92.
- Two bridges have been rated as structurally deficient. At MP 0.01, the Colorado River Viaduct (Eastbound) has a deck rating of 4. At MP 172.55, the Thornton Road TI Underpass has substructure and structural evaluation ratings of 4. In addition, eleven bridges have multiple ratings of 5 for the deck, substructure, superstructure, and structural evaluation. These 13 bridges are shown on **Figure 10**.
- The Eastbound San Cristobal RCBC at MP 59.97 is also classified as a structurally deficient major structure according to ABISS.
- Five of the nine analysis segments on I-8 exceed the threshold for "Poor" performance because they contain a high percentage of bridges that are Functionally Obsolete by current ADOT design standards. These include Segments 8-3 (40.8%), 8-4 (100.0%), 8-5 (58.5%), 8-6 (43.8%) and 8-9 (44.4%).

Table 6 summarizes the bridge performance results for the I-8 Corridor. **Figure 10** illustrates the primary bridge index performance and locations of bridge hot spots along I-8. Maps for each secondary measure can be found in **Appendix A.**

Table 6: Bridge Performance

Segment	Length (miles)	# of Bridges	Bridge Index	Bridge Sufficiency	% Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating
8-1	16.30	19	5.69	87.36	6.6%	4
8-2	5.10	6	5.31	91.38	0.0%	5
8-3	35.10	19	6.32	95.49	40.8%	6
8-4	23.10	6	6.00	94.00	100.0%	6
8-5	30.80	14	5.90	92.15	58.5%	5
8-6	9.60	18	5.79	93.01	43.8%	5
8-7	27.60	5	6.08	92.59	33.9%	6
8-8	18.90	14	5.90	92.35	38.1%	5
8-9	11.50	14	5.67	88.40	44.4%	4
Weighted Corridor Average			5.97	92.48	46.3%	5
SCALE						
Good			> 6.5	> 80	< 12%	> 6
Fair			5.0 - 6.5	50 - 80	12% - 40%	5 - 6
Poor			< 5.0	< 50	> 40 %	< 5

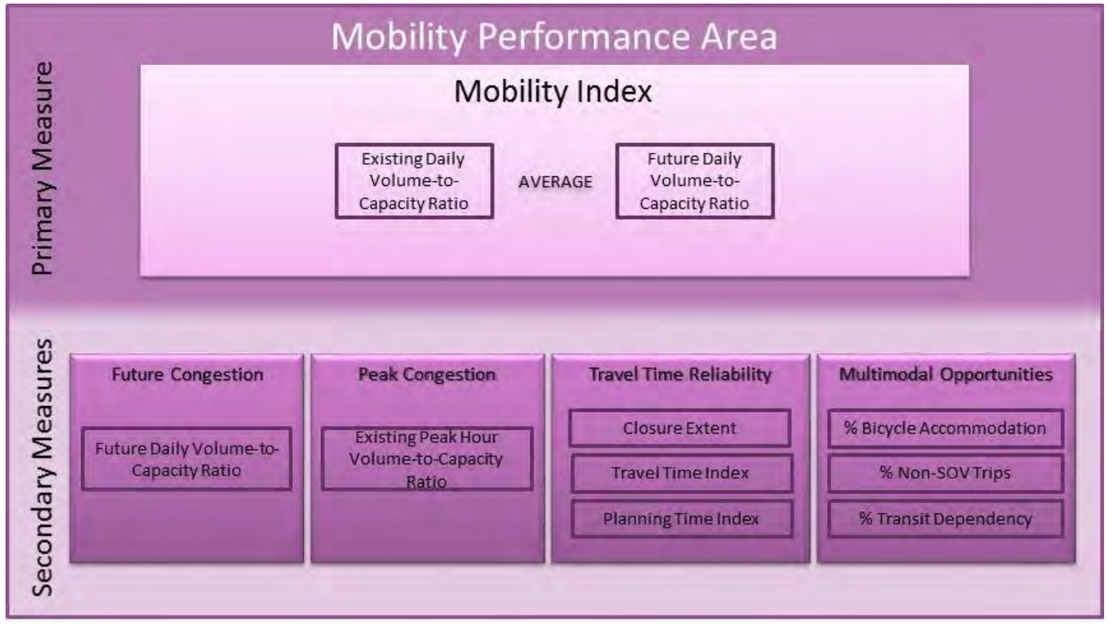
Figure 10: Bridge Performance



2.5 Mobility Performance Area

The Mobility performance area consists of a primary measure (Mobility Index) and four secondary measures, as shown in **Figure 11**. These measures assess the condition of existing mobility along the I-8 corridor. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 11: Mobility Performance Measures



Primary Mobility Index

The Mobility Index is an average of the existing (2014) daily volume-to-capacity (V/C) ratio and the future (2035 AZTDM) daily V/C ratio for each segment of the corridor. The V/C ratio is an indicator of the level of congestion. This measure compares the average annual daily traffic (AADT) volume to the capacity of the corridor segment as defined by the service volume for level of service (LOS) E. By using the average of the existing and future year daily volumes, this index measures the level of daily congestion projected to occur in approximately ten years (2025) if no capacity improvements are made to the corridor.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Mobility performance area, the relevant operating environments are urban vs. rural setting and interrupted flow (e.g., signalized at-grade intersections are present) vs. uninterrupted flow (e.g., controlled access grade-separated conditions such as a freeway or interstate highway). For the I-8 corridor, the following operating environments were identified:

- Urban or Urban-Fringe Uninterrupted Flow (Segment 8-1)
- Rural Uninterrupted Flow (Segments 8-2 through 8-9)

Secondary Mobility Measures

Four secondary measures provide and in-depth evaluation of operational characteristics of the corridor:

Future Congestion – Future Daily V/C

- The future (2035 AZTDM) daily V/C ratio; this measure is the same value used in the calculation of the Mobility Index
- Provides a measure of future congestion if no capacity improvements are made to the corridor

Peak Congestion – Existing Peak Hour V/C

- The peak hour V/C ratio for each direction of travel
- Provides a measure of existing peak hour congestion during typical weekdays

Travel Time Reliability– Three separate travel time reliability indicators together provide a comprehensive picture of how much time may be required to travel within the corridor:

- Closure Extent:
  - The average number of instances a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel; a weighted average was applied to each closure that takes into account the distance over which the closure occurs
  - Closures related to crashes, weather, or other incidents are a significant contributor to non-recurring delays; construction-related closures were excluded from the analysis
- Directional Travel Time Index (TTI):
  - The ratio of the average peak period travel time to the free-flow travel time (based on the posted speed limit) in a given direction
  - The TTI recognizes the delay potential from recurring congestion during peak periods; different thresholds are applied to uninterrupted flow (freeways) and interrupted flow (non-freeways) to account for flow characteristics

- Directional Planning Time Index (PTI):
  - The ratio of the 95th percentile travel time to the free-flow travel time (based on the posted speed limit) in a given direction
  - The PTI recognizes the delay potential from non-recurring delays such as traffic crashes, weather, or other incidents; different thresholds are applied to uninterrupted flow (freeways) and interrupted flow (non-freeways) to account for flow characteristics
  - The PTI indicates the amount of time in addition to the typical travel time that should be allocated to make an on-time trip 95% of the time in a given direction

Multimodal Opportunities – Three multimodal opportunity indicators reflect the characteristics of the corridor that promote alternate modes to the single occupancy vehicle (SOV) for trips along the corridor:

- % Bicycle Accommodation:
  - Percentage of the segment that accommodates bicycle travel; bicycle accommodation on the roadway or on shoulders varies depending on traffic volumes, speed limits, and surface type
  - Encouraging bicycle travel has the potential to reduce automobile travel, especially on non-interstate highways
- % Non-SOV Trips:
  - The percentage of trips (less than 50 miles in length) by non-SOVs
  - The percentage of non-SOV trips in a corridor gives an indication of travel patterns along a section of roadway that could benefit from additional multimodal options
- % Transit Dependency:
  - The percentage of households that have zero or one automobile and households where the total income level is below the federally defined poverty level
  - Used to track the level of need among those who are considered transit dependent and more likely to utilize transit if it is available

Mobility Performance Results

The Mobility Index provides a high-level assessment of mobility conditions for the corridor and for each segment. The four secondary measures provide more detailed information to assess mobility performance.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the mobility performance area, the relevant operating environments included urban or rural locations, as well as interrupted flow (where signalized at-grade intersections are present) and uninterrupted flow (grade-separated). For the mobility performance area, all segments of the I-8 corridor are classified as uninterrupted flow. Segment 8-1 is classified as urban, while all other segments are classified as rural.

Based on the results of this analysis, the following observations were made:

- Every segment along I-8 rates in the “Good" threshold of the Primary Mobility Index. Segment 1 within the Yuma urban area has the highest Mobility Index of all the I-8 segments. The future traffic volumes on I-8 in Segments 8-8 and 8-9 are expected to double with an annual growth rate of more than four percent, but will remain under the capacity of the corridor.
- Every segment is operating within the “Good” threshold of the existing peak hour V/C as indicated in **Table 7**. Segment 8-1 within the Yuma urban area has the highest eastbound and westbound V/C ratios of all the I-8 segments.
- Every segment along I-8 is projected to have future V/C ratios within the “Good” threshold. Segment 8-1 within the Yuma urban area is projected to have the highest future V/C ratios of all the I-8 segments.
- All westbound segments of I-8 rate in the “Good" threshold in terms of the Travel Time Index score for all vehicles traveling within the corridor. However, Segment 8-2 in the eastbound direction rates as “Fair”, indicating some level of recurring delay in those areas of the corridor as shown on **Table 7**. The westbound Segment 8-2 score can be attributed to a temporary Border Check Point facility that requires motorists to stop.
- The Directional Planning Time Index rates within the “Good" threshold in the eastbound direction, with the exception of Segments 8-1 (“Fair”), 8-2 (“Poor”) and 8-6 (“Fair”). In the westbound direction, Segments 8-1 and 8-9 rate as “Fair". These scores indicate that there is a need to plan for additional travel time when traveling within the Yuma and Casa Grande Urban Areas. **Table 7** shows the corridor directional planning time index for each segment.
- Compared to the statewide average, the extent of closures along the segments of I-8 rate in the “Good" and “Fair" thresholds, indicating that sections of I-8 are not closed as much as other corridors throughout the state. Segment 8-1 is rated as “Fair” while all other segments are rated as “Good”. Even the segment that rates in the “Fair" threshold scores in the lower third of the range relatively close to being rated as “Good". **Table 7** illustrates the directional closure scores across I-8 compared to the statewide average.
- Socio-economic characteristics:. Most of the corridor falls within the statewide average for income and vehicle availability. Segments closer to Yuma and the Phoenix metropolitan area indicate a higher concentration of potentially transit dependent households. Greyhound Bus Lines operates intercity bus service the length of the corridor. Non-single occupant vehicle trips (a minimum of a driver and one passenger) for

Segments 8-1, 8-2, 8-3, 8-7 and 8-8 are at approximately the statewide average, falling in a range of 13.1% - 16.7% (with the statewide average at 11% - 17%).

- The analysis examined an additional data source for its potential to provide a more complete understanding of daily and seasonal traffic volume variation on I-8. ADOT's Traffic Data Monitoring System (TDMS) maintains a series of permanent traffic counters that report daily traffic volumes. Three sites are available on the I-8 corridor. These sites are too few and not spaced in a way to provide corridor level analysis; however the counts do provide some information useful to identify traffic patterns. Traffic volumes followed a very similar pattern at all three locations, with no unusual peaks readily identifiable.
- Segments 8-1 and 8-7 experience a 5-18% increase in traffic volumes on Friday compared to the other weekdays and the weekend throughout the year.
- The weekend traffic volumes are lower compared to the weekday traffic volumes. The decrease in weekend traffic volumes range from 8% to 25%.

Table 7 summarizes the Mobility performance results for the I-8 corridor. **Figure 12** illustrates the primary Mobility Index performance along the I-8 corridor. Maps for each secondary measure can be found in **Appendix A**.

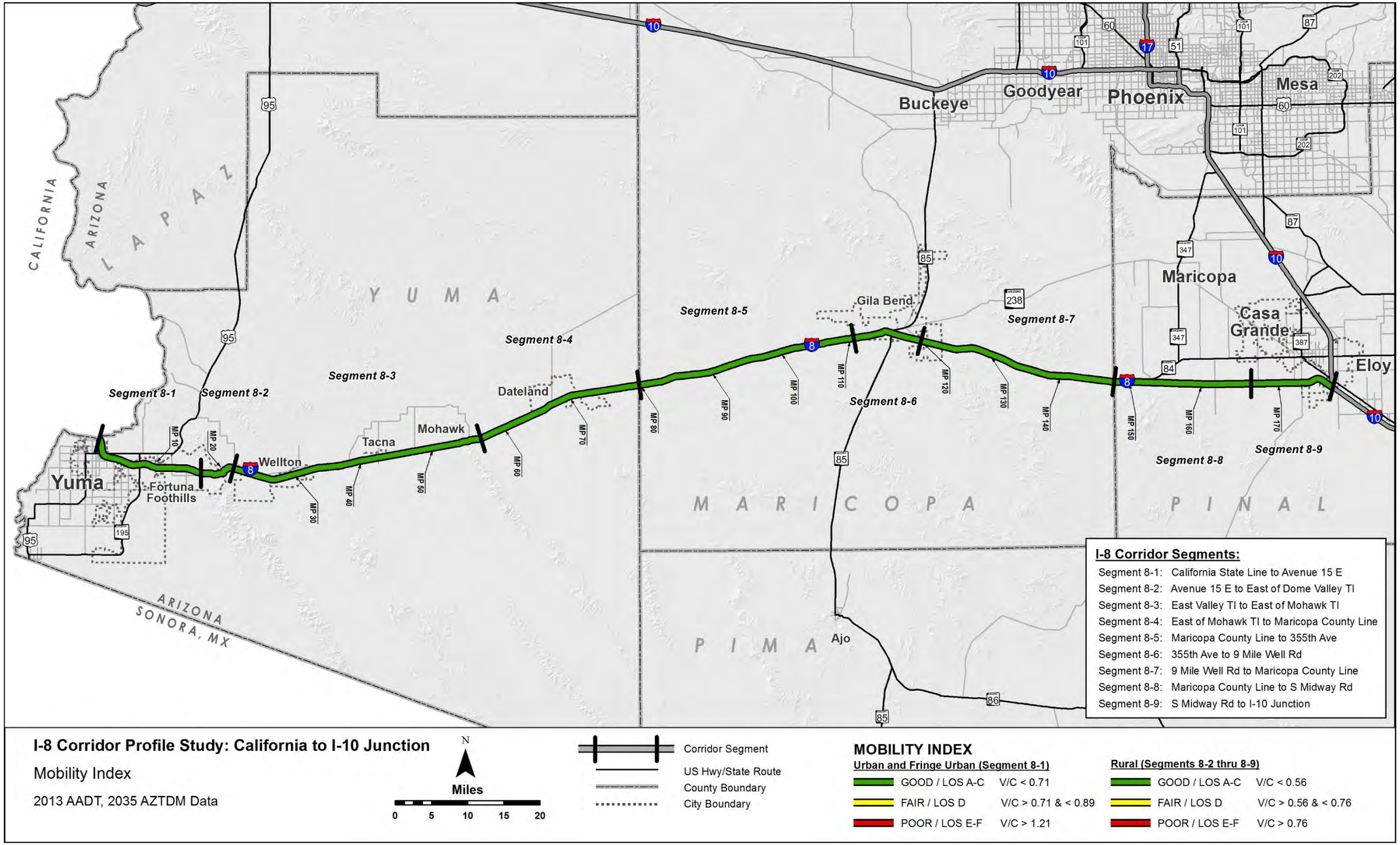
Table 7: Mobility Performance

Segment #	Segment Length (miles)	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/milepost/year/ mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
				EB	WB	EB	WB	EB	WB	EB	WB		
8-1[1^]	16.30	0.44	0.50	0.32	0.31	0.16	0.24	1.09	1.07	1.42	1.39	100%	12.5%
8-2 [2^]	5.10	0.32	0.36	0.26	0.23	0.12	0.44	1.05	1.00	1.45	1.12	100%	16.0%
8-3 [2^]	35.10	0.17	0.19	0.09	0.09	0.21	0.19	1.08	1.08	1.23	1.25	100%	9.8%
8-4 [2^]	23.10	0.16	0.17	0.11	0.10	0.03	0.04	1.07	1.06	1.22	1.20	100%	9.3%
8-5 [2^]	30.80	0.21	0.25	0.15	0.15	0.05	0.09	1.07	1.07	1.26	1.22	100%	22.5%
8-6 [2^]	9.60	0.16	0.20	0.13	0.12	0.04	0.08	1.11	1.09	1.41	1.26	100%	19.0%
8-7 [2^]	27.60	0.08	0.09	0.09	0.08	0.04	0.05	1.10	1.09	1.27	1.26	100%	16.8%
8-8 [2^]	18.90	0.09	0.11	0.09	0.08	0.02	0.04	1.08	1.09	1.25	1.24	100%	13.8%
8-9 [2^]	11.50	0.14	0.16	0.13	0.10	0.10	0.02	1.07	1.10	1.27	1.33	100%	12.2%
Weighted Corridor Average		0.20	.23	0.15	0.14	0.08	0.13	1.08	1.07	1.31	1.25	73%	14.7%

SCALE						
Performance Level	**Urban Rural**	**All**	**Uninterrupted Interrupted**		**All**	
Good	< 0.71[1] < 0.56[2]	< 0.22	< 1.15^ < 1.30*	< 1.30^ < 3.00*	> 90%	> 17%
Fair	0.71 - 0.89[1] 0.56 - 0.76[2]	0.22 – 0.62	1.15 - 1.33^ 1.30 - 2.00*	1.30 - 1.50^ 3.00 - 6.00*	60% - 90%	11% - 17%
Poor	> 0.89[1] > 0.76[2]	> 0.62	> 1.33^ > 2.00*	> 1.50^ > 6.00*	< 60%	< 11%

[1]Urban Operating Environment
[2]Rural Operating Environment
^Uninterrupted Flow Facility
*Interrupted Flow Facility

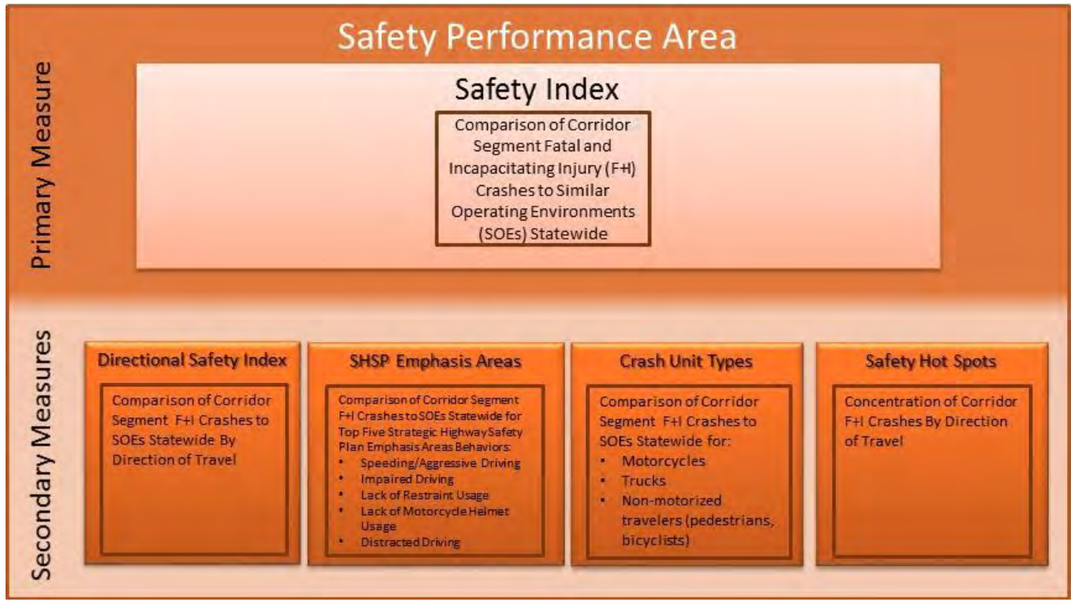
Figure 12: Mobility Performance



2.6 Safety Performance Area

The Safety performance area consists of a primary measure (Safety Index) and four secondary measures, as illustrated in **Figure 13**. All measures relate to crashes that result in fatal and incapacitating injuries, as these types of crashes are the emphasis of the ADOT Strategic Highway Safety Plan (SHSP), FHWA, and MAP-21. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 13: Safety Performance Measures



Primary Safety Index

The Safety Index is based on the bi-directional frequency and rate of fatal and incapacitating injury crashes, the relative cost of those types of crashes, and crash occurrences on similar roadways in Arizona. According to ADOT's 2010 Highway Safety Improvement Program Manual, fatal crashes have an estimated cost that is 14.5 times the estimated cost of incapacitating injury crashes ($5.8 million compared to $400,000).

Each corridor segment is rated on a scale by comparing the segment score with the average statewide score for similar operating environments. Since crash frequencies and rates vary depending on the operating environment of a particular roadway, statewide values were developed for similar operating environments defined by functional classification, urban vs. rural setting, number of travel lanes, and traffic volumes.

For the I-8 corridor, the following operating environments were identified:

- Urban 4-Lane Freeway (Segment 8-1)
- Rural 4-Lane Freeway with Daily Volume < 25,000 (Segments 8-2 through 8-9)

Secondary Safety Measures

Four secondary measures provide an in-depth evaluation of the different characteristics of safety performance:

Directional Safety Index

- This measure is based on the directional frequency and rate of fatal and incapacitating injury crashes

SHSP Emphasis Areas

ADOT's 2014 SHSP identified several emphasis areas for reducing fatal and incapacitating injury crashes. This measure compared rates of crashes in the top five SHSP emphasis areas to other corridors with a similar operating environment. The top five SHSP emphasis areas related to the following driver behaviors:

- Speeding and aggressive driving
- Impaired driving
- Lack of restraint usage
- Lack of motorcycle helmet usage
- Distracted driving

Crash Unit Types

- The percentage of total fatal and incapacitating injury crashes that involves crash unit types of motorcycles, trucks, or non-motorized travelers is compared to the statewide average on roads with similar operating environments

Safety Hot Spots

- The hot spot analysis identifies abnormally high concentrations of fatal and incapacitating injury crashes along the study corridor by direction of travel
- For the Safety Index and the secondary safety measures, any segment that has too small of a sample size to generate statistically reliable performance ratings for a particular performance measure is considered to have "insufficient data" and is excluded from the safety performance evaluation for that particular performance measure.

Safety Performance Results

The Safety Index provides a high-level assessment of safety performance for the corridor and for each segment. The four secondary measures provide more detailed information to assess safety performance.

The scale for ratings for all of the Safety performance measures depend on the crash history on similar statewide operating environments. Based on the results of this analysis, the following observations were made:

- The Safety Index scores of all I-8 segments but one are better than the statewide average within similar operating environments, in terms of fatal and incapacitating injury crashes. The segment index scores therefore fall within the Above Average threshold, regardless of operating environment or terrain. These include the urban four-lane freeway operating environment in Segment 8-1 within the Yuma metropolitan area, as well as all other segments operating in the rural four-lane environment including Segment 8-2, which traverses mountainous terrain. Segment 8-3 rated Average for the Safety Index.
- The secondary measure scores for Directional Safety Index following a similar pattern to the primary measure. All eastbound and westbound segment scores are below the state average within similar operating environments, falling within the Above Average threshold, regardless of urban or rural context or terrain features.
- Segment 8-3 and Segment 8-9 scored worst in terms of the amount of crashes caused by the top five emphasis areas, with over 53% in the rural four-lane freeway environment. Segments 1 and 2 scored within the Average range, with Segments 8-4, 8-5, and 8-8 scoring in the Above Average range. However, both Segment 8-6 and Segment 8-7 did not have a large enough sample size of fatal and incapacitating (F+I) crashes to result in a reliable score calculation.
- The sample size of F+I crashes involving trucks, motorcycles, or non-motorized travelers were all too small to result in reliable segment score calculations.
- As shown in Figure 14, no high concentrations of F+I crashes were observed at any locations on I-8 during the 2010-2014 analysis period.

Table 8 summarizes the Safety performance results for the I-8 corridor. **Figure 14** illustrates the primary Safety Index performance and locations of Safety hot spots along the I-8 corridor. Maps for each secondary measure can be found in **Appendix A**.

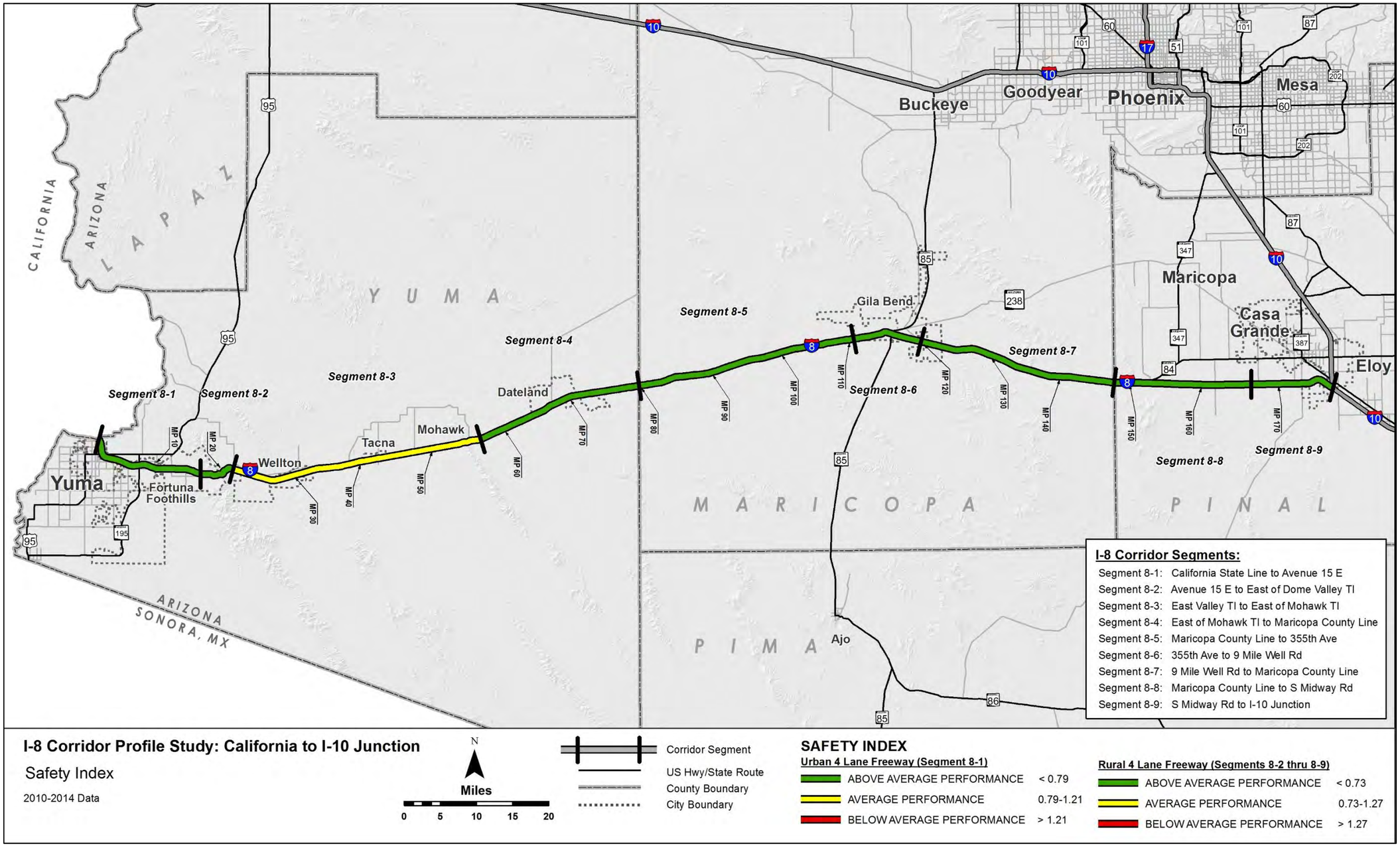
Table 8: Safety Performance

Segment #	Segment Length (miles)	Total Fatal & Incapacitating Injury Crashes (F/I)	Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors
				EB	WB	
8-1 [1]	16.30	2 / 7	0.23	0.24	0.22	56%
8-2 [2]	5.10	0 / 7	0.29	0.33	0.25	43%
8-3 [2]	35.10	8 / 19	0.96	0.95	0.97	59%
8-4 [2]	23.10	3 / 8	0.61	0.44	0.77	Insufficient Data
8-5 [2]	30.80	4 / 18	0.59	0.59	0.59	Insufficient Data
8-6 [2]	9.60	0 / 3	0.10	0.06	0.13	Insufficient Data
8-7 [2]	27.60	2 / 3	0.68	0.04	1.32	Insufficient Data
8-8 [2]	18.90	2 / 4	0.71	0.74	0.68	33%
8-9 [2]	11.50	1 / 6	0.59	0.21	0.98	Insufficient Data
Weighted Corridor Average			0.53	0.40	0.66	48%
SCALE						
Performance Level			**Urban 4-Lane Freeway Rural 4-Lane < 25,000 vpd**			
Above Average			< 0.79 < 0.73			< 49.1% < 42.8%
Average			0.79-1.21 0.73-1.27			49.1%-59.4% 42.8%-52.9%
Below Average			> 1.21 > 1.27			> 59.4% > 52.9%

[1] Urban 4-Lane Freeway / Urban or Fringe Urban Operating Environment
[2] Rural 4-Lane Freeway < 25,000 vpd / Rural Operating Environment

Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings.

Figure 14: Safety Performance



2.7 Freight Performance Area

The Freight performance area consists of a single primary measure (Freight Index) and five secondary measures, as illustrated in **Figure 15**. All measures related to the reliability of truck travel as measured by observed truck travel time speed and delays to truck travel from freeway closures or physical restrictions to truck travel. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C.**

Figure 15: Freight Performance Measures

Primary Freight Index

The Freight Index is a reliability performance measure based on the PTI for truck travel. The Truck Planning Time Index (TPTI) is the ratio of the 95th percentile truck travel time to the free-flow truck travel time. The TPTI reflects the extra buffer time needed for on-time delivery while accounting for non-recurring delay. Non-recurring delay refers to unexpected or abnormal delay due to closures or restrictions resulting from circumstances such as crashes, inclement weather, and construction activities.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Freight performance area, the relevant operating environments are interrupted flow (e.g., signalized at-grade intersections are present) and uninterrupted flow (e.g., controlled access grade-separated conditions such as a freeway or interstate highway).

For the I-8 corridor, the following operating environments were identified:

- Urban or Urban-Fringe Uninterrupted Flow (Segment 8-1)
- Rural Uninterrupted Flow (Segments 8-2 through 8-9)

Secondary Freight Measures

The Freight performance area includes five secondary measures that provide an in-depth evaluation of the different characteristics of freight performance:

Recurring Delay (Directional Truck Travel Time Index TTTI)

- The ratio of the average peak period truck travel time to the free-flow truck travel time (based on the posted speed limit up to a maximum of 65 miles per hour) in a given direction
- The TTTI recognizes the delay potential from recurring congestion during peak periods; different thresholds are applied to uninterrupted flow (freeways) and interrupted flow (non-freeways) to account for flow characteristics

Non-Recurring Delay (Directional TPTI)

- The ratio of the 95th percentile truck travel time to the free-flow truck travel time (based on the posted speed limit up to a maximum of 65 miles per hour) in a given direction
- The TPTI recognizes the delay potential from non-recurring delays such as traffic crashes, weather, or other incidents; different thresholds are applied to uninterrupted flow (freeways) and interrupted flow (non-freeways) to account for flow characteristics
- The TPTI indicates the amount of time in addition to the typical travel time that should be allocated to make an on-time trip 95% of the time in a given direction

Closure Duration

- The average time (in minutes) a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel; a weighted average is applied to each closure that takes into account the distance over which the closure occurs

Bridge Vertical Clearance

- The minimum vertical clearance (in feet) over the travel lanes for underpass structures on each segment

Bridge Vertical Clearance Hot Spots

- A Bridge vertical clearance “hot spot” exists where the underpass vertical clearance over the mainline travel lanes is less than 16.25 feet and no exit/entrance ramps exist to allow vehicles to bypass the low clearance location
- If a location with a vertical clearance less than 16.25 feet can be avoided by using immediately adjacent exit/entrance ramps rather than the mainline, it is not considered a hot spot

Freight Performance Results

The Freight Index provides a high-level assessment of freight mobility for the corridor and for each segment. The five secondary measures provide more detailed information to assess freight performance.

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the freight performance area, the relevant operating environments included interrupted flow (where signalized at-grade intersections are present) and uninterrupted flow (roads with only controlled access grade-separated conditions such as a freeway or interstate highway). All of the segments along I-8 are classified as uninterrupted flow.

Based on the results of this analysis, the following observations were made:

- All I-8 segments fall within the "Good" threshold for the primary Freight Index measure, with the exception of Segment 8-1 in the Yuma metropolitan area, which falls within the "Fair" scoring threshold.
- All eastbound and westbound segments of I-8 scored within the "Good" range in terms of Directional Truck Travel Time Index, meaning that there is little difference between observed truck free flow speeds and peak period truck speeds.
- All eastbound and westbound segments rated within the "Good" threshold for the Directional Truck Planning Time Index, with the exception of Segment 8-1. This indicates that there is some level of moderate recurring delay in the Yuma area.
- Segment scores for the duration of closures involving trucks vary throughout the I-8 corridor. The mountainous Segment 8-2 has closure durations above the state average. The remainder of segments scored below the state average for closure duration.
- There are multiple locations with truck height restrictions along I-8, with most of the restrictions concentrated in the eastern portion of the corridor near Casa Grande. Among the height restrictions, there are six locations where trucks are not able to ramp around the restriction.

Table 9 summarizes the Freight performance results for the I-8 corridor. **Figure 16** illustrates the primary Freight Index performance and locations of freight hot spots along I-8. Maps for each secondary measure can be found in **Appendix A.**

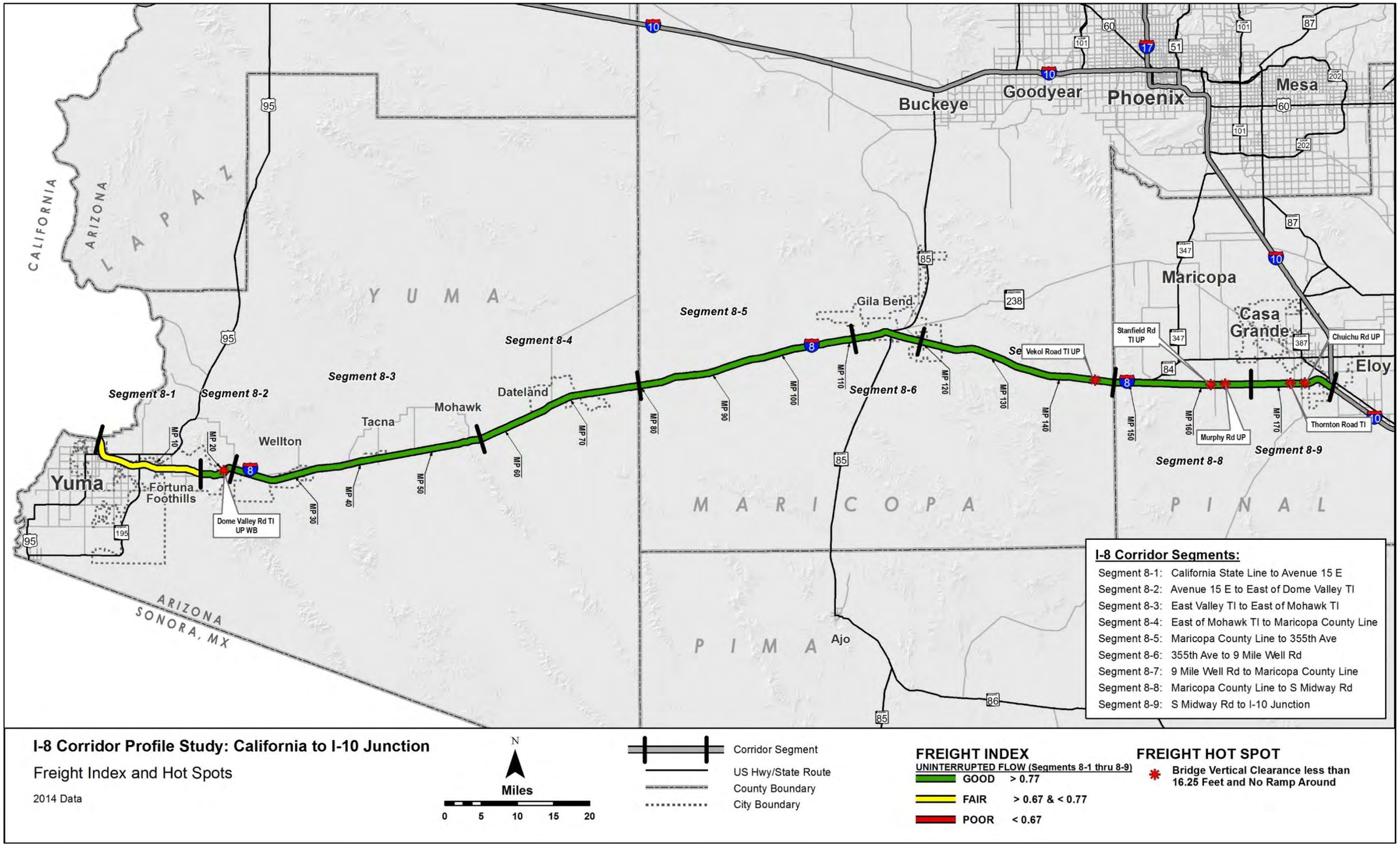
Table 9: Freight Performance

Segment	Length (miles)	Freight Index	Directional Truck TTI		Directional Truck PTI		Closure Duration (minutes/milepost closed/year/mile)		Vertical Bridge Clearance (feet)
			EB	WB	EB	WB	EB	WB	
8-1 [1^]	16.30	0.71	1.13	1.12	1.40	1.41	28.88	43.90	16.33
8-2 [2^]	5.10	0.79	1.00	1.06	1.30	1.23	17.23	140.18	16.23
8-3 [2^]	35.10	0.89	1.04	1.04	1.14	1.11	73.08	28.10	16.20
8-4 [2^]	23.10	0.90	1.03	1.03	1.12	1.11	5.20	7.68	No UP
8-5 [2^]	30.80	0.89	1.03	1.04	1.13	1.12	9.07	19.84	No UP
8-6 [2^]	9.60	0.82	1.06	1.04	1.27	1.17	24.43	21.89	16.63
8-7 [2^]	27.60	0.89	1.03	1.03	1.13	1.13	13.25	11.42	16.19
8-8 [2^]	18.90	0.89	1.03	1.03	1.13	1.11	6.29	25.18	16.09
8-9 [2^]	11.50	0.83	1.04	1.06	1.19	1.23	27.01	1.53	15.86
Weighted Corridor Averages		0.86	1.04	1.04	1.17	1.16	25.58	23.73	16.06

SCALE					
Performance Level	**Uninterrupted Interrupted**			**All**	
Good	> 0.77^ > 0.33*	< 1.15^ < 1.30*	< 1.30^ < 3.00*	< 44.18	> 16.5
Fair	0.67 - 0.77^ 0.17 - 0.33*	1.15 - 1.33^ 1.30 - 2.00*	1.30 - 1.50^ 3.00 - 6.00*	44.18 - 124.86	16.0 - 16.5
Poor	< 0.67^ < 0.17*	> 1.33^ > 2.00*	> 1.50^ > 6.00*	> 124.86	< 16.0

[1]Urban Operating Environment
[2]Rural Operating Environment
^Uninterrupted Flow Facility
*Interrupted Flow Facility

Figure 16: Freight Performance



2.8 Corridor Performance Summary

Based on the results presented in the preceding sections, the following general observations were made related to the performance of the I-8 corridor:

- **Overall performance** within all five areas evaluated is predominantly “Good” to “Fair”
- **Bridge Performance:** A total of 115 bridges were included in the evaluation. Two bridges are considered structurally deficient. These include the Eastbound Colorado River Viaduct (MP 0.01) and the Thornton Road TI Underpass (MP 172.55).
- **Pavement Performance:** 173 of the 178 miles on I-8 rate as “Good” or “Fair” for the overall Pavement Index. Segment 8-2 is the exception with a “Poor” performance. Due to the significant area of pavement cracking, four of the nine segments rate poorly for percentage of area in failure. The westbound direction exhibits more cracking than the eastbound direction.
- **Mobility Performance:** I-8 is considered to have two operating environments for evaluating Mobility. These include Urban 4-Lane Freeway and Rural 4-Lane Freeway with less than 25,000 ADT. Both the current and future capacity is considered “Good”.
- **Safety Performance:** The entire corridor has less than the statewide average crash rate for fatal and incapacitating injury crashes. Examining a five-year time period, there were two fatal crashes and seven incapacitating injury crashes in the urban area. In the rural area, there were 20 fatal crashes and 68 incapacitating injury crashes. These result in an average less than half of the statewide average.
- **Freight Performance:** The performance of freight mobility overall is “Good” within the I-8 corridor. Closures in Segment 8-2 were identified as “Poor” performance. There are six locations with vertical clearance less than 16.25 feet and no ramp around capability.
- **Poorest Performing Segment:** Segment 8-2 rated lower in performance than the other segments in the corridor. Approximately 60% of the segment is considered to have pavement failure based on the study dataset. Also, the closure duration was higher in this segment, as revealed by the Mobility and Freight secondary measures.
- **Highest Performing Segments:** Segments 8-6 and 8-7 have “Good” or “Above Average” performance in all areas except for two secondary measures, Obsolete Bridges and % of Non-Single Occupancy Vehicles.

Figure 17 shows the percentage of the I-8 corridor that rates either “good/above average performance”, “fair/average performance”, or “poor/below average performance” for each primary measure. The lowest performance along the I-8 corridor occurs in the Pavement and Bridge Performance Areas with the Mobility, Safety and Freight Performance Areas showing the highest performance.

Table 10 shows a summary of corridor performance for all primary measures and secondary measure indicators for the I-8 corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure. The weighted average ratings are summarized in **Figure 18** which also provides a brief description of each performance measure. **Figure 18** represents the average for the entire corridor and any given segment or location could have a higher or lower rating than the corridor average.

Figure 17: Performance Summary by Primary Measure

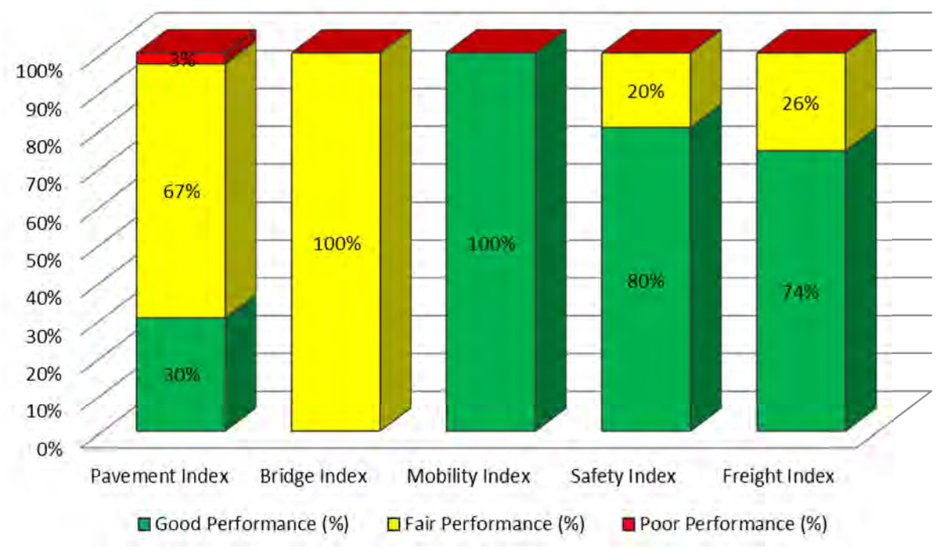


Figure 18: Corridor Performance Summary by Performance Measure

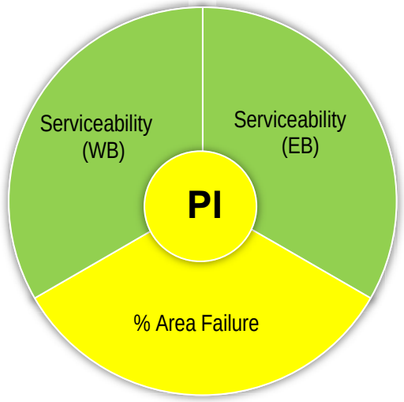
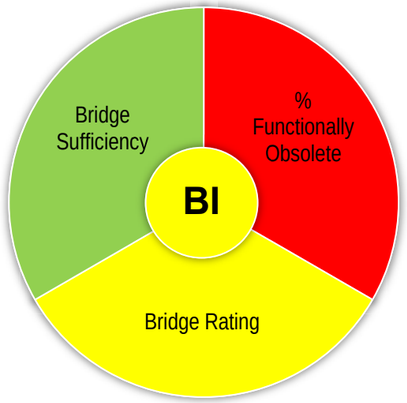
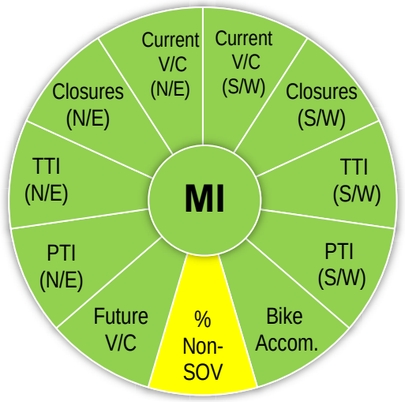
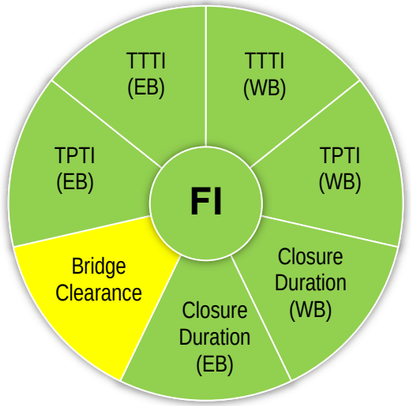
Pavement	Bridge	Mobility	Safety	Freight
				
Pavement Index (PI): based on two pavement condition ratings from the ADOT Pavement Database; the two ratings are the International Roughness Index (IRI) and the Cracking Rating.	Bridge Index (BI): based on four bridge condition ratings from the ADOT Bridge Database. The four ratings are the Deck Rating, Substructure Rating, Superstructure Rating, and Structural Evaluation Rating.	Mobility Index (MI): an average of the existing daily volume-to-capacity (V/C) ratio and the projected 2035 daily V/C ratio	Safety Index (SI): combines the bi-directional frequency and rate of fatal and incapacitating injury crashes, compared to crash occurrences on similar roadways in Arizona	Freight Index (FI): a reliability performance measure based on the bi-directional planning time index for truck travel.
➢ Directional Pavement Serviceability Rating (PSR) – the weighted average (based on number of lanes) of the PSR for the pavement in each direction of travel ➢ % Area Failure – the percentage of pavement area rated above failure thresholds for IRI or Cracking	➢ Sufficiency Rating– multipart rating includes structural adequacy and safety factors as well as functional aspects such as traffic volume and length of detour ➢ % of Deck Area on Functionally Obsolete Bridges– the percentage of deck area in a segment that is on functionally obsolete bridges; identifies bridges that no longer meet standards for current traffic volumes, lane width, shoulder width, or bridge rails; a bridge that is functionally obsolete may still be structurally sound ➢ Lowest Bridge Rating –the lowest rating of the four bridge condition ratings on each segment	➢ Future Daily V/C – the future 2035 V/C ratio provides a measure of future congestion if no capacity improvements are made to the corridor ➢ Existing Peak Hour V/C – the existing peak hour V/C ratio for each direction of travel provides a measure of existing peak hour congestion during typical weekdays ➢ Closure Extent – the average number of instances a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel ➢ Directional Travel Time Index (TTI) – the ratio of the average peak period travel time to the free-flow travel time; the TTI represents recurring delay along the corridor ➢ Directional Planning Time Index (PTI) – the ratio of the 95th percentile travel time to the free-flow travel time; the PTI represents non-recurring delay along the corridor ➢ % Bicycle Accommodation – the percentage of a segment that accommodates bicycle travel ➢ % Non-single Occupancy Vehicle (Non-SOV) Trips –the percentage of trips that are taken by vehicles carrying more than one occupant	➢ Directional Safety Index – the combination of the directional frequency and rate of fatal and incapacitating injury crashes, compared to crash occurrences on similar roadways in Arizona ➢ % of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors – the percentage of fatal and incapacitating crashes that involve at least one of the five Strategic Highway Safety Plan (SHSP) emphasis areas on a given segment compared to the statewide average percentage on roads with similar operating environments ➢ % of Fatal + Incapacitating Crashes Involving SHSP Crash Unit Types – the percentage of total fatal and incapacitating injury crashes that involves a given crash unit type (motorcycle, truck, non-motorized traveler) compared to the statewide average percentage on roads with similar operating environments	➢ Directional Truck Travel Time Index (TTTI) – the ratio of the average peak period truck travel time to the free-flow truck travel time; the TTTI represents recurring delay along the corridor ➢ Directional Truck Planning Time Index (TPTI) – the ratio the 95th percentile truck travel time to the free-flow truck travel time; the TPTI represents non-recurring delay along the corridor ➢ Closure Duration – the average time a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel ➢ Bridge Vertical Clearance – the minimum vertical clearance over the travel lanes for underpass structures on each segment

Table 10: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area											
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	% of Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/milepos/ year/mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			EB	WB								EB	WB	EB	WB	EB	WB	EB	WB		
8-1[1]	16.30	4.20	4.28	4.30	15.6%	5.69	87.36	6.6%	4	0.44	0.50	0.32	0.31	0.16	0.24	1.09	1.07	1.42	1.39	100%	12.5%
8-2[2]	5.10	2.31	3.87	4.07	60.0%	5.31	91.38	0%	5	0.32	0.36	0.26	0.23	0.12	0.44	1.05	1.00	1.45	1.12	100%	16.0%
8-3[2]	35.10	3.58	3.74	3.79	12.5%	6.32	95.49	40.8%	6	0.17	0.19	0.09	0.09	0.21	0.19	1.08	1.08	1.23	1.25	100%	9.8%
8-4[2]	23.10	3.68	3.87	3.74	23.9%	6.00	94.00	100.0%	6	0.16	0.17	0.11	0.10	0.03	0.04	1.07	1.06	1.22	1.20	100%	9.3%
8-5[2]	30.80	3.41	3.58	3.55	28.3%	5.90	92.15	58.5%	5	0.21	0.25	0.15	0.15	0.05	0.09	1.07	1.07	1.26	1.22	100%	22.5%
8-6[2]	9.60	4.17	4.01	4.03	0.0%	5.79	93.01	43.8%	5	0.16	0.20	0.13	0.12	0.04	0.08	1.11	1.09	1.41	1.26	100%	19.0%
8-7[2]	27.60	4.11	4.16	4.18	5.4%	6.08	92.59	33.9%	6	0.08	0.09	0.09	0.08	0.04	0.05	1.10	1.09	1.27	1.26	100%	16.8%
8-8[2]	18.90	3.55	3.83	3.75	18.4%	5.90	92.35	38.1%	5	0.09	0.11	0.09	0.08	0.02	0.04	1.08	1.09	1.25	1.24	100%	13.8%
8-9[2]	11.50	3.48	3.40	3.54	37.5%	5.67	88.40	44.4%	4	0.14	0.16	0.13	0.10	0.10	0.02	1.07	1.10	1.27	1.33	100%	12.2%
Weighted Corridor Average		3.69	3.85	3.85	18.8%	5.97	92.48	46.3%	5	0.20	0.23	0.15	0.14	0.08	0.13	1.08	1.07	1.31	1.25	100%	14.7%
SCALE																					
Performance Level		Interstate			All					Urban Rural	All	Uninterrupted				All					
Good/Above Average		> 3.75			< 5%	> 6.5	> 80	< 12%	> 6	< 0.71 (Urban) < 0.56 (Rural)		< 0.22		< 1.15		<1.30				> 90%	> 17%
Fair/Average		3.2 - 3.75			5% - 20%	5.0 - 6.5	50 - 80	12% - 40%	5 – 6	0.71 - 0.89 (Urban) 0.56 - 0.76 (Rural)		0.22 – 0.62		1.15-1.33		1.30-1.50				60% - 90%	11% - 17%
Poor/Below Average		< 3.2			> 20%	< 5.0	< 50	> 40 %	< 5	> 0.89 (Urban) > 0.76 (Rural)		> 0.62		> 1.33		>1.50				< 60%	< 11%

[1] Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment
[2] Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

Table 10: Corridor Performance Summary by Segment and Performance Measure (continued)

Segment	Segment Length (miles)	Safety Performance Area							Freight Performance Area							
		Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Freight Index	Directional TTI (trucks only)		Directional PTI (trucks only)		Closure Duration (mins/milepost closed/year/mile)		Bridge Vertical Clearance (feet)
			EB	WB						EB	WB	EB	WB	EB	WB	
8-1[1]	16.30	0.23	0.24	0.22	56%	Insufficient Data	Insufficient Data	Insufficient Data	0.71	1.13	1.12	1.40	1.41	28.88	43.90	16.33
8-2[2]	5.10	0.29	0.33	0.25	43%	Insufficient Data	Insufficient Data	Insufficient Data	0.79	1.00	1.06	1.30	1.23	17.23	140.18	16.23
8-3[2]	35.10	0.96	0.95	0.97	59%	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.04	1.04	1.14	1.11	73.08	28.10	16.20
8-4[2]	23.10	0.61	0.44	0.77	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.90	1.03	1.03	1.12	1.11	5.20	7.68	No Up
8-5[2]	30.80	0.59	0.59	0.59	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.04	1.13	1.12	9.07	19.84	No UP
8-6[2]	9.60	0.10	0.06	0.13	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.82	1.06	1.04	1.27	1.17	24.43	21.89	16.63
8-7[2]	27.60	0.68	0.04	1.32	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.03	1.13	1.13	13.25	11.42	16.19
8-8[2]	18.90	0.71	0.74	0.68	33%	Insufficient Data	Insufficient Data	Insufficient Data	0.89	1.03	1.03	1.13	1.11	6.29	25.18	16.09
8-9[2]	11.50	0.59	0.21	0.98	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.83	1.04	1.06	1.19	1.23	27.01	1.53	15.86
Weighted Corridor Average		0.53	0.40	0.66	48%				0.86	1.04	1.04	1.17	1.16	25.58	23.73	16.06
SCALE																
Performance Level		Urban 4 Lane Freeway Rural 4 Lane Freeway < 25,000 vpd							Uninterrupted			**All**				
Good/Above Average		< 0.79 < 0.73			< 49.1% < 42.8%	< 6.8% < 13.2%	< 9.3% < 5.0%	< 4.8% < 1.7%	> 0.77	< 1.15		< 1.30		< 44.18		> 16.5
Fair/Average		0.79 – 1.21 0.73 – 1.27			49.1% - 59.4% 42.8% - 52.9%	6.8% - 10.9% 13.2% - 17.0%	9.3% - 11.5% 5.0% - 8.5%	4.8% - 10.3% 1.7% - 2.5%	0.67 - 0.77	1.15 -1.33		1.30 -1.50		44.18 -124.86		16.0-16.5
Poor/Below Average		> 1.21 > 1.27			> 59.4% > 52.9%	> 10.9% > 17.0%	> 11.5% > 8.5%	> 10.3% > 2.5%	< 0.67	> 1.33		>1.50		> 124.86		< 16.0

[1] Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment
[2] Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings

"No UP" indicates no underpasses are present in the segment

3.0 NEEDS ASSESSMENT

3.1 Corridor Objectives

Statewide goals and performance measures were established by the ADOT Long-Range Transportation Plan (LRTP), 2010-2035. Statewide performance goals that are relevant to I-8 performance areas were identified and corridor goals were then formulated for each of the five performance areas that aligned with the overall statewide goals established by the LRTP. Based on stakeholder input, corridor goals, corridor objectives, and performance results, three "emphasis areas" were identified for the I-8 corridor: Mobility, Safety, and Freight.

Taking into account the corridor goals and identified emphasis areas, performance objectives were developed for each quantifiable performance measure that identify the desired level of performance based on the performance scale levels for the overall corridor and for each segment of the corridor. For the performance emphasis areas, the corridor-wide weighted average performance objectives are identified with a higher standard than for the other performance areas. **Table 11** shows the I-8 corridor goals, corridor objectives, and performance objectives, and how they align with the statewide goals.

It is not reasonable within a financially constrained environment to expect that every performance measure will always be at the highest levels on every corridor segment. Therefore, individual corridor segment objectives have been set as "fair/average" or better and should not fall below that standard.

Achieving corridor and segment performance objectives will help ensure that investments are targeted toward improvements that support the safe and efficient movement of travelers on the corridor. Addressing current and future congestion, thereby improving mobility on congested segments, will also help the corridor fulfill its potential as a significant contributor to the region's economy.

Corridor performance is measured against corridor and segment objectives to determine needs – the gap between observed performance and performance objectives.

Goal achievement will improve or reduce current and future congestion, increase travel time reliability, and reduce fatalities and incapacitating injuries resulting from vehicle crashes. Where performance is currently rated "good", the goal is always to maintain that standard, regardless of whether or not the performance is in an emphasis area.

Table 11: Corridor Performance Goals and Objectives

ADOT Statewide LRTP Goals	I-8 Corridor Goals	I-8 Corridor Objectives	Performance Area	Primary Measure / Secondary Measure Indicators	Performance Objective: Corridor Average	Performance Objective: Segment
Improve Mobility and Accessibility **Support Economic Growth**	Improve mobility and connectivity Provide a safe and reliable route for recreation and tourist travel to/from Mexico, Southern California and Southern Arizona destinations Provide safe, reliable and efficient connection to all communities along the corridor to permit efficient regional travel	Reduce current and future congestion in the urbanized areas Reduce delays from non-recurring events and incidents to improve reliability Improve bicycle accommodation	Mobility (Emphasis Area)	**Mobility Index** Future Daily V/C Existing Peak Hour V/C Closure Extent Directional Travel Time Index Directional Planning Time Index % Bicycle Accommodation % Non-SOV Trips	Good	Fair or Better
	Provide a safe, reliable and efficient freight route between Arizona, California and Mexico	Reduce delays and restrictions to freight movement to improve reliability Improve travel time reliability (including impacts to motorists due to freight traffic)	Freight (Emphasis Area)	**Freight Index** Directional Truck Travel Time Index Directional Truck Planning Time Index Closure Duration Bridge Vertical Clearance	Good	Fair or Better
Preserve and Maintain the State Transportation System	Preserve and modernize highway infrastructure	Maintain structural integrity of bridges	Bridge	**Bridge Index** Sufficiency Rating % of Deck Area on Functionally Obsolete Bridges Lowest Bridge Rating	Fair or Better	Fair or Better
		Improve pavement ride quality	Pavement	**Pavement Index** Directional Pavement Serviceability Rating % Area Failure	Fair or Better	Fair or Better
Enhance Safety and Security	Maintain highway security within the right-of way	Reduce fatal and serious injury crashes	Safety (Emphasis Area)	**Safety Index** Directional Safety Index % of Crashes Involving SHSP Top 5 Emphasis Areas Behaviors % of Crashes Involving Crash Unit Types	Above Average	Average or Better

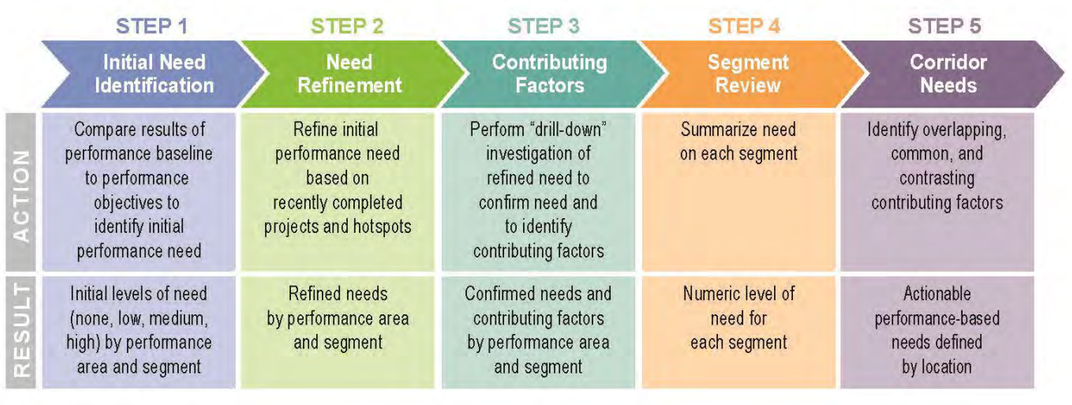
3.2 Needs Assessment Process

The following guiding principles were used as an initial step in developing a framework for the performance-based needs assessment process:

- Corridor needs are defined as the difference between the corridor performance and the performance objectives
- The needs assessment process should be systematic, progressive, and repeatable, but also allow for engineering judgment where needed
- The process should consider all primary and secondary performance measures developed for the study
- The process should develop multiple need levels including programmatic needs for the entire length of the corridor, performance area-specific needs, segment-specific needs, and location-specific needs (defined by MP limits)
- The process should produce actionable needs that can be addressed through strategic investments in corridor preservation, modernization, and expansion

The performance-based needs assessment process is illustrated in **Figure 19** and described in the following sections.

Figure 19: Needs Assessment Process



Step 1: Initial Needs Identification

The first step in the needs assessment process links baseline (existing) corridor performance with performance objectives. In this step, the baseline corridor performance is compared to the performance objectives to provide a starting point for the identification of performance needs. This mathematical comparison results in an initial need rating of None, Low, Medium, or High for each primary and secondary performance measure. An illustrative example of this process is shown below in **Figure 20**.

Figure 20: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need*	Description
6.5	Good	None	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
	Fair		
	Fair	Low	Middle 1/3 of Fair (5.5-6.0)
5.0	Fair	Medium	Lower 1/3 of Fair and top 1/3 of Poor (4.5-5.5)
	Poor		
	Poor	High	Lower 2/3 of Poor (<4.5)
	Poor		

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

The initial level of need for each segment is refined to account for hot spots and recently completed or under construction projects, resulting in a final level of need for each segment. The final levels of need for each primary and secondary performance measure are combined to produce a weighted final need rating for each segment. Values of 0, 1, 2, and 3 are assigned to the initial need levels of None, Low, Medium, and High, respectively. A weight of 1.0 is applied to the Performance Index need and equal weights of 0.20 are applied to each need for each secondary performance measure. For directional secondary performance measures, each direction of travel receives a weight of 0.10.

Step 2: Need Refinement

In Step 2, the initial level of need for each segment is refined using the following information and engineering judgment:

- For segments with an initial need of None that contain hot spots, the level of need should be increased from None to Low
- For segments with an initial level of need where recently completed projects or projects under construction are anticipated to partially or fully address the identified need, the level of need should be reduced or eliminated as appropriate
- Programmed projects that are expected to partially or fully address an identified need are not justification to lower the initial need because the programmed projects may not be implemented as planned; in addition, further investigations may suggest that changes in the scope of a programmed project may be warranted

The resulting final needs are carried forward for further evaluation in Step 3.

Step 3: Contributing Factors

In Step 3, a more detailed review of the condition and performance data available from ADOT is conducted to identify contributing factors to the need. Typically, the same databases used to develop the baseline performance serve as the principal sources for the more detailed analysis. However, other supplemental databases may also be useful sources of information. The databases used for diagnostic analysis are listed below:

Pavement Performance Area

- Pavement Rating Database

Bridge Performance Area

- ABISS

Mobility Performance Area

- Highway Performance Monitoring System (HPMS) Database
- AZTDM
- Real-time traffic conditions data produced by American Digital Cartography Inc. (HERE) Database
- Highway Conditions Reporting System (HCRS) Database

Safety Performance Area

- Crash Database

Freight Performance Area

- HERE Database
- HCRS Database

In addition, other sources considered helpful in identifying contributing factors are:

- Maintenance history (from ADOT PeCoS database for pavement), the level of past investments, or trends in historical data that provide context for pavement and bridge history
- Field observations from ADOT district personnel can be used to provide additional information regarding a need that has been identified
- Previous studies can provide additional information regarding a need that has been identified

Step 3 results in the identification of performance-based needs and contributing factors by segment (and MP locations, if appropriate) that can be addressed through investments in preservation, modernization, and expansion projects to improve corridor performance. See **Appendix D** for more information.

Step 4: Segment Review

In this step, the needs identified in Step 2 and refined in Step 3 are quantified for each segment to numerically estimate the level of need for each segment. Values of 0 to 3 are assigned to the final need levels (from Step 3) of None, Low, Medium, and High, respectively. A weighting factor is applied to the performance areas identified as emphasis areas and a weighted average need is calculated for each segment. The resulting average need score can be used to compare levels of need between segments within a corridor and between segments in different corridors.

Step 5: Corridor Needs

In this step, the needs and contributing factors for each performance area are reviewed on a segment-by-segment basis to identify actionable needs and to facilitate the formation of solution sets that address multiple performance areas and contributing factors. The intent of this process is to identify overlapping, common, and contrasting needs to help develop strategic solutions. This step results in the identification of corridor needs by specific location.

3.3 Corridor Needs Assessment

This section documents the results of the needs assessment process described in the prior section. The needs in each performance area were classified as either None, Low, Medium, or High based on how well each segment performed in the existing performance analysis. The needs for each segment were numerically combined to estimate the average level of need for each segment of the corridor

The final needs assessments for each performance measure, along with the scales used in analysis, are shown in **Table 12** through **Table 16**.

Pavement Needs Refinement and Contributing Factors

Of the 178 corridor miles, approximately 76 miles on eastbound I-8 and 79 miles on westbound I-8 have pavement needs. Pavement hot spot failure needs were identified for nine miles on eastbound I-8 and 17 miles on westbound I-8 (discounting those miles that will be addressed by future programmed projects). These areas are dispersed across the corridor. Three future pavement preservation projects are programmed on the corridor.

Key contributing factors are summarized below:

- A High initial need for Segment 8-2 was reduced to no need due to the completion of a recent pavement preservation project along the entire segment.
- A Medium initial need for Segment 8-9 was reduced to a Low need due to the completion of a recent pavement preservation project.

See other contributing factors in **Appendix D**.

Table 12: Final Pavement Needs

Segment #	Performance Score and Level of Need				Initial Segment Need*	Hot Spots	Recently Completed Projects	Final Segment Need*
	Pavement Index	Directional PSR		% Area Failure				
		EB	WB					
8-1	4.20	4.28	4.30	15.63%	0.4	WB MP 0-1, WB MP 13-15	H8158 (MP 13.70 - MP 20.45): Milled and replaced the existing pavement plus ARACFC. The project was completed in 2014.	Low
8-2	2.31	3.87	4.07	60.00%	3.6	EB MP 18-19, WB MP 16-21	H8158 (MP 13.70 - MP 20.45): Milled and replaced the existing pavement plus ARACFC. The project was completed in 2014.	None
8-3	3.58	3.74	3.79	12.50%	0.2	EB MP 23-24, EB MP 26-28, EB MP 48-52, WB MP 56-57	None	Low
8-4	3.68	3.87	3.74	23.91%	0.4	EB MP 76-77, WB MP 57-67	None	Low
8-5	3.41	3.58	3.55	28.33%	1.7	EB MP 87-89, EB MP 96-103, WB MP 97-106	None	Medium
8-6	4.17	4.01	4.03	0.00%	0.0	None	None	None
8-7	4.11	4.16	4.18	5.36%	0.0	EB MP 142-143, WB MP 145-146, WB MP 147-148	H8567 (MP-141.10 - MP-147.60): Crack sealing was completed in 2014.	None
8-8	3.55	3.83	3.75	18.42%	1.4	EB MP 152-154, WB MP 148-149, WB MP 151-153, WB MP 156-158	None	Low
8-9	3.48	3.40	3.54	37.50%	1.8	EB MP 170-171, EB MP 174-176, EB MP 177-179, WB MP 174-176,WB MP178-179	H8171 (MP 170.20 - MP 178.91): Milled and replaced existing AC plus new ARACFC. The project was completed in 2016. H8631 (MP-172.46 - MP-176.65): Repaired slope paving, and other miscellaneous work. Completed in 2015.	Low

Level of Need* (Score)	Performance Score Need Scale		Segment Level Need Scale
None* (0)	> 3.57	< 10%	0
Low (1)	3.38 – 3.57	10% - 15%	< 1.5
Medium (2)	3.02 – 3.38	15% - 25%	1.5 – 2.5
High (3)	< 3.02	> 25%	> 2.5

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Bridge Needs Refinement and Contributing Factors

Bridge needs were identified on 30 of the 115 bridges along the I-8 corridor. These included all bridges that were documented having a bridge rating of 5 or less in deck, substructure, superstructure, or overall structural evaluation. There are no projects currently programmed that relate to bridge structural improvement on the I-8 corridor.

Key contributing factors are summarized below:

- None of the initial needs required adjustment since no recent bridge work has occurred within the corridor that would change the bridge conditions.
- Three bridges showed a historical rating issue according to the review, including Smith Road OP EB, Smith Road OP WB, and Thornton Rd TI UP.

See other contributing factors in **Appendix D**.

Table 13: Final Bridge Needs

Segment #	Performance Score and Level of Need				Initial Segment Need*	Hot Spots	Recently Completed Projects	Final Segment Need*
	Bridge Index	Sufficiency Rating	Functionally Obsolete Bridges	Bridge Rating				
8-1	5.69	87.4	6.6%	4	1.4	Colorado River Viaduct EB Fortuna SPRR OP EB, Fortuna SPRR OP WB	None	Low
8-2	5.31	91.4	0.0%	5	2.2	None	None	Medium
8-3	6.32	95.5	40.8%	6	0.2	None	None	Low
8-4	6.00	94.0	100.0%	6	0.3	None	None	Low
8-5	5.90	92.2	58.5%	5	1.5	None	None	Medium
8-6	5.79	93.0	43.8%	5	1.4	Sand Tanks Wash Br EB, Sand Tanks Wash Br WB	None	Low
8-7	6.08	92.6	33.9%	6	0.2	None	None	Low
8-8	5.90	92.4	38.1%	5	1.4	Mendell Wash Br EB Bridge EB (MP 153.40), Bridge WB (MP 153.45) Smith Road OP EB, Smith Road OP WB	None	Low
8-9	5.67	88.4	44.4%	4	1.6	Santa Cruz Wash Br EB, Santa Cruz Wash Br WB Thornton Road TI UP MP	Pavement preservation including concrete bridge barrier	Medium

Level of Need* (Score)	Performance Score Need Scale				Segment Level Need Scale
None (0)	> 6.0	> 70	< 21.0%	> 5	0
Low (1)	5.5 – 6.0	60 – 70	21.0% - 31.0%	5	< 1.5
Medium (2)	4.5 – 5.5	40 – 60	31.0% - 49.0%	4	1.5 – 2.5
High (3)	< 4.5	< 40	> 49.0%	< 4	> 2.5

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Mobility Needs Refinement and Contributing Factors

Mobility was identified as a focus area for the I-8 corridor. A low level of mobility need was identified on 31 miles of I-8, concentrated in the Yuma urbanized area, Telegraph Pass, and Gila Bend. Contributing factors include reoccurring congestion and overall high traffic volumes in the two urbanized areas, with the border patrol checkpoint at MP 18 creating eastbound delays, and closures related to incidents/accidents near Telegraph Pass.

See other contributing factors in **Appendix D**.

Table 14: Final Mobility Needs

Segment	Performance Score and Level of Need											Initial Segment Need*	Recently Completed Projects	Final Segment Need*
	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent		Directional TTI		Directional PTI		% Bicycle Accommodation			
			EB	WB	EB	WB	EB	WB	EB	WB				
8-1 [1]	0.44	0.50	0.32	0.31	0.16	0.24	1.09	1.07	1.42	1.39	100%	0.2	Paving project	Low
8-2 [2]	0.32	0.36	0.26	0.23	0.12	0.44	1.05	1.00	1.45	1.12	100%	0.3	Paving project	Low
8-3 [2]	0.17	0.19	0.09	0.09	0.21	0.19	1.08	1.08	1.23	1.25	100%	0	None	None
8-4 [2]	0.16	0.17	0.11	0.10	0.03	0.04	1.07	1.06	1.22	1.20	100%	0	None	None
8-5 [2]	0.21	0.25	0.15	0.15	0.05	0.09	1.07	1.07	1.26	1.22	100%	0	None	None
8-6 [2]	0.16	0.20	0.13	0.12	0.04	0.08	1.11	1.09	1.41	1.26	100%	0.1	None	Low
8-7 [2]	0.08	0.09	0.09	0.08	0.04	0.05	1.10	1.09	1.27	1.26	100%	0	Paving project	None
8-8 [2]	0.09	0.11	0.09	0.08	0.02	0.04	1.08	1.09	1.25	1.24	100%	0	None	None
8-9 [2]	0.14	0.16	0.13	0.10	0.10	0.02	1.07	1.10	1.27	1.33	100%	0	Paving project	None

Level of Need* (Score)	Performance Score Need Scale					Segment Level Need Scale
None (0)	≤ 0.77 (Urban) ≤ 0.63 (Rural)	< 0.35	< 1.21	< 1.37	> 80%	0
Low (1)	0.77 - 0.83 (Urban) 0.63 - 0.69 (Rural)	0.35 – 0.49	1.21 – 1.27	1.37 – 1.43	70% - 80%	< 1.5
Medium (2)	0.83 - 0.95 (Urban) 0.69 - 0.83 (Rural)	0.49 – 0.75	1.27 – 1.39	1.43 – 1.57	50% - 70%	1.5 - 2.5
High (3)	≥ 0.95 (Urban) ≥ 0.83 (Rural)	> 0.75	> 1.39	> 1.57	< 50%	> 2.5

[1] Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment
[2] Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Safety Needs Refinements and Contributing Factors

Safety was identified as a focus area for the I-8 corridor. Low safety needs were identified on 78 miles of the corridor and Medium needs on 35 miles. Key contributing factors to the safety needs are summarized below:

- In the urbanized Yuma area, most incidents/accidents were related to collisions with other motor vehicles, high speed, and run off the road to the right.
- Outside the urbanized area, many incidents/accidents involved a single vehicle, frequently with the vehicle overturning or running off the road to the left. In these cases, driver inattention/distraction and high speeds were typical contributing factors.
- It has been noted that guardrail could be upgraded corridor-wide, with some sections having been updated as part of pavement preservation projects. Guardrail can be effective in reducing the severity of crashes.

See other Contributing Factors in **Appendix D**.

Table 15: Final Safety Needs

Segment	Performance Score and Level of Need							Initial Segment Need*	Hot Spots	Recently Completed Projects	Final Segment Need*
	Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Area Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers				
		EB	WB								
8-1[1]	0.23	0.24	0.22	56%	Insufficient Data	Insufficient Data	Insufficient Data	0.4	None	Paving project including guardrail and concrete barriers	Low
8-2[2]	0.29	0.33	0.25	43%	Insufficient Data	Insufficient Data	Insufficient Data	0.0	None	Paving project including guardrail and concrete barriers	None
8-3[2]	0.96	0.95	0.97	59%	Insufficient Data	Insufficient Data	Insufficient Data	1.8	None	None	Medium
8-4[2]	0.61	0.44	0.77	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.0	None	None	None
8-5[2]	0.59	0.59	0.59	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.0	None	None	None
8-6[2]	0.10	0.06	0.13	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.0	None	Paving project including guardrail	None
8-7[2]	0.68	0.04	1.32	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.2	None	Paving project including guardrail	Low
8-8[2]	0.71	0.74	0.68	33%	Insufficient Data	Insufficient Data	Insufficient Data	0.0	None	None	None
8-9[2]	0.27	0.21	0.98	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.1	None	Paving project including guardrail, concrete barriers, and shoulder improvements	Low

Level of Need* (Score)		**Performance Score Needs Scale**					**Segment Level Need Scale**
None (0)	1 2	≤ 0.93 ≤ 0.94	≤ 47% ≤ 42%	≤ 4% ≤ 8%	≤ 15% ≤ 9%	≤ 7% ≤ 2%	0
Low (1)	1 2	0.93 - 1.06 0.94 - 1.06	47% - 51% 42% - 50%	4% - 5% 8% - 10%	15% - 17% 9% - 11%	7% - 9% 2.0% - 2.2%	≤ 1.5
Medium (2)	1 2	1.06 - 1.33 1.06 - 1.30	51% - 59% 50% - 65%	5% - 7% 10% - 13%	17% - 22% 11% - 15%	9% -12% 2.2% - 2.8%	1.5 - 2.5
High (3)	1 2	≥ 1.33 ≥ 1.30	≥ 59% ≥ 65%	≥ 7% ≥ 13%	≥ 22% ≥ 15%	≥ 12% ≥ 2.8%	≥ 2.5

[1] Urban 4 Lane Freeway / Urban or Fringe Urban Operating Environment
[2] Rural 4 Lane Freeway < 25,000 vpd / Rural Operating Environment

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Freight Needs Refinements and Contributing Factors

Freight was identified as a focus area on the I-8 corridor. A Low level of freight needs were identified on 115 miles of I-8. These are concentrated between MP 0-57 and MP 120-178, which is generally the area between Yuma and Mohawk, including Telegraph Pass, and the area between Gila Bend and Casa Grande. The needs related to freight mobility were dispersed throughout these segments, with elevated levels of delay caused by congestion in the Yuma urbanized area, closures related to incidents/accidents, and bridge clearance issues.

Key contributing factors are summarized below:

- Urban congestion in the Yuma area impacting freight movement including high volumes of freight traffic passing through and originating in Yuma.
- Six bridges have clearance restrictions, consisting of less than 16.25' clearance with no ramp around opportunity.

See other Contributing Factors in **Appendix D**.

Table 16: Final Freight Needs

Segment	Performance Score and Level of Need								Initial Segment Need*	Hot Spots	Recently Completed Projects	Final Segment Need*
	Freight Index	Directional TTTI		Directional TPTI		Closure Duration		Bridge Vertical Clearance				
		EB	WB	EB	WB	EB	WB					
8-1	0.71	1.13	1.12	1.40	1.41	28.88	43.90	16.33	1.4	None	Paving project completed	Low
8-2	0.79	1.00	1.06	1.30	1.23	17.23	140.18	16.23	0.4	Dome Valley Rd TI UP WB - MP 21.06 #1325	Paving project completed	Low
8-3	0.89	1.04	1.04	1.14	1.11	73.08	28.10	16.20	0.3	None	None	Low
8-4	0.90	1.03	1.03	1.12	1.11	5.20	7.68	No UP	0.0	None	None	None
8-5	0.89	1.03	1.04	1.13	1.12	9.07	19.84	No UP	0.0	None	None	None
8-6	0.82	1.06	1.04	1.27	1.17	24.43	21.89	16.63	0.0	None	None	None
8-7	0.89	1.03	1.03	1.13	1.13	13.25	11.42	16.19	0.2	Vekol Road TI UP - MP 144.55 #550	None	Low
8-8	0.89	1.03	1.03	1.13	1.11	6.29	25.18	16.09	0.4	Stanfield Rd TI UP - MP 161.6 #1090 Murphy Rd UP - 162.5 #1091	None	Low
8-9	0.83	1.04	1.06	1.19	1.23	27.01	1.53	15.86	0.4	Thornton Rd TI UP - 172.55 #1096 Chuichu Rd UP - 173.53 #1197	Paving project completed	Low

Level of Need* (Score)	Performance Score Need Scale					Segment Level Need Scale
None (0)	≥ 0.74	≤ 1.21	≤ 1.37	≤ 71.07	≥ 16.33	0
Low (1)	0.70 - 0.74	1.21 - 1.27	1.37 - 1.43	71.07 - 97.97	16.17 - 16.33	≤ 1.5
Medium (2)	0.64 - 0.70	1.27 - 1.39	1.43 - 1.57	97.97 - 151.75	15.83 - 16.17	1.5 - 2.5
High (3)	≤ 0.64	≥ 1.39	≥ 1.57	≥ 151.75	≤ 15.83	≥ 2.5

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Segment Review

The needs for each segment were combined to numerically estimate the average level of need for each segment of the corridor. **Table 17** provides a summary of needs for each segment across all performance areas, with the overall average need for each segment presented in the last row. All of the segments showed a Low level of average need.

Table 17: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)								
	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9
	MP 0-16.3	MP 16.3-21.4	MP 21.4-56.5	MP 56.5-79.6	MP 79.6-110.4	MP 110.4-120	MP 120-147.6	MP 147.6-166.5	MP 166.5-178
Pavement	Low	None	Low	Low	Medium	None	None	Low	Low
Bridge	Low	Medium	Low	Low	Medium	Low	Low	Low	Medium
Mobility+	Low	Low	None	None	None	Low	None	None	None
Safety+	Low	None	Medium	None	None	None	Low	None	Low
Freight+	Low	Low	Low	None	None	None	Low	Low	Low
Average Need	**1.00**	**0.77**	**1.00**	**0.31**	**0.62**	**0.38**	**0.62**	**0.54**	**0.92**

Average Need Scale	
None*	< 0.1
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

** A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

+ Identified as an emphasis area for the I-8 corridor.

Summary of Corridor

The needs in each performance area are shown in **Figure 21** and summarized below:

Pavement Needs

- Of the 178 corridor miles, approximately 76 miles on eastbound I-8 and 79 miles on westbound I-8 have been identified to have pavement needs.
- Pavement hot spot failure needs were identified for 9 miles on eastbound I-8 and 17 miles on westbound I-8 (discounting those miles that will be addressed by future programmed projects).
- A high level of historical investment has occurred on Segment 8-1 through the Yuma urbanized area (MP 0-16), which warranted further investigation or alternative solutions.

Bridge Needs

- Bridge needs were identified on 30 of the 115 bridges along the I-8 corridor (26%).
- Eleven bridges have potential repetitive investment issues. Three of these bridges are also hot spots and were candidates for life-cycle cost analysis to evaluate alternative solutions.
- Two bridges have bridge ratings of 4; Colorado River Viaduct EB and Thornton Rd TI UP.
- Thirteen bridges were defined as hot spots since they had multiple bridge ratings of 5 or less.
- Of the 13 hot spot bridges, 3 also showed repetitive investment issues. These included the Smith Road OP EB, Smith Road OP WB and Thornton Rd TI UP.

Mobility Needs

- Mobility Performance is an Emphasis Area for the I-8 corridor, giving it a heavier weight in the analysis.
- A Low level of Mobility need was identified on 31 miles of I-8, concentrated in the Yuma urbanized area, Telegraph Pass, and Gila Bend. Contributing factors include reoccurring congestion and overall high traffic volumes in the urbanized area, the border patrol checkpoint at MP 18 creating eastbound delays, and closures related to incidents/accidents.
- I-8 between MP 18-21 experiences a reduction in shoulder width to accommodate bicycles.

Safety Needs

- Safety Performance is an Emphasis Area for the I-8 corridor, giving it a heavier weight in the analysis.
- In the urbanized Yuma area, most incidents/crashes were related to collisions with other motor vehicles, high speed, and run off the road to the right.
- Outside the urbanized area, many incidents/crashes were involving a single vehicle and involved the vehicle overturning or running off the road to the left. In these cases, driver inattention/distraction and high speeds were typically related, as well as involving a vehicle in transport.

Freight Needs

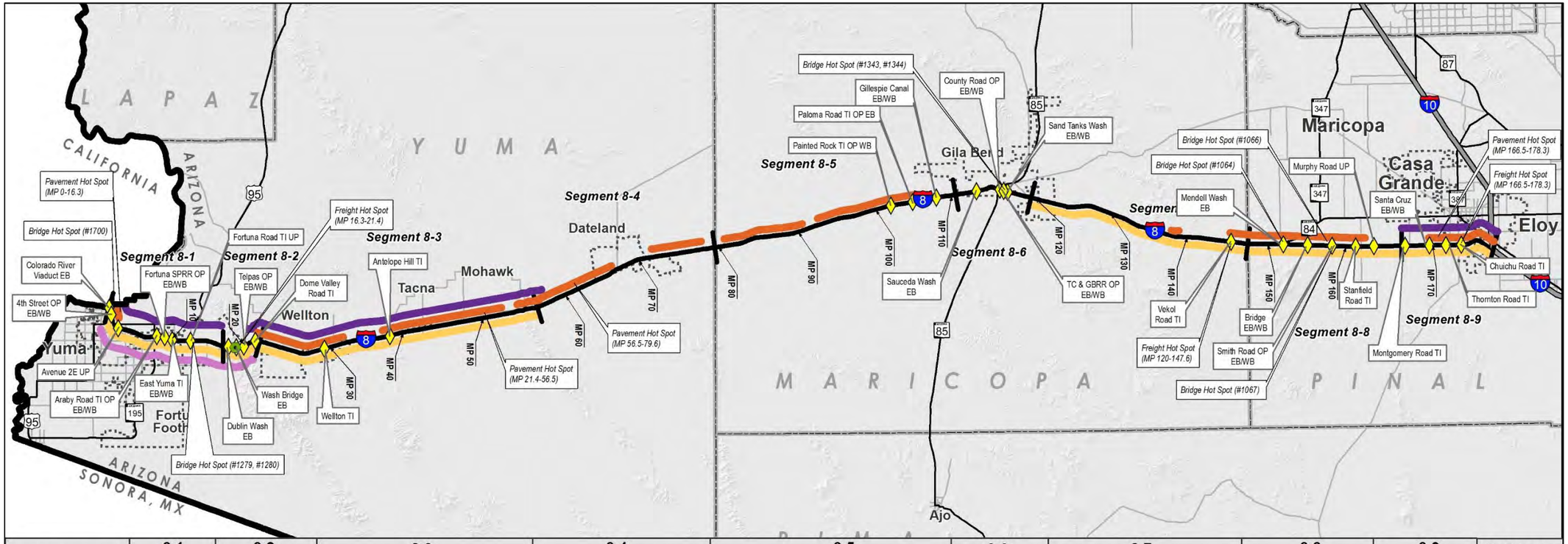
- Freight Performance is an Emphasis Area for the I-8 corridor, giving it a heavier weight in the analysis.
- Low level of Freight needs was identified on 115 miles of I-8. There are no Medium or High level of needs along the corridor. Segments 8-4 through 8-6 meet performance objectives.
- Urban congestion in the Yuma area impacting freight movement including high volumes of freight traffic passing through and originating in Yuma.
- Six bridges have clearance restrictions, consisting of less than 16.25 feet clearance and no ramp. The Thornton Rd TI UP at MP 172.55 has the lowest clearance of 15.87 feet.

Overlapping Needs

This section identifies overlapping performance needs on the I-8 corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need. Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided below:

- Overlapping Pavement, Freight, and Mobility needs occur in the Yuma urbanized area, from milepost 0-16. This section also includes bridges with needs due to hot spots. Many of the issues are due to the higher traffic volumes, including truck volume. The programmed project at Araby Road may resolve the Bridge needs as well as some of the Pavement needs.
- The area of Telegraph Pass, from approximately milepost 18-21, has significant grades and therefore suffers from Freight and Mobility needs related to delay and incidents/accidents associated with the grade. This area also has narrow shoulders, aged guardrail, and locations where climbing and passing lanes might improve safety. A bridge with a low vertical clearance (Dome Valley Rd TI UP WB) also occurs in this area.
- Milepost 21-57 also has Safety, Pavement, and Freight needs. Incidents/accidents and closures in this area, which may be attributable to pavement and guardrail quality, contribute to safety and freight needs.
- Milepost 57-66 and milepost 72-80 have both Safety and Pavement needs. Pavement and guardrail quality may contribute to safety needs. A recent pavement preservation project has been completed between milepost 66-72
- Approaching the Casa Grande urbanized area, milepost 148-178 has needs in Pavement and Freight, with bridges having needs as well as height restrictions related to freight. A bridge with both Bridge and Freight needs is Thornton Road TI (No. 1196, MP 172.55).

Figure 21: Corridor Needs Summary



Performance Area	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	Perfomance Area
	MP 0-16.3	MP 16.3-21.4	MP 21.4-56.5	MP 56.5-79.6	MP 79.6-110.4	MP 110-4-120	MP 120-147.6	MP 147.6-166.5	MP 166.5-178	
Pavement	Low	None*	Low	Low	Medium	None*	None*	Low	Low	Pavement
Bridge	Low	Medium	Low	Low	Medium	Low	Low	Low	Medium	Bridge
Mobility+	Low	Low	None*	None*	None*	Low	None*	None*	None*	Mobility+
Safety+	Low	None*	Medium	None*	None*	None*	Low	None*	Low	Safety+
Freight+	Low	Low	Low	None*	None*	None*	Low	Low	Low	Freight+
Average Need (0-3)	1.00	0.77	1.00	0.31	0.62	0.38	0.62	0.54	0.92	Average Need (0-3)

+ Identified as emphasis area for I-8 Corridor

A segment need rating of **'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance scoreexceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

I-8 Corridor Profile Study: California to I-10 Junction
Needs Summary

N
Miles
0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
Border Patrol Check Point

Performance Area Needs
Pavement
Mobility
Safety
Freight
Bridge

Level of Need
Low
Medium
High

4.0 STRATEGIC SOLUTIONS

The principal objective of the CPS is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State's key transportation corridors. One of the first steps in the development of strategic solutions is to identify areas of elevated levels of need (i.e., Medium or High). Addressing areas of Medium or High need will have the greatest effect on corridor performance and are the focus of the strategic solutions. Segments with Medium or High needs and specific locations of hot spots are considered strategic investment areas for which strategic solutions should be developed. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. The I-8 strategic investment areas (resulting from the elevated needs) are shown in **Figure 22**.

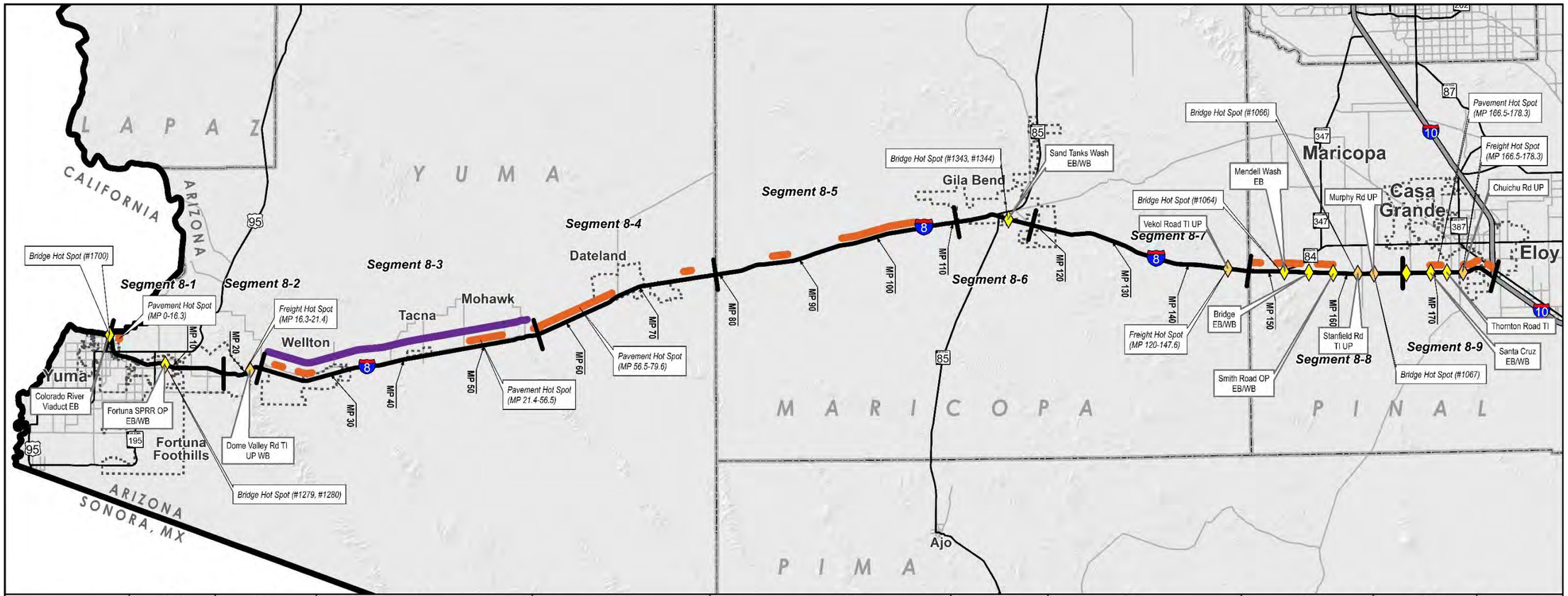
4.1 Screening Process

This section examines qualifying strategic needs and determines if the needs in those locations require action. In some cases, needs that are identified do not advance to solutions development and are screened out from further consideration because they have been or will be addressed through other measures, including:

- A project is programmed to address this need
- The need is a result of a Pavement or Bridge hot spot that does not show historical investment or rating issues; these hot spots will likely be addressed through other ADOT programming means
- A bridge is not a hot spot but is located within a segment with a Medium or High level of need; this bridge will likely be addressed through current ADOT bridge maintenance and preservation programming processes
- The need is determined to be non-actionable (i.e., cannot be addressed through an ADOT project)
- The conditions/characteristics of the location have changed since the performance data was collected that was used to identify the need

Table 18 notes if each potential strategic need advanced to solution development, and if not, the reason for screening the potential strategic need out of the process. Locations advancing to solutions development are marked with Yes (Y); locations not advancing are marked with No (N) and highlighted. This screening table provides specific information about the needs in each segment that will be considered for strategic investment. The table identifies the level of need – either Medium or High segment needs, or segments without Medium or High level of need that have a hot spot. Each area of need is assigned a location number in the screening table to help document and track locations considered for strategic investment.

Figure 22: Strategic Investment Areas



Performance Area	8-1 MP 0-16.3	8-2 MP 16.3-21.4	8-3 MP 21.4-56.5	8-4 MP 56.5-79.6	8-5 MP 79.6-110.4	8-6 MP 110-4-120	8-7 MP 120-147.6	8-8 MP 147.6-166.5	8-9 MP 166.5-178	Perfomance Area
Pavement	Hot Spot	-	Hot Spot	Hot Spot	Medium	-	-	Hot Spot	Hot Spot	Pavement
Bridge	Hot Spot	Medium	-	-	Medium	Hot Spot	-	Hot Spot	Medium	Bridge
Mobility+	-	-	-	-	-	-	-	-	-	Mobility+
Safety+	-	-	Medium	-	-	-	-	-	-	Safety+
Freight+	-	Hot Spot	-	-	-	-	Hot Spot	Hot Spot	Hot Spot	Freight+

+ Identified as Emphasis Area for I-8 Corridor

Note: Figure shows strategic investment areas, which are segments with Medium and High levels of need and locations of hotspots. A"-" symbol indicates a segment level of need of Low or None, which is not considered strategic.

I-8 Corridor Profile Study: California to I-10 Junction
Strategic Investment Areas

N
Miles
0 5 10 15 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

Performance Area Needs
Pavement
Mobility
Safety
Freight
Bridge
Truck Height Restriction Hot Spot

Level of Need
Low
Medium
High

Table 18: Strategic Investment Area Screening

Segment # and MP	Level of Strategic Need					Location #	Need Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-1 MP 0.0-16.3	Hot Spot	Hot Spot	-	-	-	L1	Pavement	Hot spot in westbound lanes MP 0-1 (High IRI) and a high level of historical investment has occurred on Segment 8-1	Y	
						L2	Bridge	Hot spot at Colorado River Viaduct EB MP 0.01 (#1700) with Deck Rating 4	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment. Further, this structure is maintained by Caltrans.
						L3	Bridge	Hot spot at Fortuna SPRR OP EB (MP 8.69, #1279) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L4	Bridge	Hot spot at Fortuna SPRR OP WB (MP 8.70, #1280) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
8-2 MP 16.3-21.4	-	Medium	-	-	Hot Spot	L5	Bridge	Medium level of need, however none of the following structures within this segment were hot spots: Dublin Wash Br EB (MP 16.85, #1566) Wash Br EB (MP 18.12, #303) Telpas OP WB Over EB (MP 18.80, #971) Telpas OP WB Over EB (MP 20.40, #972) Dome Valley Rd TI UP EB (MP 21.04, #1324) Dome Valley Rd TI UP WB (MP 21.06, #1325)	N	Structures do not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L6	Freight	Hot spot at Dome Valley Rd TI UP WB (MP 21.06 #1325) has low clearance of 16.23'. Cannot ramp around.	Y	
8-3 MP 21.4-56.5	Hot Spot	-	-	Medium	-	L7	Pavement	Hot spot in EB lanes MP 23-24 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. A pavement preservation project is currently programmed (MP 21-29) for FY 2016, which will address deficiency.
						L8	Pavement	Hot spot in EB lanes MP 26-28 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. A pavement preservation project is currently programmed (MP 21-29) for FY 2016, which will address deficiency.
						L9	Pavement	Hot spot in EB lanes MP 48-52 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L10	Pavement	Hot spot in WB lanes MP 56-56.5 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-3. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L43	Safety	Crash trends show single vehicle (78%), speed too fast for conditions (41%), ran off the road left (37%), ran off the road right (15%), and daylight conditions (74%).	Y	

Legend: Strategic investment area screened out from further consideration.

Table 18: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Need Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-4 MP 56.5-79.6	Hot Spot	-	-	-	-	L11	Pavement	Hot spot in WB lanes MP 56.5-67 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-4. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L12	Pavement	Hot spot in EB lanes MP 76-77 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-4. No pavement reservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
8-5 MP 79.6-110.4	Medium	Medium	-	-	-	L13	Pavement	Hot spot in EB lanes MP 87-89 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-5. No pavement preservation projects are currently programmed for this portion of the segment. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L14	Pavement	Hot spot in EB lanes MP 96-99 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-4. A pavement preservation project programmed (MP 96-106) for FY 2019, which will address deficiency.
						L15	Pavement	Hot spot in WB lanes MP 97-106 (High IRI and Cracking)	N	A medium level of historical investment has occurred on Segment 8-4. A pavement preservation project programmed (MP 96-106) for FY 2019, which will address deficiency.
						L16	Pavement	Hot spot in EB lanes MP 100-103 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-4. A pavement preservation project programmed (MP 96-106) for FY 2019, which will address deficiency.
						L17	Bridge	Medium level of need related to three functionally obsolete bridges. None of the following bridges were identified as hot spots. Wash Bridge EB (MP 83.14, #317) Sentinel TI OP EB (MP 87.04, #687) Sentinel TI OP WB (MP 87.04, #688) Painted Rock TI OP EB (MP 102.27, #509) Painted Rock TI OP WB (MP 102.27, #510) Paloma Rd TI OP EB (MP 106.54, #566) Paloma Rd TI OP WB (MP 106.54, #567) Gillespie Canal Br EB (MP 107.02, #489) Gillespie Canal Br WB (MP 107.03, #568) Gillespie Canal Br EB (MP 109.55, #490) Gillespie Canal Br WB (MP 109.55, #569) Wash Bridge SFR (MP 110.35, #1505)	N	Structures do not have a historical rating issue according to the review, therefore they are not considered for strategic investment. Anticipated to be addressed through current ADOT bridge maintenance and preservation programming processes.

Legend: Strategic investment area screened out from further consideration.

Table 18: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Need Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-6 MP 110.4-120.0	-	Hot Spot	-	-	-	L18	Bridge	Hot spot at Sand Tanks Wash Bridge EB (MP 117.43, #1343) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L19	Bridge	Hot spot at Sand Tanks Wash Bridge WB (MP 117.43, #1344) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
8-7 MP 120.0-147.6	-	-	-	-	Hot Spot	L20	Freight	Hot spot at Vekol Road TI UP (MP 144.55 #550) has low clearance of 16.19'. Cannot ramp around in eastbound direction.	Y	
8-8 MP 147.6-166.5	Hot Spot	Hot Spot	-	-	Hot Spot	L21	Pavement	Hot spot in WB lanes MP 148-149 (High Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L22	Pavement	Hot spot in WB lanes MP 151-153 (High Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L23	Pavement	Hot spot in EB lanes MP 152-154 (High IRI and Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L24	Pavement	Hot spot in WB lanes MP 156-158 (High IRI and Cracking)	N	A low level of historical investment has occurred on Segment 8-8. No pavement preservation projects are currently programmed. Anticipated to be addressed through current ADOT pavement maintenance and preservation programming processes.
						L25	Bridge	Hot spot at Mendell Wash Bridge EB (MP 151.90, #1064) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L26	Bridge	Hot spot at Bridge EB MP 153.40 (#1066) with Deck Rating 5, Substructure Rating 5, Superstructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L27	Bridge	Hot spot at Bridge WB MP 153.46 (#1067) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L28	Bridge	Hot spot at Smith Road OP EB MP 157.55 (#1068) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5. Structure shows high level of historical rating issues in the historical review.	Y	

Legend: Strategic investment area screened out from further consideration.

Table 18: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Need Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
8-8 MP 147.6-166.5	Hot Spot	Hot Spot	-	-	Hot Spot	L29	Bridge	Hot spot at Smith Road OP WB MP 157.55 (#1069) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5. Structure shows high level of historical rating issues in the historical review.	Y	
						L30	Freight	Hot spot at Stanfield Rd TI UP (MP 161.6 #1090) has low clearance of 16.09'. Cannot ramp around.	Y	
						L31	Freight	Hot spot at Murphy Rd UP (MP 162.5 #1091) has low clearance of 16.19'. Cannot ramp around.	Y	
8-9 MP 166.5-178.3	Hot Spot	Medium	-	-	Hot Spot	L32	Pavement	Hot spot in EB lanes MP 170-171 (High IRI and High Cracking)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L33	Pavement	Hot spot in EB lanes MP 174-176 (High IRI and High Cracking)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L34	Pavement	Hot spot in WB lanes MP 174-176 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L35	Pavement	Hot spot in EB lanes MP 177-179 (High IRI and High Cracking)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L36	Pavement	Hot spot in WB lanes MP 178-179 (High IRI)	N	A medium level of historical investment has occurred on Segment 8-9, there is a pavement preservation project programmed MP 169.5-178 FY 2016 which will address deficiency.
						L37	Bridge	Hot spot at Montgomery Rd TI UP (MP 167.50, #1140) with superstructure rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L38	Bridge	Hot spot at Santa Cruz Wash Br EB (MP 170.90, #1142) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L39	Bridge	Hot spot at Santa Cruz Wash Br WB MP 170.90 (#1143) with Deck Rating 5, Substructure Rating 5, Evaluation Rating 5	N	Structure does not have a historical rating issue according to the historical review, therefore it is not considered for strategic investment.
						L40	Bridge	Hot spot at Thornton Rd TI UP MP 172.55 (#1196) with Substructure Rating 4, Evaluation Rating 4. Structure shows high level of historical rating issues in the historical review.	Y	
						L41	Freight	Hot spot at Thornton Rd TI UP (MP 172.55) has low clearance of 15.86'. Cannot ramp around in the eastbound direction.	Y	
						L42	Freight	Hot spot at Chuichu Rd UP (MP 173.53 #1197) has low clearance of 16.04'. Cannot ramp around.	Y	

Legend: Strategic investment area screened out from further consideration.

4.2 Candidate Solutions

For each elevated need within a strategic investment area that is not screened out, a candidate solution is developed to address the identified need. Each candidate solution is assigned to one of the following three P2P investment categories based on the scope of the solution:

- Preservation
- Modernization
- Expansion

Documented performance needs serve as the foundation for developing candidate solutions for corridor preservation, modernization, and expansion. Candidate solutions are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the I-8 corridor will be considered along with other candidate projects in the ADOT statewide programming process.

Characteristics of Strategic Solutions

Candidate solutions should include some or all of the following characteristics:

- Do not recreate or replace results from normal programming processes
- May include programs or initiatives, areas for further study, and infrastructure projects
- Address elevated levels of need (High or Medium) and hot spots
- Focus on investments in modernization projects (to optimize current infrastructure)
- Address overlapping needs
- Reduce costly repetitive maintenance
- Extend operational life of system and delay expansion
- Leverage programmed projects that can be expanded to address other strategic elements
- Provide measurable benefit

Candidate Solutions

A set of 9 candidate solutions are proposed to address the identified needs on the I-8 corridor.

Table 19 identifies each strategic location that has been assigned a candidate solution with a number (e.g., CS8.1, CS8.2, etc.). Each candidate solution is comprised of one or more components to address the identified needs. The assigned candidate solution numbers are linked to the location number and provide tracking capability through the rest of the process. The locations of proposed solutions are shown on the map in **Figure 23**.

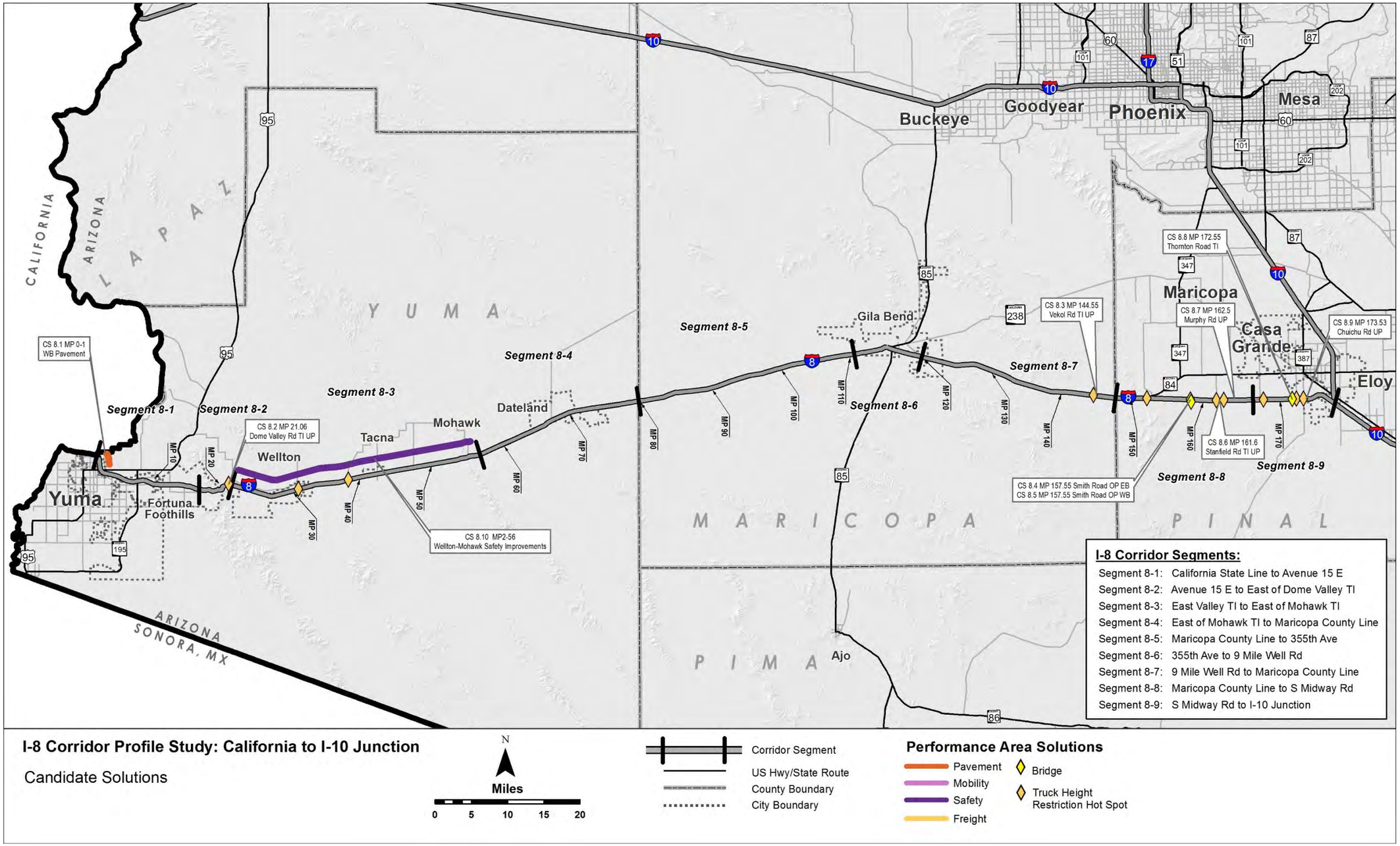
Candidate solutions developed to address an elevated need in the Pavement or Bridge performance area will include two options; rehabilitation or full replacement. These solutions are initially evaluated through a Life-Cycle Cost Analysis (LCCA) to provide insights into the cost-effectiveness of these options so a recommended approach can be identified. Candidate solutions developed to address an elevated need in the Mobility, Safety, or Freight performance areas are advanced directly to the Performance Effectiveness Evaluation. In some cases, there may be multiple solutions identified to address the same area of need.

Candidate solutions that are recommended to expand or modify the scope of an already programmed project are noted and are not advanced to solution evaluation and prioritization. These solutions are directly recommended for programming.

Table 19: Candidate Solutions

Candidate Solution #	Segment #	Location #	Beginning Milepost	Ending Milepost	Candidate Solution Name	Option	Scope	Investment Category Preservation [P] Modernization [M] Expansion [E]
CS8.1	8-1	L1	0	1	CA Border to MP 1 Pavement Project	A B	Rehabilitate pavement Replace pavement	P M
CS8.2	8-2	L6	21.06	21.06	Dome Valley Rd TI UP (#1325) (WB I-8) Freight / Bridge Vertical Clearance Mitigation	A B	Reprofile mainline Replace bridge	M M
CS8.3	8-7	L20	144.55	144.55	Vekol Road TI UP (#550) (WB & EB I-8) Freight / Bridge Vertical Clearance Mitigation	A B	Reprofile mainline Replace bridge	M M
CS8.4	8-8	L28	157.55	157.55	Smith Road OP EB (#1068) Bridge Project	A B	Rehabilitate bridge Replace bridge	P M
CS8.5	8-8	L29	157.55	157.55	Smith Road OP WB (#1069) Bridge Project	A B	Rehabilitate bridge Replace bridge	P M
CS8.6	8-8	L30	161.6	161.6	Stanfield Rd TI UP (#1090) (WB & EB I-8) Freight / Bridge Vertical Clearance Mitigation	A B	Reprofile mainline Replace bridge	M M
CS8.7	8-8	L31	162.5	162.5	Murphy Rd UP (#1091) (WB & EB I-8) Freight / Bridge Vertical Clearance Mitigation	A B	Reprofile mainline Replace bridge	M M
CS8.8	8-9	L40 & L41	172.55	172.55	Thornton Rd TI UP (#1196) (WB & EB I-8) Bridge Project	A B	Rehabilitate bridge and reprofile mainline Replace bridge	M M
CS8.9	8-9	L42	173.53	173.53	Chuichu Rd UP (#1197) (WB & EB I-8) Freight / Bridge Vertical Clearance Mitigation	A B	Reprofile mainline Replace bridge	M M
CS8.10	8-3	L43	22	56	Wellton – Mohawk Safety Improvements	-	Install speed feedback signs (EB MP 28, EB MP 40, EB MP 45, EB MP 53.75, WB MP 23, WB MP 31.5, WB MP 44, WB MP 56.5) Install Lighting WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99)	M

Figure 23: Candidate Solutions



5.0 SOLUTION EVALUATION AND PRIORITIZATION

Candidate solutions are evaluated using the following steps: LCCA (where applicable), Performance Effectiveness Evaluation, Solution Risk Analysis, and Candidate Solution Prioritization. The methodology and approach to this evaluation are shown in **Figure 24** and described more fully below.

Life-Cycle Cost Analysis

All Pavement and Bridge candidate solutions have two options: rehabilitation/repair or reconstruction. These options are evaluated through an LCCA to determine the best approach for each location where a Pavement or Bridge solution is recommended. The LCCA can eliminate options from further consideration and identify which options should be carried forward for further evaluation.

When multiple independent candidate solutions are developed for Mobility, Safety, or Freight strategic investment areas, these candidate solution options advance directly to the Performance Effectiveness Evaluation without an LCCA.

Performance Effectiveness Evaluation

After completing the LCCA process, all remaining candidate solutions are evaluated based on their performance effectiveness. This process includes determining a Performance Effectiveness Score (PES) based on how much each solution impacts the existing performance and needs scores for each segment. This evaluation also includes a Performance Area Risk Analysis to help differentiate between similar solutions based on factors that are not directly addressed in the performance system.

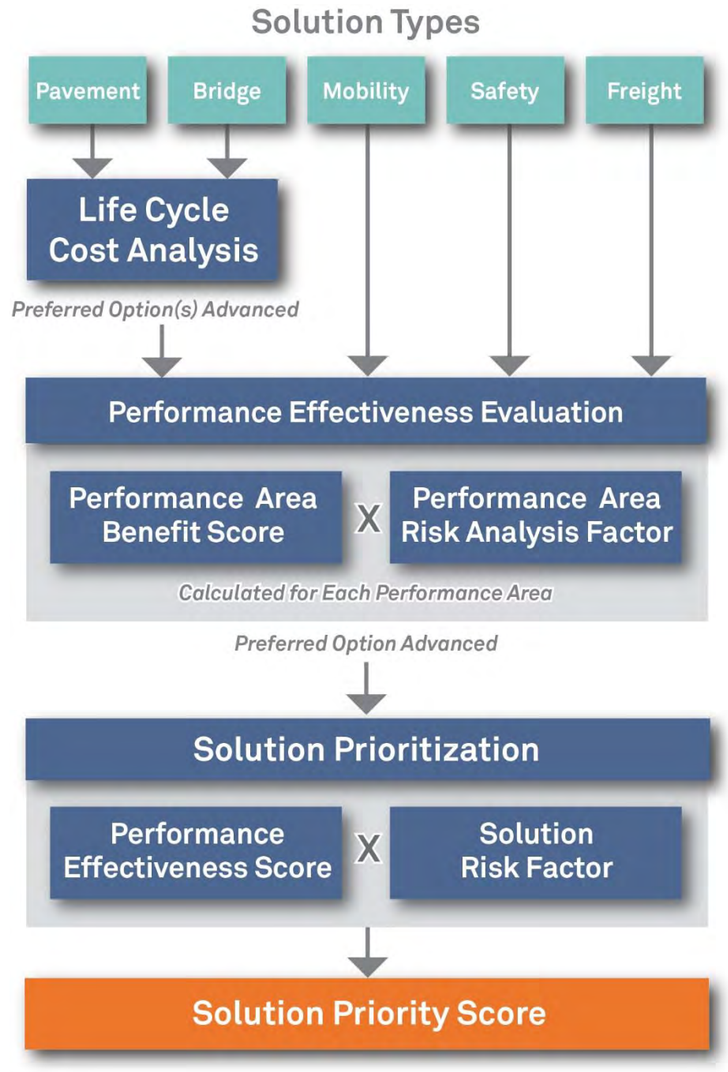
Solution Risk Analysis

All candidate solutions advanced through the Performance Effectiveness Evaluation are also evaluated through a Solution Risk Analysis process. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of performance failure.

Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score. The candidate solutions are ranked by prioritization score from highest to lowest. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Solutions that address multiple performance areas tend to score higher in this process.

Figure 24: Candidate Solution Evaluation Process



5.1 Life-Cycle Cost Analysis

LCCA is conducted for any candidate solution that is developed as a result of a need in the Pavement or Bridge performance area. The intent of the LCCA is to determine which options warrant further investigation and eliminate options that would not be considered strategic.

LCCA is an economic analysis that compares cost streams over time and presents the results in a common measure, the present value of all future costs. The cost stream occurs over an analysis period that is long enough to provide a reasonably fair comparison among alternatives that may differ significantly in scale of improvement actions over shorter time periods. For both bridge and pavement LCCA, the costs are focused on agency (ADOT) costs for corrective actions to meet the objective of keeping the bridge or pavement serviceable over a long period of time.

LCCA is performed to provide a more complete holistic perspective on asset performance and agency costs over the life of an investment stream. This approach helps ADOT look beyond initial and short-term costs, which often dominate the considerations in transportation investment decision making and programming.

Bridge LCCA

For the bridge LCCA, three basic strategies are analyzed that differ in timing and scale of improvement actions to maintain the selected bridges, as described below:

- Bridge replacement (large upfront cost but small ongoing costs afterwards)
- Bridge rehabilitation until replacement (moderate upfront costs then small to moderate ongoing costs until replacement)
- On-going repairs until replacement (low upfront and ongoing costs until replacement)

The bridge LCCA model developed for the CPS reviews the characteristics of the candidate bridges including bridge ratings and deterioration rates to develop the three improvement strategies (full replacement, rehabilitation until replacement, and repair until replacement). Each strategy consists of a set of corrective actions that contribute to keeping the bridge serviceable over the analysis period. Cost and effect of these improvement actions on the bridge condition are essential parts of the model. Other considerations in the model include bridge age, elevation, pier height, length-to-span ratio, skew angle, and substandard characteristics such as shoulders and vehicle clearance. The following assumptions are included in the bridge LCCA model:

- The bridge LCCA only addresses the structural condition of the bridge and does not address other issues or costs
- The bridge will require replacement at the end of its 75-year service life regardless of current condition
- The bridge elevation, pier height, skew angle, and length-to-span ratio can affect the replacement and rehabilitation costs
- The current and historical ratings are used to estimate a rate of deterioration for each candidate bridge
- Following bridge replacement, repairs will be needed every 20 years
- Different bridge repair and rehabilitation strategies have different costs, expected service life, and benefit to the bridge rating
- The Net Present Value (NPV) of future costs is discounted at 3% and all dollar amounts are in 2015 dollars
- If the LCCA evaluation recommends rehabilitation or repair, the solution is not considered strategic and the rehabilitation or repair will be addressed by normal programming processes
- Since this LCCA is conducted at a planning level, and due to the variabilities in costs and improvement strategies, the LCCA NPV results that are within 15% should be considered equally; in such a case, the solution should be carried forward as a strategic replacement project – more detailed scoping will confirm if replacement or rehabilitation is needed

Based on the candidate solutions presented in **Table 19**, LCCA was conducted for three bridges on the I-8 corridor. A summary of this analysis is shown in **Table 20**. Additional information regarding the bridge LCCA is included in **Appendix E**.

Pavement LCCA

The LCCA approach to pavement is very similar to the process used for bridges. For the pavement LCCA, three basic strategies are analyzed that differ in timing and scale of improvement actions to maintain the selected pavement, as described below:

- Pavement replacement (large upfront cost but small ongoing costs afterwards – could be replacement with asphalt or concrete pavement)
- Pavement major rehabilitation until replacement (moderate upfront costs then small to moderate ongoing costs until replacement)
- Pavement minor rehabilitation until replacement (low upfront and ongoing costs until replacement)

The pavement LCCA model developed for the CPS reviews the characteristics of the candidate paving locations including the historical rehabilitation frequency to develop potential improvement strategies (full replacement, major rehabilitation until replacement, and minor rehabilitation until replacement, for either concrete or asphalt, as applicable). Each strategy consists of a set of corrective actions that contribute to keeping the pavement serviceable over the analysis period. The following assumptions are included in the pavement LCCA model:

- The pavement LCCA only addresses the condition of the pavement and does not address other issues or costs
- The historical pavement rehabilitation frequencies at each location are used to estimate future rehabilitation frequencies

- Different pavement replacement and rehabilitation strategies have different costs and expected service life
- The net present value of future costs is discounted at 3% and all dollar amounts are in 2015 dollars
- If the LCCA evaluation recommends rehabilitation or repair, the solution is not considered strategic and the rehabilitation will be addressed by normal programming processes
- Because this LCCA is conducted at a planning level, and due to the variabilities in costs and improvement strategies, the LCCA net present value results that are within 15% should be considered equally; in such a case, the solution should be carried forward as a strategic replacement project – more detailed scoping will confirm if replacement or rehabilitation is needed

Based on the candidate solutions presented in **Table 19**, LCCA was conducted for one pavement section on the I-8 corridor. A summary of this analysis is shown in **Table 21**. Additional information regarding the pavement LCCA is contained in **Appendix E**.

As shown in **Tables 20** and **21**, the following conclusions were determined based on the LCCA:

- Rehabilitation or repair was determined to be the most effective approach for the candidate solutions listed below and these locations do not have other Needs. Therefore, it is assumed that the identified needs will be addressed by normal programming processes and these candidate solutions will be dropped from further consideration.
    - CA Border to MP 1 Pavement Project (CS8-1)
    - Smith Road OP EB (#1068) Bridge Project (CS8-4)
    - Smith Road OP WB (#1069) Bridge Project (CS8-5)

- Rehabilitation or repair was determined to be the most effective approach for the candidate solution listed below, however, this location had other needs, so it was carried forward for further consideration.
    - Thornton Rd TI UP (#1196) Bridge Project (CS8-8)

Table 20: Bridge Life Cycle Cost Analysis Results

Candidate Solution	Present Value at 3% Discount Rate ($)			Ratio of Present Value Compared to Lowest Present Value			Other Needs	Results
	Replace	Rehab	Repair	Replace	Rehab	Repair		
Smith Road OP EB (CS8-4)	$1,174,758	$1,083,530	**$875,819**	1.34	1.24	1.00	No	Not strategic as a stand-alone solution and no other Needs; no further evaluation
Smith Road OP WB (CS8-5)	$1,174,758	$1,075,380	**$815,250**	1.45	1.32	1.00	No	Not strategic as a stand-alone solution and no other Needs; no further evaluation
Thornton Road TI (CS8-8)	$2,888,512	$2,414,455	**$2,117,179**	1.36	1.14	1.00	Yes	Not strategic as a stand-alone solution; carry forward for further evaluation with other needs

Table 21: Pavement Life Cycle Cost Analysis Results

Candidate Solution	Present Value at 3% Discount Rate ($)				Ratio of Present Value Compared to Lowest Present Value				Other Needs	Results
	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehabilitation	Asphalt Light Rehabilitation	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehabilitation	Asphalt Light Rehabilitation		
CA Border to MP 1 Pavement Project (CS8-1)	$8,795,411	$8,052,390	**$6,307,010**	$6,901,615	1.40	1.28	1.00	1.09	No	Not strategic as a stand-alone solution and no other Needs; no further evaluation

5.2 Performance Effectiveness Evaluation

The results of the Performance Effectiveness Evaluation are combined with the results of a Performance Area Risk Analysis to determine a PES. The objectives of the Performance Effectiveness Evaluation include:

- Measure the benefit to the performance system versus the cost of the solution
- Include risk factors to help differentiate between similar solutions
- Apply to each performance area that is affected by the candidate solution
- Account for emphasis areas identified for the corridor

The Performance Effectiveness Evaluation includes the following steps:

- Estimate the post-solution performance for each of the five performance areas (Pavement, Bridge, Mobility, Safety, and Freight)
- Use the post-solution performance scores to calculate a post-solution level of need for each of the five performance areas
- Compare the pre-solution level of need to the post-solution level of need to determine the reduction in level of need (potential solution benefit) for each of the five performance areas
- Calculate performance area risk weighting factors for each of the five performance areas
- Use the reduction in level of need (benefit) and risk weighting factors to calculate the PES

Post-Solution Performance Estimation

For each performance area, a slightly different approach is used to estimate the post-solution performance. This process is based on the following assumptions:

- Pavement:
  - The IRI rating would decrease (to 30 for replacement or 45 for rehabilitation)
  - The Cracking rating would decrease (to 0 for replacement or rehabilitation)
- Bridge:
  - The structural ratings would increase (+1 for repair, +2 for rehabilitation, or increase to 8 for replacement)
  - The Sufficiency Rating would increase (+10 for repair, +20 for rehabilitation, or increase to 98 for replacement)
- Mobility:
  - Additional lanes would increase the capacity and therefore affect the Mobility Index and associated secondary measures
  - Other improvements (e.g., ramp metering, parallel ramps, variable speed limits) would also increase the capacity (to a lesser extent than additional lanes) and therefore would affect the Mobility Index and associated secondary measures
  - Changes in the Mobility Index (due to increased capacity) would have a direct effect on the TTI secondary measure
  - Changes in the Mobility Index (due to increased capacity) and Safety Index (due to crash reductions) would have a direct effect on the PTI secondary measure
  - Changes in the Safety Index (due to crash reductions) would have a direct effect on the Closure Extent secondary measure
- Safety:
  - Crash modification factors were developed that would be applied to estimate the reduction in crashes (for additional information see **Appendix F**)
- Freight:
  - Changes in the Mobility Index (due to increased capacity) and Safety Index (due to crash reductions) would have a direct effect on the Freight Index and the TPTI secondary measure
  - Changes in the Mobility Index (due to increased capacity) would have a direct effect on the TTTI secondary measure
  - Changes in the Safety Index (due to crash reductions) would have a direct effect on the Closure Duration secondary measure

Performance Area Risk Analysis

The Performance Area Risk Analysis is intended to develop a numeric risk weighting factor for each of the five performance areas (Pavement, Bridge, Mobility, Safety, and Freight). This risk analysis addresses other considerations for each performance area that are not directly included in the performance system. A risk weighting factor is calculated for each candidate solution based on the specific characteristics at the solution location. For example, the Pavement Risk Factor is based on factors such as the elevation, daily traffic volumes, and amount of truck traffic. Additional information regarding the Performance Area Risk Factors is included in **Appendix G**.

Following the calculation of the reduction in level of need (benefit) and the Performance Area Risk Factors, these values are used to calculate the PES. In addition, the reduction in level of Need in each emphasis area is also included in the PES.

Net Present Value Factor

The benefit (reduction in need) is measured as a one-time benefit. However, different types of solutions will have varying service lives during which the benefits will be obtained. For example, a preservation solution would likely have a shorter stream of benefits over time when compared to a modernization or expansion solution. To address the varying lengths of benefit streams, each solution is classified as a 10-year, 20-year, 30-year, or 75-year benefit stream, or the NPV factor (F_{NPV}). A 3% discount rate is used to calculate F_{NPV} for each classification of solution. The service lives and respective factors are described below:

- A 10-year service life is generally reflective of preservation solutions such as pavement and bridge preservation; these solutions would likely have a 10-year stream of benefits; for these solutions, a F_{NPV} of 8.8 is used in the PES calculation
- A 20-year service life is generally reflective of modernization solutions that do not include new infrastructure; these solutions would likely have a 20-year stream of benefits; for these solutions, a F_{NPV} of 15.3 is used in the PES calculation
- A 30-year service life is generally reflective of expansion solutions or modernization solutions that include new infrastructure; these solutions would likely have a 30-year stream of benefits; for these solutions, a F_{NPV} of 20.2 is used in the PES calculation
- A 75-year service life is used for bridge replacement solutions; these solutions would likely have a 75-year stream of benefits; for these solutions, a F_{NPV} of 30.6 is used in the PES calculation

Vehicle-Miles Travelled Factor

Another factor in assessing benefits is the number of travelers who would benefit from the implementation of the candidate solution. This factor varies between candidate solutions depending on the length of the solution and the magnitude of daily traffic volumes. Multiplying the solution length by the daily traffic volume results in vehicle-miles travelled (VMT), which provides a measure of the amount of traffic exposure that would receive the benefit of the proposed solution. The VMT is converted to a VMT factor (known as F_{VMT}), which is on a scale between 0 and 5, using the equation below:

$$F_{VMT} = 5 - (5 \times e^{VMT \times -0.0000139})$$

Performance Effectiveness Score

The PES is calculated using the following equation:

PES = (Sum of all Risk Factored Benefit Scores + Sum of all Risk Factored Emphasis Area Scores) / Cost) x F_{VMT} x F_{NPV}

Where:

Risk Factored Benefit Score = Reduction in Segment-Level Need (benefit) x Performance Area Risk Weighting Factor (calculated for each performance area)

Risk Factored Emphasis Area Score = Reduction in Corridor-Level Need x Performance Area Risk Factors x Emphasis Area Factor (calculated for each emphasis area)

*Cost = estimate cost of candidate solution in millions of dollars (see **Appendix H**)*

F_{VMT} = Factor between 0 and 5 to account for VMT at location of candidate solution based on existing (2014) daily volume and length of solution

F_{NPV} = Factor (ranging from 8.8 to 30.6 as previously described) to address anticipated longevity of service life (and duration of benefits) for each candidate solution

The resulting PES values are shown in **Table 22**. Additional information regarding the calculation of the PES is contained in **Appendix I**.

For candidate solutions with multiple options to address Mobility, Safety, or Freight needs, the PES should be compared to help identify the best performing option. If one option clearly performs better than the other options (e.g., more than twice the PES value and a difference in magnitude of at least 20 points), the other options can be eliminated from further consideration. If multiple options have similar PES values, or there are other factors not accounted for in the performance system that could significantly influence the ultimate selection of an option (e.g., potential environmental concerns, potential adverse economic impacts), those options should all be advanced to the prioritization process.

On the I-8 corridor, six candidate solutions have options to address Freight needs by improving the vertical clearance at bridges that can't be ramped around. In most cases, the most effective option was to reprofile the mainline roadway. Two locations showed more benefit in replacing the bridge due to the poor existing structure performance rating.

As was previously mentioned, rehabilitation or repair was determined to be the most effective approach for the candidate solutions listed below that were subjected to LCCA. Subsequently, these candidate solutions were dropped from further consideration and no PES values were calculated for these solutions:

- CA Border to MP 1 Pavement Project (CS8.1, MP 0-1)
- Smith Road OP EB (#1068) Bridge Project (CS8-4, MP 157.55)
- Smith Road OP WB (#1069) Bridge Project (CS8-5, MP 157.55)

Table 22: Performance Effectiveness Scores

Candidate Solution #	Segment #	Option	Candidate Solution Name	Milepost Location	Estimated Cost ($ million)	Risk Factored Benefit Score					Risk Factored Emphasis Area Scores			Total Factored Benefit Score	F_{VMT}	F_{NPV}	Performance Effectiveness Score
						Pavement	Bridge	Safety	Mobility	Freight	Safety	Mobility	Freight				
CS8.2	8-2	A	Dome Valley Rd TI WB UP (#1325) Reprofile	21.06	$0.3	0.093	0.000	0.003	0.003	0.501	0.001	0.000	0.000	0.600	0.04	20.2	2.2
		B	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	21.06	$1.8	0.000	1.136	0.003	0.003	0.501	0.001	0.000	0.000	1.644	0.09	30.6	2.5
CS8.3	8-7	A	Vekol Road TI UP (#550) Reprofile	144.55	$0.6	0.000	0.000	0.000	0.000	0.302	0.000	0.000	0.000	0.302	0.09	20.2	0.9
		B	Vekol Road TI UP (#550) Bridge Replacement	144.55	$2.2	0.000	1.156	0.000	0.000	0.302	0.000	0.000	0.000	1.457	0.07	30.6	1.5
CS8.6	8-8	A	Stanfield Rd TI UP (#1090) Reprofile	161.6	$0.8	0.203	0.000	0.000	0.000	0.404	0.000	0.000	0.000	0.607	0.12	20.2	1.9
		B	Stanfield Rd TI UP (#1090) Bridge Replacement	161.6	$2.2	0.000	0.462	0.000	0.000	0.404	0.000	0.000	0.000	0.866	0.08	30.6	0.9
CS8.7	8-8	A	Murphy Rd UP (#1091) Reprofile	162.5	$0.6	0.104	0.000	0.000	0.000	0.404	0.000	0.000	0.000	0.508	0.09	20.2	1.6
		B	Murphy Rd UP (#1091) Bridge Replacement	162.5	$2.6	0.000	0.531	0.000	0.000	0.404	0.000	0.000	0.000	0.935	0.08	30.6	0.8
CS8.8	8-9	A	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	172.55	$2.9	1.953	0.777	0.001	0.001	0.881	0.001	0.000	0.000	3.614	0.28	20.2	7.0
		B	Thornton Rd TI UP (#1196) Bridge Replacement	172.55	$3.4	0.000	1.072	0.001	0.001	0.881	0.001	0.000	0.000	1.956	0.12	30.6	2.1
CS8.9	8-9	A	Chuichu Rd UP (#1197) Reprofile	173.53	$0.9	1.313	0.000	0.001	0.001	0.881	0.001	0.000	0.000	2.197	0.21	20.2	10.7
		B	Chuichu Rd UP (#1197) Bridge Replacement	173.53	$2.6	0.000	0.892	0.001	0.001	0.881	0.001	0.000	0.000	1.776	0.12	30.6	2.4
CS8-10	8-3		Wellton-Mohawk Safety Improvements	22 - 56	$2.8	0.000	0.000	0.332	0.005	0.024	0.009	0.000	0.061	0.291	4.95	8.8	4.5

5.3 Solution Risk Analysis

Following the calculation of the PES, an additional step is taken to develop the prioritized list of solutions. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of performance failure. **Figure 25** shows the risk matrix used to develop the risk weighting factors.

Figure 25: Risk Matrix

		Severity/Consequence				
		Insignificant	**Minor**	**Significant**	**Major**	**Catastrophic**
Frequency/ Likelihood	**Very Rare**	Low	Low	Low	Moderate	Major
	Rare	Low	Low	Moderate	Major	Major
	Seldom	Low	Moderate	Moderate	Major	Severe
	Common	Moderate	Moderate	Major	Severe	Severe
	Frequent	Moderate	Major	Severe	Severe	Severe

Using the risk matrix in **Figure 25**, numeric values were assigned to each category of frequency and severity. The higher the risk, the higher the numeric factor that was assigned. The risk weight for each area of the matrix was calculated by multiplying the severity factor times the frequency factor. These numeric factors are shown in **Figure 26**.

Figure 26: Numeric Risk Matrix

			Severity/Consequence				
			Insignificant	**Minor**	**Significant**	**Major**	**Catastrophic**
		Weight	1.00	1.10	1.20	1.30	1.40
Frequency/ Likelihood	**Very Rare**	1.00	1.00	1.10	1.20	1.30	1.40
	Rare	1.10	1.10	1.21	1.32	1.43	1.54
	Seldom	1.20	1.20	1.32	1.44	1.56	1.68
	Common	1.30	1.30	1.43	1.56	1.69	1.82
	Frequent	1.40	1.40	1.54	1.68	1.82	1.96

Using the values in **Figure 26**, risk weighting factors were calculated for each of the following four risk categories (low, moderate, major, and severe). These values are simply the average of the values in **Figure 26** that fall within each category. The resulting average risk weighting factors are:

Low	Moderate	Major	Severe
1.14	1.36	1.51	1.78

The risk weighting factors listed above are assigned to the five performance areas as follows:

- Safety = 1.78
  - The Safety performance area quantifies the likelihood of fatal or incapacitating injury crashes; therefore, it is assigned the Severe (1.78) risk weighting factor
- Bridge = 1.51
  - The Bridge performance area focuses on the structural adequacy of bridges; a bridge failure may result in crashes or traffic being detoured for long periods of time resulting in significant travel time increases; therefore, it is assigned the Major (1.51) risk weighting factor
- Mobility and Freight = 1.36
  - The Mobility and Freight performance areas focus on capacity and congestion; failure in either of these performance areas would result in increased travel times but would not have significant effect on safety (crashes) that would not already be addressed in the Safety performance area; therefore, they are assigned the Moderate (1.36) risk weighing factor
- Pavement = 1.14
  - The Pavement performance area focuses on the ride quality of the pavement; failure in this performance area would likely be a spot location that would not dramatically affect drivers beyond what is already captured in the Safety performance area; therefore, it is assigned the Low (1.14) risk weighting factor

The benefit in each performance area is calculated for each candidate solution as part of the Performance Effectiveness Evaluation. Using this information on benefits and the risk factors listed above, a weighted (based on benefit) solution-level numeric risk factor is calculated for each candidate solution. For example, a solution that has 50% of its benefit in Safety and 50% of its benefit in Mobility has a weighted risk factor of 1.57 (0.50 x 1.36 + 0.50 x 1.78 = 1.57).

5.4 Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score as follows:

Prioritization Score = PES x Weighted Risk Factor x Segment Average Need Score

Where:

*PES = Performance Effectiveness Score as shown in **Table 22***

Weighted Risk Factor = Weighted factor to address risk of not implementing a solution based on the likelihood and severity of the performance failure

*Segment Average Need Score = Segment average need score as shown in **Table 17***

Table 23 shows the prioritization scores for the candidate solutions subjected to the solution evaluation and prioritization process. Solutions that address multiple performance areas tend to score higher in this process. A prioritized list of candidate solutions is provided in the subsequent section. See **Appendix J** for additional information on the prioritization process.

Table 23: Prioritization Scores

Candidate Solution #	Segment #	Option	Candidate Solution Name	Milepost Location	Estimated Cost ($ million)	Performance Effectiveness Score	Weighted Risk Factor	Segment Average Need Score	Prioritization Score	Percentage by which Solution Reduces Performance Area Needs				
										Pavement	Bridge	Mobility	Safety	Freight
CS8.2	8-2	A	Dome Valley Rd TI WB UP (#1325) Reprofile	21.06	$0.3	2.2	1.329	0.77	2	15.4%		0.7%	0.5%	83.4%
		B	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	21.06	$1.8	2.5	1.465	0.77	3		69.1%	0.3%	0.2%	30.4%
CS8.3	8-7	A	Vekol Road TI UP (#550) Reprofile	144.55	$0.6	0.9	1.360	0.38	1		0.0%			100.0%
		B	Vekol Road TI UP (#550) Bridge Replacement	144.55	$2.2	1.5	1.479	0.92	1		79.3%			20.7%
CS8.6	8-8	A	Stanfield Rd TI UP (#1090) Reprofile	161.6	$0.8	1.9	1.287	0.54	1	33.4%				66.6%
		B	Stanfield Rd TI UP (#1090) Bridge Replacement	161.6	$2.2	0.9	1.440	0.54	1		53.3%			46.7%
CS8.7	8-8	A	Murphy Rd UP (#1091) Reprofile	162.5	$0.6	1.6	1.315	0.54	1	20.5%				79.5%
		B	Murphy Rd UP (#1091) Bridge Replacement	162.5	$2.6	0.8	1.445	0.54	1		56.8%			43.2%
CS8.8	8-9	A	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	172.55	$2.9	7.0	1.274	0.92	8	54.0%	21.5%			24.4%
		B	Thornton Rd TI UP (#1196) Bridge Replacement	172.55	$3.4	2.1	1.443	0.92	3		54.8%	0.1%	0.1%	45.0%
CS8.9	8-9	A	Chuichu Rd UP (#1197) Reprofile	173.53	$0.9	10.7	1.229	0.92	12	59.8%		0.1%	0.1%	40.1%
		B	Chuichu Rd UP (#1197) Bridge Replacement	173.53	$2.6	2.4	1.436	0.92	3		50.2%	0.1%	0.1%	49.6%
CS8.10	8-3		Wellton-Mohawk Safety Improvements	22-56	$2.8	4.5	1.722	1.00	8			86.3%	3.1%	10.6%

6.0 SUMMARY OF CORRIDOR RECOMMENDATIONS

6.1 Prioritized Candidate Solution Recommendations

Table 24 and **Figure 27** show the prioritized candidate solutions recommended for the I-8 corridor in ranked order of priority. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Implementation of these solutions is anticipated to improve performance of the I-8 corridor. The following observations were noted about the prioritized solutions:

- In the context of the eleven corridors assessed in the corridor profile program, the solutions for I-8 do not score high since the need level is Low in all performance areas.
- Candidate Solution 8.9 Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation ranked highest on the corridor due to a reduction in both Freight and Pavement needs at a relatively low cost. Thornton Rd TI UP (#1196) Bridge Vertical Clearance Mitigation also ranked near the top of the corridor list.
- Several sections of I-8 roadway considered pavement hot spots will not be improved by any currently programmed projects. It is anticipated that other preservation programming processes will address these needs in the future.

6.2 Other Corridor Recommendations

As part of the investigation of strategic investment areas and candidate solutions, other corridor recommendations can also be identified. These recommendations could include modifications to the existing Statewide Construction Program, areas for further study, or other corridor-specific recommendations that are not related to construction or policy. The list below identifies other corridor recommendations for the I-8 corridor:

- Consider a corridor strategy to upgrade all bridges to current standards in anticipation of increased truck/freight traffic over the medium to long term.
- Consider corridor wide ITS solutions to assist truck/freight traffic over the medium to long term.

6.3 Policy and Initiative Recommendations

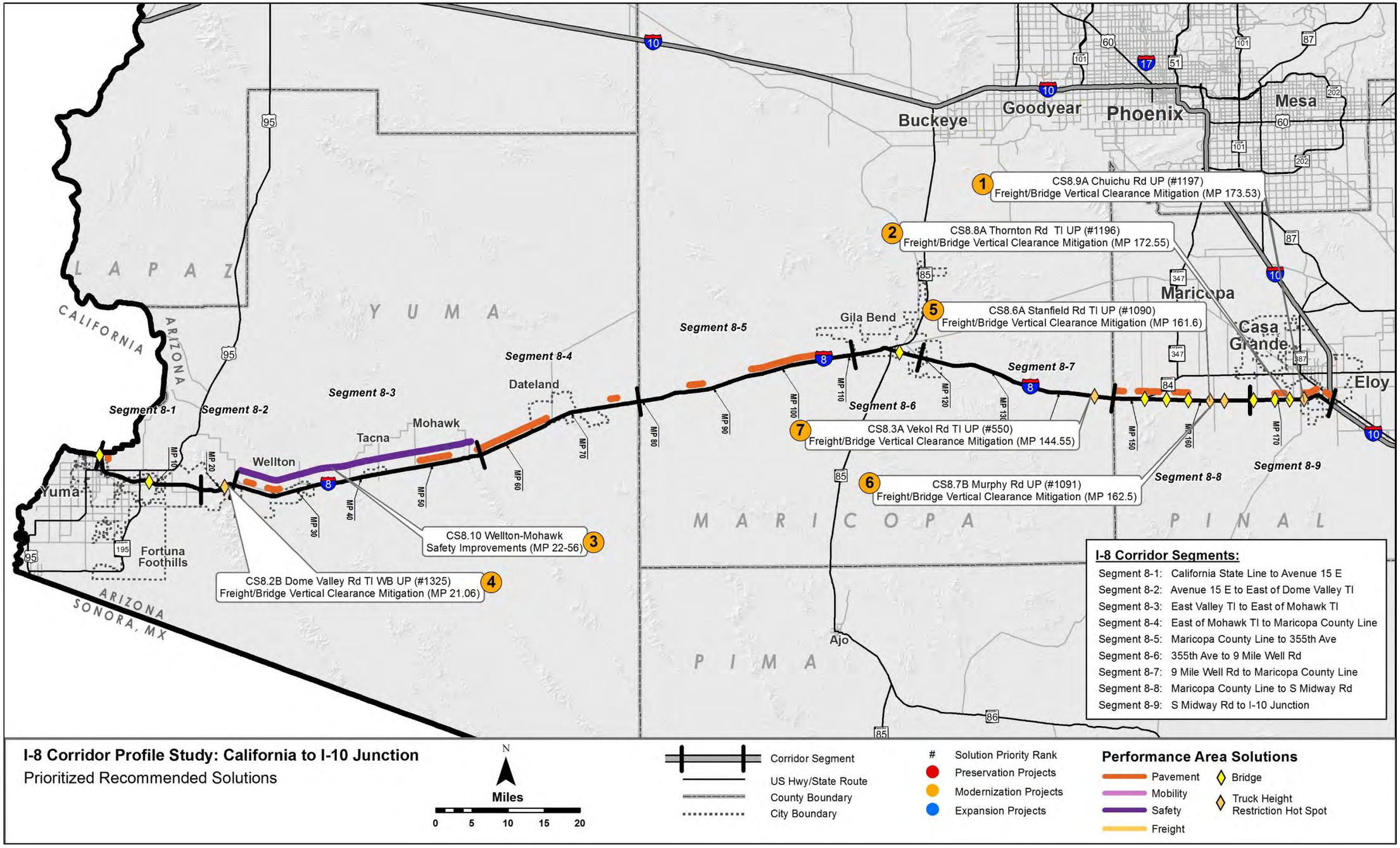
In addition to location-specific needs, general corridor and system-wide needs have also been identified through the CPS process. While these needs are more overarching and cannot be individually evaluated through this process, it is important to document them. A list of recommended policies and initiatives was developed for consideration when programming future projects not only on I-8, but across the entire state highway system where the conditions are applicable. The following list, which is in no particular order of priority, was derived from the Round 1, Round 2, and Round 3 CPS:

- Install Intelligent Transportation System (ITS) conduit with all new infrastructure projects
- Prepare strategic plans for Closed Circuit Television (CCTV) camera and Road Weather Information System (RWIS) locations statewide
- Leverage power and communication at existing weigh-in-motion (WIM), dynamic message signs (DMS), and call box locations to expand ITS applications across the state
- Consider solar power for lighting and ITS where applicable
- Investigate ice formation prediction technology where applicable
- Conduct highway safety manual evaluation for all future programmed projects
- Develop infrastructure maintenance and preservation plans (including schedule and funding) for all pavement and bridge infrastructure replacement or expansion projects
- Develop standardized bridge maintenance procedures so districts can do routine maintenance work
- Review historical ratings and level of previous investment during scoping of pavement and bridge projects. In pavement locations that warrant further investigation, conduct subsurface investigations during project scoping to determine if full replacement is warranted
- For pavement rehabilitation projects, enhance the amount/level of geotechnical investigations to address issues specific to the varying conditions along the project
- Expand programmed and future pavement projects as necessary to include shoulders
- Expand median cable barrier guidelines to account for safety performance
- Install CCTV cameras with all DMS
- In locations with limited communications, use CCTV cameras to provide still images rather than streaming video
- Develop statewide program for pavement replacement
- Install additional continuous permanent count stations along strategic corridors to enhance traffic count data
- When reconstruction or rehabilitation activities will affect existing bridge vertical clearance, the dimension of the new bridge vertical clearance should be a minimum of 16.25 feet where feasible
- All new or reconstructed roadway/shoulder edges adjacent to an unpaved surface should be constructed with a Safety Edge
- Collision data on tribal lands may be incomplete or inconsistent; additional coordination for data on tribal lands is required to ensure adequate reflection of safety issues
- Expand data collection devices statewide to measure freight delay
- Evaluate and accommodate potential changes in freight and goods movement trends that may result from improvements and expansions to the state roadway network

Table 24: Prioritized Recommended Solutions

Rank	Candidate Solution #	Option	Candidate Solution Name	Candidate Solution Scope	Estimated Cost ($ million)	Investment Category [P] Preservation [M] Modernization [E]Expansion	Prioritization Score
1	CS8.9	A	Chuichu Rd UP (#1197) Freight / Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	$0.9	M	12
		B	*Chuichu Rd UP (#1197)* *Freight / Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$2.6*	*M*	*3*
2	CS8.8	A	Thornton Rd TI UP (#1196) Freight / Bridge Vertical Clearance Mitigation	Rehabilitate the bridge Re-profile roadway to achieve 16.5 feet vertical clearance	$2.9	M	8
		B	*Thornton Rd TI UP (#1196)* *Freight / Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$3.4*	*M*	*3*
3	CS8.10	-	Wellton-Mohawk Safety Improvements	Speed Feedback Signs (EB MP 28, EB MP 40, EB MP 45, EB MP 53.75, WB MP 23, WB MP 31.5, WB MP 44, WB MP 56.5) Install Lighting (WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99)	$2.8	M	8
4	CS8.2	B	Dome Valley Rd TI WB UP (#1325) Freight / Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	$1.8	M	3
		A	*Dome Valley Rd TI WB UP (#1325)* *Freight / Bridge Vertical Clearance Mitigation*	*Re-profile roadway to achieve 16.5 feet vertical clearance*	*$0.3*	*M*	*2*
5	CS8.6	A	Stanfield Rd TI UP (#1090) Freight / Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	$0.8	M	1
		B	*Stanfield Rd TI UP (#1090)* *Freight / Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$2.2*	*M*	*1*
6	CS8.7	A	Murphy Rd UP (#1091) Freight / Bridge Vertical Clearance Mitigation	Re-profile roadway to achieve 16.5 feet vertical clearance	$0.6	M	1
		B	*Murphy Rd UP (#1091)* *Freight / Bridge Vertical Clearance Mitigation*	*Replace bridge to achieve 16.5 feet vertical clearance*	*$2.6*	*M*	*1*
7	CS8.3	B	Vekol Road TI UP (#550) Freight / Bridge Vertical Clearance Mitigation	Replace bridge to achieve 16.5 feet vertical clearance	$2.2	M	1
		A	*Vekol Road TI UP (#550)* *Freight / Bridge Vertical Clearance Mitigation*	*Re-profile roadway to achieve 16.5 feet vertical clearance*	*$0.6*	*M*	*1*

Figure 27: Prioritized Recommended Solutions



6.4 Next Steps

The candidate solutions recommended in this study are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the I-8 corridor will be considered along with other candidate projects in the ADOT statewide programming process.

It is important to note that the candidate solutions are intended to represent strategic solutions to address existing performance needs related to the Pavement, Bridge, Mobility, Safety, and Freight performance areas. Therefore, the strategic solutions are not intended to preclude recommendations related to the ultimate vision for the corridor that may have been defined in the context of prior planning studies and/or design concept reports. Recommendations from such studies are still relevant to addressing the ultimate corridor objectives.

Upon completion of all three CPS rounds, the results will be incorporated into a summary document comparing all corridors that is expected to provide a performance-based review of statewide needs and candidate solutions.

Appendix A: Corridor Performance Maps

This appendix contains maps of each primary and secondary measure associated with the five performance areas for the I-8 corridor. The following are the areas and maps included:

Pavement Performance Area:

- Pavement Index and Hot Spots
- Pavement Serviceability (directional)
- Percentage of Pavement Area Failure

Bridge Performance Area:

- Bridge Index and Hot Spots
- Bridge Sufficiency
- Percent of Deck Area on Functionally Obsolete Bridges
- Lowest Bridge Rating

Mobility Performance Area:

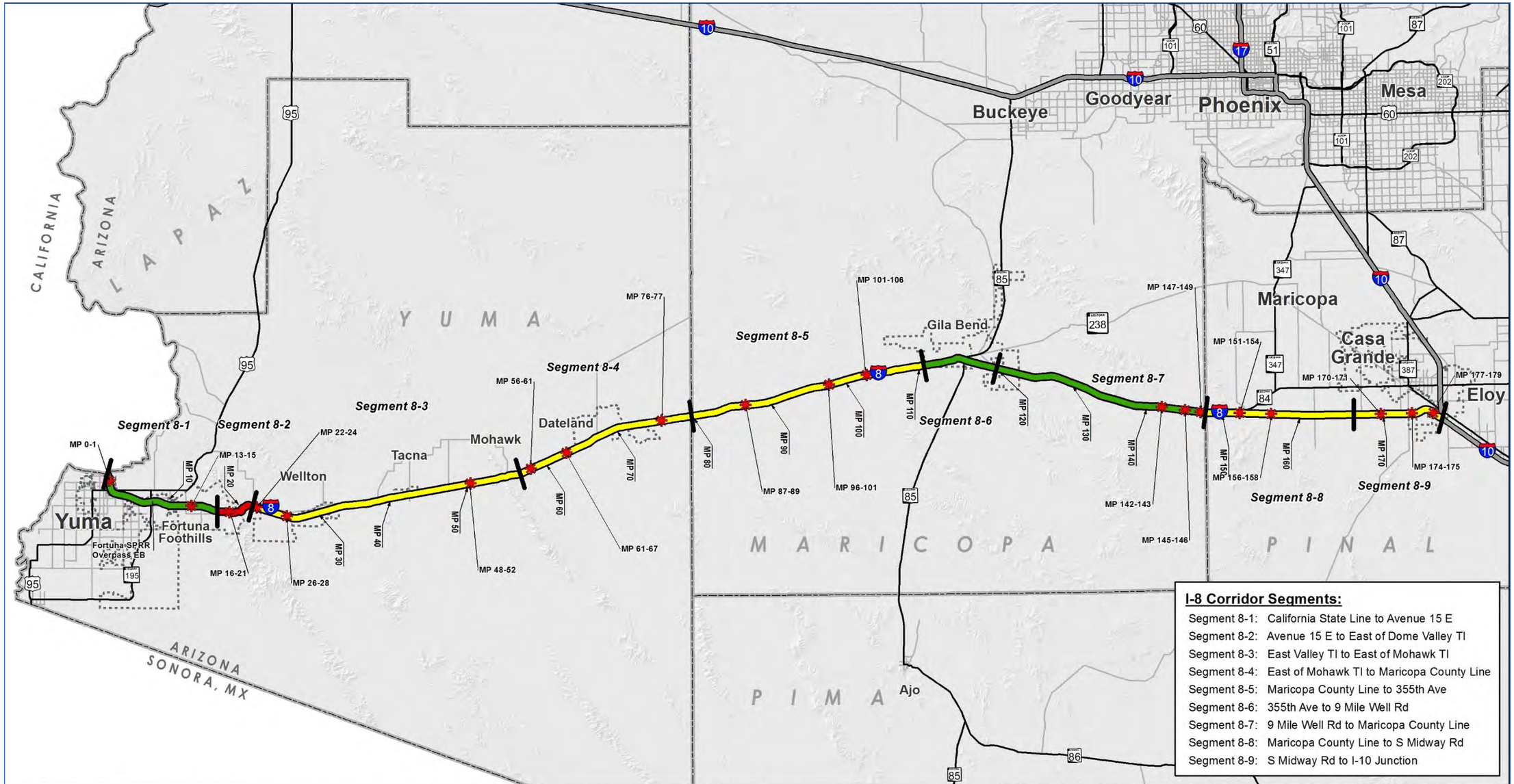
- Mobility Index
- Future Daily V/C
- Existing Peak V/C (directional)
- Average Instances Per Year a Given Milepost is Closed Per Segment Mile
- All Vehicles Travel Time Index
- All Vehicles Planning Time Index
- Multimodal Opportunities
- Bicycle Accommodation

Safety Performance Area:

- Safety Index
- Safety Index (Directional)
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors Compared to the Statewide Average for Similar Segments

Freight Performance Area:

- Freight Index and Hot Spots
- Truck Travel Time Index
- Truck Planning Time Index
- Average Minutes per Year Given Milepost Is Closed per Segment Mile
- Bridge Vertical Clearance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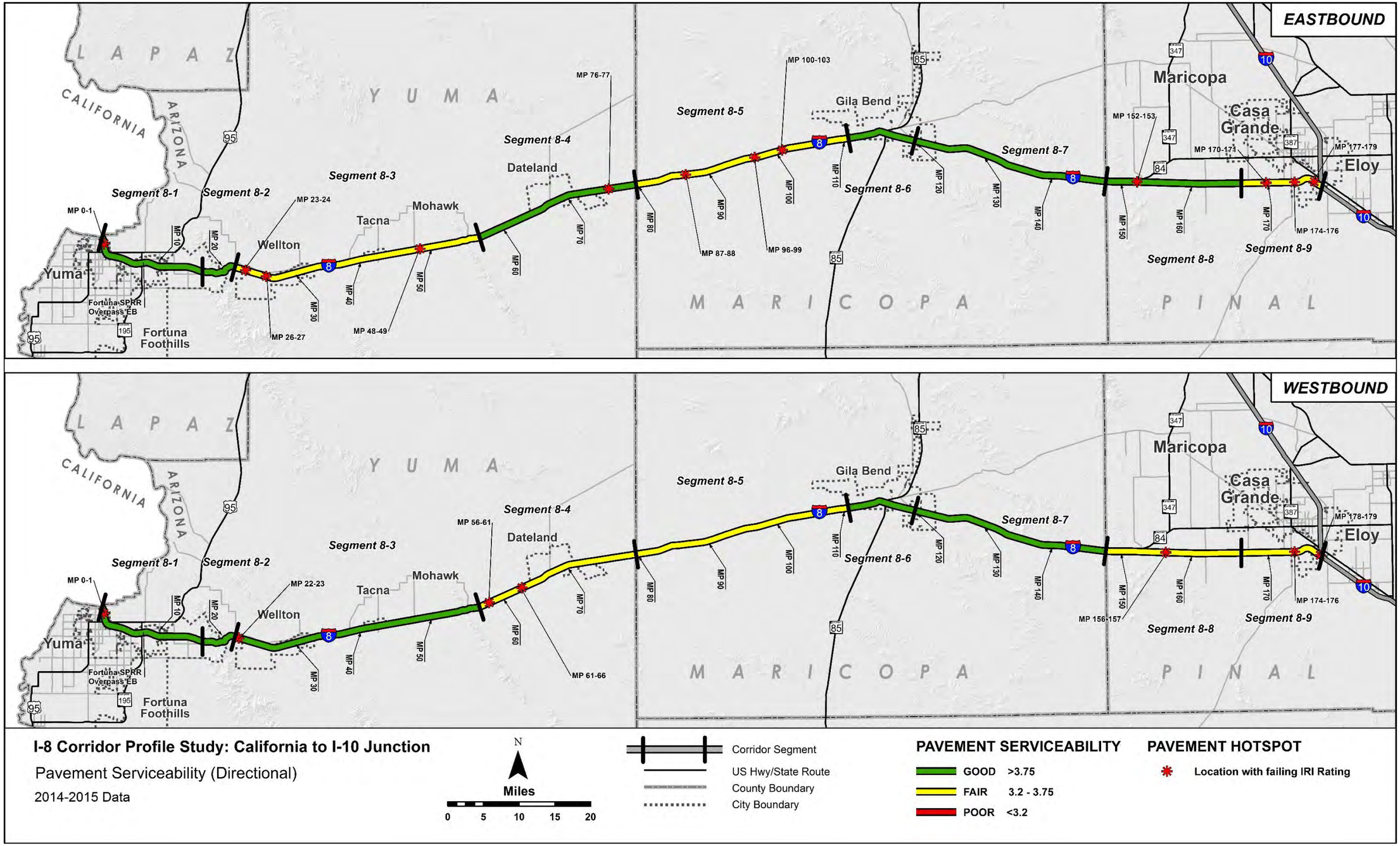
Segment 8-7
Segment 8-8
Segment 8-9
MP 0-1
MP 13-15
MP 22-24
MP 16-21
MP 26-28
MP 48-52
MP 61-67
MP 56-61
MP 76-77
MP 87-89
MP 96-101
MP 101-106
MP 142-143
MP 145-146
MP 147-149
MP 151-154
MP 156-158
MP 170-171
MP 174-175
MP 177-179
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
Segment 8-2: Avenue 15 E to East of Dome Valley TI
Segment 8-3: East Valley TI to East of Mohawk TI
Segment 8-4: East of Mohawk TI to Maricopa County Line
Segment 8-5: Maricopa County Line to 355th Ave
Segment 8-6: 355th Ave to 9 Mile Well Rd
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Pavement Index and Hot Spots
2014-2015 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
PAVEMENT INDEX
GOOD > 3.75
FAIR 3.2 - 3.75
POOR < 3.2
PAVEMENT HOT SPOT
Location of Pavement in Failure



I-8 Corridor Profile Study: California to I-10 Junction

Pavement Serviceability (Directional)

2014-2015 Data

N

Miles

0 5 10 15 20

Corridor Segment

US Hwy/State Route

County Boundary

City Boundary

PAVEMENT SERVICEABILITY

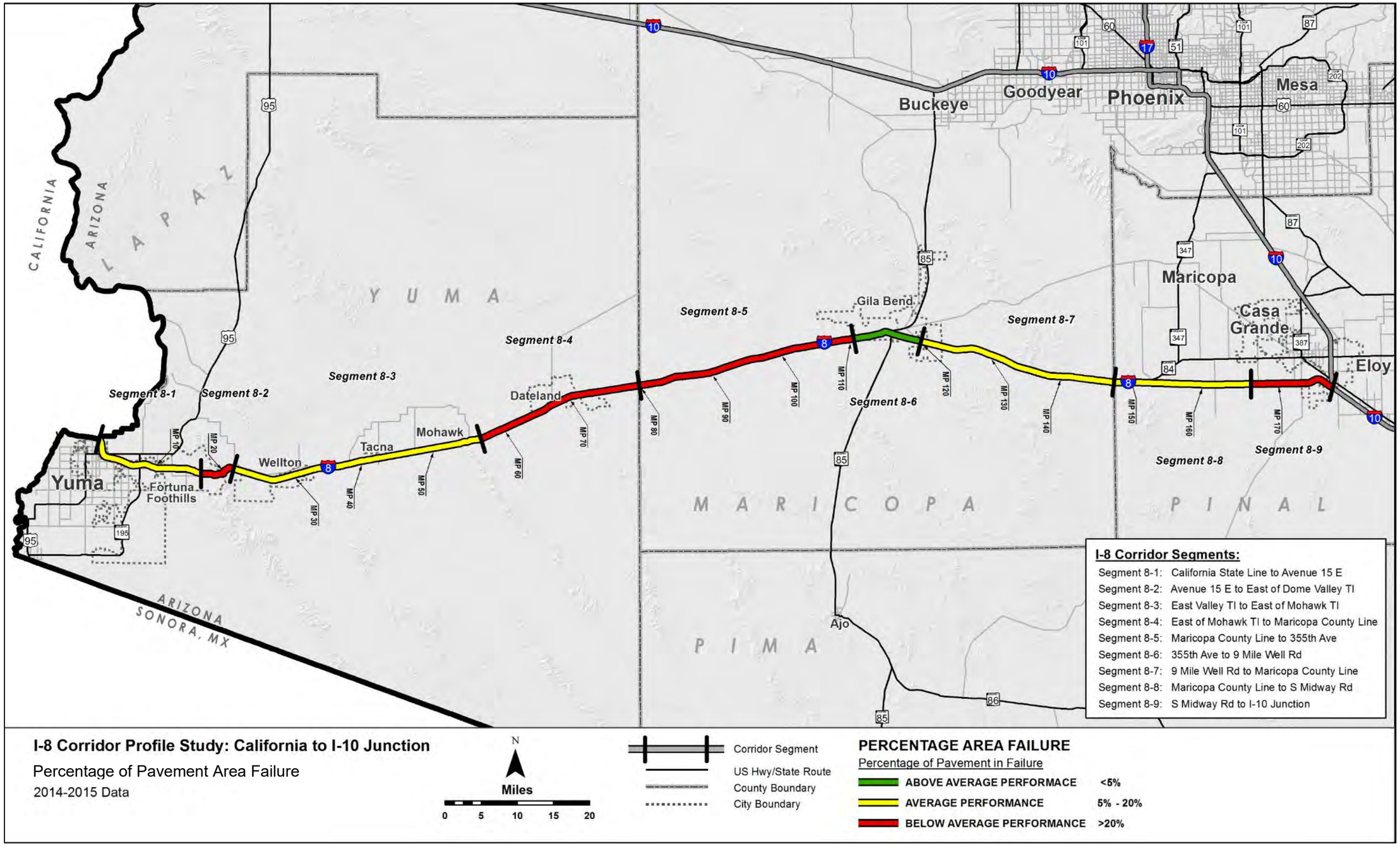
GOOD >3.75

FAIR 3.2 - 3.75

POOR <3.2

PAVEMENT HOTSPOT

Location with failing IRI Rating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Segment 8-9
MP 10
MP 20
MP 30
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MP 60
MP 70
MP 80
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
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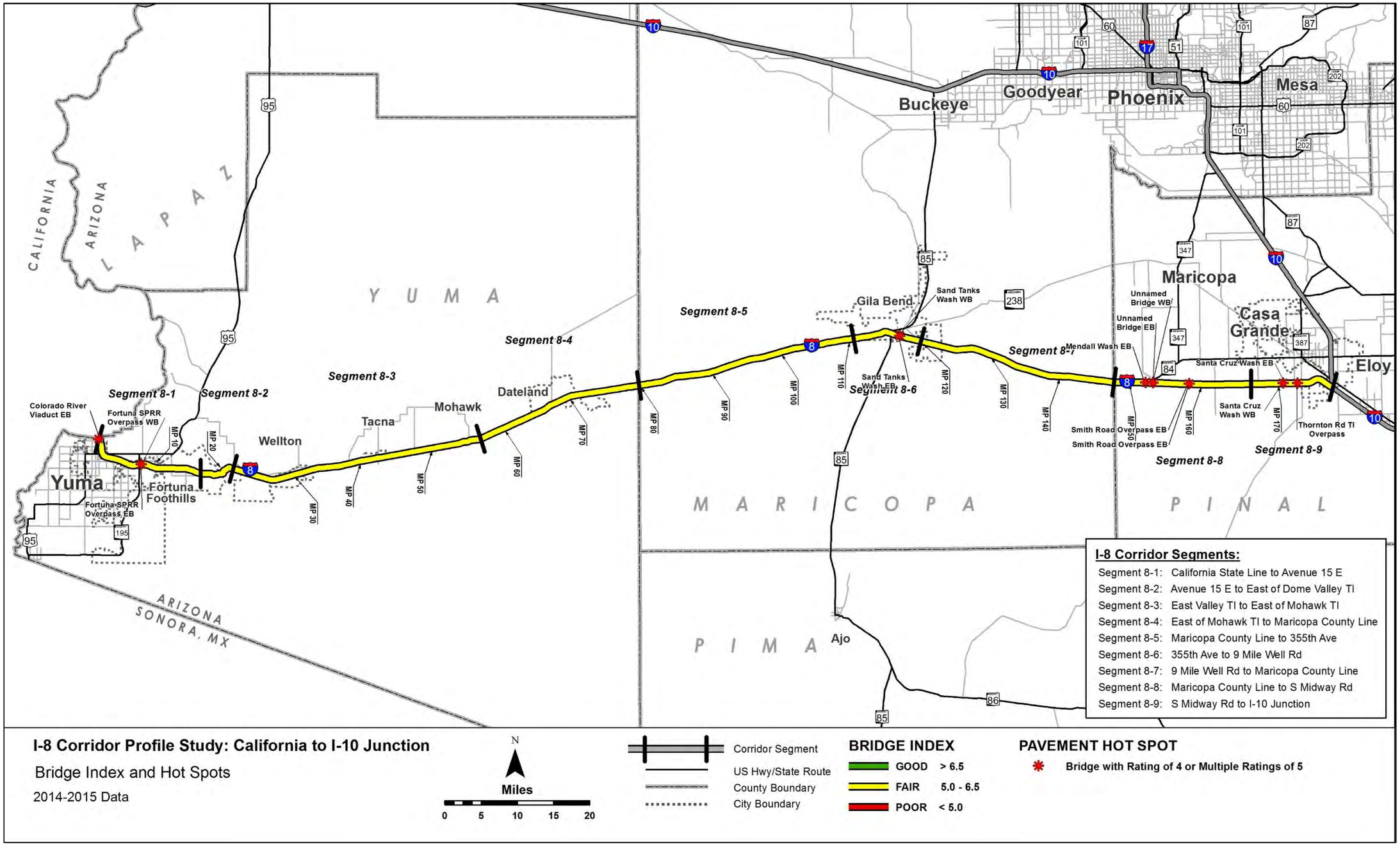
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
Segment 8-2: Avenue 15 E to East of Dome Valley TI
Segment 8-3: East Valley TI to East of Mohawk TI
Segment 8-4: East of Mohawk TI to Maricopa County Line
Segment 8-5: Maricopa County Line to 355th Ave
Segment 8-6: 355th Ave to 9 Mile Well Rd
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Percentage of Pavement Area Failure
2014-2015 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
PERCENTAGE AREA FAILURE
Percentage of Pavement in Failure
ABOVE AVERAGE PERFORMACE <5%
AVERAGE PERFORMANCE 5% - 20%
BELOW AVERAGE PERFORMANCE >20%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Segment 8-9
Colorado River Viaduct EB
Fortuna SPRR Overpass WB
Fortuna SPRR Overpass EB
Sand Tanks Wash WB
Sand Tanks Wash EB
Unnamed Bridge WB
Unnamed Bridge EB
Mendall Wash EB
Santa Cruz Wash EB
Santa Cruz Wash WB
Smith Road Overpass EB
Smith Road Overpass EB
Thornton Rd TI Overpass
MP 10
MP 20
MP 30
MP 40
MP 50
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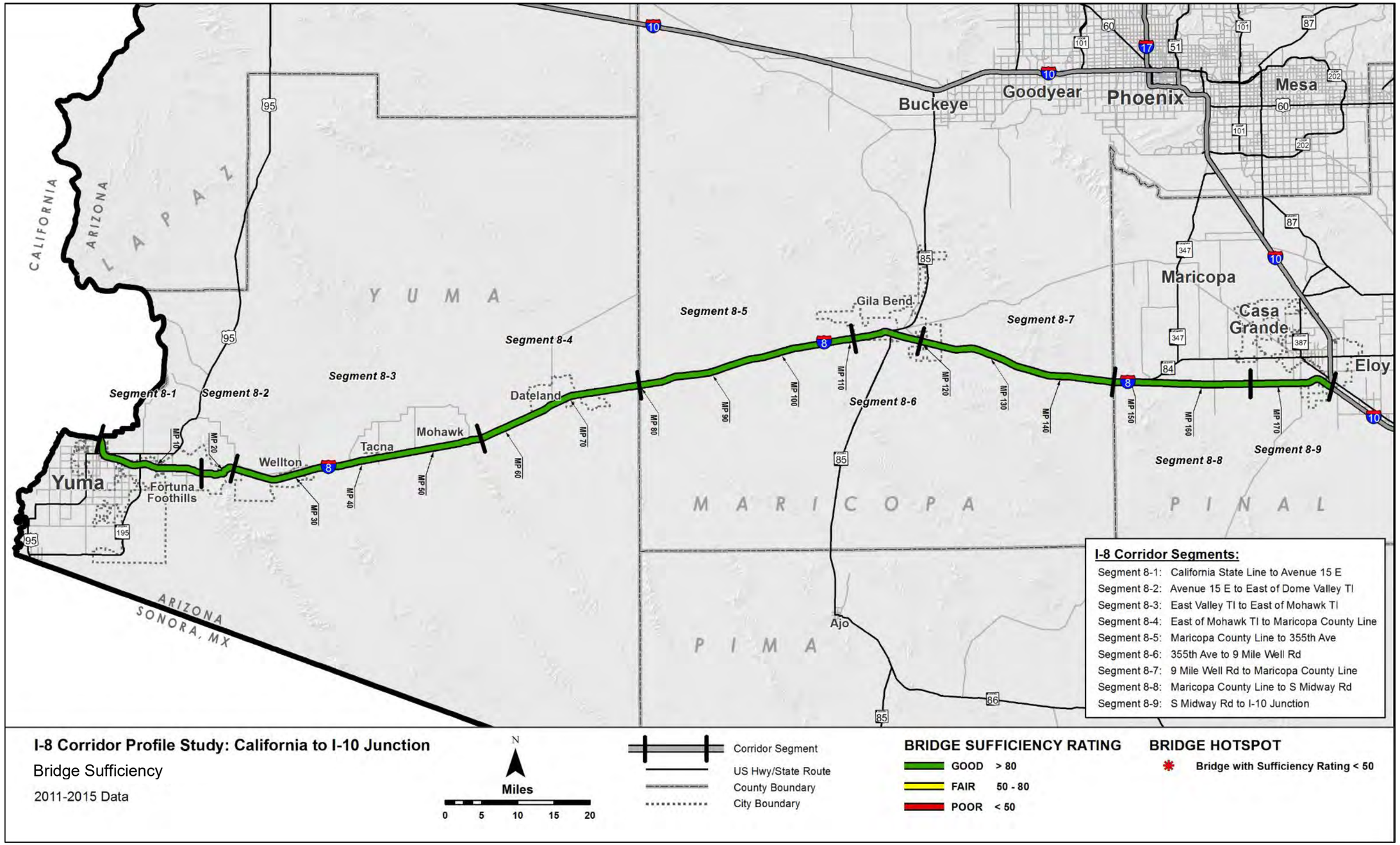
I-8 Corridor Profile Study: California to I-10 Junction
Bridge Index and Hot Spots
2014-2015 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
BRIDGE INDEX
GOOD > 6.5
FAIR 5.0 - 6.5
POOR < 5.0
PAVEMENT HOT SPOT
Bridge with Rating of 4 or Multiple Ratings of 5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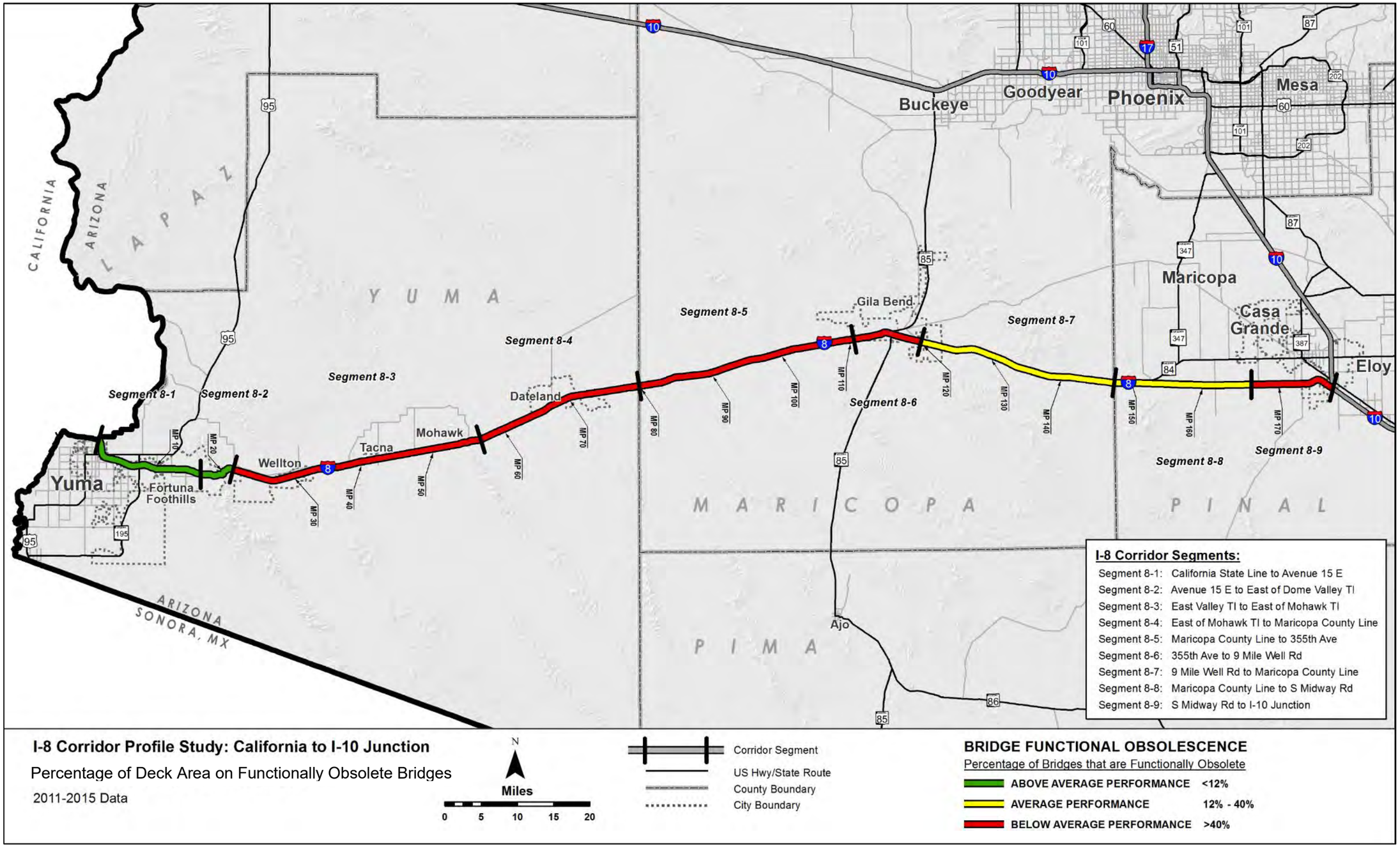
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Bridge Sufficiency
2011-2015 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
BRIDGE SUFFICIENCY RATING
GOOD > 80
FAIR 50 - 80
POOR < 50
BRIDGE HOTSPOT
Bridge with Sufficiency Rating < 50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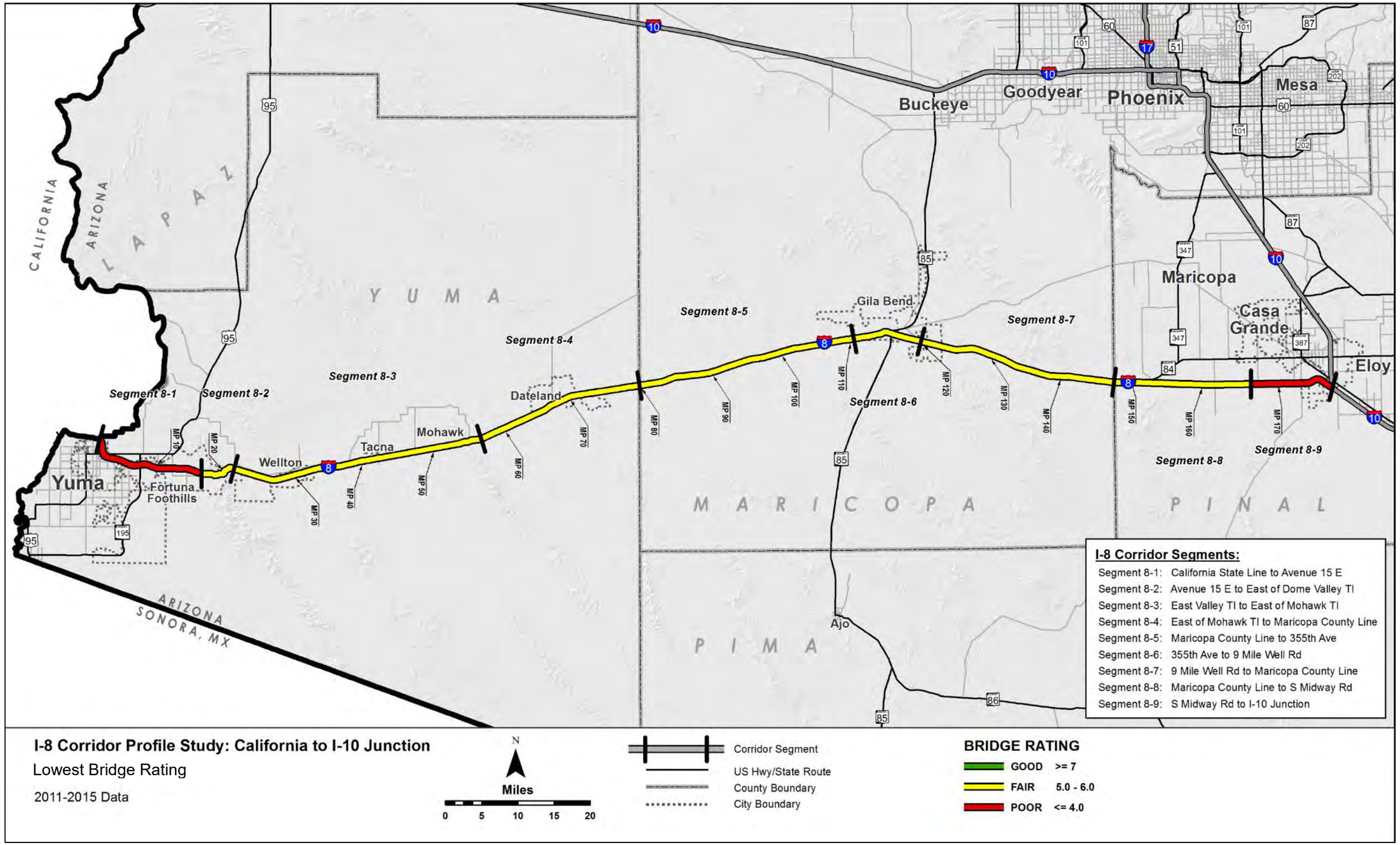
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Percentage of Deck Area on Functionally Obsolete Bridges
2011-2015 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
BRIDGE FUNCTIONAL OBSOLESCENCE
Percentage of Bridges that are Functionally Obsolete
ABOVE AVERAGE PERFORMANCE <12%
AVERAGE PERFORMANCE 12% - 40%
BELOW AVERAGE PERFORMANCE >40%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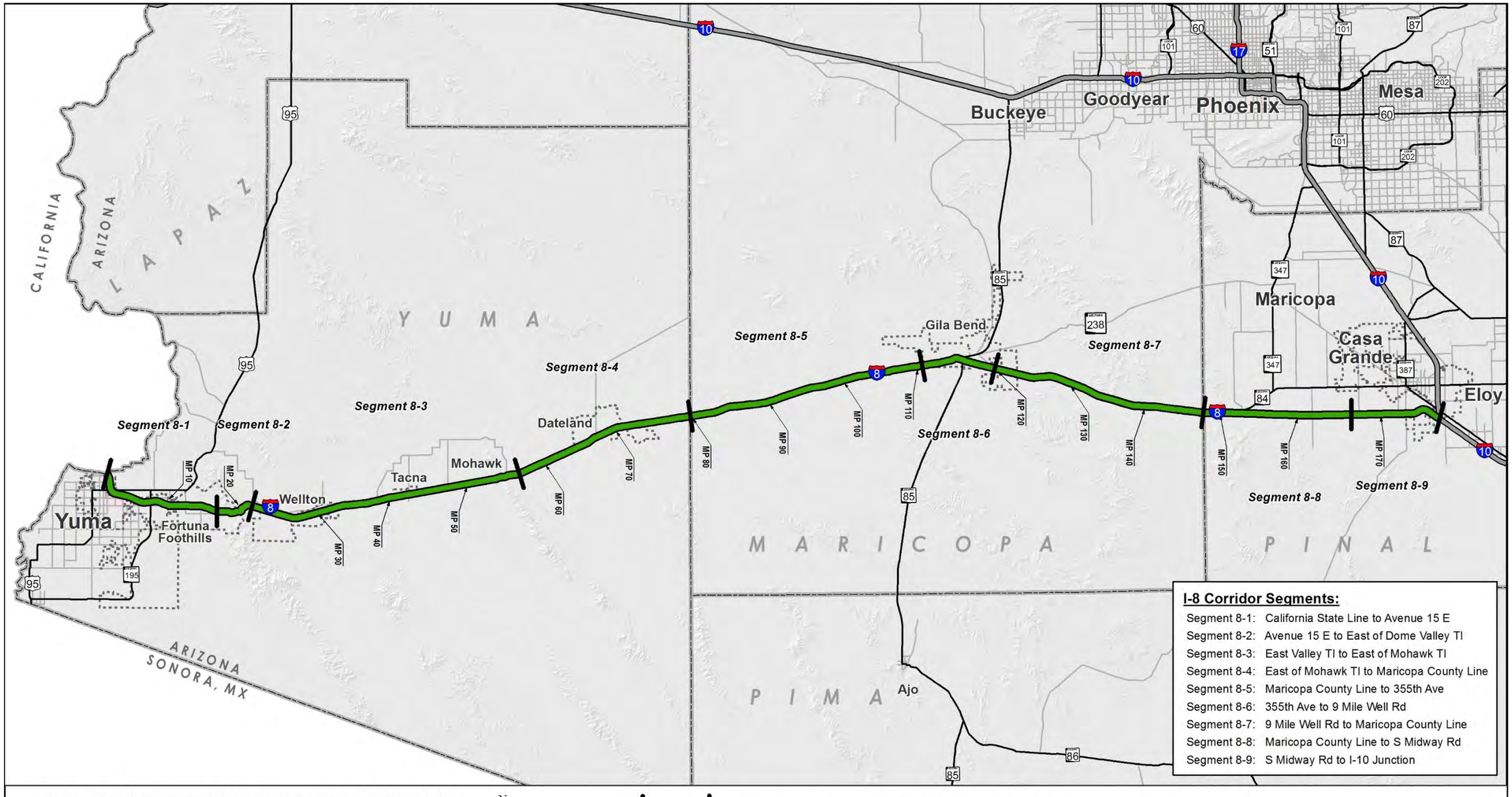
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Lowest Bridge Rating
2011-2015 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
BRIDGE RATING
GOOD >= 7
FAIR 5.0 - 6.0
POOR <= 4.0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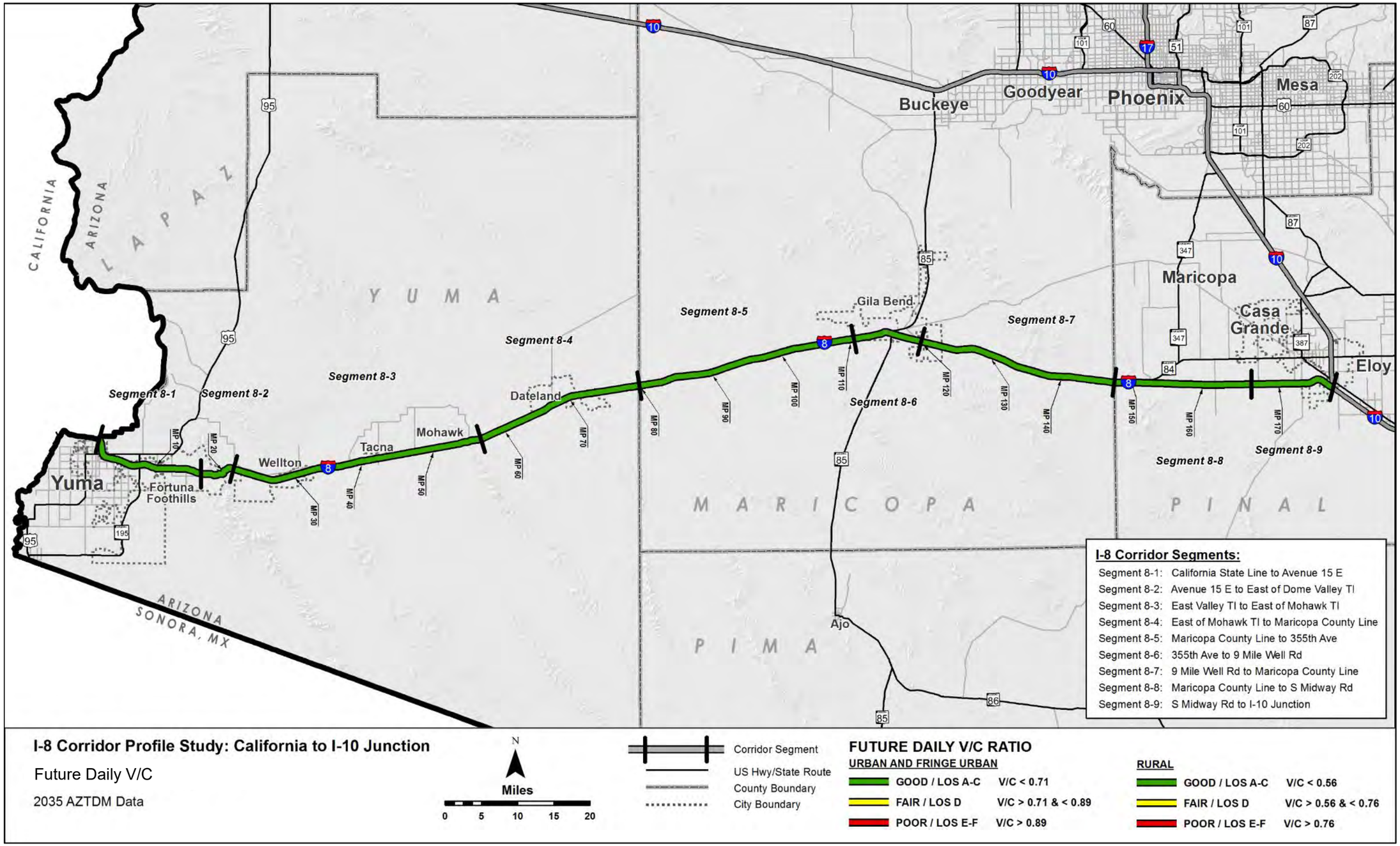
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Mobility Index
2013 AADT, 2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
MOBILITY INDEX
Urban and Fringe Urban (Segment 8-1)
GOOD / LOS A-C V/C < 0.71
FAIR / LOS D V/C > 0.71 & < 0.89
POOR / LOS E-F V/C > 1.21
Rural (Segments 8-2 thru 8-9)
GOOD / LOS A-C V/C < 0.56
FAIR / LOS D V/C > 0.56 & < 0.76
POOR / LOS E-F V/C > 0.76


CALIFORNIA
ARIZONA
LA PAZ
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PIMA
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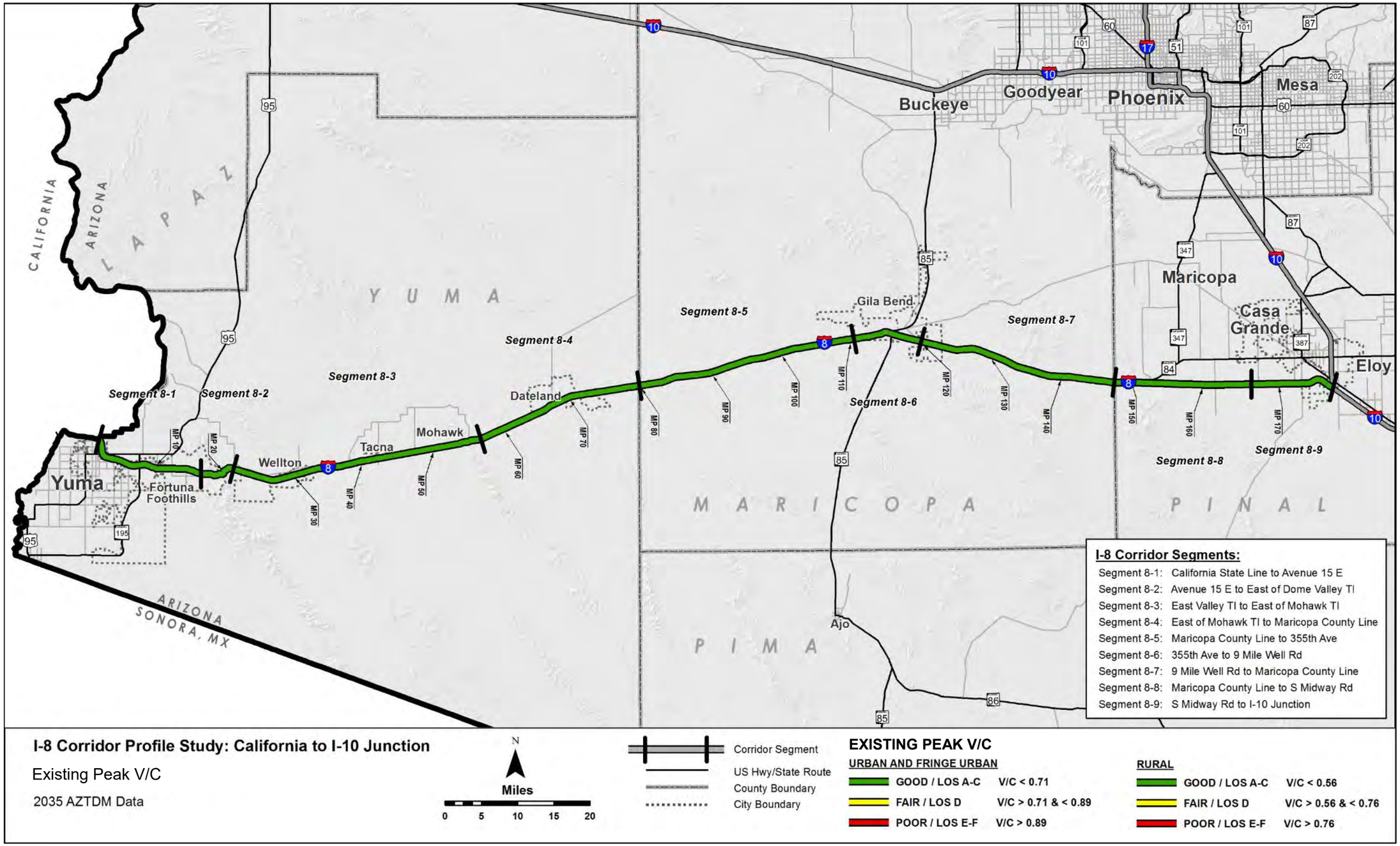
SONORA, MX
Buckeye
Goodyear
Phoenix
Mesa
Maricopa
Casa Grande
Eloy
Gila Bend
Ajo
Dateland
Mohawk
Tacna
Wellton
Yuma
Fortuna Foothills
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
MP 10
MP 20
MP 30
MP 40
MP 50
MP 60
MP 70
MP 80
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
Segment 8-2: Avenue 15 E to East of Dome Valley TI
Segment 8-3: East Valley TI to East of Mohawk TI
Segment 8-4: East of Mohawk TI to Maricopa County Line
Segment 8-5: Maricopa County Line to 355th Ave
Segment 8-6: 355th Ave to 9 Mile Well Rd
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Future Daily V/C
2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
FUTURE DAILY V/C RATIO
URBAN AND FRINGE URBAN
GOOD / LOS A-C V/C < 0.71
FAIR / LOS D V/C > 0.71 & < 0.89
POOR / LOS E-F V/C > 0.89
RURAL
GOOD / LOS A-C V/C < 0.56
FAIR / LOS D V/C > 0.56 & < 0.76
POOR / LOS E-F V/C > 0.76


CALIFORNIA
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MARICOPA
PINAL
PIMA
Buckeye
Goodyear
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Mesa
Maricopa
Casa Grande
Eloy
Gila Bend
Ajo
Dateland
Mohawk
Tacna
Wellton
Yuma
Fortuna Foothills
ARIZONA
SONORA, MX
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
Segment 8-2: Avenue 15 E to East of Dome Valley TI
Segment 8-3: East Valley TI to East of Mohawk TI
Segment 8-4: East of Mohawk TI to Maricopa County Line
Segment 8-5: Maricopa County Line to 355th Ave
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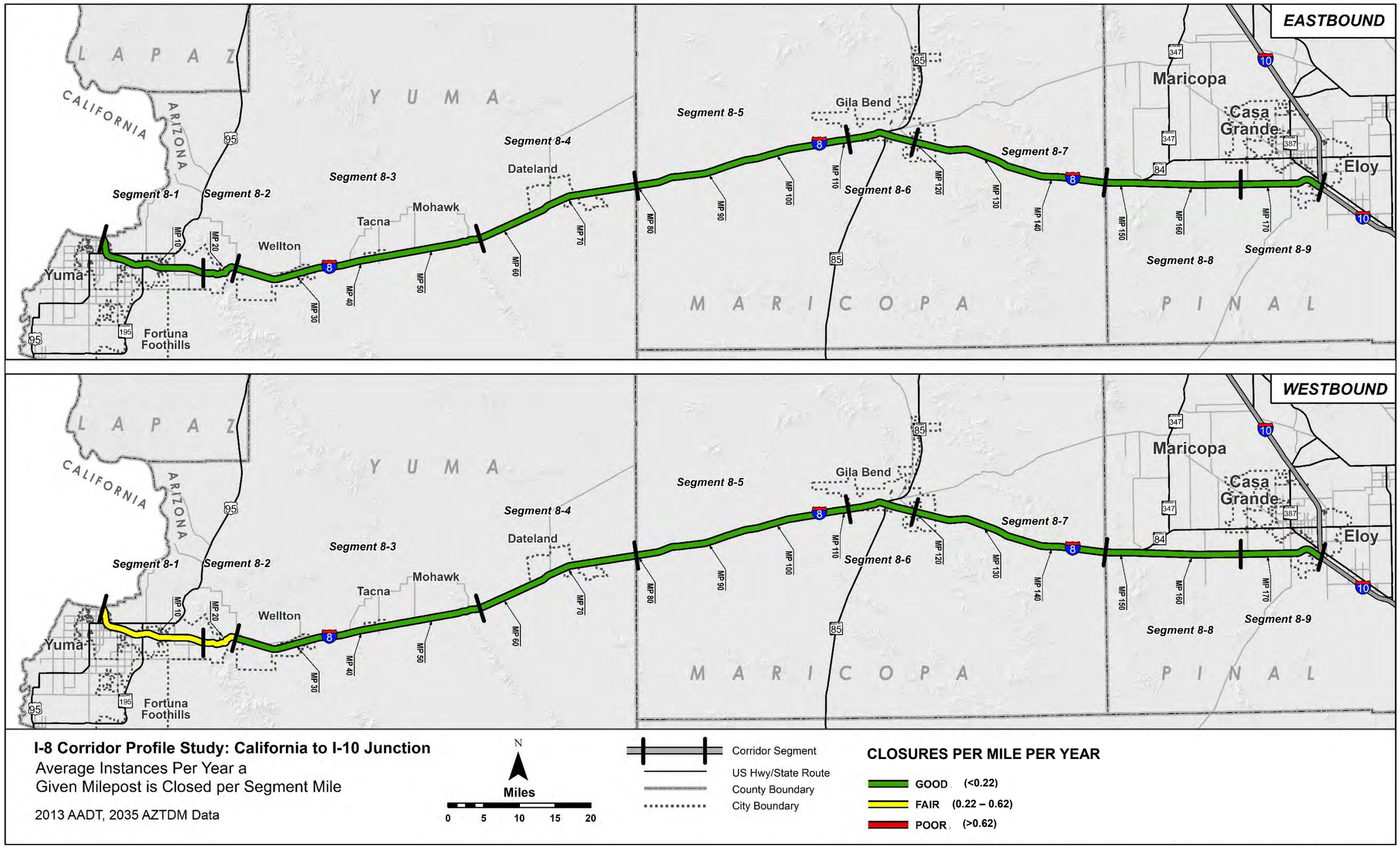
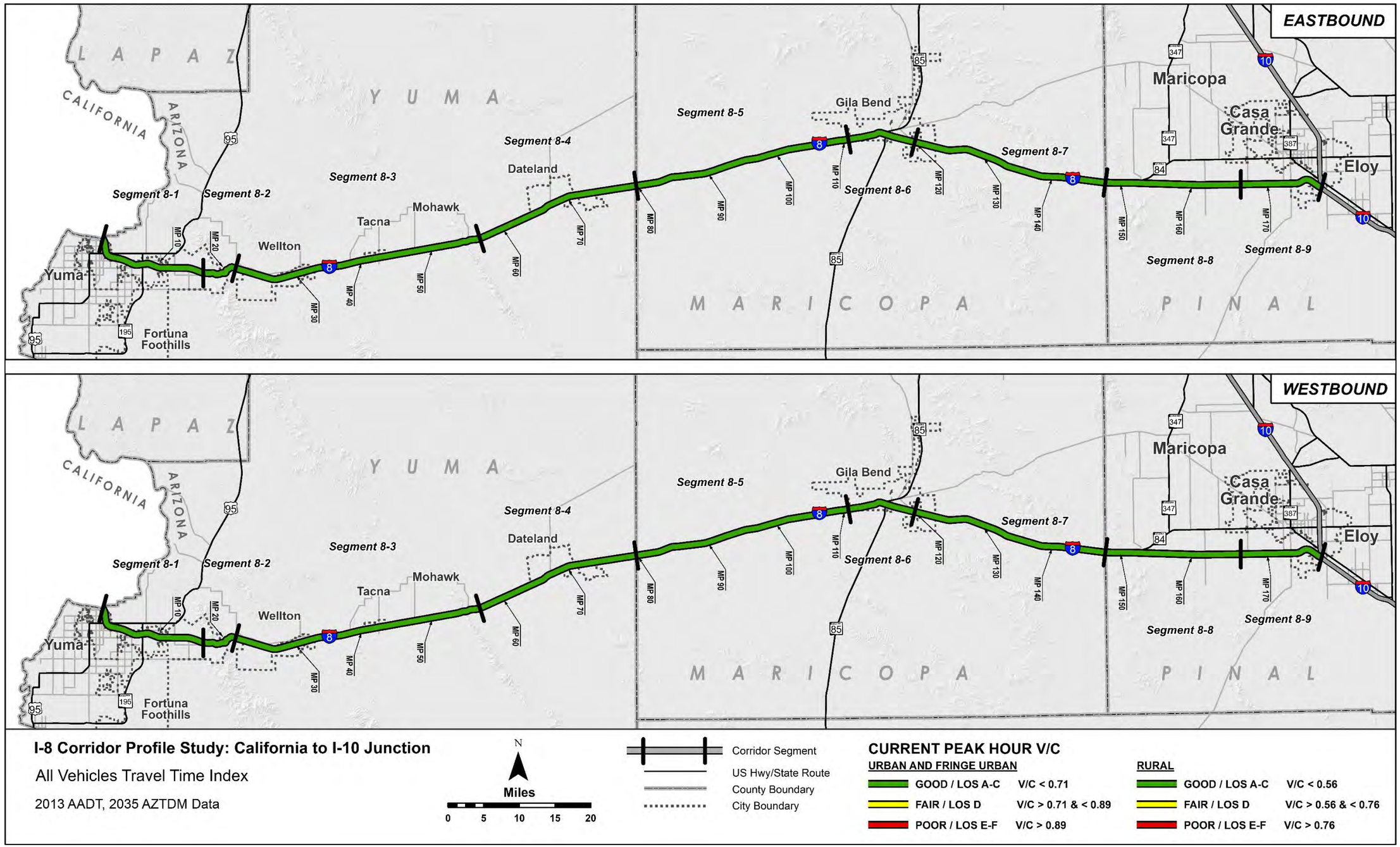
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Existing Peak V/C
2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
EXISTING PEAK V/C
URBAN AND FRINGE URBAN
GOOD / LOS A-C V/C < 0.71
FAIR / LOS D V/C > 0.71 & < 0.89
POOR / LOS E-F V/C > 0.89
RURAL
GOOD / LOS A-C V/C < 0.56
FAIR / LOS D V/C > 0.56 & < 0.76
POOR / LOS E-F V/C > 0.76


EASTBOUND
WESTBOUND
L A P A Z
CALIFORNIA
ARIZONA
Y U M A
M A R I C O P A
P I N A L
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
Yuma
Fortuna Foothills
Wellton
Tacna
Mohawk
Dateland
Gila Bend
Maricopa
Casa Grande
Eloy
MP 10
MP 20
MP 30
MP 40
MP 50
MP 60
MP 70
MP 80
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Profile Study: California to I-10 Junction
Average Instances Per Year a
Given Milepost is Closed per Segment Mile
2013 AADT, 2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
CLOSURES PER MILE PER YEAR
GOOD (<0.22)
FAIR (0.22 – 0.62)
POOR (>0.62)


EASTBOUND
WESTBOUND
L A P A Z
CALIFORNIA
ARIZONA
Y U M A
M A R I C O P A
P I N A L
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
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Segment 8-9
Yuma
Fortuna Foothills
Wellton
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Dateland
Gila Bend
Maricopa
Casa Grande
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MP 10
MP 20
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MP 70
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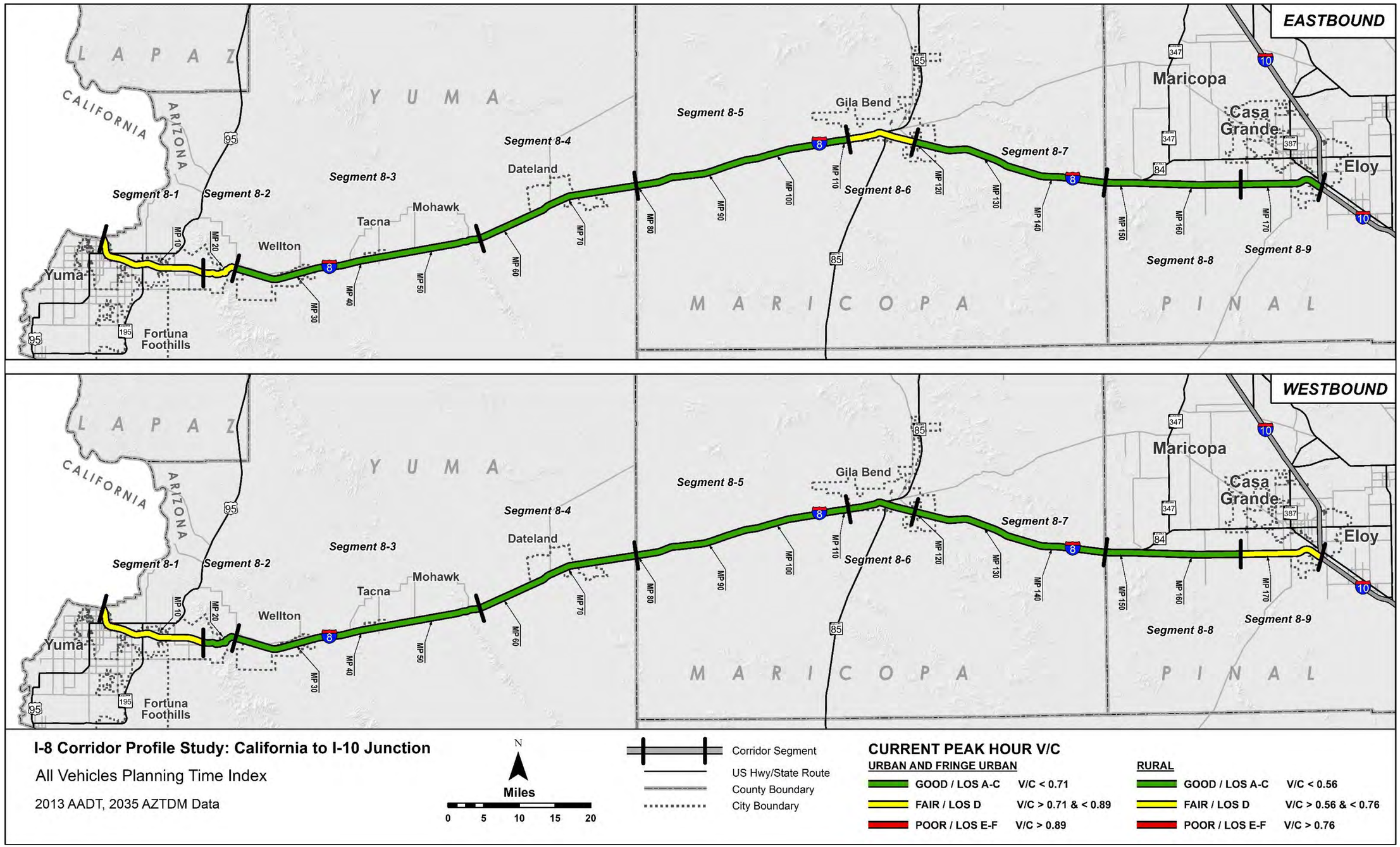
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
8
10
85
95
195
347
387
84
I-8 Corridor Profile Study: California to I-10 Junction
All Vehicles Travel Time Index
2013 AADT, 2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
CURRENT PEAK HOUR V/C
URBAN AND FRINGE URBAN
GOOD / LOS A-C V/C < 0.71
FAIR / LOS D V/C > 0.71 & < 0.89
POOR / LOS E-F V/C > 0.89
RURAL
GOOD / LOS A-C V/C < 0.56
FAIR / LOS D V/C > 0.56 & < 0.76
POOR / LOS E-F V/C > 0.76


EASTBOUND
WESTBOUND
L A P A Z
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ARIZONA
Y U M A
M A R I C O P A
P I N A L
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
Yuma
Fortuna Foothills
Wellton
Tacna
Mohawk
Dateland
Gila Bend
Maricopa
Casa Grande
Eloy
MP 10
MP 20
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MP 70
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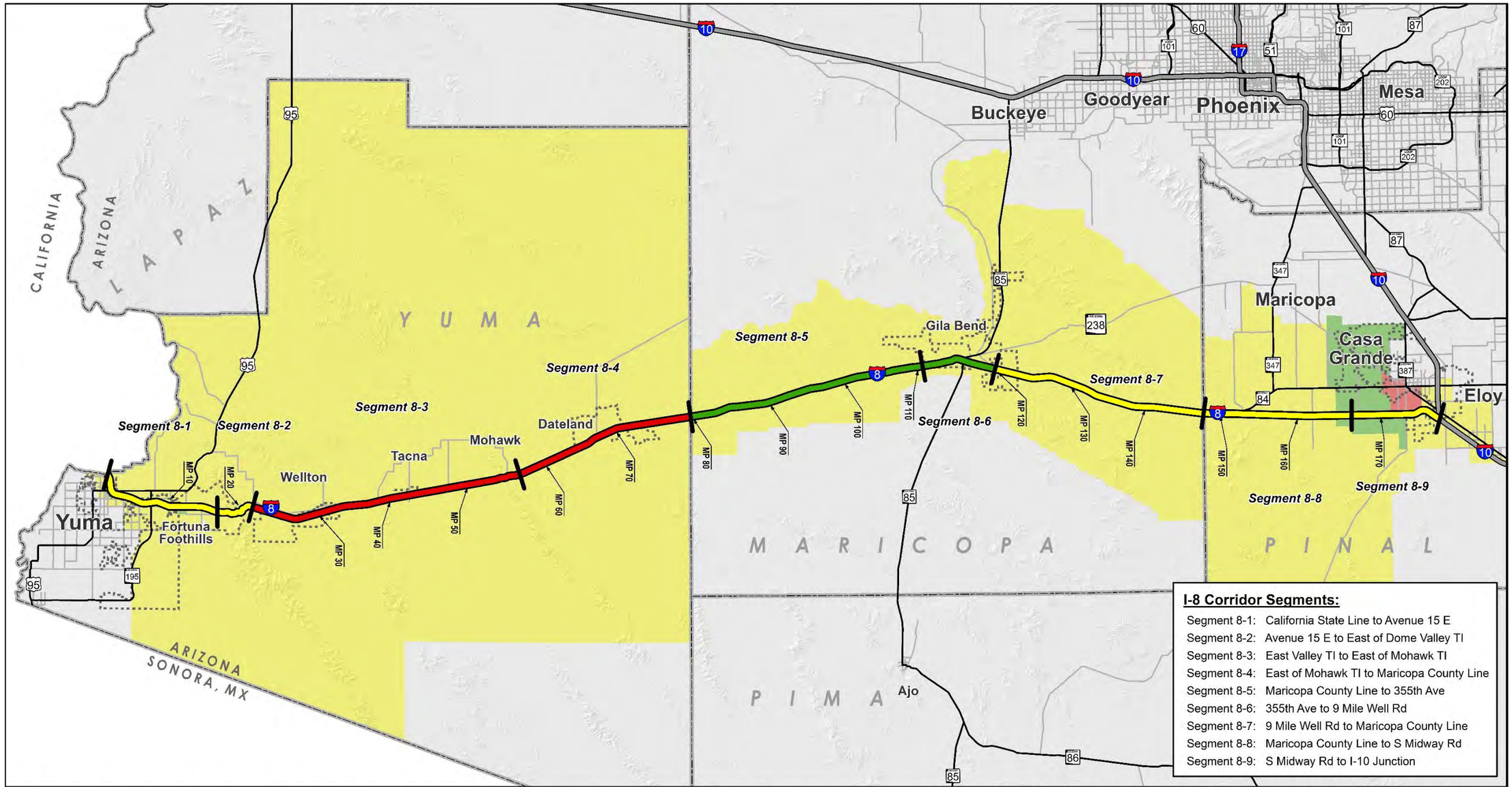
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Profile Study: California to I-10 Junction
All Vehicles Planning Time Index
2013 AADT, 2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
CURRENT PEAK HOUR V/C
URBAN AND FRINGE URBAN
GOOD / LOS A-C V/C < 0.71
FAIR / LOS D V/C > 0.71 & < 0.89
POOR / LOS E-F V/C > 0.89
RURAL
GOOD / LOS A-C V/C < 0.56
FAIR / LOS D V/C > 0.56 & < 0.76
POOR / LOS E-F V/C > 0.76


CALIFORNIA
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Mohawk
Dateland
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
MP 10
MP 20
MP 30
MP 40
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MP 80
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
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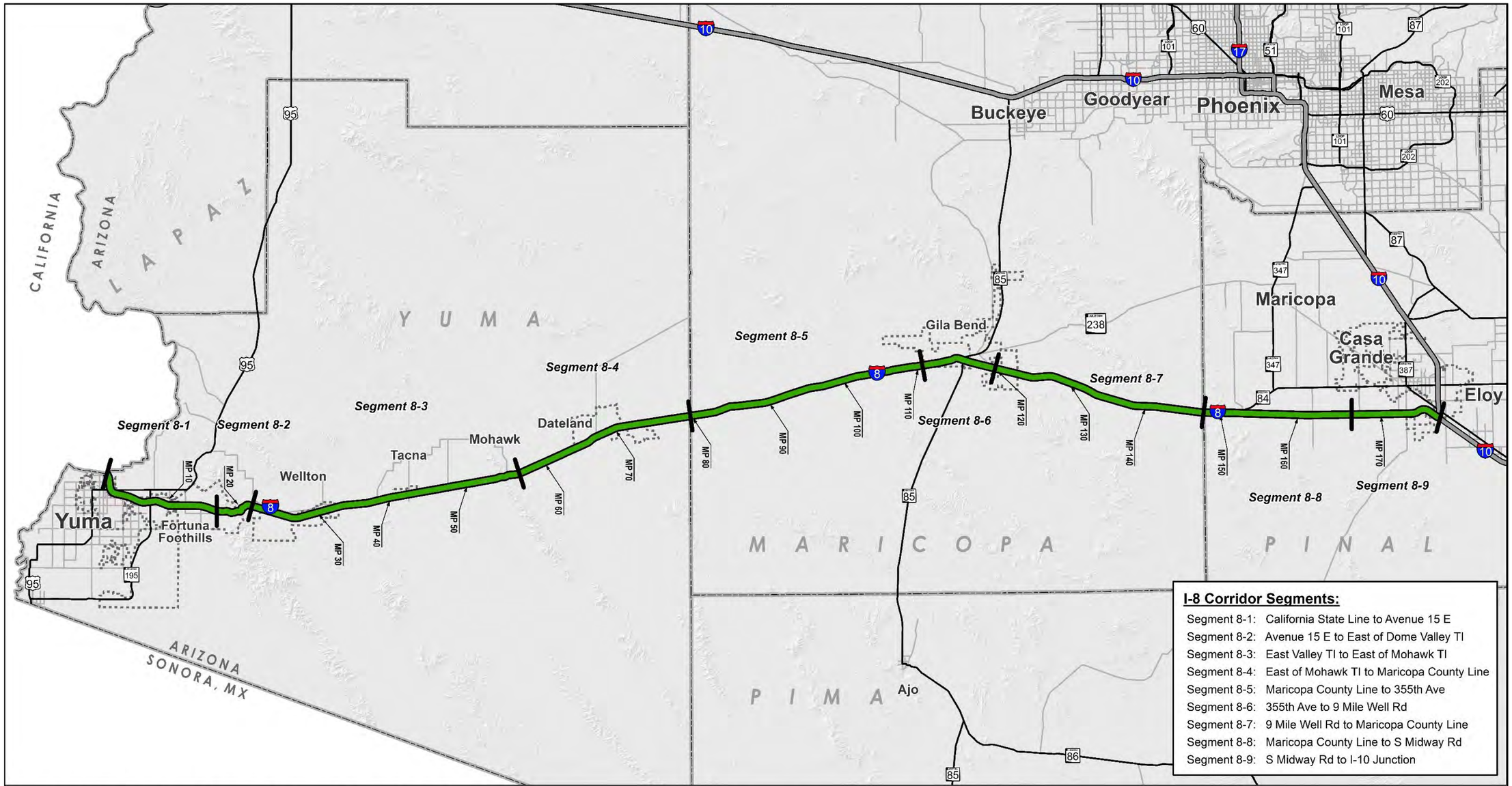
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Multimodal Opportunities
2009-2013 ACS, 2013 AADT, 2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
Average Non-Single Occupancy Vehicle Trips by Corridor Segment
Segment ABOVE the Statewide Average Range
Segment WITHIN the Statewide Average Range
Segment BELOW the Statewide Average Range
Census Tracts of Zero/One Vehicle Households and population in Poverty
Tracts ABOVE the Statewide Average Range
Tracts WITHIN the Statewide Average Range
Tracts BELOW the Statewide Average Range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Fortuna Foothills
Segment 8-1
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Segment 8-9
I-8 Corridor Segments:
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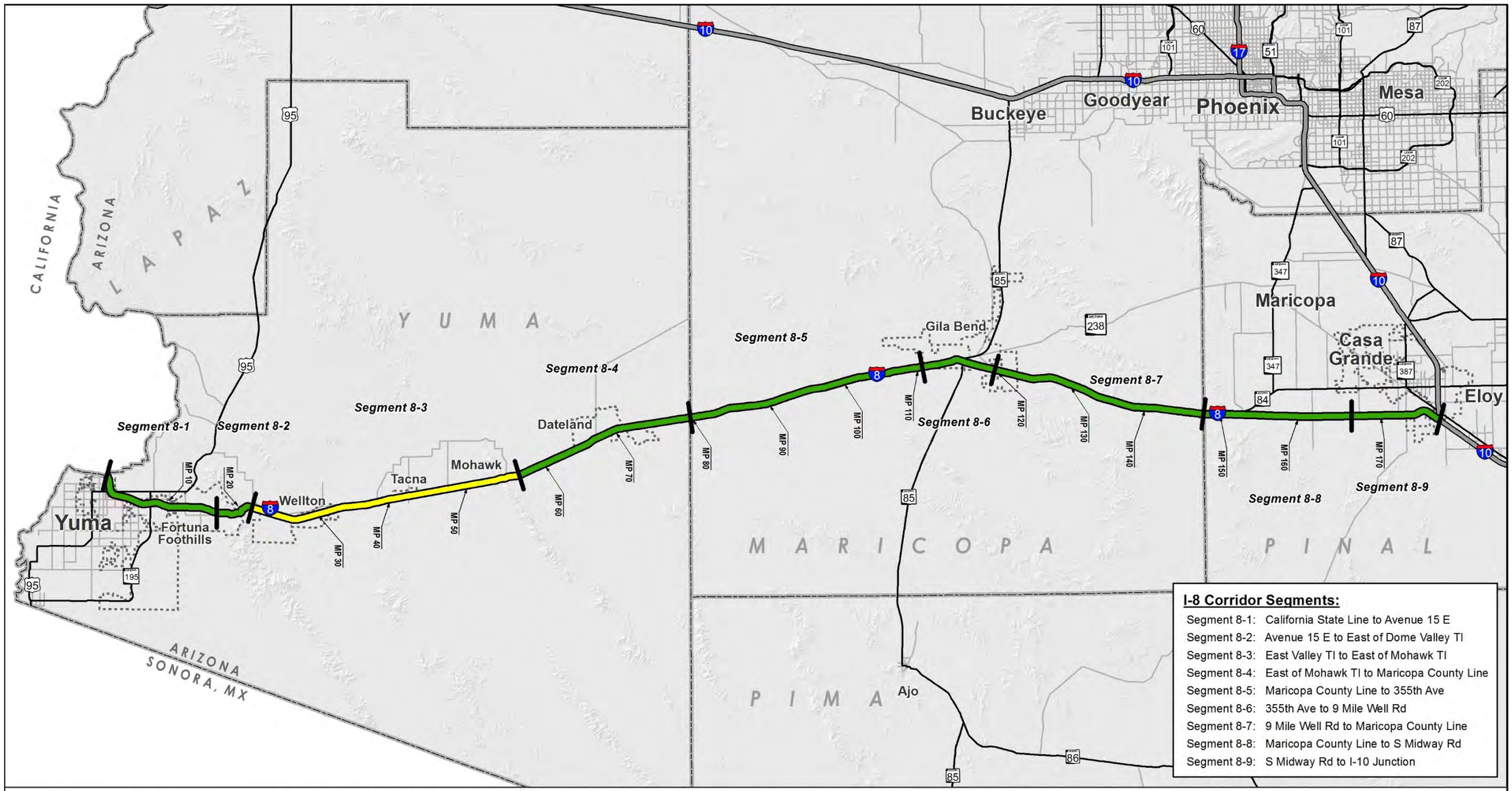
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Bicycle Accomodation
2013 AADT, 2035 AZTDM Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
% BICYCLE ACCOMODATION
GOOD >= 90%
FAIR >= 60% & < 90%
POOR < 60%


CALIFORNIA
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PIMA
ARIZONA
SONORA, MX
Buckeye
Goodyear
Phoenix
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Maricopa
Casa Grande
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Wellton
Yuma
Fortuna Foothills
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
MP 10
MP 20
MP 30
MP 40
MP 50
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MP 80
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
Segment 8-2: Avenue 15 E to East of Dome Valley TI
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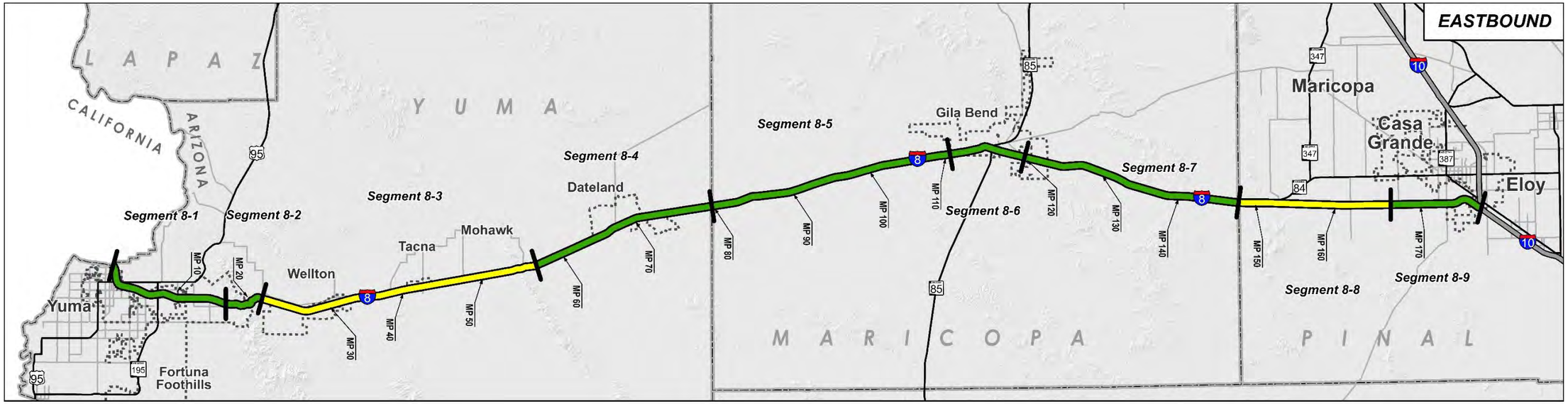
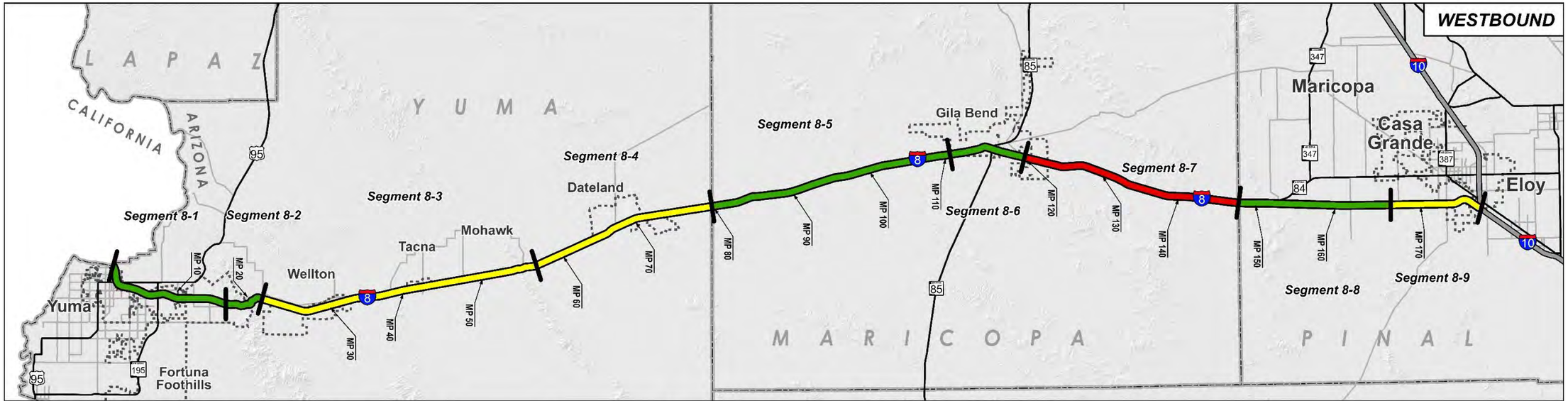
Segment 8-6: 355th Ave to 9 Mile Well Rd
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Safety Index
2010-2014 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
SAFETY INDEX
Urban 4 Lane Freeway (Segment 8-1)
ABOVE AVERAGE PERFORMANCE < 0.79
AVERAGE PERFORMANCE 0.79-1.21
BELOW AVERAGE PERFORMANCE > 1.21
Rural 4 Lane Freeway (Segments 8-2 thru 8-9)
ABOVE AVERAGE PERFORMANCE < 0.73
AVERAGE PERFORMANCE 0.73-1.27
BELOW AVERAGE PERFORMANCE > 1.27





I-8 Corridor Profile Study: California to I-10 Junction

Safety Index (Directional)

2010-2014 Data

N

Miles

0 5 10 15 20

Corridor Segment

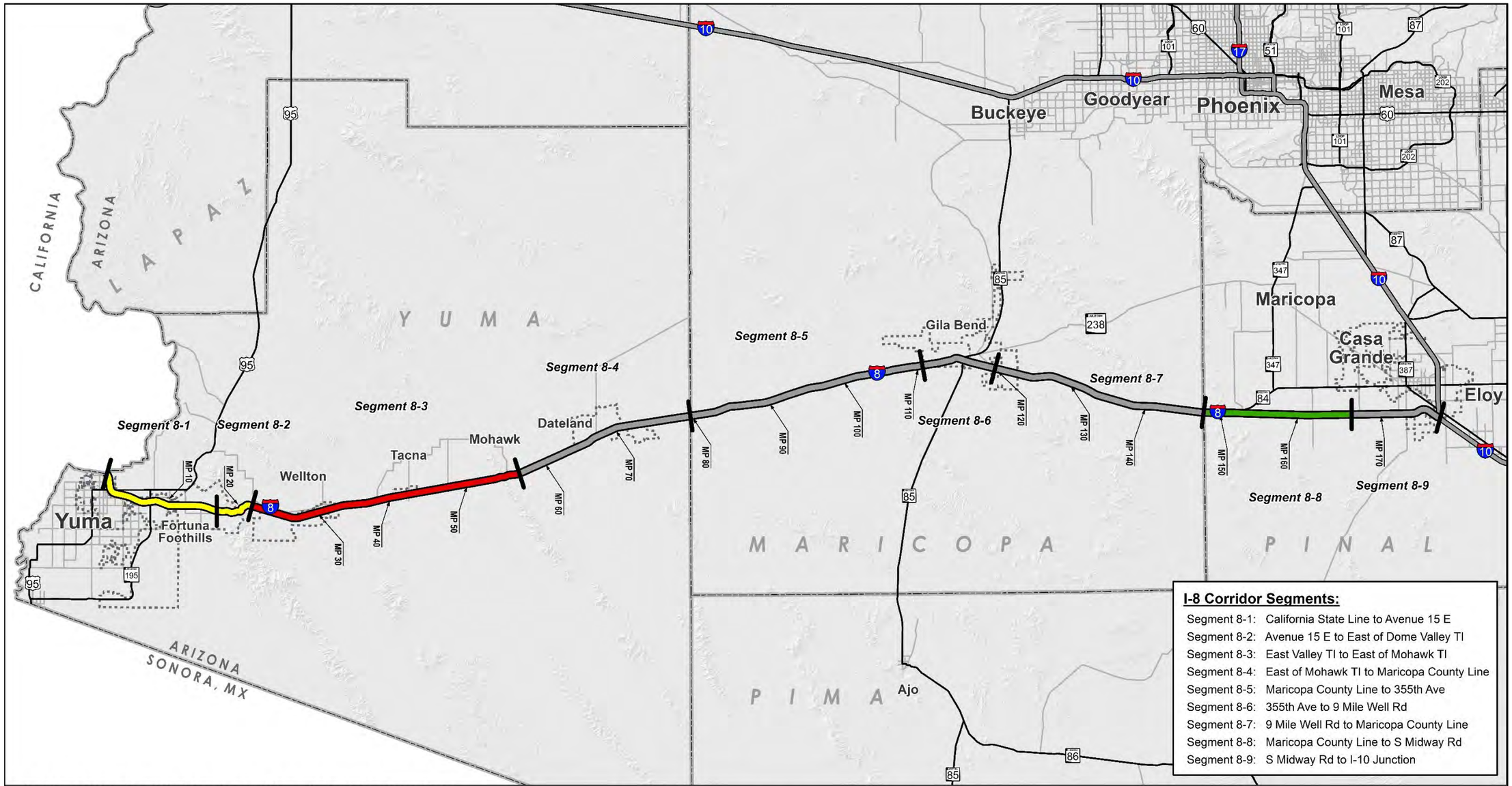
US Hwy/State Route

County Boundary

City Boundary

SAFETY INDEX

Urban 4 Lane Freeway		Rural 4 Lane Freeway	
ABOVE AVERAGE PERFORMANCE	<0.79	ABOVE AVERAGE PERFORMANCE	<0.73
AVERAGE PERFORMANCE	0.79-1.21	AVERAGE PERFORMANCE	0.73-1.27
BELOW AVERAGE PERFORMANCE	>1.21	BELOW AVERAGE PERFORMANCE	>1.27


CALIFORNIA
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ARIZONA
SONORA, MX
Buckeye
Goodyear
Phoenix
Mesa
Maricopa
Casa Grande
Eloy
Gila Bend
Ajo
Yuma
Fortuna Foothills
Wellton
Tacna
Mohawk
Dateland
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
MP 10
MP 20
MP 30
MP 40
MP 50
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MP 70
MP 80
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
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Segment 8-3: East Valley TI to East of Mohawk TI
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Segment 8-6: 355th Ave to 9 Mile Well Rd
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Relative Frequency of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors Compared to the Statewide Average for Similar Segments
2010-2014 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
SAFETY INDEX
Urban 4 Lane Freeway (Segment 8-1)
ABOVE AVERAGE PERFORMANCE < 0.79
AVERAGE PERFORMANCE 0.79-1.21
BELOW AVERAGE PERFORMANCE > 1.21
Rural 4 Lane Freeway (Segments 8-2 thru 8-9)
ABOVE AVERAGE PERFORMANCE < 0.73
AVERAGE PERFORMANCE 0.73-1.27
BELOW AVERAGE PERFORMANCE > 1.27

CALIFORNIA
ARIZONA
LA PAZ
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PINAL
PIMA
Buckeye
Goodyear
Phoenix
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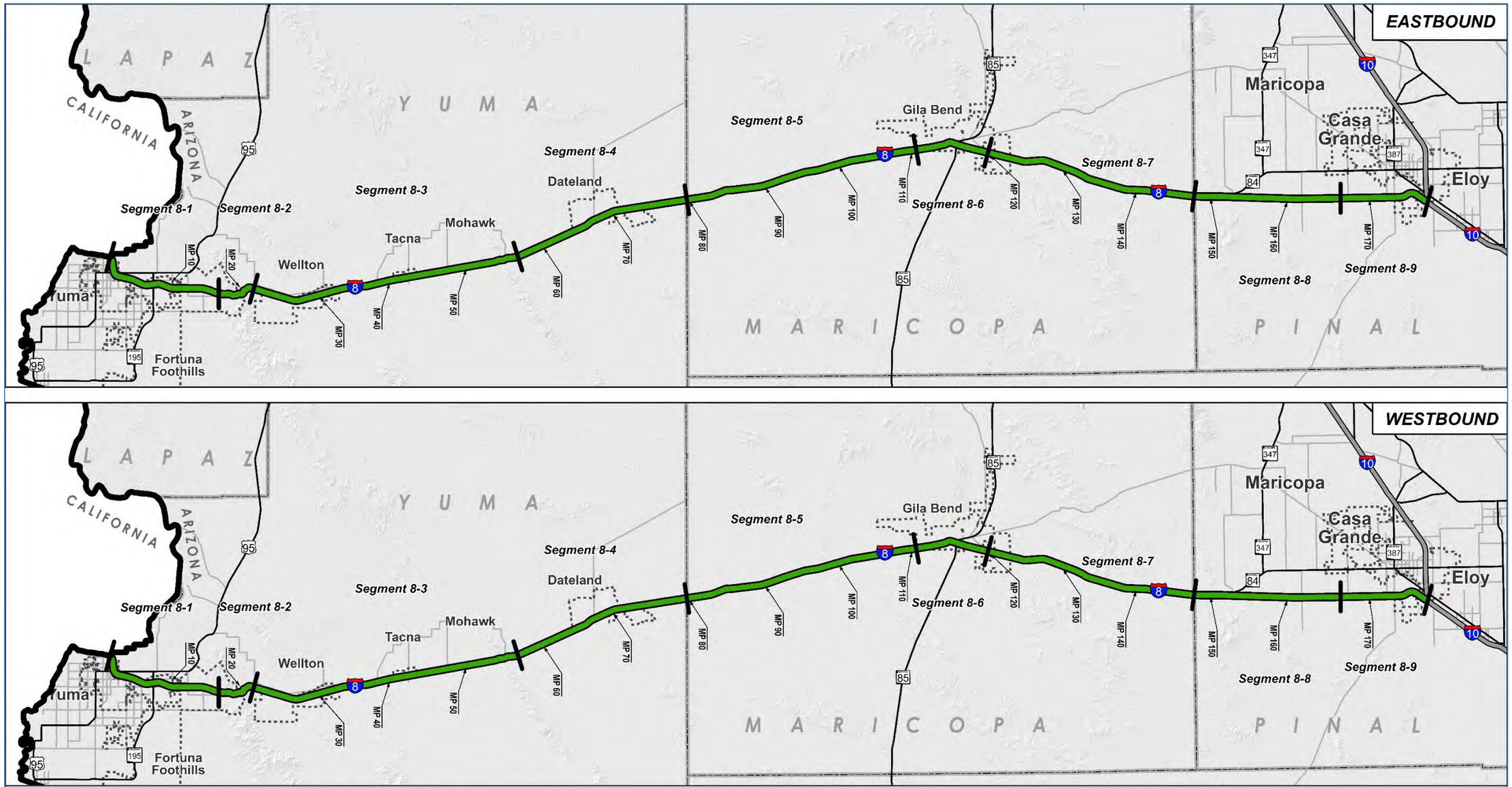
Maricopa
Casa Grande
Eloy
Gila Bend
Ajo
Yuma
Fortuna Foothills
Wellton
Tacna
Mohawk
Dateland
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-8
Segment 8-9
Stanfield Rd TI UP
Vekol Road TI UP
Chuichu Rd UP
Thornton Road TI
Murphy Rd UP
Dome Valley Rd TI UP WB
ARIZONA
SONORA, MX
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
Segment 8-2: Avenue 15 E to East of Dome Valley TI
Segment 8-3: East Valley TI to East of Mohawk TI
Segment 8-4: East of Mohawk TI to Maricopa County Line
Segment 8-5: Maricopa County Line to 355th Ave
Segment 8-6: 355th Ave to 9 Mile Well Rd
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Freight Index and Hot Spots
2014 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
FREIGHT INDEX
UNINTERRUPTED FLOW (Segments 8-1 thru 8-9)
GOOD > 0.77
FAIR > 0.67 & < 0.77
POOR < 0.67
FREIGHT HOT SPOT
Bridge Vertical Clearance less than 16.25 Feet and No Ramp Around



I-8 Corridor Profile Study: California to I-10 Junction

Truck Travel Time Index

2014 Data

N

Miles

0 5 10 15 20

Corridor Segment

US Hwy/State Route

County Boundary

City Boundary

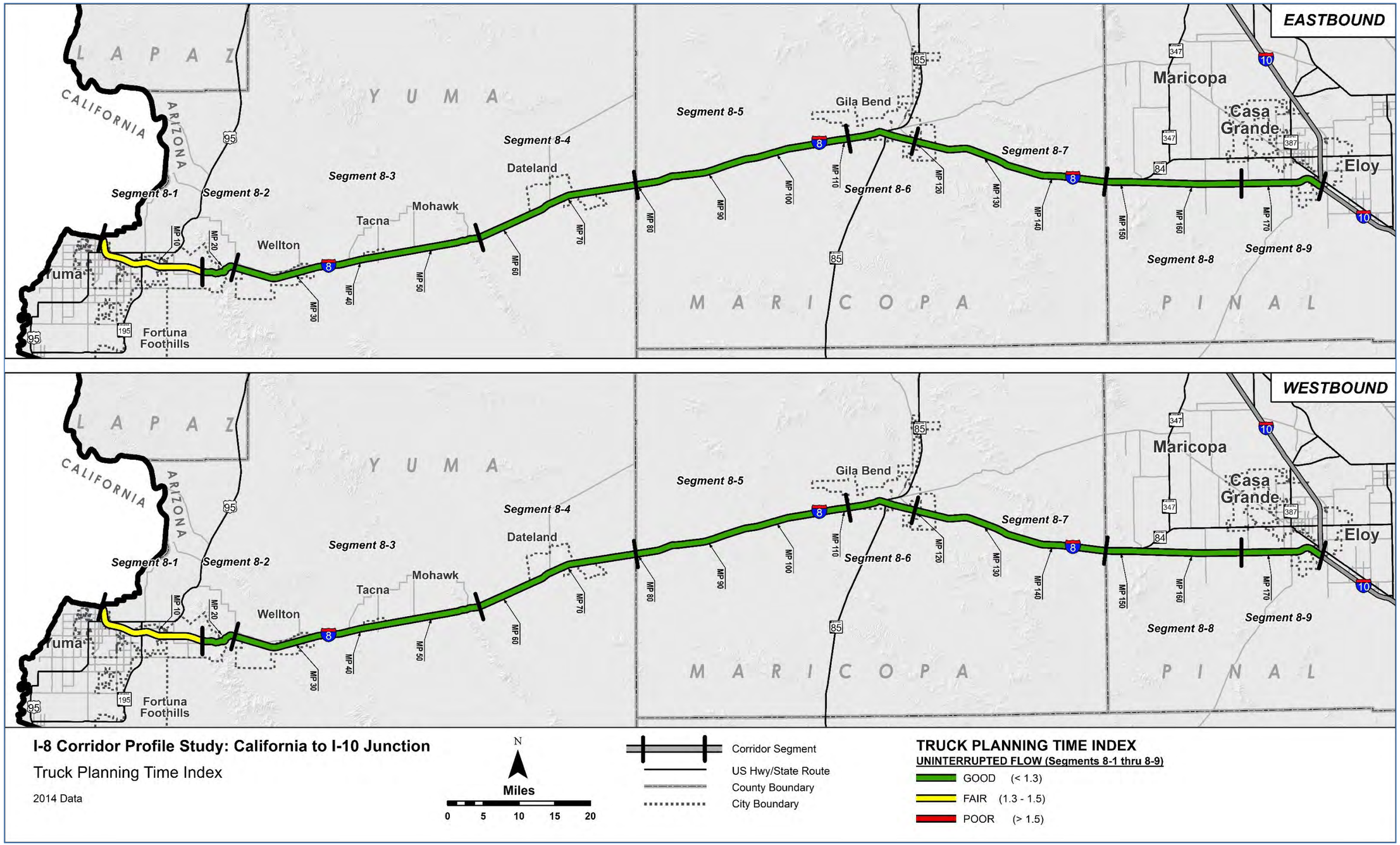
TRUCK TRAVEL TIME INDEX

UNINTERRUPTED FLOW (Segments 8-1 thru 8-9)

GOOD (< 1.15)

FAIR (1.15 - 1.33)

POOR (> 1.33)



I-8 Corridor Profile Study: California to I-10 Junction

Truck Planning Time Index

2014 Data

N

Miles

0 5 10 15 20

Corridor Segment

US Hwy/State Route

County Boundary

City Boundary

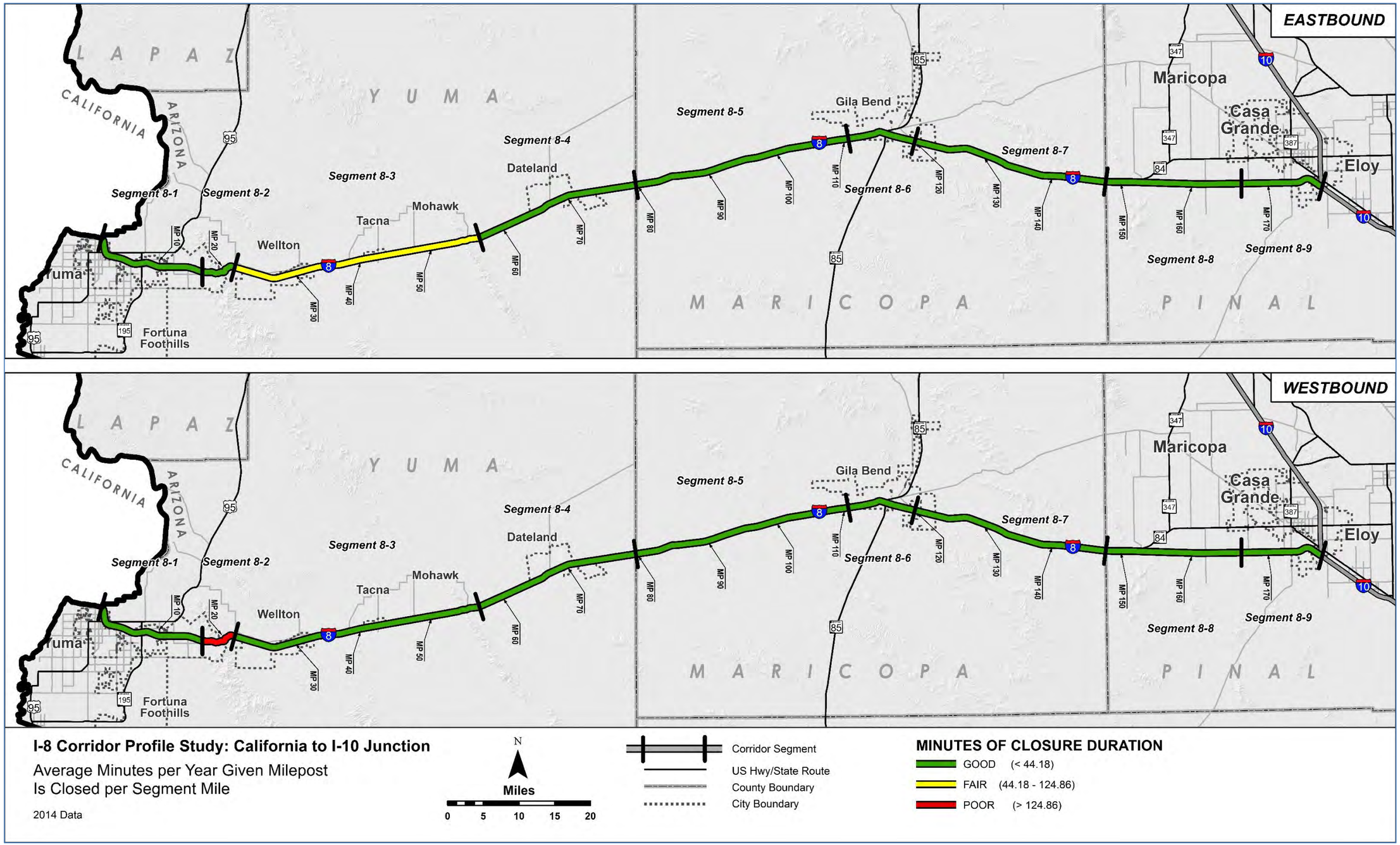
TRUCK PLANNING TIME INDEX

UNINTERRUPTED FLOW (Segments 8-1 thru 8-9)

GOOD (< 1.3)

FAIR (1.3 - 1.5)

POOR (> 1.5)


EASTBOUND
WESTBOUND
L A P A Z
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M A R I C O P A
P I N A L
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
Yuma
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MP 90
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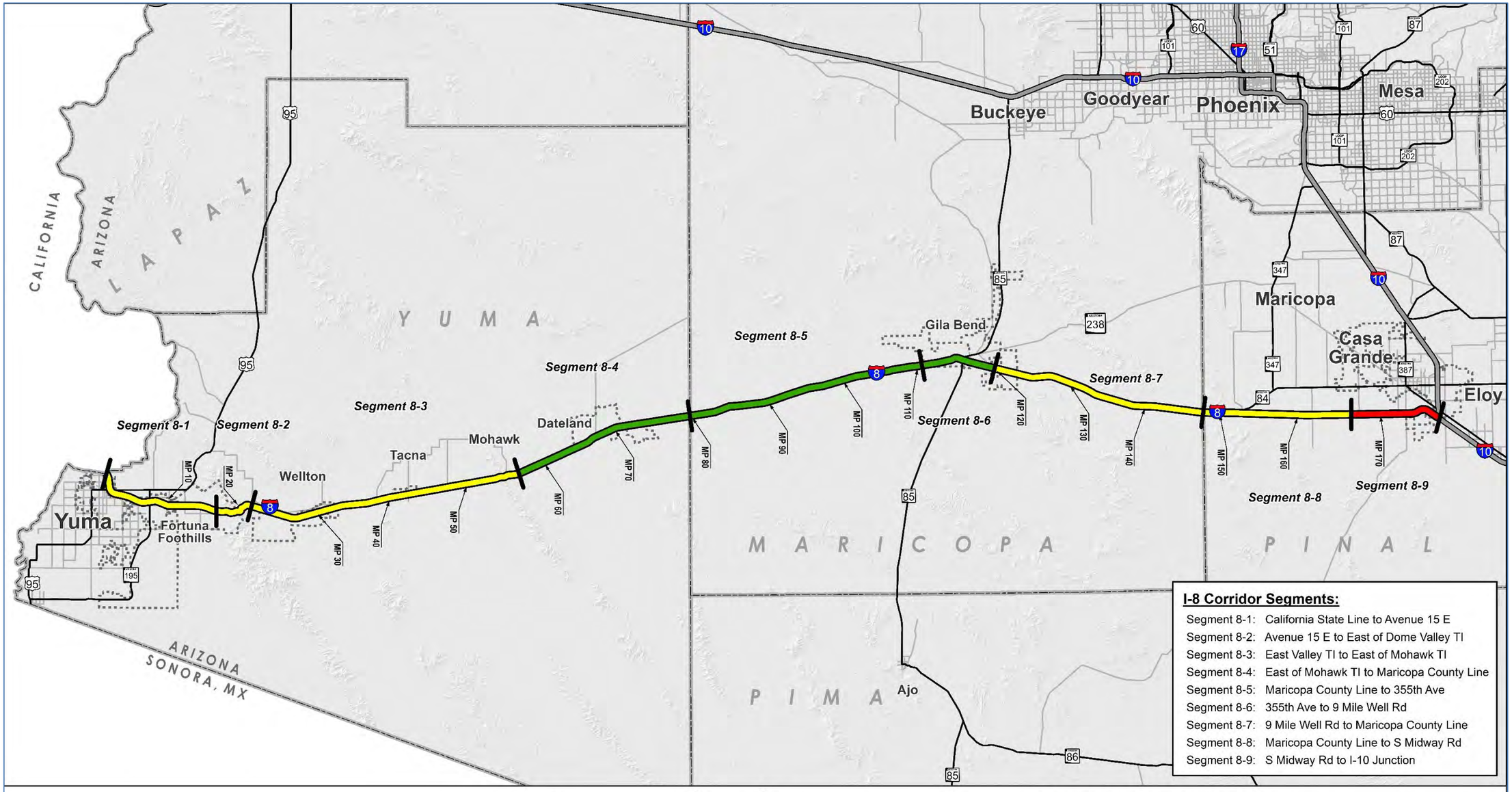
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Profile Study: California to I-10 Junction
Average Minutes per Year Given Milepost
Is Closed per Segment Mile
2014 Data
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
MINUTES OF CLOSURE DURATION
GOOD (< 44.18)
FAIR (44.18 - 124.86)
POOR (> 124.86)


CALIFORNIA
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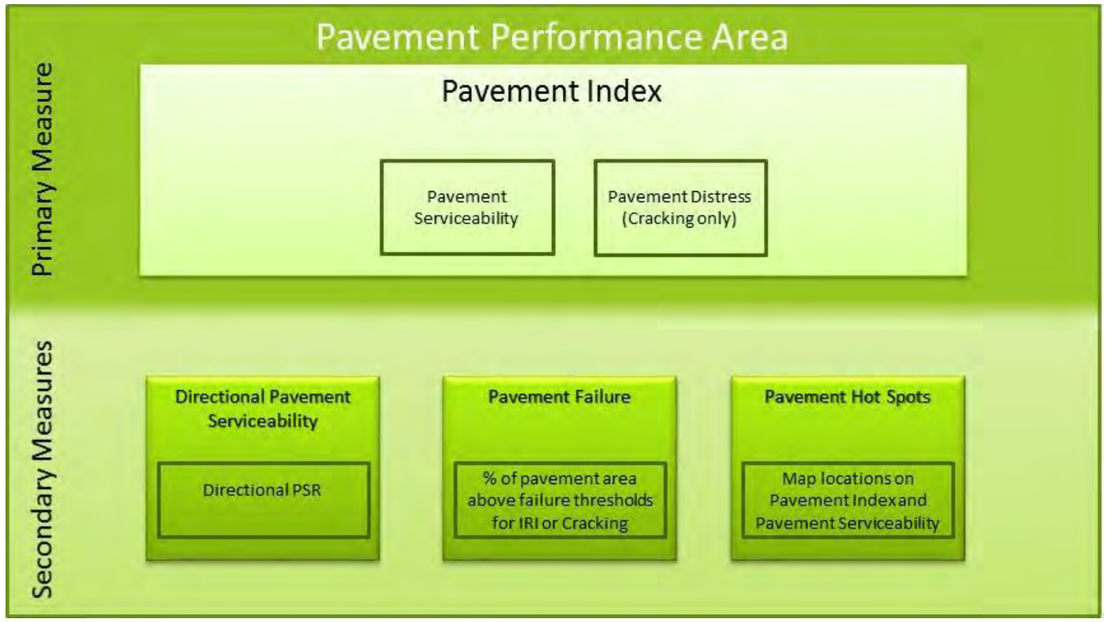
Wellton
Tacna
Mohawk
Dateland
Segment 8-1
Segment 8-2
Segment 8-3
Segment 8-4
Segment 8-5
Segment 8-6
Segment 8-7
Segment 8-8
Segment 8-9
MP 10
MP 20
MP 30
MP 40
MP 50
MP 60
MP 70
MP 80
MP 90
MP 100
MP 110
MP 120
MP 130
MP 140
MP 150
MP 160
MP 170
I-8 Corridor Segments:
Segment 8-1: California State Line to Avenue 15 E
Segment 8-2: Avenue 15 E to East of Dome Valley TI
Segment 8-3: East Valley TI to East of Mohawk TI
Segment 8-4: East of Mohawk TI to Maricopa County Line
Segment 8-5: Maricopa County Line to 355th Ave
Segment 8-6: 355th Ave to 9 Mile Well Rd
Segment 8-7: 9 Mile Well Rd to Maricopa County Line
Segment 8-8: Maricopa County Line to S Midway Rd
Segment 8-9: S Midway Rd to I-10 Junction
I-8 Corridor Profile Study: California to I-10 Junction
Bridge Vertical Clearance
N
Miles
0 5 10 15 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
BRIDGE VERTICAL CLEARANCE
GOOD (> 16.5)
FAIR (16.0 - 16.5)
POOR (< 16.0)

Appendix B: Performance Area Detailed Calculation Methodologies

Pavement Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Pavement performance area as shown in the following graphic:



This performance area is used to evaluate mainline pavement condition. Pavement condition data for ramps, frontage roads, crossroads, etc. was not included in the evaluation.

Primary Pavement Index

The Pavement Index is calculated based on the use of two pavement condition ratings from the ADOT Pavement Database. The two ratings are the International Roughness Index (IRI) and the Cracking rating. The calculation of the Pavement Index uses a combination of these two ratings.

The IRI is a measurement of the pavement roughness based on field-measured longitudinal roadway profiles. To facilitate the calculation of the index, the IRI rating was converted to a Pavement Serviceability Rating (PSR) using the following equation:

$$PSR = 5 * e^{-0.0038*IRI}$$

The Cracking Rating is a measurement of the amount of surface cracking based on a field-measured area of 1,000 square feet that serves as a sample for each mile. To facilitate the calculation of the index, the Cracking Rating was converted to a Pavement Distress Index (PDI) using the following equation:

$$PDI = 5 - (0.345 * C^{0.66})$$

Both the PSR and PDI use a 0 to 5 scale with 0 representing the lowest performance and 5 representing the highest performance. The performance thresholds for interstates and non-interstates shown in the tables below were used for the PSR and PDI.

Performance Level for Interstates	IRI (PSR)	Cracking (PDI)
Good	<75 (>3.75)	<7 (>3.75)
Fair	75 - 117 (3.20 - 3.75)	7 - 12 (3.22 - 3.75)
Poor	>117 (<3.20)	>12 (<3.22)

Performance Level for Non-Interstates	IRI (PSR)	Cracking (PDI)
Good	<94 (>3.5)	<9 (>3.5)
Fair	94 - 142 (2.9 - 3.5)	9 - 15 (2.9 - 3.5)
Poor	>142 (<2.9)	>15 (<2.9)

The PSR and PDI are calculated for each 1-mile section of roadway. If PSR or PDI falls into a poor rating (<3.2 for interstates, for example) for a 1-mile section, then the score for that 1-mile section is entirely (100%) based on the lower score (either PSR or PDI). If neither PSR or PDI fall into a poor rating for a 1-mile section, then the score for that 1-mile section is based on a combination of the lower rating (70% weight) and the higher rating (30% weight). The result is a score between 0 and 5 for each direction of travel of each mile of roadway based on a combination of both the PSR and the PDI.

The project corridor has been divided into segments. The Pavement Index for each segment is a weighted average of the directional ratings based on the number of travel lanes. Therefore, the condition of a section with more travel lanes will have a greater influence on the resulting segment Pavement Index than a section with fewer travel lanes.

Secondary Pavement Measures

Three secondary measures are evaluated:

- Directional Pavement Serviceability
- Pavement Failure
- Pavement Hot Spots

Directional Pavement Serviceability: Similar to the Pavement Index, the Directional Pavement Serviceability is calculated as a weighted average (based on number of lanes) for each segment. However, this rating only utilizes the PSR and is calculated separately for each direction of travel. The PSR uses a 0 to 5 scale with 0 representing the lowest performance and 5 representing the highest performance.

Pavement Failure: The percentage of pavement area rated above the failure thresholds for IRI or Cracking is calculated for each segment. In addition, the Standard score (z-score) is calculated for each segment.

The Standard score (z-score) is the number of standard deviations above or below the mean. Therefore, a Standard score between -0.5 and +0.5 is "average", less than -0.5 is lower (better) than average, and higher than +0.5 is above (worse) than average.

Pavement Hot Spots: The Pavement Index map identifies locations that have an IRI rating or Cracking rating that fall above the failure threshold as identified by ADOT Pavement Group. For interstates, an IRI rating above 105 or a Cracking rating above 15 will be used as the thresholds which are slightly different than the ratings shown previously. For non-interstates, an IRI rating above 142 or a Cracking rating above 15 will be used as the thresholds.

Scoring

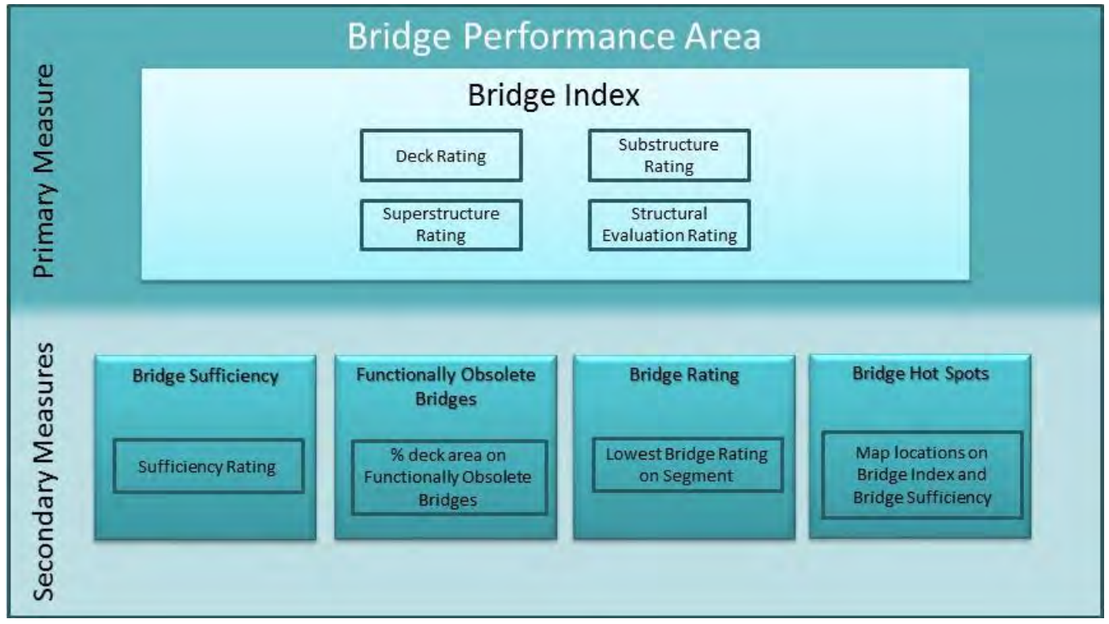
Performance Level	Pavement Index	
	Interstates	Non-Interstates
Good	>3.75	>3.5
Fair	3.2 - 3.75	2.9 - 3.5
Poor	<3.2	<2.9

Performance Level	Directional Pavement Serviceability	
	Interstates	Non-Interstates
Good	>3.75	>3.5
Fair	3.2 - 3.75	2.9 - 3.5
Poor	<3.2	<2.9

Performance Level	% Pavement Failure
Good	< 5%
Fair	5% – 20%
Poor	>20%

Bridge Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Bridge performance area as shown in the following graphic:



This performance area is used to evaluate mainline bridges. Bridges on ramps (that do not cross the mainline), frontage roads, etc. should not be included in the evaluation. Basically, any bridge that carries mainline traffic or carries traffic over the mainline should be included and bridges that do not carry mainline traffic, run parallel to the mainline (frontage roads), or do not cross the mainline should not be included.

Primary Bridge Index

The Bridge Index is calculated based on the use of four bridge condition ratings from the ADOT Bridge Database, also known as the Arizona Bridge Information and Storage System (ABISS). The four ratings are the Deck Rating, Substructure Rating, Superstructure Rating, and Structural Evaluation Rating. The calculation of the Bridge Index uses the lowest of these four ratings.

Each of the four condition ratings use a 0 to 9 scale with 0 representing the lowest performance and 9 representing the highest performance.

The project corridor has been divided into segments and the bridges are grouped together according to the segment definitions. In order to report the Bridge Index for each corridor segment, the Bridge Index for each segment is a weighted average based on the deck area for each bridge. Therefore, the condition of a larger bridge will have a greater influence on the resulting segment Bridge Index than a smaller bridge.

Secondary Bridge Measures

Four secondary measures will be evaluated:

- Bridge Sufficiency
- Functionally Obsolete Bridges
- Bridge Rating
- Bridge Hot Spots

Bridge Sufficiency: Similar to the Bridge Index, the Bridge Sufficiency rating is calculated as a weighted average (based on deck area) for each segment. The Bridge Sufficiency rating is a scale of 0 to 100 with 0 representing the lowest performance and 100 representing the highest performance. A rating of 80 or above represents “good” performance, a rating between 50 and 80 represents “fair” performance, and a rating below 50 represents “poor” performance.

Functionally Obsolete Bridges: The percentage of total deck area in a segment that is on functionally obsolete bridges is calculated for each segment. The deck area for each bridge within each segment that has been identified as functionally obsolete is totaled and divided by the total deck area for the segment to calculate the percentage of deck area on functionally obsolete bridges for each segment.

The thresholds for this performance measure are determined based on the Standard score (z-score). The Standard score (z-score) is the number of standard deviations above or below the mean. Therefore, a Standard score between -0.5 and +0.5 is “average”, less than -0.5 is lower (better) than average, and higher than +0.5 is above (worse) average.

Bridge Rating: The Bridge Rating simply identifies the lowest bridge rating on each segment. This performance measure is not an average and therefore is not weighted based on the deck area. The Bridge Index identifies the lowest rating for each bridge, as described above. Each of the four condition ratings use a 0 to 9 scale with 0 representing the lowest performance and 9 representing the highest performance.

Bridge Hot Spots: The Bridge Index map identifies individual bridge locations that are identified as hot spots. Hot spots are bridges that have a single rating of 4 in any of the four ratings, or multiple ratings of 5 in the deck, substructure or superstructure ratings.

Scoring:

Performance Level	Bridge Index
Good	>6.5
Fair	5.0-6.5
Poor	<5.0

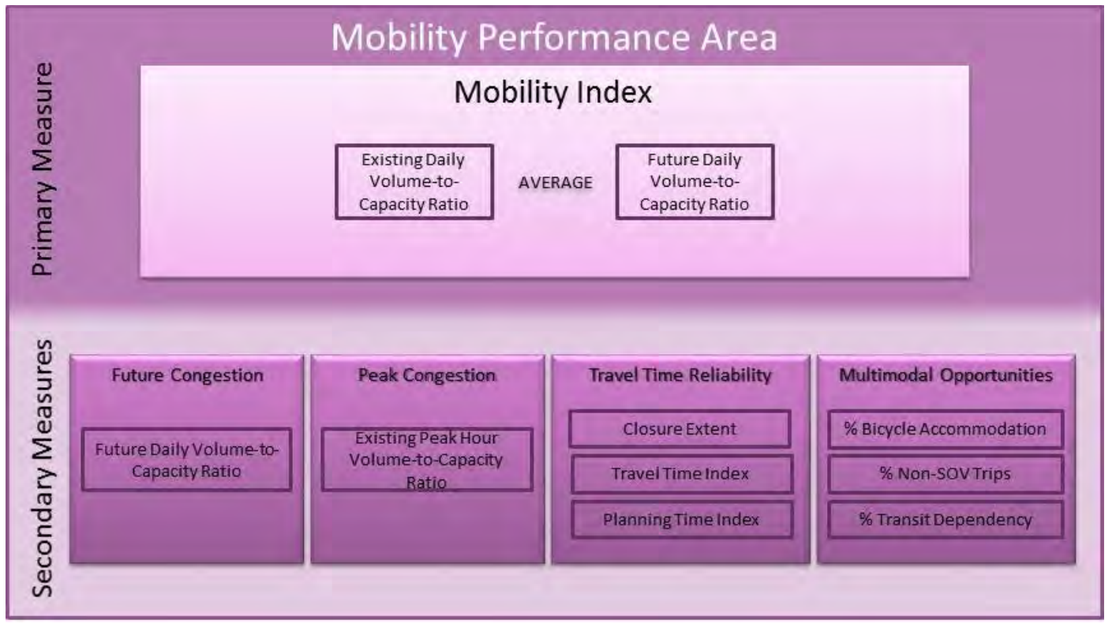
Performance Level	Sufficiency Rating
Good	>80
Fair	50-80
Poor	<50

Performance Level	Bridge Rating
Good	>6
Fair	5-6
Poor	<5

Performance Level	% Functionally Obsolete
Good	< 12%
Fair	12%-40%
Poor	>40%

Mobility Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Mobility performance area as shown in the following graphic:



Primary Mobility Index

The primary Mobility Index is an average of the existing daily volume-to-capacity (V/C) ratio and the future daily V/C ratio for each segment of the corridor.

Existing Daily V/C: The existing daily V/C ratio for each segment is calculated by dividing the 2014 Annual Average Daily Traffic (AADT) volume for each segment by the total Level of Service (LOS) E capacity volume for that segment

The capacity is calculated using the HERS Procedures for Estimating Highway Capacity[1]. The HERS procedure incorporates HCM 2010 methodologies. The methodology includes capacity estimation procedures for multiple facility types including freeways, rural two-lane highways, multilane highways, and signalized and non-signalized urban sections.

The segment capacity is defined as a function of the number of mainline lanes, shoulder width, interrupted or uninterrupted flow facilities, terrain type, percent of truck traffic, and the designated urban or rural environment.

The AADT for each segment is calculated by applying a weighted average across the length of the segment based on the individual 24-hour volumes and distances associated with each HPMS count station within each segment.

The following example equation is used to determine the weighted average of a segment with two HPMS count locations within the corridor

((HPMS 1 Distance x HPMS 1 Volume) + (HPMS 2 Distance x HPMS 2 Volume))/Total Segment Length

For specific details regarding the HERS methodology used, refer to the *Procedures for Estimating Highway Capacity, draft Technical Memorandum.*

Future Daily V/C: The future daily V/C ratio for each segment is calculated by dividing the 2035 AADT volume for each segment by the 2014 LOS E capacity. The capacity volume used in this calculation is the same as is utilized in the existing daily V/C equation.

The future AADT daily volumes are generated by applying an average annual compound growth rate (ACGR) to each 2014 AADT segment volume. The following equation is used to apply the average annual compound growth rate:

2035 AADT = 2014 AADT x ((1+ACGR)^(2035-2014))

The ACGR for each segment is defined by comparing the total volumes in the 2010 Arizona Travel Demand Model (AZTDM2) to the 2035 AZTDM2 traffic volumes at each existing HPMS count station location throughout the corridor. Each 2010 and 2035 segment volume is defined using the same weighted average equation described in the *Existing Daily V/C* section above and then summing the directional volumes for each location. The following equation is used to determine the ACGR for each segment:

ACGR = ((2035 Volume/2010 Volume)^(1/(2035-2010))))-1

Secondary Mobility Measures

Four secondary measures are evaluated:

- Future Congestion
- Peak Congestion
- Travel Time Reliability

[1] HERS Support – 2011, Task 6: Procedures for Estimating Highway Capacity, draft Technical Memorandum. Cambridge Systematics. Prepared for the Federal Highway Administration. March 2013.

  - Closure Extent
  - Directional Travel Time Index
  - Directional Planning Time Index
- Multimodal Opportunities
  - % Bicycle Accommodation
  - % Non-Single Occupancy Vehicle (SOV) Trips
  - % Transit Dependency

Future Congestion: The future daily V/C ratios for each segment in the corridor that are calculated and used in the Mobility Index as part of the overall average between Existing Daily V/C and Future Daily V/C are applied independently as a secondary measure. The methods to calculate the Future Daily V/C can be referenced in the Mobility Index section.

Peak Congestion: Peak Congestion has been defined as the peak hour V/C ratio in both directions of the corridor. The peak hour V/C ratio is calculated using the HERS method as described previously. The peak hour volume utilizes the directional AADT for each segment, which is calculated by applying a weighted average across the length of the segment based on the individual directional 24-hour volumes and distances associated with each HPMS count station within each segment. The segment capacity is defined based on the characteristics of each segment including number of lanes, terrain type, and environment, similar to the 24-hour volumes using the HERS method.

Travel Time Reliability: Travel time reliability is a secondary measure that includes three indicators. The three indicators are the number of times a piece of a corridor is closed for any specific reason, the directional Travel Time Index (TTI), and the directional Planning Time Index (PTI).

Closure Extent: The number of times a roadway is closed is documented through the HCRS dataset. Closure Extent is defined as the average number of times a particular milepost of the corridor is closed per year per mile in a specific direction of travel. The weighted average of each occurrence takes into account the distance over which a specific occurrence spans.

Thresholds that determine levels of good, fair, and poor are based on the average number of closures per mile per year within each of the identified statewide significant corridors by ADOT. The thresholds shown at the end of this section represent statewide averages across those corridors.

Directional Travel Time and Planning Time Index: In terms of overall mobility, the TTI is the relationship of the mean peak period travel time in a specific section of the corridor to the free-flow travel time in the same location. The PTI is the relationship of the 95th percentile highest travel time to the free-flow travel time (based on the posted speed limit) in a specific section of the corridor. The TTI and PTI can be converted into speed-based indices by recognizing that speed is equal to distance traveled divided by travel time. The inverse relationship between travel time and speed means that the 95th percentile highest travel time corresponds to the 5th percentile lowest speed.

Using HERE data provided by ADOT, four time periods for each data point were collected throughout the day (AM peak, mid-day, PM peak, and off-peak). Using the mean speeds and 5th percentile lowest mean speeds collected over 2014 for these time periods for each data location, four TTI and PTI calculations were made using the following formulas:

TTI = Posted Speed Limit/Mean Peak Hour Speed

PTI = Posted Speed Limit/5th Percentile Lowest Speed

The highest value of the four time periods calculation is defined as the TTI for that data point. The average TTI is calculated within each segment based on the number of data points collected. The value of the average TTI across each entry is used as the TTI for each respective segment within the corridor.

Multimodal Opportunities: Three multimodal opportunity indicators reflect the characteristics of the corridor that promote alternate modes to a single occupancy vehicle (SOV) for trips along the corridor. The three indicators include the percent bicycle accommodation, non-SOV trips, and transit dependency along the corridor.

Percent Bicycle Accommodation: For this secondary performance evaluation, outside shoulder widths are evaluated considering the roadway's context and conditions. This requires use of the roadway data that includes right shoulder widths, shoulder surface types, and speed limits, all of which are available in the following ADOT geographic information system (GIS) data sets:

- Right Shoulder Widths
- Left Shoulder Widths (for undivided roadways)
- Shoulder Surface Type (Both Left/Right)
- Speed Limit

Additionally, each segment's average AADT, estimated earlier in the Mobility performance area methodology, is used for the criteria to determine if the existing shoulder width meets the effective width.

The criteria for screening if a shoulder segment meets the recommended width criteria are as followed:

(1) If AADT <= 1500 OR Speed Limit <= 25 miles per hour (mph):
The segment's general purpose lane can be shared with bicyclists (no effective shoulder width required)

(2) If AADT > 1500 AND Speed Limit between (25 - 50 mph) AND Pavement Surface is Paved:
Effective shoulder width required is 4 feet or greater

(3) If AADT > 1500 AND Speed Limit >= 50 mph and Pavement Surface is Paved:
Effective shoulder width required is 6 feet or greater

The summation of the length of the shoulder sections that meet the defined effective width criteria, based on criteria above, is divided by the segment's total length to estimate the percent of the segment that accommodates bicycles as illustrated at the end of this section. If shoulder data is not available or appears erroneous, field measurements can substitute for the shoulder data.

Percent Non-SOV Trips: The percentage of non-SOV trips over distances less than 50 miles gives an indication of travel patterns along a section of the corridor that could benefit from additional multimodal options in the future.

Thresholds that determine levels of good, fair, and poor are based on the percent non-SOV trips within each of the identified statewide significant corridors by ADOT. The thresholds shown at the end of this section represent statewide averages across those corridors.

Percent Transit Dependency: 2008-2012 U.S. Census American Community Survey tract and state level geographic data and attributes from the tables B08201 (Number of Vehicles Available by Household Size) and B17001 (Population in Poverty within the Last 12 Months) were downloaded with margins of error included from the Census data retrieval application Data Ferret. Population ranges for each tract were determined by adding and subtracting the margin of error to each estimate in excel. The tract level attribute data was then joined to geographic tract data in GIS. Only tracts within a one mile buffer of each corridor are considered for this evaluation.

Tracts that have a statistically significantly larger number of either people in poverty or households with only one or no vehicles available than the state average are considered potentially transit dependent.

Example: The state average for zero or one vehicles households (HHs) is between 44.1% and 45.0%. Tracts which have the lower bound of their range above the upper bound of the state range have a greater percentage of zero/one vehicle HHs than the state average. Tracts that have their upper bound beneath the lower bound of the state range have a lesser percentage of zero/one vehicles HHs than the state average. All other tracts that have one of their bounds overlapping with the state average cannot be considered statistically significantly different because there is a chance the value is actually the same.

In addition to transit dependency, the following attributes are added to the Multimodal Opportunities map based on available data.

- Shoulder width throughout the corridor based on 'Shoulder Width' GIS dataset provided by ADOT
- Intercity bus routes
- Multiuse paths within the corridor right-of-way, if applicable

Scoring:

Volume-to-Capacity Ratios		
Urban and Fringe Urban		
Good - LOS A-C	V/C ≤ 0.71	*Note - ADOT Roadway Design Standards indicate Urban and Fringe Urban roadways should be designed to level of service C or better
Fair - LOS D	V/C > 0.71 & ≤ 0.89	
Poor - LOS E or less	V/C > 0.89	
Rural		
Good - LOS A-B	V/C ≤ 0.56	*Note - ADOT Roadway Design Standards indicate Rural roadways should be designed to level of service B or better
Fair - LOS C	V/C > 0.56 & ≤ 0.76	
Poor - LOS D or less	V/C > 0.76	

Performance Level	Closure Extent
Good	≤ 0.22
Fair	> 0.22 & ≤ 0.62
Poor	V/C > 0.62

Performance Level	TTI on Uninterrupted Flow Facilities
Good	< 1.15
Fair	≥ 1.15 & < 1.33
Poor	≥ 1.33

Performance Level	TTI on Interrupted Flow Facilities
Good	< 1.30
Fair	≥ 1.30 & < 1.2.00
Poor	≥ 2.00

Performance Level	PTI on Uninterrupted Flow Facilities
Good	< 1.30
Fair	≥ 1.30 & < 1.50
Poor	≥ 1.50

Performance Level	PTI Interrupted Flow Facilities
Good	< 3.00
Fair	≥ 3.00 & < 6.00
Poor	≥ 6.00

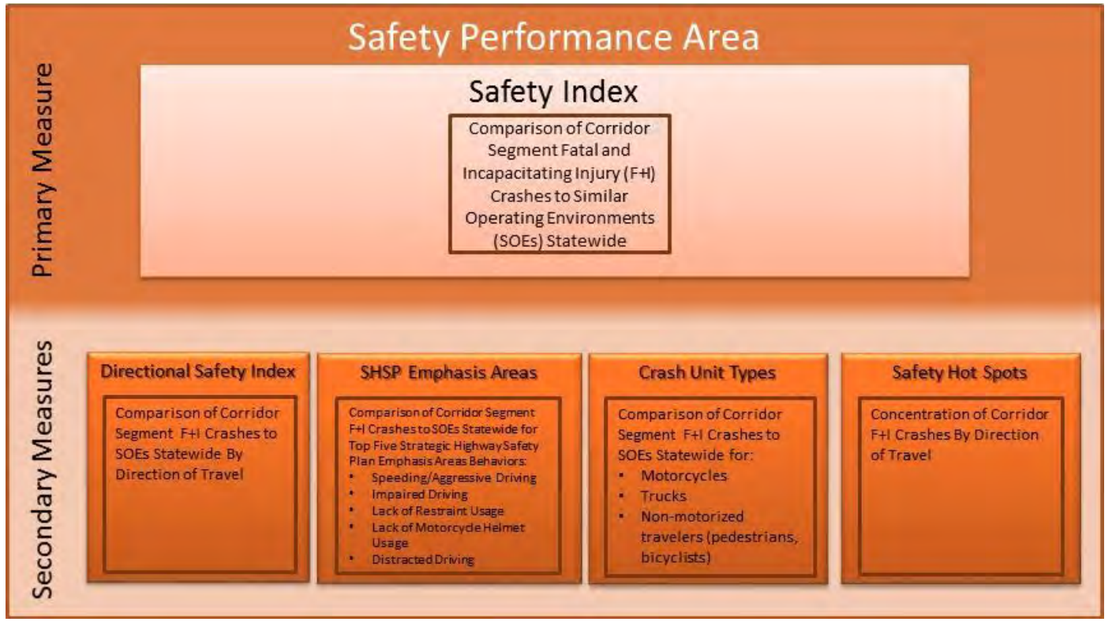
Performance Level	Percent Bicycle Accommodation
Good	≥ 90%
Fair	> 60% & ≤ 90%
Poor	< 60%

Performance Level	Percent Non-SOV Trips
Good	≥ 17%
Fair	> 11% & ≤ 17%
Poor	< 11%

Performance Level	Percent Transit Dependency
Good	Tracts with both zero and one vehicle household population in poverty percentages below the statewide average
Fair	Tracts with either zero and one vehicle household or population in poverty percentages below the statewide average
Poor	Tracts with both zero and one vehicle household and population in poverty percentages above the statewide average

Safety Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Safety performance area as shown in the following graphic:



Primary Safety Index

The Safety Index is a safety performance measure based on the bi-directional (i.e., both directions combined) frequency and rate of fatal and incapacitating injury crashes, the relative cost of those types of crashes, and crash occurrences on similar roadways in Arizona. According to ADOT's 2010 Highway Safety Improvement Program Manual, fatal crashes have an estimated cost that is 14.5 times the estimated cost of incapacitating injury crashes ($5.8 million compared to $400,000).

The Combined Safety Score (CSS) is an interim measure that combines fatal and incapacitating injury crashes into a single value. The CSS is calculated using the following generalized formula:

*CSS = 14.5 * (Normalized Fatal Crash Rate + Frequency) + (Normalized Incapacitating Injury Crash Rate + Frequency)*

Because crashes vary depending on the operating environment of a particular roadway, statewide CSS values were developed for similar operating environments defined by functional classification, urban vs. rural setting, number of travel lanes, and traffic volumes. To determine the Safety Index of a particular segment, the segment CSS is compared to the average statewide CSS for the similar statewide operating environment.

The Safety Index is calculated using the following formula:

Safety Index = Segment CSS / Statewide Similar Operating Environment CSS

The average annual Safety Index for a segment is compared to the statewide similar operating environment annual average, with one standard deviation from the statewide average forming the scale break points.

The more a particular segment's Safety Index value is below the statewide similar operating environment average, the better the safety performance is for that particular segment as a lower value represents fewer crashes.

Scoring:

The scale for rating the Safety Index depends on the operating environments selected, as shown in the table below.

Similar Operating Environment	Safety Index (Overall & Directional)	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	0.94	1.06
2 or 3 or 4 Lane Divided Highway	0.77	1.23
4 or 5 Lane Undivided Highway	0.80	1.20
6 Lane Highway	0.56	1.44
Rural 4 Lane Freeway with Daily Volume < 25,000	0.73	1.27
Rural 4 Lane Freeway with Daily Volume > 25,000	0.68	1.32
Urban 4 Lane Freeway	0.79	1.21
Urban or Rural 6 Lane Freeway	0.82	1.18
Urban > 6 Lane Freeway	0.80	1.20

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

Some corridor segments may have a very low number of total fatal and incapacitating injury crashes. Low crash frequencies (i.e., a small sample size) can translate into performance ratings that can be unstable. In some cases, a change in crash frequency of one crash (one additional crash or one less crash) could result in a change in segment performance of two levels. To avoid reliance on performance ratings where small changes in crash frequency result in large changes in performance, the following two criteria were developed to identify segments with "insufficient data" for assessing performance for the Safety Index. Both of these criteria must be met for a segment to have "insufficient data" to reliably rate the Safety Index performance:

- If the crash sample size (total fatal plus incapacitating injury crashes) for a given segment is less than five crashes over the five-year analysis period; AND

- If a change in one crash results in a change in segment performance by two levels (i.e., a change from below average to above average performance or a change from above average to below average frequency), the segment has "insufficient data" and Safety Index performance ratings are unreliable.

Secondary Safety Measures

The Safety performance area has four secondary measures related to fatal and incapacitating injury crashes:

- Directional Safety Index
- Strategic Highway Safety Plan (SHSP) Behavior Emphasis Areas
- Crash Unit Types
- Safety Hot Spots

Directional Safety Index: The Direction Safety Index shares the same calculation procedure and thresholds as the Safety Index. However, the measure is based on the directional frequency and rate of fatal and incapacitating injury crashes.

Similar to the Safety Index, the segment CSS is compared to the average statewide CSS for the similar statewide operating environment. The Directional Safety Index follows the lead of the Safety Index in terms of "insufficient data" status. If the Safety Index meets both criteria for "insufficient data", the Directional Safety Index should also be changed to "insufficient data". If the Safety Index does not meet both criteria for "insufficient data", the Directional Safety Index would also not change to say "insufficient data"

SHSP Behavior Emphasis Areas: ADOT's 2014 SHSP identifies several emphasis areas for reducing fatal and incapacitating injury crashes. The top five SHSP emphasis areas relate to the following driver behaviors:

- Speeding and aggressive driving
- Impaired driving
- Lack of restraint usage
- Lack of motorcycle helmet usage
- Distracted driving

To develop a performance measure that reflects these five emphasis areas, the percentage of total fatal and incapacitating injury crashes that involves at least one of the emphasis area driver behaviors on a particular segment is compared to the statewide average percentage of crashes involving at least one of the emphasis area driver behaviors on roads with similar operating environments in a process similar to how the Safety Index is developed.

To increase the crash sample size for this performance measure, the five behavior emphasis areas are combined to identify fatal and incapacitating injury crashes that exhibit one or more of the behavior emphasis areas.

The SHSP behavior emphasis areas performance is calculated using the following formula:

% Crashes Involving SHSP Behavior Emphasis Areas = Segment Crashes Involving SHSP Behavior Emphasis Areas / Total Segment Crashes

The percentage of total crashes involving SHSP behavior emphasis areas for a segment is compared to the statewide percentages on roads with similar operating environments. One standard deviation from the statewide average percentage forms the scale break points.

When assessing the performance of the SHSP behavior emphasis areas, the more the frequency of crashes involving SHSP behavior emphasis areas is below the statewide average implies better levels of segment performance. Thus, lower values are better, similar to the Safety Index.

Scoring:

The scale for rating the SHSP behavior emphasis areas performance depends on the crash history on similar statewide operating environments, as shown in the table below:

Similar Operating Environment	Crashes in SHSP Top 5 Emphasis Areas	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	51.2%	57.5%
2 or 3 or 4 Lane Divided Highway	44.4%	54.4%
4 or 5 Lane Undivided Highway	42.4%	51.1%
6 Lane Highway	35.3%	46.5%
Rural 4 Lane Freeway with Daily Volume < 25,000	42.8%	52.9%
Rural 4 Lane Freeway with Daily Volume > 25,000	40.8%	57.1%
Urban 4 Lane Freeway	49.1%	59.4%
Urban or Rural 6 Lane Freeway	33.5%	57.2%
Urban > 6 Lane Freeway	42.6%	54.8%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

The SHSP behavior emphasis areas secondary safety performance measure for the Safety performance area includes proportions of specific types of crashes within the total fatal and incapacitating injury crash frequencies. This more detailed categorization of fatal and incapacitating injury crashes can result in low crash frequencies (i.e., a small sample size) that translate into performance ratings that can be unstable. In some cases, a change in crash frequency of one crash (one additional crash or one less crash) could result in a change in segment performance of two levels. To avoid reliance on performance ratings where small changes in crash frequency result in large changes in performance, the following criteria were developed to identify segments with "insufficient data" for assessing performance for the SHSP behavior emphasis areas secondary

safety performance measure. If any of these criteria are met for a segment, that segment has "insufficient data" to reliably rate the SHSP behavior emphasis areas performance:

- If the crash sample size (total fatal plus incapacitating injury crashes) for a given segment is less than five crashes over the five-year analysis period, the segment has "insufficient data" and performance ratings are unreliable. OR
- If a change in one crash results in a change in segment performance by two levels (i.e., a change from below average to above average performance or a change from above average to below average frequency), the segment has "insufficient data" and performance ratings are unreliable. OR
- If the corridor average segment crash frequency for the SHSP behavior emphasis areas performance measure is less than two crashes over the five-year analysis period, the entire SHSP behavior emphasis areas performance measure has "insufficient data" and performance ratings are unreliable.

Crash Unit Type Emphasis Areas: ADOT's SHSP also identifies emphasis areas that relate to the following "unit-involved" crashes:

- Heavy vehicle (trucks)-involved crashes
- Motorcycle-involved crashes
- Non-motorized traveler (pedestrians and bicyclists)-involved crashes

To develop a performance measure that reflects the aforementioned crash unit type emphasis areas, the percentage of total fatal and incapacitating injury crashes that involves a given crash unit type emphasis area on a particular segment is compared to the statewide average percentage of crashes involving that same crash unit type emphasis area on roads with similar operating environments in a process similar to how the Safety Index is developed.

The SHSP crash unit type emphasis areas performance is calculated using the following formula:

% Crashes Involving Crash Unit Type = Segment Crashes Involving Crash Unit Type / Total Segment Crashes

The percentage of total crashes involving crash unit types for a segment is compared to the statewide percentages on roads with similar operating environments. One standard deviation from the statewide average percentage forms the scale break points.

When assessing the performance of the crash unit types, the more the frequency of crashes involving crash unit types is below the statewide average implies better levels of segment performance. Thus, lower values are better, similar to the Safety Index. The scale for rating the unit-involved crash performance depends on the crash history on similar statewide operating environments, as shown in the following tables.

Scoring:

Similar Operating Environment	Crashes Involving Trucks	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	5.2%	7.1%
2 or 3 or 4 Lane Divided Highway	3.5%	7.3%
4 or 5 Lane Undivided Highway	6.1%	9.6%
6 Lane Highway	0.3%	8.7%
Rural 4 Lane Freeway with Daily Volume < 25,000	13.2%	17.0%
Rural 4 Lane Freeway with Daily Volume > 25,000	7.2%	12.9%
Urban 4 Lane Freeway	6.8%	10.9%
Urban or Rural 6 Lane Freeway	6.2%	11.0%
Urban > 6 Lane Freeway	2.5%	6.0%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

Similar Operating Environment	Crashes Involving Motorcycles	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	18.5%	26.5%
2 or 3 or 4 Lane Divided Highway	16.3%	26.3%
4 or 5 Lane Undivided Highway	6.4%	9.4%
6 Lane Highway	0.0%	20.0%
Rural 4 Lane Freeway with Daily Volume < 25,000	5.0%	8.5%
Rural 4 Lane Freeway with Daily Volume > 25,000	7.7%	17.1%
Urban 4 Lane Freeway	9.3%	11.5%
Urban or Rural 6 Lane Freeway	6.7%	12.9%
Urban > 6 Lane Freeway	12.6%	20.5%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

Similar Operating Environment	Crashes Involving Non-Motorized Travelers	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	2.2%	4.2%
2 or 3 or 4 Lane Divided Highway	2.4%	4.5%
4 or 5 Lane Undivided Highway	4.7%	7.9%
6 Lane Highway	8.4%	17.4%
Rural 4 Lane Freeway with Daily Volume < 25,000	1.7%	2.5%
Rural 4 Lane Freeway with Daily Volume > 25,000	0.0%	0.0%
Urban 4 Lane Freeway	4.8%	10.3%
Urban or Rural 6 Lane Freeway	0.9%	6.7%
Urban > 6 Lane Freeway	0.5%	1.5%

** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

The crash unit types have the same “insufficient data” criteria as the SHSP behavior emphasis areas.

Safety Hot Spots: A hot spot analysis was conducted that identified abnormally high concentrations of fatal and incapacitating injury crashes along the study corridor by direction of travel. The identification of crash concentrations involves a GIS-based function known as “kernel density analysis”. This measure is mapped for graphical display purposes with the Directional Safety Index but is not included in the Safety performance area rating calculations.

Freight Performance Area Calculation Methodologies

This section summarizes the approach for developing the primary and secondary performance measures in the Freight performance area as shown in the following graphic:

Primary Freight Index

The Freight Index is a reliability performance measure based on the planning time index for truck travel. The industry standard definition for the Truck Planning Time Index (TPTI) is the ratio of total travel time needed for 95% on-time arrival to free-flow travel time. The TPTI reflects the extra buffer time needed for on-time delivery while accounting for non-recurring delay. Non-recurring delay refers to unexpected or abnormal delay due to closures or restrictions resulting from circumstances such as crashes, inclement weather, and construction activities.

The TPTI can be converted into a speed-based index by recognizing that speed is equal to distance traveled divided by travel time. The inverse relationship between travel time and speed means that the 95th percentile highest travel time corresponds to the 5th percentile lowest speed. The speed-based TPTI is calculated using the following formula:

TPTI = Free-Flow Truck Speed / Observed 5th Percentile Lowest Truck Speed

Observed 5th percentile lowest truck speeds are available in the 2014 American Digital Cartography, Inc. HERE (formerly NAVTEQ) database to which ADOT has access. The free-flow truck speed is assumed to be 65 miles per hour or the posted speed, whichever is less. This upper limit of 65 mph accounts for governors that trucks often have that restrict truck speeds to no more than 65 mph, even when the speed limit may be higher.

For each corridor segment, the TPTI is calculated for each direction of travel and then averaged to create a bi-directional TPTI. When assessing performance using TPTI, the higher the TPTI value is above 1.0, the more buffer time is needed to ensure on-time delivery.

The Freight Index is calculated using the following formula to invert the overall TPTI:

Freight Index = 1 / Bi-directional TPTI

Inversion of the TPTI allows the Freight Index to have a scale where the higher the value, the better the performance, which is similar to the directionality of the scales of most of the other primary measures. This Freight Index scale is based on inverted versions of TPTI scales created previously by ADOT. The scale for rating the Freight Index differs between uninterrupted and interrupted flow facilities.

Secondary Freight Measures

The Freight performance area includes five secondary measures that provide an in-depth evaluation of the different characteristics of freight performance:

- Recurring Delay (Directional TTTI)
- Non-Recurring Delay (Directional TPTI)
- Closure Duration
- Bridge Vertical Clearance
- Bridge Vertical Clearance Hot Spots

Recurring Delay (Directional TTTI): The performance measure for recurring delay is the Directional Truck Travel Time Index (TTTI). The industry standard definition for TTTI is the ratio of average peak period travel time to free-flow travel time. The TTTI reflects the extra time spent in traffic during peak times due to recurring delay. Recurring delay refers to expected or normal delay due to roadway capacity constraints or traffic control devices.

Similar to the TPTI, the TTTI can be converted into a speed-based index by recognizing that speed is equal to distance traveled divided by travel time. The speed-based TTTI can be calculated using the following formula:

TTTI = Free-Flow Truck Speed / Observed Average Peak Period Truck Speed

Observed average peak period truck speeds are available in the 2014 American Digital Cartography, Inc. HERE (formerly NAVTEQ) database to which ADOT has access. The free-flow truck speed is assumed to be 65 mph or the posted speed, whichever is less.

For each corridor segment, the TTTI is calculated for each direction of travel. With the TTTI, the higher the TTTI value is above 1.0, the more time is spent in traffic during peak times. TTTI values are generally lower than TPTI values. The Directional TTTI scale is based on TTTI scales created previously by ADOT.

Non-Recurring Delay (Directional TPTI): The performance measure for non-recurring delay is the Directional TPTI. Directional TPTI is calculated as described previously as an interim step in the development of the Freight Index.

For each corridor segment, the TPTI is calculated for each direction of travel. With the TPTI, the higher the TPTI value is above 1.0, the more buffer time is needed to ensure on-time delivery.

Closure Duration: This performance measure related to road closures is average roadway closure (i.e., full lane closure) duration time in minutes. There are three main components to full closures that affect reliability – frequency, duration, and extent. In the freight industry, closure duration is the most important component because trucks want to minimize travel time and delay.

Data on the frequency, duration, and extent of full roadway closures on the ADOT State Highway System is available for 2010-2014 in the HCRS database that is managed and updated by ADOT.

The average closure duration in a segment – in terms of the average time a milepost is closed per mile per year on a given segment – is calculated using the following formula:

*Closure Duration = Sum of Segment (Closure Clearance Time * Closure Extent) / Segment Length*

The segment closure duration time in minutes can then be compared to statewide averages for closure duration in minutes, with one-half standard deviation from the average forming the scale break points. The scale for rating closure duration in minutes is found at the end of this section.

Bridge Vertical Clearance: This performance measure uses the vertical clearance information from the ADOT Bridge Database to identify locations with low vertical clearance. The minimum vertical clearance for all underpass structures (i.e., structures under which mainline traffic passes) is determined for each segment.

Bridge Vertical Clearance Hot Spots: This performance measure related to truck restrictions is the locations, or hot spots, where bridge vertical clearance issues restrict truck travel. Sixteen feet three inches (16.25') is the minimum standard vertical clearance value for state highway bridges over travel lanes.

Locations with lower vertical clearance values than the minimum standard are categorized by the ADOT Intermodal Transportation Department Engineering Permits Section as either locations where ramps exist that allow the restriction to be avoided or locations where ramps do not exist and the restriction cannot be avoided. The locations with vertical clearances below the minimum standard that cannot be ramped around are considered hot spots. This measure is mapped for graphical display purposes with the bridge vertical clearance map but is not included in the Freight performance area rating calculations.

Scoring:

Performance Level	Freight Index	
	Uninterrupted Flow Facilities	Interrupted Flow Facilities
Good	> 0.77	> 0.33
Fair	0.67 – 0.77	0.17 – 0.33
Poor	< 0.67	< 0.17

Performance Level	TTTI	
	Uninterrupted Flow Facilities	Interrupted Flow Facilities
Good	< 1.15	< 1.30
Fair	1.15 – 1.33	1.30 – 2.00
Poor	> 1.33	> 2.00

Performance Level	TPTI	
	Uninterrupted Flow Facilities	Interrupted Flow Facilities
Good	< 1.30	< 3.00
Fair	1.30 – 1.50	3.00 – 6.00
Poor	> 1.50	> 6.00

Performance Level	Closure Duration (minutes)
Good	< 44.18
Fair	44.18 – 124.86
Poor	> 124.86

Performance Level	Bridge Vertical Clearance
Good	> 16.5'
Fair	16.0' – 16.5'
Poor	< 16.0'

Appendix C: Performance Area Data

Pavement Performance Area Data

				Eastbound			Westbound			EB		WB		Composite		Pavement Index	% Pavement Failure	
				# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	EB	WB		EB	WB
Segment 8-1: California State Line to Avenue 15 E (MP 0 to MP 16.3)																		
Mile 1	0	to	1	2	111.97	0	2	115.88	0	3.27	5.0	3.22	5.0	3.79	3.75		2	2
Mile 2	1	to	2	2	34.69	0	2	25.72	0	4.38	5.0	4.53	5.0	4.57	4.67		0	0
Mile 3	2	to	3	2	35.30	0	2	32.18	0	4.37	5.0	4.42	5.0	4.56	4.60		0	0
Mile 4	3	to	4	2	42.74	0	2	40.02	0	4.25	5.0	4.29	5.0	4.48	4.51		0	0
Mile 5	4	to	5	2	27.71	0	2	25.80	0	4.50	5.0	4.53	5.0	4.65	4.67		0	0
Mile 6	5	to	6	2	26.75	0	2	26.11	0	4.52	5.0	4.53	5.0	4.66	4.67		0	0
Mile 7	6	to	7	2	28.89	0	2	29.85	0	4.48	5.0	4.46	5.0	4.64	4.62		0	0
Mile 8	7	to	8	2	35.34	0	2	34.49	0	4.37	5.0	4.39	5.0	4.56	4.57		0	0
Mile 9	8	to	9	2	39.71	0	2	44.49	0	4.30	5.0	4.22	5.0	4.51	4.46		0	0
Mile 10	9	to	10	2	45.70	0	2	41.18	0	4.20	5.0	4.28	5.0	4.44	4.49		0	0
Mile 11	10	to	11	2	31.04	0	2	37.49	0	4.44	5.0	4.34	5.0	4.61	4.54		0	0
Mile 12	11	to	12	2	30.67	0	2	30.55	0	4.45	5.0	4.45	5.0	4.61	4.62		0	0
Mile 13	12	to	13	2	35.41	0	2	26.99	0	4.37	5.0	4.51	5.0	4.56	4.66		0	0
Mile 14	13	to	14	2	39.26	0	2	39.15	55	4.31	5.0	4.31	0.1	4.51	0.14		0	2
Mile 15	14	to	15	2	50.74	30	2	53.47	30	4.12	1.7	4.08	1.7	1.74	1.74		2	2
Mile 15	15	to	16	2	45.84	0	2	42.19	0	4.20	5.0	4.26	5.0	4.44	4.48		0	0
			Total	32			32											10
			Weighted Average							4.28	4.80	4.30	4.49	4.33	4.07			
			Factor							1.00		1.00						
			Indicator Score							**4.28**		**4.30**						**15.6%**
			Pavement Index													**4.20**		
Segment 8-2: Avenue 15E to East of Dome Valley TI (MP 16.3 - MP 21.4)																		
Mile 1	16	to	17	2	94.06	0	2	40.86	30	3.50	5.0	4.28	1.7	3.95	1.74		0	2
Mile 2	17	to	18	2	53.90	0	2	42.79	40	4.07	5.0	4.25	1.1	4.35	1.06		0	2
Mile 3	18	to	19	2	46.71	30	2	61.53	40	4.19	1.7	3.96	1.1	1.74	1.06		2	2
Mile 4	19	to	20	2	53.49	1	2	48.21	35	4.08	4.7	4.16	1.4	4.25	1.40		0	2
Mile 5	20	to	21	2	93.74	0	2	77.55	65	3.50	5.0	3.72	-0.4	3.95	-0.42		0	2
			Total	10			10											12
			Weighted Average							3.87	4.28	4.07	0.97	3.65	0.97			
			Factor							1.00		1.00						
			Indicator Score							**3.87**		**4.07**						**60.0%**
			Pavement Index													**2.31**		

Segment 8-3: East of Dome Valley TI to East of Mohawk TI (MP 21.4 - MP 56.5)																			
Mile 1	21	to	22	2	94.36	8	2	91.37	2	3.49	3.6	3.53	4.5	3.54	3.81		0	0
Mile 2	22	to	23	2	100.66	15	2	115.69	8	3.41	2.9	3.22	3.6	2.94	3.35		0	2
Mile 3	23	to	24	2	112.31	20	2	79.63	10	3.26	2.5	3.69	3.4	2.51	3.50		2	0
Mile 4	24	to	25	2	99.13	12	2	89.85	15	3.43	3.2	3.55	2.9	3.28	2.94		0	0
Mile 5	25	to	26	2	83.20	15	2	104.76	8	3.64	2.9	3.36	3.6	2.94	3.44		0	0
Mile 6	26	to	27	2	125.11	15	2	85.06	15	3.11	2.9	3.62	2.9	2.94	2.94		2	0
Mile 7	27	to	28	2	97.93	20	2	83.42	12	3.45	2.5	3.64	3.2	2.51	3.35		2	0
Mile 8	28	to	29	2	93.51	15	2	91.34	15	3.50	2.9	3.53	2.9	2.94	2.94		0	0
Mile 9	29	to	30	2	51.32	4	2	50.97	15	4.11	4.1	4.12	2.9	4.12	2.94		0	0
Mile 10	30	to	31	2	37.81	0	2	45.08	0	4.33	5.0	4.21	5.0	4.53	4.45		0	0
Mile 11	31	to	32	2	47.79	0	2	52.63	0	4.17	5.0	4.09	5.0	4.42	4.37		0	0
Mile 12	32	to	33	2	58.42	0	2	43.62	0	4.00	5.0	4.24	5.0	4.30	4.47		0	0
Mile 13	33	to	34	2	45.78	5	2	54.80	2	4.20	4.0	4.06	4.5	4.06	4.18		0	0
Mile 14	34	to	35	2	50.32	4	2	50.90	0	4.13	4.1	4.12	5.0	4.13	4.38		0	0
Mile 15	35	to	36	2	49.01	0	2	51.99	1	4.15	5.0	4.10	4.7	4.41	4.27		0	0
Mile 16	36	to	37	2	61.65	5	2	68.08	0	3.96	4.0	3.86	5.0	3.97	4.20		0	0
Mile 17	37	to	38	2	99.63	5	2	79.01	3	3.42	4.0	3.70	4.3	3.60	3.88		0	0
Mile 18	38	to	39	2	78.50	15	2	66.44	5	3.71	2.9	3.88	4.0	2.94	3.92		0	0
Mile 19	39	to	40	2	80.51	15	2	62.61	5	3.68	2.9	3.94	4.0	2.94	3.96		0	0
Mile 20	40	to	41	2	90.37	10	2	64.87	8	3.55	3.4	3.91	3.6	3.46	3.72		0	0
Mile 21	41	to	42	2	67.71	9	2	75.24	7	3.87	3.5	3.76	3.8	3.63	3.75		0	0
Mile 22	42	to	43	2	66.82	9	2	63.59	7	3.88	3.5	3.93	3.8	3.63	3.81		0	0
Mile 23	43	to	44	2	68.67	10	2	66.31	10	3.85	3.4	3.89	3.4	3.55	3.56		0	0
Mile 24	44	to	45	2	67.12	10	2	69.26	12	3.87	3.4	3.84	3.2	3.56	3.41		0	0
Mile 25	45	to	46	2	72.52	7	2	65.62	3	3.80	3.8	3.90	4.3	3.77	4.01		0	0
Mile 26	46	to	47	2	80.26	10	2	59.45	9	3.69	3.4	3.99	3.5	3.50	3.67		0	0
Mile 27	47	to	48	2	92.27	10	2	84.24	10	3.52	3.4	3.63	3.4	3.45	3.49		0	0
Mile 28	48	to	49	2	108.90	7	2	85.15	4	3.31	3.8	3.62	4.1	3.44	3.77		2	0
Mile 29	49	to	50	2	100.83	10	2	81.99	12	3.41	3.4	3.66	3.2	3.41	3.35		0	0
Mile 30	50	to	51	2	83.99	20	2	76.78	12	3.63	2.5	3.73	3.2	2.51	3.38		2	0
Mile 31	51	to	52	2	76.86	20	2	65.62	4	3.73	2.5	3.90	4.1	2.51	3.97		2	0
Mile 32	52	to	53	2	74.90	7	2	70.50	7	3.76	3.8	3.82	3.8	3.76	3.78		0	0
Mile 33	53	to	54	2	65.82	6	2	71.08	5	3.89	3.9	3.82	4.0	3.88	3.87		0	0
Mile 34	54	to	55	2	63.56	10	2	67.64	9	3.93	3.4	3.87	3.5	3.57	3.63		0	0
Mile 35	55	to	56	2	70.82	20	2	87.03	15	3.82	2.5	3.59	2.9	2.51	2.94		2	0
Mile 36	56	to	57	2	49.60	4	2	132.59	7	4.14	4.1	3.02	3.8	4.14	3.02		0	2
			Total	72			72											18
			Weighted Average							3.74	3.54	3.79	3.84	3.48	3.68			
			Factor							1.00		1.00						
			Indicator Score							**3.74**		**3.79**						**12.5%**
			Pavement Index													**3.58**		

Segment 8-4: East of Dome Valley TI to East of Mohawk TI (MP 56.5 - MP 79.6)																		
Mile 1	57	to	58	2	54.48	2	2	134.04	25	4.07	4.5	3.00	2.1	4.18	2.11		0	2
Mile 2	58	to	59	2	50.98	4	2	144.53	25	4.12	4.1	2.89	2.1	4.13	2.11		0	2
Mile 3	59	to	60	2	73.91	4	2	150.82	10	3.78	4.1	2.82	3.4	3.88	2.82		0	2
Mile 4	60	to	61	2	76.60	3	2	147.16	15	3.74	4.3	2.86	2.9	3.90	2.86		0	2
Mile 5	61	to	62	2	82.70	2	2	148.27	20	3.65	4.5	2.85	2.5	3.89	2.51		0	2
Mile 6	62	to	63	2	62.58	4	2	132.66	25	3.94	4.1	3.02	2.1	4.00	2.11		0	2
Mile 7	63	to	64	2	84.91	7	2	133.96	20	3.62	3.8	3.01	2.5	3.66	2.51		0	2
Mile 8	64	to	65	2	79.93	6	2	123.40	10	3.69	3.9	3.13	3.4	3.75	3.13		0	2
Mile 9	65	to	66	2	70.03	5	2	126.12	6	3.83	4.0	3.10	3.9	3.88	3.10		0	2
Mile 10	66	to	67	2	28.81	0	2	36.71	35	4.48	5.0	4.35	1.4	4.64	1.40		0	2
Mile 11	67	to	68	2	36.31	0	2	46.21	0	4.36	5.0	4.19	5.0	4.55	4.44		0	0
Mile 12	68	to	69	2	28.11	0	2	30.18	0	4.49	5.0	4.46	5.0	4.65	4.62		0	0
Mile 13	69	to	70	2	29.33	0	2	35.07	0	4.47	5.0	4.38	5.0	4.63	4.56		0	0
Mile 14	70	to	71	2	33.90	0	2	33.83	0	4.40	5.0	4.40	5.0	4.58	4.58		0	0
Mile 15	71	to	72	2	64.07	3	2	37.33	0	3.92	4.3	4.34	5.0	4.03	4.54		0	0
Mile 16	72	to	73	2	99.24	12	2	49.05	6	3.43	3.2	4.15	3.9	3.28	3.96		0	0
Mile 17	73	to	74	2	68.72	6	2	47.52	7	3.85	3.9	4.17	3.8	3.86	3.88		0	0
Mile 18	74	to	75	2	104.91	8	2	44.17	7	3.36	3.6	4.23	3.8	3.44	3.90		0	0
Mile 19	75	to	76	2	99.34	4	2	54.44	8	3.43	4.1	4.07	3.6	3.64	3.77		0	0
Mile 20	76	to	77	2	126.64	6	2	53.93	8	3.09	3.9	4.07	3.6	3.09	3.77		2	0
Mile 21	77	to	78	2	95.82	10	2	39.93	4	3.47	3.4	4.30	4.1	3.44	4.19		0	0
Mile 22	78	to	79	2	50.54	8	2	49.14	7	4.13	3.6	4.15	3.8	3.79	3.87		0	0
Mile 23	79	to	80	2	82.72	7	2	46.03	8	3.65	3.8	4.20	3.6	3.68	3.81		0	0
			Total	46			46											22
			Weighted Average							3.87	4.18	3.74	3.55	3.94	3.41			
			Factor							1.00		1.00						
			Indicator Score							**3.87**		**3.74**						**23.9%**
			Pavement Index													**3.68**		

Segment 8-5: Maricopa County Line to 355th Avenue (MP 79.6 - MP 110.4)																		
Mile 1	80	to	81	2	86.57	8	2	45.62	8	3.60	3.6	4.20	3.6	3.61	3.81		0	0
Mile 2	81	to	82	2	88.86	8	2	49.45	15	3.57	3.6	4.14	2.9	3.59	2.94		0	0
Mile 3	82	to	83	2	68.70	6	2	91.52	7	3.85	3.9	3.53	3.8	3.86	3.60		0	0
Mile 4	83	to	84	2	61.82	12	2	80.95	8	3.95	3.2	3.68	3.6	3.44	3.65		0	0
Mile 5	84	to	85	2	74.59	15	2	78.69	7	3.77	2.9	3.71	3.8	2.94	3.72		0	0
Mile 6	85	to	86	2	63.19	7	2	90.54	10	3.93	3.8	3.54	3.4	3.81	3.46		0	0
Mile 7	86	to	87	2	89.75	12	2	89.75	6	3.56	3.2	3.56	3.9	3.32	3.65		0	0
Mile 8	87	to	88	2	109.59	4	2	95.90	6	3.30	4.1	3.47	3.9	3.55	3.59		2	0
Mile 9	88	to	89	2	87.18	30	2	91.90	15	3.59	1.7	3.53	2.9	1.74	2.94		2	0
Mile 10	89	to	90	2	69.05	12	2	84.18	10	3.85	3.2	3.63	3.4	3.41	3.49		0	0
Mile 11	90	to	91	2	73.93	8	2	57.12	3	3.78	3.6	4.02	4.3	3.68	4.10		0	0
Mile 12	91	to	92	2	75.44	5	2	51.79	3	3.75	4.0	4.11	4.3	3.83	4.16		0	0
Mile 13	92	to	93	2	77.48	5	2	62.85	4	3.72	4.0	3.94	4.1	3.81	4.00		0	0
Mile 14	93	to	94	2	94.03	12	2	65.17	7	3.50	3.2	3.90	3.8	3.30	3.80		0	0
Mile 15	94	to	95	2	91.50	7	2	70.23	5	3.53	3.8	3.83	4.0	3.60	3.88		0	0
Mile 16	95	to	96	2	91.61	5	2	76.84	10	3.53	4.0	3.73	3.4	3.67	3.52		0	0
Mile 17	96	to	97	2	120.58	10	2	95.63	12	3.16	3.4	3.48	3.2	3.16	3.30		2	0
Mile 18	97	to	98	2	122.67	12	2	105.87	12	3.14	3.2	3.34	3.2	3.14	3.26		2	2
Mile 19	98	to	99	2	149.95	8	2	109.42	10	2.83	3.6	3.30	3.4	2.83	3.34		2	2
Mile 20	99	to	100	2	74.92	10	2	122.00	8	3.76	3.4	3.15	3.6	3.52	3.15		0	2
Mile 21	100	to	101	2	105.12	15	2	119.81	20	3.35	2.9	3.17	2.5	2.94	2.51		2	2
Mile 22	101	to	102	2	106.21	7	2	111.06	12	3.34	3.8	3.28	3.2	3.46	3.24		2	2
Mile 23	102	to	103	2	139.79	7	2	211.28	12	2.94	3.8	2.24	3.2	2.94	2.24		2	2
Mile 24	103	to	104	2	87.95	6	2	183.61	15	3.58	3.9	2.49	2.9	3.67	2.49		0	2
Mile 25	104	to	105	2	89.72	15	2	162.99	35	3.56	2.9	2.69	1.4	2.94	1.40		0	2
Mile 26	105	to	106	2	95.09	4	2	159.18	35	3.48	4.1	2.73	1.4	3.68	1.40		0	2
Mile 27	106	to	107	2	70.58	3	2	52.96	4	3.82	4.3	4.09	4.1	3.96	4.10		0	0
Mile 28	107	to	108	2	64.27	2	2	57.85	4	3.92	4.5	4.01	4.1	4.08	4.05		0	0
Mile 29	108	to	109	2	66.36	4	2	53.70	2	3.89	4.1	4.08	4.5	3.96	4.19		0	0
Mile 30	109	to	110	2	70.75	4	2	55.90	3	3.82	4.1	4.04	4.3	3.92	4.12		0	0
			Total	60			60											34
			Weighted Average							3.58	3.60	3.55	3.48	3.45	3.37			
			Factor							1.00		1.00						
			Indicator Score							**3.58**		**3.55**						**28.3%**
			Pavement Index													**3.41**		

Segment 8-6: 355th Avenue to 9 Mile Well Road (MP 110.4 - MP 120.0)																		
Mile 1	110	to	111	2	61.38	3	2	56.66	4	3.96	4.3	4.03	4.1	4.06	4.06		0	0
Mile 2	111	to	112	2	63.65	2	2	58.61	5	3.93	4.5	4.00	4.0	4.08	4.00		0	0
Mile 3	112	to	113	2	55.72	2	2	60.03	4	4.05	4.5	3.98	4.1	4.17	4.03		0	0
Mile 4	113	to	114	2	75.52	4	2	73.20	3	3.75	4.1	3.79	4.3	3.87	3.94		0	0
Mile 5	114	to	115	2	63.69	4	2	60.29	4	3.93	4.1	3.98	4.1	3.99	4.02		0	0
Mile 6	115	to	116	2	79.83	3	2	88.59	3	3.69	4.3	3.57	4.3	3.87	3.79		0	0
Mile 7	116	to	117	2	58.93	0	2	56.27	1	4.00	5.0	4.04	4.7	4.30	4.22		0	0
Mile 8	117	to	118	2	55.19	0	2	45.29	0	4.05	5.0	4.21	5.0	4.34	4.45		0	0
Mile 9	118	to	119	2	36.22	0	2	42.12	0	4.36	5.0	4.26	5.0	4.55	4.48		0	0
Mile 10	119	to	120	2	31.32	0	2	33.15	0	4.44	5.0	4.41	5.0	4.61	4.59		0	0
			Total	20			20											0
			Weighted Average							4.01	4.58	4.03	4.46	4.18	4.16			
			Factor							1.00		1.00						
			Indicator Score							**4.01**		**4.03**						**0.0%**
			Pavement Index													**4.17**		

Segment 8-7: 9 Mile Well Road to Maricopa County Line (MP 120.0 - MP 147.6)																			
Mile 1	120	to	121	2	28.34	2	2	30.34	0	4.49	4.5	4.46	5.0	4.47	4.62		0	0
Mile 2	121	to	122	2	27.95	0	2	32.74	0	4.50	5.0	4.42	5.0	4.65	4.59		0	0
Mile 3	122	to	123	2	31.65	0	2	30.44	0	4.43	5.0	4.45	5.0	4.60	4.62		0	0
Mile 4	123	to	124	2	29.54	4	2	29.68	0	4.47	4.1	4.47	5.0	4.24	4.63		0	0
Mile 5	124	to	125	2	27.92	0	2	27.90	0	4.50	5.0	4.50	5.0	4.65	4.65		0	0
Mile 6	125	to	126	2	28.10	0	2	29.36	0	4.49	5.0	4.47	5.0	4.65	4.63		0	0
Mile 7	126	to	127	2	30.31	0	2	32.28	0	4.46	5.0	4.42	5.0	4.62	4.60		0	0
Mile 8	127	to	128	2	31.28	0	2	31.04	0	4.44	5.0	4.44	5.0	4.61	4.61		0	0
Mile 9	128	to	129	2	30.82	0	2	30.61	0	4.45	5.0	4.45	5.0	4.61	4.62		0	0
Mile 10	129	to	130	2	29.32	0	2	32.42	0	4.47	5.0	4.42	5.0	4.63	4.59		0	0
Mile 11	130	to	131	2	29.45	0	2	32.32	0	4.47	5.0	4.42	5.0	4.63	4.60		0	0
Mile 12	131	to	132	2	28.42	0	2	31.78	0	4.49	5.0	4.43	5.0	4.64	4.60		0	0
Mile 13	132	to	133	2	29.11	0	2	30.32	0	4.48	5.0	4.46	5.0	4.63	4.62		0	0
Mile 14	133	to	134	2	29.61	0	2	31.00	0	4.47	5.0	4.44	5.0	4.63	4.61		0	0
Mile 15	134	to	135	2	60.15	2	2	51.06	0	3.98	4.5	4.12	5.0	4.12	4.38		0	0
Mile 16	135	to	136	2	80.78	1	2	76.77	5	3.68	4.7	3.73	4.0	3.97	3.82		0	0
Mile 17	136	to	137	2	87.91	5	2	86.03	2	3.58	4.0	3.61	4.5	3.71	3.86		0	0
Mile 18	137	to	138	2	82.17	4	2	75.47	4	3.66	4.1	3.75	4.1	3.80	3.87		0	0
Mile 19	138	to	139	2	96.38	6	2	78.60	1	3.47	3.9	3.71	4.7	3.59	3.99		0	0
Mile 20	139	to	140	2	76.81	3	2	83.62	3	3.73	4.3	3.64	4.3	3.90	3.83		0	0
Mile 21	140	to	141	2	84.39	2	2	80.16	6	3.63	4.5	3.69	3.9	3.88	3.74		0	0
Mile 22	141	to	142	2	60.32	1	2	44.95	1	3.98	4.7	4.21	4.7	4.18	4.35		0	0
Mile 23	142	to	143	2	54.88	20	2	42.28	4	4.06	2.5	4.26	4.1	2.51	4.17		2	0
Mile 24	143	to	144	2	52.23	12	2	50.30	7	4.10	3.2	4.13	3.8	3.48	3.87		0	0
Mile 25	144	to	145	2	60.19	12	2	50.75	12	3.98	3.2	4.12	3.2	3.45	3.49		0	0
Mile 26	145	to	146	2	52.81	15	2	55.37	30	4.09	2.9	4.05	1.7	2.94	1.74		0	2
Mile 27	146	to	147	2	56.16	12	2	48.32	9	4.04	3.2	4.16	3.5	3.47	3.72		0	0
Mile 28	147	to	148	2	68.78	15	2	77.91	20	3.85	2.9	3.72	2.5	2.94	2.51		0	2
			Total	56		56												6
			Weighted Average							4.16	4.33	4.18	4.43	4.08	4.14			
			Factor							1.00		1.00						
			Indicator Score							**4.16**		**4.18**						**5.4%**
			Pavement Index													**4.11**		

Segment 8-8: Maricopa County Line to S Midway Road (MP 147.6 - MP 166.5)																		
Mile 1	148	to	149	2	69.68	5	2	98.14	45	3.84	4.0	3.44	0.7	3.89	0.74		0	2
Mile 2	149	to	150	2	74.44	5	2	76.31	10	3.77	4.0	3.74	3.4	3.84	3.52		0	0
Mile 3	150	to	151	2	60.23	3	2	78.04	15	3.98	4.3	3.72	2.9	4.07	2.94		0	0
Mile 4	151	to	152	2	101.28	3	2	65.99	20	3.40	4.3	3.89	2.5	3.67	2.51		0	2
Mile 5	152	to	153	2	118.90	12	2	49.69	25	3.18	3.2	4.14	2.1	3.18	2.11		2	2
Mile 6	153	to	154	2	104.99	25	2	46.17	12	3.36	2.1	4.20	3.2	2.11	3.51		2	0
Mile 7	154	to	155	2	89.42	7	2	44.56	15	3.56	3.8	4.22	2.9	3.62	2.94		0	0
Mile 8	155	to	156	2	79.40	15	2	50.97	15	3.70	2.9	4.12	2.9	2.94	2.94		0	0
Mile 9	156	to	157	2	87.46	5	2	169.88	14	3.59	4.0	2.62	3.0	3.71	2.62		0	2
Mile 10	157	to	158	2	66.96	3	2	98.35	50	3.88	4.3	3.44	0.4	4.00	0.44		0	2
Mile 11	158	to	159	2	79.55	1	2	87.46	12	3.70	4.7	3.59	3.2	3.98	3.33		0	0
Mile 12	159	to	160	2	86.24	0	2	91.73	0	3.60	5.0	3.53	5.0	4.02	3.97		0	0
Mile 13	160	to	161	2	89.21	0	2	98.63	0	3.56	5.0	3.44	5.0	3.99	3.91		0	0
Mile 14	161	to	162	2	36.46	0	2	97.64	0	4.35	5.0	3.45	5.0	4.55	3.92		0	0
Mile 15	162	to	163	2	40.17	0	2	74.65	0	4.29	5.0	3.77	5.0	4.50	4.14		0	0
Mile 16	163	to	164	2	37.37	0	2	69.50	0	4.34	5.0	3.84	5.0	4.54	4.19		0	0
Mile 17	164	to	165	2	37.11	0	2	48.38	0	4.34	5.0	4.16	5.0	4.54	4.41		0	0
Mile 18	165	to	166	2	35.67	0	2	59.38	0	4.37	5.0	3.99	5.0	4.56	4.29		0	0
Mile 19	166	to	167	2	54.76	0	2	62.27	0	4.06	5.0	3.95	5.0	4.34	4.26		0	0
			Total	38			38											14
			Weighted Average							3.83	4.29	3.75	3.55	3.90	3.19			
			Factor							1.00		1.00						
			Indicator Score							**3.83**		**3.75**						**18.4%**
			Pavement Index													**3.55**		
Segment 8-9: S Midway Road to Interstate 10 (MP 166.5 - MP 178.3)																		
Mile 1	167	to	168	2	46.28	0	2	60.77	0	4.19	5.0	3.97	5.0	4.44	4.28		0	0
Mile 2	168	to	169	2	87.18	0	2	59.75	0	3.59	5.0	3.98	5.0	4.01	4.29		0	0
Mile 3	169	to	170	2	85.66	0	2	66.80	0	3.61	5.0	3.88	5.0	4.03	4.22		0	0
Mile 4	170	to	171	2	129.94	0	2	94.50	0	3.05	5.0	3.49	5.0	3.05	3.94		2	0
Mile 5	171	to	172	2	101.81	4	2	87.30	5	3.40	4.1	3.59	4.0	3.62	3.71		0	0
Mile 6	172	to	173	2	105.37	15	2	97.50	12	3.35	2.9	3.45	3.2	2.94	3.29		2	0
Mile 7	173	to	174	2	103.67	5	2	97.34	3	3.37	4.0	3.45	4.3	3.56	3.70		0	0
Mile 8	174	to	175	2	111.36	8	2	106.49	2	3.27	3.6	3.34	4.5	3.38	3.67		2	2
Mile 9	175	to	176	2	113.18	9	2	115.42	9	3.25	3.5	3.22	3.5	3.34	3.32		2	2
Mile 10	176	to	177	2	84.34	8	2	88.61	4	3.63	3.6	3.57	4.1	3.63	3.74		0	0
Mile 11	177	to	178	2	111.65	12	2	96.10	3	3.27	3.2	3.47	4.3	3.24	3.72		2	0
Mile 12	178	to	179	2	149.51	70	2	124.73	5	2.83	-0.7	3.11	4.0	-0.70	3.11		2	2
			Total	24			24											18
			Weighted Average							3.40	3.70	3.54	4.33	3.21	3.75			
			Factor							1.00		1.00						
			Indicator Score							**3.40**		**3.54**						**37.5%**
			Pavement Index													**3.48**		

Bridge Performance Area Data

Structure Name		Structure No. (N8)	Milepost (A232)	Area (SF)	Bridge Sufficiency	Bridge Index					Functionally Obsolete Bridges	Bridge Rating	Hot Spots on Bridge Index Map
					Sufficiency Rating	Deck (N58)	Sub (N59)	Super (N60)	Eval (N67)	Lowest	Deck Area on Func Obsolete		
Segment 8-1: California State Line to Avenue 15 E (MP 0 to MP 16.3)													
Colorado River Viaduct EB		1700	0.01	117,107	95.00	4	8	7	7	4.0			Yes
Colorado River Viaduct WB		1701	0.01	113,657	97.00	7	7	7	7	7.0			Yes
4th Street UPRR UP		2075	0.58	17,318		N	7	6	6	6.0			
4th St TI OP WB		1323	0.58	10,528	93.00	5	6	6	6	5.0			
4th St TI OP EB		1322	0.58	8,323	93.22	5	6	8	6	5.0			
US 95 TI UP		1380	2.23	34,580	77.81	7	6	7	6	6.0			
Ave 2E UP		1381	2.99	23,220	88.97	5	6	8	6	5.0			
Ave 3E TI OP WB		2682	3.99	9,556	94.00	7	7	8	7	7.0	9,556		
Ave 3E TI OP EB		2681	3.99	9,556	94.00	7	7	8	7	7.0	9,556		
Araby Rd TI OP WB		1278	7.67	5,968	93.00	5	7	7	7	5.0	5,968		
Araby Rd TI OP EB		1277	7.67	5,968	93.00	5	7	7	7	5.0	5,968		
Fortuna SPRR OP EB		1279	8.69	10,004	77.60	5	5	7	5	5.0			Yes
Fortuna SPRR OP WB		1280	8.70	10,004	77.55	5	5	7	5	5.0			Yes
E Yuma TI OP EB		1188	9.43	11,143	86.85	5	7	7	7	5.0			
E Yuma TI OP WB		1281	9.44	11,143	86.72	5	7	7	7	5.0			
Fortuna Rd TI UP		2432	12.20	27,014	78.12	7	8	8	8	7.0			
Foothills Blvd TI UP		2117	14.25	26,967	80.40	7	7	7	7	7.0			
Fortuna Wash Br EB		1190	14.87	8,729	96.40	6	7	7	7	6.0			
Fortuna Wash Br WB		1191	14.87	8,729	96.41	6	7	7	7	6.0			
	Total			469,514									
	Weighted Average				87.36					5.69	6.61%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**87.36**						**6.61%**	**4**	
	Bridge Index									**5.69**			

Segment 8-2: Avenue 15E to East of Dome Valley TI (MP 16.3 - MP 21.4)													
Dublin Wash Br EB		1566	16.85	1,732	86.17	7	7	6	5	5.0			
Wash Br EB		303	18.12	2,097	85.17	7	7	7	5	5.0			
Telpas OP WB Over EB		971	18.80	12,095	88.86	5	7	7	7	5.0			
Telpas OP WB Over EB		972	20.40	11,305	88.86	5	6	7	6	5.0			
Dome Vly Rd TI UP EB		1324	21.04	6,734	99.16	6	7	7	7	6.0			
Dome Vly Rd TI UP WB		1325	21.06	5,673	96.42	6	6	7	6	6.0			
	Total			39,636									
	Weighted Average				91.38					5.31	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**91.38**						**0.00%**	**5**	
	Bridge Index									**5.31**			
Segment 8-3: East of Dome Valley TI to East of Mohawk TI (MP 21.4 - MP 56.5)													
Red Top Wash Br WB		1327	22.90	6,374	96.45	6	8	7	7	6.0			
Red Top Wash Br EB		1326	22.90	6,374	96.47	6	8	7	7	6.0			
Ligurta Wash Br WB		1329	24.10	19,041	96.45	6	8	7	7	6.0			
Ligurta Wash Br EB		1328	24.10	19,041	96.47	6	7	7	7	6.0			
Ave 25E OP WB		1331	26.70	4,344	91.15	6	6	7	6	6.0	4,344		
Ave 25E OP EB		1330	26.70	4,344	91.65	6	6	7	6	6.0	4,344		
Wellton TI UP		1332	30.80	10,820	94.84	6	6	7	6	6.0	10,820		
Wellton Canal Br EB		1333	31.50	4,425	97.57	6	6	7	6	6.0			
Wellton Canal Br WB		1334	31.50	4,425	97.58	6	6	8	6	6.0			
Ave 31E UP		1335	32.89	8,279	97.68	6	6	7	6	6.0			
Ave 33E UP		1336	34.91	20,352	94.88	7	8	7	7	7.0	20,352		
Mohawk Canal Br OP EB		2738	36.40	11,290	97.57	7	8	8	8	7.0			
Mohawk Canal Br OP WB		2739	36.40	11,334	96.74	7	7	7	7	7.0			
Antelope Hill TI UP		1194	37.98	9,133	89.83	6	7	7	7	6.0	9,133		
Tacna TI UP		1195	42.08	8,992	94.80	6	7	7	7	6.0	8,992		
Mohawk SPRR OP WB		1136	54.85	6,304	96.62	7	8	7	7	7.0			
Mohawk SPRR OP EB		1135	54.85	6,304	96.62	7	8	7	7	7.0			
Mohawk TI OP EB		784	54.90	6,510	93.60	6	6	7	6	6.0	6,510		
Mohawk TI OP WB		785	54.90	6,510	93.60	6	6	7	6	6.0	6,510		
	Total			174,196									
	Weighted Average				95.49					6.32	40.76%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**95.49**						**40.76%**	**6**	
	Bridge Index									**6.32**			

Segment 8-4: East of Dome Valley TI to East of Mohawk TI (MP 56.5 - MP 79.6)													
Dateland TI OP EB		681	67.43	4,666	94.00	6	6	7	6	6.0	4,666		
Dateland TI OP WB		682	67.43	4,666	94.00	6	6	7	6	6.0	4,666		
Aztec TI OP EB		683	73.48	4,171	94.00	6	6	7	6	6.0	4,171		
Aztec TI OP WB		684	73.48	4,171	94.00	6	6	7	6	6.0	4,171		
Spot Rd TI OP WB		686	78.40	4,171	94.00	6	6	7	6	6.0	4,171		
Spot Rd TI OP EB		685	78.40	4,171	94.00	6	6	7	6	6.0	4,171		
	Total			26,016									
	Weighted Average				94.00					6.00	100.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**94.00**						**100.00%**	**6**	
	Bridge Index									**6.00**			
Segment 8-5: Maricopa County Line to 355th Avenue (MP 79.6 - MP 110.4)													
Wash Bridge EB		317	83.14	5,197	94.42	6	6	6	6	6.0			
Sentinel TI OP EB		687	87.04	4,171	94.00	6	6	7	6	6.0	4,171		
Sentinel TI OP WB		688	87.04	4,171	94.00	6	6	7	6	6.0	4,171		
Painted Rock TI OP EB		509	102.27	3,870	94.00	6	6	6	6	6.0	3,870		
Painted Rock TI OP WB		510	102.27	3,870	94.00	6	6	6	6	6.0	3,870		
Paloma Rd TI OP EB		566	106.54	4,171	94.00	6	6	7	6	6.0	4,171		
Paloma Rd TI OP WB		567	106.54	4,171	94.00	6	6	7	6	6.0	4,171		
Gillespie Canal Br EB		489	107.02	1,935	85.00	7	7	6	5	5.0			
Gillespie Cnl Br SFR		1009	107.02	2,160	85.43	7	7	6	6	6.0			
Gillespie Cnal Br WB		568	107.03	1,849	97.67	7	7	6	6	6.0			
Gillespie Cnl Br SFR		1010	109.55	2,544	85.43	6	6	6	6	6.0			
Gillespie Canal Br EB		490	109.55	2,295	87.78	7	7	6	5	5.0			
Gillespie Cnal Br WB		569	109.55	2,193	97.67	7	7	6	6	6.0			
Wash Bridge SFR		1505	110.35	1,232	72.84	7	7	6	6	6.0	1,232		
	Total			43,829									
	Weighted Average				92.15					5.90	58.54%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**92.15**						**58.54%**	**5**	
	Bridge Index									**5.90**			

Segment 8-6: 355th Avenue to 9 Mile Well Road (MP 110.4 - MP 120.0)													
Citrus Vly TI OP EB		570	111.42	4,171	94.00	6	6	7	6	6.0	4,171		
Citrus Vly TI OP WB		571	111.42	4,171	94.00	6	6	7	6	6.0	4,171		
Sauceda Wash Br WB		1554	113.27	4,518	96.60	6	6	6	6	6.0			
Sauceda Wash Br EB		442	113.27	4,050	85.40	6	6	7	5	5.0			
Sauceda Wash Br SFR		439	113.27	2,359	76.84	6	6	7	6	6.0			
SB 8 & SPRR OP WB		1556	115.14	26,755	93.57	6	7	7	7	6.0	26,755		
SB 8 & SPRR OP EB		1555	115.14	26,755	93.57	6	7	7	7	6.0	26,755		
Hwy 85 OP WB		1557	115.62	6,943	97.89	6	6	7	6	6.0			
Hwy 85 OP EB		1558	115.62	6,943	97.77	6	6	7	6	6.0			
Gila Bend Cnl Br WB		1395	115.95	3,627	97.86	6	7	6	6	6.0			
Gila Bend Cnl Br EB		1394	115.95	4,473	97.82	6	7	6	6	6.0			
TC & GBRR OP WB		1340	116.35	4,824	86.84	6	8	5	5	5.0			
TC & GBRR OP EB		1339	116.35	4,824	86.79	6	8	5	5	5.0			
County Rd OP WB		1342	116.76	4,312	95.85	6	6	7	6	6.0			
County Rd OP EB		1341	116.76	4,301	95.82	6	6	7	6	6.0			
Sand Tanks Wash Br WB		1344	117.43	8,161	85.83	5	5	6	5	5.0			Yes
Sand Tanks Wash Br EB		1343	117.43	8,161	84.79	5	5	6	5	5.0			Yes
E Gila Bend TI UP		1345	119.42	11,928	98.87	6	7	7	7	6.0			
	Total			141,276									
	Weighted Average				93.01					5.79	43.78%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**93.01**						**43.78%**	**5**	
	Bridge Index									**5.79**			
Segment 8-7: 9 Mile Well Road to Maricopa County Line (MP 120.0 - MP 147.6)													
Freeman TI OP WB		534	140.80	1,175	90.78	7	7	7	7	7.0	1,175		
Freeman TI OP EB		533	140.80	1,160	90.78	7	7	7	7	7.0	1,175		
Vekol Road TI UP		550	144.55	6,960	81.36	6	7	7	6	6.0	6,960		
Vekol Wash Bridge WB		422	144.74	8,460	96.37	7	6	6	6	6.0			
Vekol Wash Bridge EB		552	144.74	9,728	97.77	6	7	7	7	6.0			
	Total			27,483									
	Weighted Average				92.59					6.08	33.88%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**92.59**						**33.88%**	**6**	
	Bridge Index									**6.08**			

Segment 8-8: Maricopa County Line to S Midway Road (MP 147.6 - MP 166.5)													
State Rte 84 TI UP		1063	151.70	10,349	92.66	6	7	7	7	6.0	10,349		
Mendell Wash Br WB		1065	151.90	6,134	97.80	6	6	6	6	6.0			
Mendell Wash Br EB		1064	151.90	6,986	85.77	5	5	6	5	5.0			Yes
Bridge EB		1066	153.40	6,091	85.76	5	5	5	5	5.0			Yes
Bridge WB		1067	153.45	6,091	85.76	5	5	6	5	5.0			Yes
Smith Road OP EB		1068	157.55	3,888	70.16	5	5	7	5	5.0	3,888		Yes
Smith Road OP WB		1069	157.55	3,888	70.15	5	5	7	5	5.0	3,888		Yes
Santa Rosa Cnl Br WB		1437	160.57	2,821	97.80	7	7	7	7	7.0			
Santa Rosa Cnl Br EB		1436	160.57	2,821	97.80	7	7	7	7	7.0			
Stanfield Rd TI UP		1090	161.60	9,768	95.84	7	7	7	7	7.0	9,768		
Murphy Rd UP		1091	162.50	8,499	94.98	6	6	6	6	6.0	8,499		
Santa Rosa Wash Br EB		1092	163.00	21,824	95.80	6	6	6	6	6.0			
Santa Rosa Wash Br WB		1093	163.00	21,824	95.80	6	6	6	6	6.0			
Russell Road UP		1094	164.50	9,434	94.94	7	6	7	6	6.0	9,434		
	Total			120,418									
	Weighted Average				92.35					5.90	38.06%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**92.35**						**38.06%**	**5**	
	Bridge Index									**5.90**			
Segment 8-9: S Midway Road to Interstate 10 (MP 166.5 - MP 178.3)													
Midway Rd UP		1137	166.50	8,499	94.89	6	7	7	7	6.0	8,499		
Greenes Wash Br WB		1139	166.90	16,579	95.80	6	6	7	6	6.0			
Greenes Wash Br EB		1138	166.90	16,579	95.80	6	6	7	6	6.0			
Montgomery Rd TI UP		1140	167.50	8,499	84.92	7	7	5	5	5.0	8,499		
Bianco Rd TI UP		1141	169.54	8,499	95.93	7	7	6	6	6.0	987		
Santa Cruz Wash Br EB		1142	170.90	12,355	82.22	5	5	6	5	5.0			Yes
Santa Cruz Wash Br WB		1143	170.90	12,355	83.73	5	5	7	5	5.0			Yes
Thornton Rd TI UP		1196	172.55	10,794	68.65	6	4	7	4	4.0			Yes
Chuichu Rd UP		1197	173.53	8,448	90.88	6	7	6	6	6.0	8,448		
Treckell Rd TI UP		1198	174.55	8,715	90.82	6	7	6	6	6.0	8,715		
Peart Rd OP WB		1200	175.65	3,962	93.74	6	6	7	6	6.0	3,962		
Peart Rd OP EB		1199	175.65	3,962	93.69	6	6	7	6	6.0	3,962		
I8 EB TI OP		1103	178.33	7,711	94.00	7	6	7	6	6.0	7,711		
I8 WB TI OP		1102	178.33	10,067	77.00	7	7	7	7	7.0	10,067		
	Total			137,024									
	Weighted Average				88.40					5.67	44.41%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**88.40**						**44.41%**	**4**	
	Bridge Index									**5.67**			

Mobility Performance Area Data

Segment	Begin MP	End MP	Length (mi)	Facility Type	Flow Type	Terrain	No. of Lanes	Capacity Environment Type	Lane Width (feet)	Posted Speed Limit (mph)	Divided or Undivided	Access Points (per mile)	% No-Passing Zone	Street Parking
8-1	0	16.3	16.3	Urban	Uninterrupted	Rolling	4	Freeway Segment	12.00	65	Divided	N/A	0%	N/A
8-2	16.3	21.4	5.1	Rural	Uninterrupted	Mountainous	4	Freeway Segment	12.00	65	Divided	N/A	0%	N/A
8-3	21.4	56.5	35.1	Rural	Uninterrupted	Rolling	4	Freeway Segment	12.00	67.5	Divided	N/A	0%	N/A
8-4	56.5	79.6	23.1	Rural	Uninterrupted	Level	4	Freeway Segment	12.00	75	Divided	N/A	0%	N/A
8-5	79.6	110.4	30.8	Rural	Uninterrupted	Level	4	Freeway Segment	12.00	75	Divided	N/A	0%	N/A
8-6	110.4	120	9.6	Rural	Uninterrupted	Rolling	4	Freeway Segment	12.00	75	Divided	N/A	0%	N/A
8-7	120	147.6	19	Rural	Uninterrupted	Level	4	Freeway Segment	12.00	75	Divided	N/A	0%	N/A
8-8	147.6	166.5	18.9	Rural	Uninterrupted	Level	4	Freeway Segment	12.00	75	Divided	N/A	0%	N/A
8-9	166.5	178	11.5	Rural	Uninterrupted	Level	4	Freeway Segment	12.00	73	Divided	N/A	0%	N/A

Car TTI and PTI/Truck TTTI and TPTI – Eastbound

Seg-ment	TMC	Time Period	week type	Road Number	Road Direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-1	115P05117	1 AM Peak	Weekday	I-8	Eastbound	59.2	55.6	45.3	45.3	65	65	65	1.10	1.17	1.44	1.44	1.13	1.20	1.44	1.44
8-1	115P05117	2 Mid Day	Weekday	I-8	Eastbound	61.4	56.4	45.3	45.3	65	65	65	1.06	1.15	1.44	1.44				
8-1	115P05117	3 PM Peak	Weekday	I-8	Eastbound	60.6	56.2	45.3	45.3	65	65	65	1.07	1.16	1.44	1.44				
8-1	115P05117	4 Evening	Weekday	I-8	Eastbound	57.6	54.2	45.3	45.3	65	65	65	1.13	1.20	1.44	1.44				
8-1	115P05118	1 AM Peak	Weekday	I-8	Eastbound	58.9	55.0	44.6	44.6	65	65	65	1.10	1.18	1.46	1.46	1.15	1.19	1.52	1.49
8-1	115P05118	2 Mid Day	Weekday	I-8	Eastbound	58.1	55.0	43.5	44.6	65	65	65	1.12	1.18	1.49	1.46				
8-1	115P05118	3 PM Peak	Weekday	I-8	Eastbound	58.4	55.4	43.5	45.4	65	65	65	1.11	1.17	1.49	1.43				
8-1	115P05118	4 Evening	Weekday	I-8	Eastbound	56.6	54.6	42.8	43.5	65	65	65	1.15	1.19	1.52	1.49				
8-1	115P05119	1 AM Peak	Weekday	I-8	Eastbound	58.2	57.9	38.7	48.3	65	65	65	1.12	1.12	1.68	1.35	1.14	1.14	1.86	1.40
8-1	115P05119	2 Mid Day	Weekday	I-8	Eastbound	57.3	57.9	34.9	48.3	65	65	65	1.13	1.12	1.86	1.35				
8-1	115P05119	3 PM Peak	Weekday	I-8	Eastbound	58.3	58.5	37.9	49.7	65	65	65	1.12	1.11	1.71	1.31				
8-1	115P05119	4 Evening	Weekday	I-8	Eastbound	57.1	57.2	41.5	46.4	65	65	65	1.14	1.14	1.57	1.40				
8-1	115P05120	1 AM Peak	Weekday	I-8	Eastbound	62.6	57.5	53.1	40.4	65	65	65	1.04	1.13	1.22	1.61	1.07	1.13	1.36	1.61
8-1	115P05120	2 Mid Day	Weekday	I-8	Eastbound	61.7	58.3	51.0	43.7	65	65	65	1.05	1.12	1.27	1.49				
8-1	115P05120	3 PM Peak	Weekday	I-8	Eastbound	62.0	58.9	51.0	48.3	65	65	65	1.05	1.10	1.27	1.35				
8-1	115P05120	4 Evening	Weekday	I-8	Eastbound	60.5	57.7	47.9	42.3	65	65	65	1.07	1.13	1.36	1.54				
8-1	115P05121	1 AM Peak	Weekday	I-8	Eastbound	64.4	60.1	56.0	49.6	65	65	65	1.01	1.08	1.16	1.31	1.03	1.08	1.26	1.31
8-1	115P05121	2 Mid Day	Weekday	I-8	Eastbound	64.0	60.1	54.9	51.5	65	65	65	1.02	1.08	1.18	1.26				
8-1	115P05121	3 PM Peak	Weekday	I-8	Eastbound	64.3	60.7	55.1	53.8	65	65	65	1.01	1.07	1.18	1.21				
8-1	115P05121	4 Evening	Weekday	I-8	Eastbound	62.9	60.3	51.5	51.9	65	65	65	1.03	1.08	1.26	1.25				
8-1	115P05122	1 AM Peak	Weekday	I-8	Eastbound	64.4	61.2	57.2	53.8	65	65	65	1.01	1.06	1.14	1.21	1.02	1.07	1.19	1.22

Seg-ment	TMC	Time Period	week type	Road Number	Road Direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-1	115P05122	2 Mid Day	Weekday	I-8	Eastbound	64.5	60.7	56.4	53.4	65	65	65	1.01	1.07	1.15	1.22				
8-1	115P05122	3 PM Peak	Weekday	I-8	Eastbound	65.0	61.3	57.2	55.2	65	65	65	1.00	1.06	1.14	1.18				
8-1	115P05122	4 Evening	Weekday	I-8	Eastbound	63.6	61.1	54.8	54.8	65	65	65	1.02	1.06	1.19	1.19				
8-1	115P05123	1 AM Peak	Weekday	I-8	Eastbound	63.8	61.6	56.6	55.5	65	65	65	1.02	1.05	1.15	1.17	1.03	1.07	1.19	1.23
8-1	115P05123	2 Mid Day	Weekday	I-8	Eastbound	63.9	61.1	56.2	54.4	65	65	65	1.02	1.06	1.16	1.20				
8-1	115P05123	3 PM Peak	Weekday	I-8	Eastbound	64.1	60.9	55.8	54.7	65	65	65	1.01	1.07	1.16	1.19				
8-1	115P05123	4 Evening	Weekday	I-8	Eastbound	63.2	60.8	54.7	53.0	65	65	65	1.03	1.07	1.19	1.23				
8-1	115P05124	1 AM Peak	Weekday	I-8	Eastbound	58.5	56.6	42.2	42.2	65	65	65	1.11	1.15	1.54	1.54	1.11	1.15	1.54	1.54
8-1	115P05124	2 Mid Day	Weekday	I-8	Eastbound	58.9	56.7	43.2	43.2	65	65	65	1.10	1.15	1.50	1.50				
8-1	115P05124	3 PM Peak	Weekday	I-8	Eastbound	60.3	57.7	45.6	45.4	65	65	65	1.08	1.13	1.42	1.43				
8-1	115P05124	4 Evening	Weekday	I-8	Eastbound	60.2	58.1	45.9	45.6	65	65	65	1.08	1.12	1.42	1.42				
8-2	115P05125	1 AM Peak	Weekday	I-8	Eastbound	52.6	47.7	37.9	34.7	55	55	45	1.00	1.00	1.45	1.30	1.00	1.00	1.45	1.30
8-2	115P05125	2 Mid Day	Weekday	I-8	Eastbound	53.1	48.4	38.6	35.4	55	55	45	1.00	1.00	1.43	1.27				
8-2	115P05125	3 PM Peak	Weekday	I-8	Eastbound	54.5	50.1	40.4	40.1	55	55	45	1.00	1.00	1.36	1.12				
8-2	115P05125	4 Evening	Weekday	I-8	Eastbound	53.0	49.5	39.2	38.3	55	55	45	1.00	1.00	1.40	1.18				
8-3	115P05126	1 AM Peak	Weekday	I-8	Eastbound	69.2	62.6	60.9	57.6	75	75	65	1.00	1.04	1.23	1.13	1.00	1.05	1.28	1.18
8-3	115P05126	2 Mid Day	Weekday	I-8	Eastbound	69.9	62.5	60.9	57.3	75	75	65	1.00	1.04	1.23	1.13				
8-3	115P05126	3 PM Peak	Weekday	I-8	Eastbound	70.1	62.5	61.3	57.6	75	75	65	1.00	1.04	1.22	1.13				
8-3	115P05126	4 Evening	Weekday	I-8	Eastbound	68.0	62.0	58.8	55.3	75	75	65	1.00	1.05	1.28	1.18				
8-3	115P05127	1 AM Peak	Weekday	I-8	Eastbound	69.9	63.2	61.5	58.9	75	75	65	1.00	1.03	1.22	1.10	1.00	1.03	1.22	1.12
8-3	115P05127	2 Mid Day	Weekday	I-8	Eastbound	70.5	63.0	61.5	58.8	75	75	65	1.00	1.03	1.22	1.11				
8-3	115P05127	3 PM Peak	Weekday	I-8	Eastbound	71.1	63.1	62.8	59.2	75	75	65	1.00	1.03	1.19	1.10				

Seg-ment	TMC	Time Period	week type	Road Number	Road Direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-3	115P05127	4 Evening	Weekday	I-8	Eastbound	69.4	62.9	61.9	58.1	75	75	65	1.00	1.03	1.21	1.12				
8-3	115P05128	1 AM Peak	Weekday	I-8	Eastbound	70.6	62.6	61.5	58.4	75	75	65	1.00	1.04	1.22	1.11	1.00	1.04	1.22	1.13
8-3	115P05128	2 Mid Day	Weekday	I-8	Eastbound	71.1	62.6	61.5	58.4	75	75	65	1.00	1.04	1.22	1.11				
8-3	115P05128	3 PM Peak	Weekday	I-8	Eastbound	71.7	62.7	62.8	58.8	75	75	65	1.00	1.04	1.19	1.10				
8-3	115P05128	4 Evening	Weekday	I-8	Eastbound	69.7	62.4	62.0	57.5	75	75	65	1.00	1.04	1.21	1.13				
8-3	115P05129	1 AM Peak	Weekday	I-8	Eastbound	70.8	62.5	61.5	58.5	75	75	65	1.00	1.04	1.22	1.11	1.00	1.04	1.22	1.13
8-3	115P05129	2 Mid Day	Weekday	I-8	Eastbound	71.4	62.5	62.7	58.5	75	75	65	1.00	1.04	1.20	1.11				
8-3	115P05129	3 PM Peak	Weekday	I-8	Eastbound	71.8	62.5	63.4	59.0	75	75	65	1.00	1.04	1.18	1.10				
8-3	115P05129	4 Evening	Weekday	I-8	Eastbound	69.6	62.2	62.3	57.6	75	75	65	1.00	1.04	1.20	1.13				
8-4	115P05130	1 AM Peak	Weekday	I-8	Eastbound	71.0	63.1	61.8	58.9	75	75	65	1.00	1.03	1.21	1.10	1.00	1.04	1.21	1.12
8-4	115P05130	2 Mid Day	Weekday	I-8	Eastbound	71.5	63.0	62.8	58.7	75	75	65	1.00	1.03	1.19	1.11				
8-4	115P05130	3 PM Peak	Weekday	I-8	Eastbound	71.9	63.1	63.4	59.2	75	75	65	1.00	1.03	1.18	1.10				
8-4	115P05130	4 Evening	Weekday	I-8	Eastbound	69.6	62.8	62.6	58.1	75	75	65	1.00	1.04	1.20	1.12				
8-4	115P05131	1 AM Peak	Weekday	I-8	Eastbound	70.6	63.3	60.9	59.0	75	75	65	1.00	1.03	1.23	1.10	1.00	1.03	1.23	1.11
8-4	115P05131	2 Mid Day	Weekday	I-8	Eastbound	71.4	63.2	62.1	58.7	75	75	65	1.00	1.03	1.21	1.11				
8-4	115P05131	3 PM Peak	Weekday	I-8	Eastbound	72.1	63.2	63.2	59.0	75	75	65	1.00	1.03	1.19	1.10				
8-4	115P05131	4 Evening	Weekday	I-8	Eastbound	70.0	63.0	62.8	58.5	75	75	65	1.00	1.03	1.19	1.11				
8-4	115P05132	1 AM Peak	Weekday	I-8	Eastbound	70.8	63.4	61.5	58.9	75	75	65	1.00	1.02	1.22	1.10	1.00	1.03	1.22	1.11
8-4	115P05132	2 Mid Day	Weekday	I-8	Eastbound	71.4	63.4	62.1	58.3	75	75	65	1.00	1.03	1.21	1.11				
8-4	115P05132	3 PM Peak	Weekday	I-8	Eastbound	72.1	63.3	63.2	59.1	75	75	65	1.00	1.03	1.19	1.10				
8-4	115P05132	4 Evening	Weekday	I-8	Eastbound	70.0	63.1	62.7	58.3	75	75	65	1.00	1.03	1.20	1.11				
8-4	115P05133	1 AM Peak	Weekday	I-8	Eastbound	70.5	62.6	61.3	58.3	75	75	65	1.00	1.04	1.22	1.12	1.00	1.04	1.22	1.13

Seg-ment	TMC	Time Period	week type	Road Number	Road Direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-4	115P05133	2 Mid Day	Weekday	I-8	Eastbound	71.6	62.6	61.3	57.3	75	75	65	1.00	1.04	1.22	1.13				
8-4	115P05133	3 PM Peak	Weekday	I-8	Eastbound	72.3	62.7	62.3	58.3	75	75	65	1.00	1.04	1.20	1.12				
8-4	115P05133	4 Evening	Weekday	I-8	Eastbound	70.0	62.5	62.3	57.3	75	75	65	1.00	1.04	1.20	1.13				
8-5	115P05134	1 AM Peak	Weekday	I-8	Eastbound	73.2	63.7	58.7	58.7	75	75	65	1.00	1.02	1.28	1.11	1.00	1.02	1.28	1.11
8-5	115P05134	2 Mid Day	Weekday	I-8	Eastbound	74.5	63.7	58.7	58.7	75	75	65	1.00	1.02	1.28	1.11				
8-5	115P05134	3 PM Peak	Weekday	I-8	Eastbound	75.6	63.6	58.7	58.7	75	75	65	1.00	1.02	1.28	1.11				
8-5	115P05134	4 Evening	Weekday	I-8	Eastbound	72.5	63.7	58.7	58.7	75	75	65	1.00	1.02	1.28	1.11				
8-5	115P05135	1 AM Peak	Weekday	I-8	Eastbound	69.9	63.0	60.7	58.3	75	75	65	1.00	1.03	1.24	1.11	1.00	1.04	1.24	1.14
8-5	115P05135	2 Mid Day	Weekday	I-8	Eastbound	71.0	62.9	61.6	57.7	75	75	65	1.00	1.03	1.22	1.13				
8-5	115P05135	3 PM Peak	Weekday	I-8	Eastbound	71.6	62.9	62.1	58.3	75	75	65	1.00	1.03	1.21	1.11				
8-5	115P05135	4 Evening	Weekday	I-8	Eastbound	69.4	62.7	60.9	57.3	75	75	65	1.00	1.04	1.23	1.14				
8-5	115P05136	1 AM Peak	Weekday	I-8	Eastbound	69.3	62.4	56.0	55.4	75	75	65	1.00	1.04	1.34	1.17	1.00	1.04	1.34	1.17
8-5	115P05136	2 Mid Day	Weekday	I-8	Eastbound	71.0	62.7	60.5	56.8	75	75	65	1.00	1.04	1.24	1.14				
8-5	115P05136	3 PM Peak	Weekday	I-8	Eastbound	71.4	62.7	60.1	57.4	75	75	65	1.00	1.04	1.25	1.13				
8-5	115P05136	4 Evening	Weekday	I-8	Eastbound	69.1	62.4	58.6	56.3	75	75	65	1.00	1.04	1.28	1.16				
8-5	115P05137	1 AM Peak	Weekday	I-8	Eastbound	70.7	63.2	61.5	58.7	75	75	65	1.00	1.03	1.22	1.11	1.00	1.03	1.22	1.11
8-5	115P05137	2 Mid Day	Weekday	I-8	Eastbound	71.4	63.1	62.8	59.3	75	75	65	1.00	1.03	1.19	1.10				
8-5	115P05137	3 PM Peak	Weekday	I-8	Eastbound	72.2	63.2	63.4	59.3	75	75	65	1.00	1.03	1.18	1.10				
8-5	115P05137	4 Evening	Weekday	I-8	Eastbound	70.0	63.0	62.8	58.4	75	75	65	1.00	1.03	1.19	1.11				
8-5	115P05138	1 AM Peak	Weekday	I-8	Eastbound	70.4	63.4	61.5	58.4	75	75	65	1.00	1.03	1.22	1.11	1.00	1.03	1.22	1.11
8-5	115P05138	2 Mid Day	Weekday	I-8	Eastbound	71.0	63.4	61.5	59.1	75	75	65	1.00	1.03	1.22	1.10				
8-5	115P05138	3 PM Peak	Weekday	I-8	Eastbound	72.0	63.3	62.8	59.1	75	75	65	1.00	1.03	1.19	1.10				

Seg-ment	TMC	Time Period	week type	Road Number	Road Direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-5	115P05138	4 Evening	Weekday	I-8	Eastbound	70.1	63.1	62.3	58.4	75	75	65	1.00	1.03	1.20	1.11				
8-6	115P05139	1 AM Peak	Weekday	I-8	Eastbound	70.4	63.5	61.6	58.8	75	75	65	1.00	1.02	1.22	1.11	1.00	1.03	1.22	1.11
8-6	115P05139	2 Mid Day	Weekday	I-8	Eastbound	71.2	63.5	61.6	59.4	75	75	65	1.00	1.02	1.22	1.09				
8-6	115P05139	3 PM Peak	Weekday	I-8	Eastbound	72.2	63.5	62.9	59.2	75	75	65	1.00	1.02	1.19	1.10				
8-6	115P05139	4 Evening	Weekday	I-8	Eastbound	70.1	63.2	62.5	58.4	75	75	65	1.00	1.03	1.20	1.11				
8-6	115P05140	1 AM Peak	Weekday	I-8	Eastbound	69.2	61.2	59.5	52.2	75	75	65	1.00	1.06	1.26	1.25	1.00	1.07	1.28	1.26
8-6	115P05140	2 Mid Day	Weekday	I-8	Eastbound	69.8	61.6	59.1	54.3	75	75	65	1.00	1.06	1.27	1.20				
8-6	115P05140	3 PM Peak	Weekday	I-8	Eastbound	70.9	61.7	61.3	53.9	75	75	65	1.00	1.05	1.22	1.21				
8-6	115P05140	4 Evening	Weekday	I-8	Eastbound	68.6	61.0	58.4	51.6	75	75	65	1.00	1.07	1.28	1.26				
8-6	115P05141	1 AM Peak	Weekday	I-8	Eastbound	65.0	59.4	43.5	45.4	75	75	65	1.00	1.10	1.73	1.43	1.00	1.10	1.73	1.43
8-6	115P05141	2 Mid Day	Weekday	I-8	Eastbound	68.8	61.1	49.8	47.2	75	75	65	1.00	1.06	1.51	1.38				
8-6	115P05141	3 PM Peak	Weekday	I-8	Eastbound	69.1	61.2	51.0	46.7	75	75	65	1.00	1.06	1.47	1.39				
8-6	115P05141	4 Evening	Weekday	I-8	Eastbound	68.0	61.2	54.5	49.8	75	75	65	1.00	1.06	1.38	1.31				
8-7	115P05142	1 AM Peak	Weekday	I-8	Eastbound	67.1	63.0	56.6	58.6	75	75	65	1.00	1.03	1.33	1.11	1.00	1.04	1.33	1.14
8-7	115P05142	2 Mid Day	Weekday	I-8	Eastbound	69.0	62.8	59.7	58.3	75	75	65	1.00	1.04	1.26	1.11				
8-7	115P05142	3 PM Peak	Weekday	I-8	Eastbound	70.2	63.0	60.9	58.7	75	75	65	1.00	1.03	1.23	1.11				
8-7	115P05142	4 Evening	Weekday	I-8	Eastbound	68.5	62.7	59.7	57.2	75	75	65	1.00	1.04	1.26	1.14				
8-7	115P05143	1 AM Peak	Weekday	I-8	Eastbound	69.8	63.8	61.7	59.1	75	75	65	1.00	1.02	1.22	1.10	1.00	1.03	1.22	1.12
8-7	115P05143	2 Mid Day	Weekday	I-8	Eastbound	70.4	63.4	61.7	58.3	75	75	65	1.00	1.03	1.22	1.11				
8-7	115P05143	3 PM Peak	Weekday	I-8	Eastbound	71.6	63.5	62.9	58.8	75	75	65	1.00	1.02	1.19	1.10				
8-7	115P05143	4 Evening	Weekday	I-8	Eastbound	70.3	63.4	62.9	58.0	75	75	65	1.00	1.03	1.19	1.12				
8-8	115P05144	1 AM Peak	Weekday	I-8	Eastbound	68.7	63.4	58.4	58.4	75	75	65	1.00	1.03	1.28	1.11	1.00	1.03	1.28	1.15

Seg-ment	TMC	Time Period	week type	Road Number	Road Direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-8	115P05144	2 Mid Day	Weekday	I-8	Eastbound	69.6	63.0	59.7	57.1	75	75	65	1.00	1.03	1.26	1.14				
8-8	115P05144	3 PM Peak	Weekday	I-8	Eastbound	70.7	63.3	60.9	57.9	75	75	65	1.00	1.03	1.23	1.12				
8-8	115P05144	4 Evening	Weekday	I-8	Eastbound	69.0	62.9	60.9	56.5	75	75	65	1.00	1.03	1.23	1.15				
8-8	115P05145	1 AM Peak	Weekday	I-8	Eastbound	70.0	64.1	62.0	59.6	75	75	65	1.00	1.01	1.21	1.09	1.00	1.02	1.21	1.11
8-8	115P05145	2 Mid Day	Weekday	I-8	Eastbound	70.5	63.8	62.4	59.6	75	75	65	1.00	1.02	1.20	1.09				
8-8	115P05145	3 PM Peak	Weekday	I-8	Eastbound	71.4	63.8	63.4	59.6	75	75	65	1.00	1.02	1.18	1.09				
8-8	115P05145	4 Evening	Weekday	I-8	Eastbound	70.0	63.5	62.7	58.4	75	75	65	1.00	1.02	1.20	1.11				
8-9	115P05146	1 AM Peak	Weekday	I-8	Eastbound	69.0	63.8	58.5	59.3	75	75	65	1.00	1.02	1.28	1.10	1.00	1.03	1.28	1.13
8-9	115P05146	2 Mid Day	Weekday	I-8	Eastbound	69.9	63.6	60.9	59.3	75	75	65	1.00	1.02	1.23	1.10				
8-9	115P05146	3 PM Peak	Weekday	I-8	Eastbound	71.3	63.6	62.8	59.0	75	75	65	1.00	1.02	1.19	1.10				
8-9	115P05146	4 Evening	Weekday	I-8	Eastbound	69.9	63.3	62.1	57.7	75	75	65	1.00	1.03	1.21	1.13				
8-9	115P05147	1 AM Peak	Weekday	I-8	Eastbound	69.6	63.6	59.3	58.4	75	75	65	1.00	1.02	1.26	1.11	1.00	1.03	1.26	1.14
8-9	115P05147	2 Mid Day	Weekday	I-8	Eastbound	70.2	63.4	60.7	58.4	75	75	65	1.00	1.03	1.24	1.11				
8-9	115P05147	3 PM Peak	Weekday	I-8	Eastbound	71.7	63.5	63.2	58.4	75	75	65	1.00	1.02	1.19	1.11				
8-9	115P05147	4 Evening	Weekday	I-8	Eastbound	70.5	63.1	62.7	57.1	75	75	65	1.00	1.03	1.20	1.14				
8-9	115P05148	1 AM Peak	Weekday	I-8	Eastbound	69.3	63.3	58.5	57.3	75	75	65	1.00	1.03	1.28	1.14	1.00	1.04	1.28	1.23
8-9	115P05148	2 Mid Day	Weekday	I-8	Eastbound	69.9	62.5	59.8	53.3	75	75	65	1.00	1.04	1.25	1.22				
8-9	115P05148	3 PM Peak	Weekday	I-8	Eastbound	71.2	62.6	61.5	54.1	75	75	65	1.00	1.04	1.22	1.20				
8-9	115P05148	4 Evening	Weekday	I-8	Eastbound	70.1	62.3	61.5	52.8	75	75	65	1.00	1.04	1.22	1.23				
8-9	115P05149	1 AM Peak	Weekday	I-8	Eastbound	67.9	62.5	55.4	55.9	75	75	65	1.00	1.04	1.35	1.16	1.00	1.05	1.35	1.19
8-9	115P05149	2 Mid Day	Weekday	I-8	Eastbound	68.4	61.9	56.4	55.4	75	75	65	1.00	1.05	1.33	1.17				
8-9	115P05149	3 PM Peak	Weekday	I-8	Eastbound	70.1	62.2	59.8	55.9	75	75	65	1.00	1.05	1.25	1.16				

Seg-ment	TMC	Time Period	week type	Road Number	Road Direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-9	115P05149	4 Evening	Weekday	I-8	Eastbound	69.1	61.6	57.8	54.6	75	75	65	1.00	1.05	1.30	1.19				
8-9	115P05150	1 AM Peak	Weekday	I-8	Eastbound	67.3	61.8	55.5	54.6	65	65	65	1.00	1.05	1.17	1.19	1.00	1.06	1.19	1.24
8-9	115P05150	2 Mid Day	Weekday	I-8	Eastbound	67.3	61.6	54.6	55.1	65	65	65	1.00	1.05	1.19	1.18				
8-9	115P05150	3 PM Peak	Weekday	I-8	Eastbound	68.4	61.7	57.4	54.6	65	65	65	1.00	1.05	1.13	1.19				
8-9	115P05150	4 Evening	Weekday	I-8	Eastbound	66.8	61.1	55.0	52.4	65	65	65	1.00	1.06	1.18	1.24				

Car TTI and PTI/Truck TTTI and TPTI – Westbound

Segment	TMC	time period	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-1	115N05117	1 AM Peak	Weekday	I-8	Westbound	61.0	57.0	51.3	48.2	65	65	65	1.07	1.14	1.27	1.35	1.12	1.15	1.40	1.38
8-1	115N05117	2 Mid Day	Weekday	I-8	Westbound	59.5	56.6	47.2	49.2	65	65	65	1.09	1.15	1.38	1.32				
8-1	115N05117	3 PM Peak	Weekday	I-8	Westbound	59.6	56.5	48.2	48.2	65	65	65	1.09	1.15	1.35	1.35				
8-1	115N05117	4 Evening	Weekday	I-8	Westbound	58.0	56.5	46.3	47.2	65	65	65	1.12	1.15	1.40	1.38				
8-1	115N05118	1 AM Peak	Weekday	I-8	Westbound	62.0	57.6	46.7	41.8	65	65	65	1.05	1.13	1.39	1.56	1.10	1.18	1.78	1.76
8-1	115N05118	2 Mid Day	Weekday	I-8	Westbound	59.7	55.2	38.5	36.8	65	65	65	1.09	1.18	1.69	1.76				
8-1	115N05118	3 PM Peak	Weekday	I-8	Westbound	59.7	55.3	36.5	37.1	65	65	65	1.09	1.18	1.78	1.75				
8-1	115N05118	4 Evening	Weekday	I-8	Westbound	58.9	57.3	37.8	40.2	65	65	65	1.10	1.13	1.72	1.62				
8-1	115N05119	1 AM Peak	Weekday	I-8	Westbound	62.4	59.3	52.4	51.4	65	65	65	1.04	1.10	1.24	1.26	1.09	1.10	1.38	1.29
8-1	115N05119	2 Mid Day	Weekday	I-8	Westbound	61.2	59.3	48.8	51.9	65	65	65	1.06	1.10	1.33	1.25				
8-1	115N05119	3 PM Peak	Weekday	I-8	Westbound	60.7	58.9	48.0	51.4	65	65	65	1.07	1.10	1.35	1.26				
8-1	115N05119	4 Evening	Weekday	I-8	Westbound	59.4	59.1	47.2	50.5	65	65	65	1.09	1.10	1.38	1.29				
8-1	115N05120	1 AM Peak	Weekday	I-8	Westbound	65.4	61.7	58.4	56.9	65	65	65	1.00	1.05	1.11	1.14	1.02	1.06	1.19	1.18
8-1	115N05120	2 Mid Day	Weekday	I-8	Westbound	65.1	61.5	57.4	56.6	65	65	65	1.00	1.06	1.13	1.15				
8-1	115N05120	3 PM Peak	Weekday	I-8	Westbound	65.4	61.4	57.1	56.6	65	65	65	1.00	1.06	1.14	1.15				
8-1	115N05120	4 Evening	Weekday	I-8	Westbound	63.8	61.4	54.7	55.2	65	65	65	1.02	1.06	1.19	1.18				
8-1	115N05121	1 AM Peak	Weekday	I-8	Westbound	65.3	61.8	58.4	56.5	65	65	65	1.00	1.05	1.11	1.15	1.02	1.06	1.16	1.17
8-1	115N05121	2 Mid Day	Weekday	I-8	Westbound	65.2	61.7	57.6	56.5	65	65	65	1.00	1.05	1.13	1.15				
8-1	115N05121	3 PM Peak	Weekday	I-8	Westbound	65.5	61.5	57.6	56.2	65	65	65	1.00	1.06	1.13	1.16				
8-1	115N05121	4 Evening	Weekday	I-8	Westbound	64.0	61.5	55.8	55.5	65	65	65	1.02	1.06	1.16	1.17				

Segment	TMC	time period	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-1	115N05122	1 AM Peak	Weekday	I-8	Westbound	64.8	61.6	58.0	55.6	65	65	65	1.00	1.06	1.12	1.17	1.02	1.06	1.18	1.18
8-1	115N05122	2 Mid Day	Weekday	I-8	Westbound	64.4	61.6	56.4	56.0	65	65	65	1.01	1.06	1.15	1.16				
8-1	115N05122	3 PM Peak	Weekday	I-8	Westbound	64.7	61.4	57.2	56.0	65	65	65	1.00	1.06	1.14	1.16				
8-1	115N05122	4 Evening	Weekday	I-8	Westbound	63.5	61.3	55.2	55.2	65	65	65	1.02	1.06	1.18	1.18				
8-1	115N05123	1 AM Peak	Weekday	I-8	Westbound	63.9	60.3	54.8	47.2	65	65	65	1.02	1.08	1.19	1.38	1.03	1.08	1.22	1.38
8-1	115N05123	2 Mid Day	Weekday	I-8	Westbound	63.6	61.0	54.4	52.2	65	65	65	1.02	1.07	1.19	1.25				
8-1	115N05123	3 PM Peak	Weekday	I-8	Westbound	63.7	60.7	55.2	52.2	65	65	65	1.02	1.07	1.18	1.25				
8-1	115N05123	4 Evening	Weekday	I-8	Westbound	62.9	60.2	53.3	49.1	65	65	65	1.03	1.08	1.22	1.32				
8-1	115N05124	1 AM Peak	Weekday	I-8	Westbound	56.4	51.4	38.5	34.5	65	65	65	1.15	1.26	1.69	1.88	1.16	1.28	1.80	1.95
8-1	115N05124	2 Mid Day	Weekday	I-8	Westbound	56.0	51.2	36.0	34.2	65	65	65	1.16	1.27	1.80	1.90				
8-1	115N05124	3 PM Peak	Weekday	I-8	Westbound	56.8	51.0	36.0	33.4	65	65	65	1.14	1.28	1.80	1.95				
8-1	115N05124	4 Evening	Weekday	I-8	Westbound	56.1	52.3	36.1	34.8	65	65	65	1.16	1.24	1.80	1.87				
8-2	115N05125	1 AM Peak	Weekday	I-8	Westbound	69.6	61.8	59.7	52.8	65	65	65	1.00	1.05	1.09	1.23	1.00	1.06	1.12	1.23
8-2	115N05125	2 Mid Day	Weekday	I-8	Westbound	69.2	62.0	58.3	55.3	65	65	65	1.00	1.05	1.12	1.17				
8-2	115N05125	3 PM Peak	Weekday	I-8	Westbound	68.8	61.6	57.8	55.3	65	65	65	1.00	1.06	1.12	1.18				
8-2	115N05125	4 Evening	Weekday	I-8	Westbound	68.0	62.0	57.8	55.5	65	65	65	1.00	1.05	1.12	1.17				
8-3	115N05126	1 AM Peak	Weekday	I-8	Westbound	71.3	63.6	62.8	60.0	75	75	65	1.00	1.02	1.19	1.08	1.00	1.03	1.26	1.10
8-3	115N05126	2 Mid Day	Weekday	I-8	Westbound	70.6	63.4	60.6	59.6	75	75	65	1.00	1.03	1.24	1.09				
8-3	115N05126	3 PM Peak	Weekday	I-8	Westbound	70.3	63.0	59.6	58.9	75	75	65	1.00	1.03	1.26	1.10				
8-3	115N05126	4 Evening	Weekday	I-8	Westbound	69.4	63.2	60.9	59.2	75	75	65	1.00	1.03	1.23	1.10				
8-3	115N05127	1 AM Peak	Weekday	I-8	Westbound	71.5	62.9	61.7	59.0	75	75	65	1.00	1.03	1.22	1.10	1.00	1.04	1.28	1.11

Segment	TMC	time period	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-3	115N05127	2 Mid Day	Weekday	I-8	Westbound	70.7	62.7	58.5	58.5	75	75	65	1.00	1.04	1.28	1.11				
8-3	115N05127	3 PM Peak	Weekday	I-8	Westbound	70.5	62.4	58.5	58.5	75	75	65	1.00	1.04	1.28	1.11				
8-3	115N05127	4 Evening	Weekday	I-8	Westbound	69.5	62.6	60.9	58.5	75	75	65	1.00	1.04	1.23	1.11				
8-3	115N05128	1 AM Peak	Weekday	I-8	Westbound	71.8	62.0	63.1	58.2	75	75	65	1.00	1.05	1.19	1.12	1.00	1.05	1.23	1.12
8-3	115N05128	2 Mid Day	Weekday	I-8	Westbound	71.5	62.0	61.8	58.3	75	75	65	1.00	1.05	1.21	1.11				
8-3	115N05128	3 PM Peak	Weekday	I-8	Westbound	70.9	61.7	61.5	57.8	75	75	65	1.00	1.05	1.22	1.12				
8-3	115N05128	4 Evening	Weekday	I-8	Westbound	69.2	61.9	60.9	58.1	75	75	65	1.00	1.05	1.23	1.12				
8-3	115N05129	1 AM Peak	Weekday	I-8	Westbound	72.1	63.2	63.4	59.4	75	75	65	1.00	1.03	1.18	1.09	1.00	1.04	1.21	1.10
8-3	115N05129	2 Mid Day	Weekday	I-8	Westbound	71.7	63.0	62.8	59.4	75	75	65	1.00	1.03	1.19	1.09				
8-3	115N05129	3 PM Peak	Weekday	I-8	Westbound	71.0	62.8	62.2	58.8	75	75	65	1.00	1.04	1.21	1.10				
8-3	115N05129	4 Evening	Weekday	I-8	Westbound	69.7	63.0	61.8	59.0	75	75	65	1.00	1.03	1.21	1.10				
8-4	115N05130	1 AM Peak	Weekday	I-8	Westbound	72.6	63.5	63.3	59.7	75	75	65	1.00	1.02	1.18	1.09	1.00	1.03	1.19	1.10
8-4	115N05130	2 Mid Day	Weekday	I-8	Westbound	71.9	63.2	62.8	59.5	75	75	65	1.00	1.03	1.19	1.09				
8-4	115N05130	3 PM Peak	Weekday	I-8	Westbound	71.4	63.0	62.8	59.2	75	75	65	1.00	1.03	1.19	1.10				
8-4	115N05130	4 Evening	Weekday	I-8	Westbound	70.1	63.2	62.8	59.5	75	75	65	1.00	1.03	1.19	1.09				
8-4	115N05131	1 AM Peak	Weekday	I-8	Westbound	72.5	63.7	63.3	59.7	75	75	65	1.00	1.02	1.18	1.09	1.00	1.03	1.21	1.10
8-4	115N05131	2 Mid Day	Weekday	I-8	Westbound	71.9	63.3	62.9	59.5	75	75	65	1.00	1.03	1.19	1.09				
8-4	115N05131	3 PM Peak	Weekday	I-8	Westbound	71.3	63.1	62.2	59.3	75	75	65	1.00	1.03	1.21	1.10				
8-4	115N05131	4 Evening	Weekday	I-8	Westbound	70.2	63.4	62.9	59.7	75	75	65	1.00	1.03	1.19	1.09				
8-4	115N05132	1 AM Peak	Weekday	I-8	Westbound	72.9	63.6	63.5	59.5	75	75	65	1.00	1.02	1.18	1.09	1.00	1.03	1.19	1.09
8-4	115N05132	2 Mid Day	Weekday	I-8	Westbound	72.4	63.3	62.8	59.5	75	75	65	1.00	1.03	1.19	1.09				

Segment	TMC	time period	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-4	115N05132	3 PM Peak	Weekday	I-8	Westbound	71.8	63.2	62.8	59.5	75	75	65	1.00	1.03	1.19	1.09				
8-4	115N05132	4 Evening	Weekday	I-8	Westbound	70.7	63.4	62.8	59.5	75	75	65	1.00	1.03	1.19	1.09				
8-4	115N05133	1 AM Peak	Weekday	I-8	Westbound	74.6	63.5	62.7	62.7	75	75	65	1.00	1.02	1.20	1.04	1.00	1.03	1.20	1.17
8-4	115N05133	2 Mid Day	Weekday	I-8	Westbound	75.0	63.4	62.7	62.7	75	75	65	1.00	1.03	1.20	1.04				
8-4	115N05133	3 PM Peak	Weekday	I-8	Westbound	74.2	63.0	62.7	55.8	75	75	65	1.00	1.03	1.20	1.17				
8-4	115N05133	4 Evening	Weekday	I-8	Westbound	72.6	63.4	62.7	55.8	75	75	65	1.00	1.02	1.20	1.17				
8-5	115N05134	1 AM Peak	Weekday	I-8	Westbound	72.4	63.6	62.9	59.2	75	75	65	1.00	1.02	1.19	1.10	1.00	1.03	1.22	1.11
8-5	115N05134	2 Mid Day	Weekday	I-8	Westbound	71.8	63.2	62.6	59.2	75	75	65	1.00	1.03	1.20	1.10				
8-5	115N05134	3 PM Peak	Weekday	I-8	Westbound	71.1	62.9	61.5	58.8	75	75	65	1.00	1.03	1.22	1.11				
8-5	115N05134	4 Evening	Weekday	I-8	Westbound	70.1	63.3	61.5	59.2	75	75	65	1.00	1.03	1.22	1.10				
8-5	115N05135	1 AM Peak	Weekday	I-8	Westbound	72.0	62.0	62.2	54.9	75	75	65	1.00	1.05	1.21	1.19	1.00	1.05	1.23	1.19
8-5	115N05135	2 Mid Day	Weekday	I-8	Westbound	71.6	62.2	61.3	56.3	75	75	65	1.00	1.04	1.22	1.15				
8-5	115N05135	3 PM Peak	Weekday	I-8	Westbound	70.8	62.1	61.3	57.1	75	75	65	1.00	1.05	1.22	1.14				
8-5	115N05135	4 Evening	Weekday	I-8	Westbound	69.6	62.3	60.9	56.7	75	75	65	1.00	1.04	1.23	1.15				
8-5	115N05136	1 AM Peak	Weekday	I-8	Westbound	72.1	63.4	63.4	59.8	75	75	65	1.00	1.02	1.18	1.09	1.00	1.03	1.19	1.10
8-5	115N05136	2 Mid Day	Weekday	I-8	Westbound	71.7	63.1	63.0	59.7	75	75	65	1.00	1.03	1.19	1.09				
8-5	115N05136	3 PM Peak	Weekday	I-8	Westbound	70.7	63.0	62.8	59.5	75	75	65	1.00	1.03	1.19	1.09				
8-5	115N05136	4 Evening	Weekday	I-8	Westbound	69.8	63.1	62.8	59.3	75	75	65	1.00	1.03	1.19	1.10				
8-5	115N05137	1 AM Peak	Weekday	I-8	Westbound	71.4	63.6	61.6	59.4	75	75	65	1.00	1.02	1.22	1.09	1.00	1.03	1.22	1.10
8-5	115N05137	2 Mid Day	Weekday	I-8	Westbound	71.1	63.2	61.6	59.0	75	75	65	1.00	1.03	1.22	1.10				
8-5	115N05137	3 PM Peak	Weekday	I-8	Westbound	70.2	62.9	61.4	59.0	75	75	65	1.00	1.03	1.22	1.10				

Segment	TMC	time period	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-5	115N05137	4 Evening	Weekday	I-8	Westbound	69.7	63.3	61.6	59.0	75	75	65	1.00	1.03	1.22	1.10				
8-5	115N05138	1 AM Peak	Weekday	I-8	Westbound	71.6	63.6	62.2	59.6	75	75	65	1.00	1.02	1.21	1.09	1.00	1.03	1.22	1.10
8-5	115N05138	2 Mid Day	Weekday	I-8	Westbound	71.0	63.0	61.5	58.9	75	75	65	1.00	1.03	1.22	1.10				
8-5	115N05138	3 PM Peak	Weekday	I-8	Westbound	70.4	62.9	61.5	58.9	75	75	65	1.00	1.03	1.22	1.10				
8-5	115N05138	4 Evening	Weekday	I-8	Westbound	69.8	63.3	61.7	59.3	75	75	65	1.00	1.03	1.22	1.10				
8-6	115N05139	1 AM Peak	Weekday	I-8	Westbound	69.8	62.9	59.1	57.8	75	75	65	1.00	1.03	1.27	1.12	1.00	1.04	1.28	1.16
8-6	115N05139	2 Mid Day	Weekday	I-8	Westbound	69.9	62.5	59.7	57.1	75	75	65	1.00	1.04	1.26	1.14				
8-6	115N05139	3 PM Peak	Weekday	I-8	Westbound	69.5	62.2	59.1	56.6	75	75	65	1.00	1.04	1.27	1.15				
8-6	115N05139	4 Evening	Weekday	I-8	Westbound	68.6	62.3	58.6	55.8	75	75	65	1.00	1.04	1.28	1.16				
8-6	115N05140	1 AM Peak	Weekday	I-8	Westbound	70.6	62.3	57.5	53.5	75	75	65	1.00	1.04	1.30	1.22	1.00	1.05	1.31	1.25
8-6	115N05140	2 Mid Day	Weekday	I-8	Westbound	70.5	62.3	57.7	54.8	75	75	65	1.00	1.04	1.30	1.19				
8-6	115N05140	3 PM Peak	Weekday	I-8	Westbound	69.0	62.2	57.1	54.8	75	75	65	1.00	1.05	1.31	1.19				
8-6	115N05140	4 Evening	Weekday	I-8	Westbound	68.6	61.9	57.7	52.1	75	75	65	1.00	1.05	1.30	1.25				
8-6	115N05141	1 AM Peak	Weekday	I-8	Westbound	72.1	63.9	62.8	59.7	75	75	65	1.00	1.02	1.19	1.09	1.00	1.02	1.20	1.10
8-6	115N05141	2 Mid Day	Weekday	I-8	Westbound	71.3	63.4	62.5	59.6	75	75	65	1.00	1.02	1.20	1.09				
8-6	115N05141	3 PM Peak	Weekday	I-8	Westbound	69.9	63.7	63.1	59.7	75	75	65	1.00	1.02	1.19	1.09				
8-6	115N05141	4 Evening	Weekday	I-8	Westbound	69.6	63.7	62.8	58.9	75	75	65	1.00	1.02	1.19	1.10				
8-7	115N05142	1 AM Peak	Weekday	I-8	Westbound	71.9	63.7	62.7	59.0	75	75	65	1.00	1.02	1.20	1.10	1.00	1.03	1.23	1.11
8-7	115N05142	2 Mid Day	Weekday	I-8	Westbound	70.9	63.3	60.8	58.5	75	75	65	1.00	1.03	1.23	1.11				
8-7	115N05142	3 PM Peak	Weekday	I-8	Westbound	69.3	63.1	61.1	58.5	75	75	65	1.00	1.03	1.23	1.11				
8-7	115N05142	4 Evening	Weekday	I-8	Westbound	69.2	63.6	61.6	58.5	75	75	65	1.00	1.02	1.22	1.11				

Segment	TMC	time period	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-7	115N05143	1 AM Peak	Weekday	I-8	Westbound	70.6	63.2	59.1	56.8	75	75	65	1.00	1.03	1.27	1.14	1.00	1.03	1.29	1.14
8-7	115N05143	2 Mid Day	Weekday	I-8	Westbound	69.7	62.8	58.4	57.2	75	75	65	1.00	1.03	1.28	1.14				
8-7	115N05143	3 PM Peak	Weekday	I-8	Westbound	68.6	63.0	58.4	57.2	75	75	65	1.00	1.03	1.28	1.14				
8-7	115N05143	4 Evening	Weekday	I-8	Westbound	68.0	63.4	58.1	57.2	75	75	65	1.00	1.03	1.29	1.14				
8-8	115N05144	1 AM Peak	Weekday	I-8	Westbound	70.3	63.5	59.7	58.9	75	75	65	1.00	1.02	1.26	1.10	1.00	1.03	1.26	1.11
8-8	115N05144	2 Mid Day	Weekday	I-8	Westbound	69.8	63.1	60.3	58.4	75	75	65	1.00	1.03	1.24	1.11				
8-8	115N05144	3 PM Peak	Weekday	I-8	Westbound	68.6	63.2	60.1	59.1	75	75	65	1.00	1.03	1.25	1.10				
8-8	115N05144	4 Evening	Weekday	I-8	Westbound	68.4	63.7	59.7	58.4	75	75	65	1.00	1.02	1.26	1.11				
8-8	115N05145	1 AM Peak	Weekday	I-8	Westbound	70.9	63.9	61.5	59.6	75	75	65	1.00	1.02	1.22	1.09	1.00	1.02	1.23	1.11
8-8	115N05145	2 Mid Day	Weekday	I-8	Westbound	70.3	63.5	60.8	58.5	75	75	65	1.00	1.02	1.23	1.11				
8-8	115N05145	3 PM Peak	Weekday	I-8	Westbound	69.8	63.7	61.9	59.6	75	75	65	1.00	1.02	1.21	1.09				
8-8	115N05145	4 Evening	Weekday	I-8	Westbound	69.8	64.0	62.1	59.1	75	75	65	1.00	1.01	1.21	1.10				
8-9	115N05146	1 AM Peak	Weekday	I-8	Westbound	71.3	63.9	62.9	59.6	75	75	65	1.00	1.02	1.19	1.09	1.00	1.02	1.23	1.11
8-9	115N05146	2 Mid Day	Weekday	I-8	Westbound	70.9	63.5	61.2	58.5	75	75	65	1.00	1.02	1.23	1.11				
8-9	115N05146	3 PM Peak	Weekday	I-8	Westbound	70.4	63.8	62.9	59.6	75	75	65	1.00	1.02	1.19	1.09				
8-9	115N05146	4 Evening	Weekday	I-8	Westbound	70.3	63.9	62.9	58.5	75	75	65	1.00	1.02	1.19	1.11				
8-9	115N05147	1 AM Peak	Weekday	I-8	Westbound	70.8	63.7	61.4	58.7	75	75	65	1.00	1.02	1.22	1.11	1.00	1.03	1.23	1.11
8-9	115N05147	2 Mid Day	Weekday	I-8	Westbound	70.8	63.3	61.0	58.4	75	75	65	1.00	1.03	1.23	1.11				
8-9	115N05147	3 PM Peak	Weekday	I-8	Westbound	70.2	63.5	62.1	58.7	75	75	65	1.00	1.02	1.21	1.11				
8-9	115N05147	4 Evening	Weekday	I-8	Westbound	70.2	63.7	62.1	58.4	75	75	65	1.00	1.02	1.21	1.11				
8-9	115N05148	1 AM Peak	Weekday	I-8	Westbound	70.5	62.3	59.5	54.6	75	75	65	1.00	1.04	1.26	1.19	1.00	1.05	1.26	1.23

Segment	TMC	time period	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars Peak TTI	Trucks Peak TTI	Cars Peak PTI	Trucks Peak PTI
8-9	115N05148	2 Mid Day	Weekday	I-8	Westbound	70.1	62.4	60.5	55.9	75	75	65	1.00	1.04	1.24	1.16				
8-9	115N05148	3 PM Peak	Weekday	I-8	Westbound	69.8	62.5	61.5	56.7	75	75	65	1.00	1.04	1.22	1.15				
8-9	115N05148	4 Evening	Weekday	I-8	Westbound	69.5	62.0	60.5	53.0	75	75	65	1.00	1.05	1.24	1.23				
8-9	115N05149	1 AM Peak	Weekday	I-8	Westbound	69.8	62.6	59.2	57.9	75	75	65	1.00	1.04	1.27	1.12	1.00	1.05	1.31	1.16
8-9	115N05149	2 Mid Day	Weekday	I-8	Westbound	69.4	62.8	59.5	58.2	75	75	65	1.00	1.04	1.26	1.12				
8-9	115N05149	3 PM Peak	Weekday	I-8	Westbound	69.3	62.8	59.7	58.4	75	75	65	1.00	1.03	1.26	1.11				
8-9	115N05149	4 Evening	Weekday	I-8	Westbound	68.2	62.1	57.4	56.0	75	75	65	1.00	1.05	1.31	1.16				
8-9	115N05150	1 AM Peak	Weekday	I-8	Westbound	57.7	56.5	42.8	44.8	65	65	65	1.13	1.15	1.52	1.45	1.18	1.17	1.61	1.54
8-9	115N05150	2 Mid Day	Weekday	I-8	Westbound	57.8	57.3	44.8	45.6	65	65	65	1.12	1.14	1.45	1.43				
8-9	115N05150	3 PM Peak	Weekday	I-8	Westbound	58.0	56.9	45.2	46.3	65	65	65	1.12	1.14	1.44	1.40				
8-9	115N05150	4 Evening	Weekday	I-8	Westbound	55.2	55.8	40.3	42.1	65	65	65	1.18	1.17	1.61	1.54				

Closure Data

Segment	Length (miles)	# of closures	Total miles of closures		Average Occurrences/Mile/Year	
			EB	WB	EB	WB
8-1	16.3	23	12.7	19.8	0.16	0.24
8-2	5.1	10	3.0	11.1	0.12	0.44
8-3	35.1	25	36.4	33.0	0.21	0.19
8-4	23.4	8	3.0	5.0	0.03	0.04
8-5	30.5	16	8.0	14.4	0.05	0.09
8-6	9.6	6	2.0	4.0	0.04	0.08
8-7	27.6	12	5.0	7.0	0.04	0.05
8-8	19.0	6	2.0	4.0	0.02	0.04
8-9	11.8	7	6.0	1.0	0.10	0.02

	ITIS Category Description											
	Closures		Incidents/Accidents		Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
Segment	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
8-1	0	0	12	11	0	0	0	0	0	0	0	0
8-2	0	0	3	7	0	0	0	0	0	0	0	0
8-3	0	0	16	9	0	0	0	0	0	0	0	0
8-4	0	0	3	5	0	0	0	0	0	0	0	0
8-5	0	0	5	12	0	0	0	0	0	0	0	0
8-6	0	0	2	3	0	0	0	0	0	0	0	0
8-7	0	0	5	7	0	0	0	0	0	0	0	0
8-8	0	0	2	4	0	0	0	0	0	0	0	0
8-9	0	0	6	1	0	0	0	0	0	0	0	0

HPMS Data

SEGMENT	MP_FROM	MP_TO	WEIGHTED AVERAGE NB/EB AADT	WEIGHTED AVERAGE SB/WB AADT	WEIGHTED AVERAGE AADT	NB/EB AADT	SB/WB AADT	2014 AADT	K Factor	D-Factor	T-Factor
8-1	0	16	13123	13071	26194	14580	14344	28925	9	52	20
8-2	16	21	6887	6553	13440	6859	5989	12848	9	53	26
8-3	21	57	5189	4916	10105	4987	4684	9671	6	52	25
8-4	57	80	5986	5566	11551	5485	5234	10719	8	51	25
8-5	80	110	6575	6044	12619	6704	6561	13265	9	51	25
8-6	110	120	3305	3069	6375	3309	3145	6455	12	51	31
8-7	120	148	2907	2562	5469	2772	2466	5238	12	53	32
8-8	148	167	2683	2574	5257	2876	2621	5497	12	52	33
8-9	167	178	3922	3436	7358	4861	3738	8599	10	56	33

SEGMENT	Loc ID	BMP	EMP	Length	Pos Dir AADT	Neg Dir AADT	Corrected Pos Dir AADT	Corrected Neg Dir AADT	2014 AADT	K Factor	D-Factor	D-Factor Adjusted	T-Factor
8-1	100001	0.00	0.50	0.50	11064	10019	11064	10019	21084	12	62	52	18
	100002	0.50	2.24	1.74	10416	11815	10416	11815	22233	12	57	53	18
	100003	2.24	3.98	1.74	20874	19649	20874	19649	40523	12	57	52	16
	100004	3.98	7.60	3.62	22279	22184	22279	22184	44463	11	58	50	16
	100005	7.60	9.40	1.80	20170	19981	20170	19981	40152	10	59	50	16
	100006	9.40	12.22	2.82	19309	19790	19309	19790	39099	9	52	51	16
	100007	12.22	14.24	2.02	10690	11135	10690	11135	21827	7	50	51	18
	100008	14.24	21.04	6.80	7910	6980	7910	6980	14891	6	50	53	26
8-2	100009	21.04	30.81	9.77	6859	5989	6859	5989	12848	9	53	53	26
8-3	100010	30.81	37.96	7.15	6120	5742	6120	5742	11862	8	54	52	26
	100011	37.96	42.08	4.12	5213	4448	5213	4448	9661	6	51	54	25
	100012	42.08	54.96	12.88	4800	4373	4800	4373	9174	6	54	52	25
	100013	54.96	67.44	12.48	4456	4476	4456	4476	8932	6	54	50	25
8-4	100014	67.44	73.48	6.04	4792	4359	4792	4359	9152	7	52	52	25
	100015	73.48	78.47	4.99	4763	4303	4763	4303	9066	8	54	53	25
	100016	78.47	87.04	8.57	6850	6206	6394	6394	12787	8	57	50	25
8-5	100017	87.04	102.30	15.26	8069	3951	7333	7333	14665	9	57	50	25
	100018	102.30	106.48	4.18	7005	6146	7005	6146	13151	8	51	53	25
	100019	106.48	111.43	4.95	4512	4534	4512	4534	9046	9	50	50	25
8-6	100020	111.43	115.15	3.72	4990	4733	4990	4733	9723	8	51	51	25
	100021	115.15	115.63	0.48	3714	1896	3714	1896	5611	7	59	66	25
	100022	115.63	119.43	3.80	2621	2464	3292	3292	6584	8	57	50	25
	100023	119.43	140.81	21.38	3010	2871	3010	2871	5882	13	58	51	32
8-7	100024	140.81	144.56	3.75	2754	2468	2754	2468	5223	12	55	53	32
	100025	144.56	151.69	7.13	2781	2465	2781	2465	5246	12	56	53	32
8-8	100026	151.69	161.53	9.84	2873	2462	2873	2462	5336	12	71	54	33
	100027	161.53	167.53	6.00	0	0	2881	2881	5762	11	68	50	33
8-9	100028	167.53	169.54	2.01	3112	2880	3112	2880	5992	11	60	52	33
	100029	169.54	172.54	3.00	4650	3878	4650	3878	8528	9	50	55	33
	100030	172.54	174.54	2.00	4932	3624	4932	3624	8556	10	51	58	33
	100031	174.54	178.33	3.79	5919	4141	5919	4141	10060	10	52	59	33

Bicycle Accommodation Data

Segment	BMP	EMP	Divided or Non	EB Right Shoulder Width	WB Right Shoulder Width	EB Left Shoulder Width	WB Left Shoulder Width	EB Effective Length of Shoulder	WB Effective Length of Shoulder	% Bicycle Accommodation
8-1	0	16.3	Divided	10.0	10.0	4.0	4.0	15.5	15.5	100%
8-2	16.3	21.4	Divided	10.0	10.0	4.0	4.0	5.1	5.1	100%
8-3	21.4	56.5	Divided	10.0	10.0	4.0	4.0	35.1	35.1	100%
8-4	56.5	79.6	Divided	9.9	9.9	4.8	4.0	22.8	23.0	100%
8-5	79.6	110.4	Divided	10.0	10.0	4.0	4.0	30.8	30.8	100%
8-6	110.4	120	Divided	10.0	10.0	4.0	4.0	9.6	9.6	100%
8-7	120	147.6	Divided	10.0	10.0	4.0	4.0	27.6	27.6	100%
8-8	147.6	166.5	Divided	9.7	9.4	3.7	3.4	18.9	18.9	100%
8-9	166.5	178	Divided	9.6	9.6	4.9	3.6	11.5	11.5	100%

AZTDM Data

SEGMENT	Growth Rate	% Non-SOV
8-1	1.47%	12.5%
8-2	1.06%	16.0%
8-3	0.90%	9.8%
8-4	1.02%	9.3%
8-5	1.72%	22.5%
8-6	2.98%	19.0%
8-7	1.35%	16.8%
8-8	1.94%	13.8%
8-9	1.49%	12.2%

HERS Capacity Calculation Data

Segment	Capacity Environment Type	Facility Type	Terrain	Lane Width	EB Rt Shoulder	WB Rt Shoulder	F_{lw} or f_w or f_{LS}	EB F_{lc}	WB F_{lc}	Total Ramp Density[1]	PHF	E_T	f_{HV}	f_M	f_A	g/C^2	f_G	f_{NP}	Nm	f_p	EB FFS	WB FFS	EB Peak-Hour Capacity	WB Peak-Hour Capacity	Major Direction Peak-Hour Capacity	Daily Capacity[3]
8-1	1	Urban	Rolling	12.00	10.00	10.00	0.0	0	0	1.52	0.9	2	0.909	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70.82	70.82	4102	4102	N/A	78,130
8-2	1	Rural	Mountainous	12.00	10.00	10.00	0.0	0	0	0	0.9	5	0.524	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	2362	2362	N/A	44,996
8-3	1	Rural	Rolling	12.00	10.00	10.00	0.0	0	0	0	0.9	3	0.727	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	3281	3281	N/A	62,504
8-4	1	Rural	Level	12.00	9.92	9.95	0.0	0	0	0	0.9	2	0.889	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	4011	4011	N/A	76,394
8-5	1	Rural	Level	12.00	10.00	10.00	0.0	0	0	0	0.9	2	0.889	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	4011	4011	N/A	76,394
8-6	1	Rural	Rolling	12.00	10.00	10.00	0.0	0	0	0	0.9	3	0.683	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	3080	3080	N/A	58,664
8-7	1	Rural	Level	12.00	10.00	10.00	0.0	0	0	0	0.9	2	0.862	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	3890	3890	N/A	74,089
8-8	1	Rural	Level	12.00	9.74	9.40	0.0	0	0	0	0.9	2	0.858	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	3873	3873	N/A	73,771
8-9	1	Rural	Level	12.00	9.63	9.63	0.0	0	0	0	0.9	2	0.858	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.40	75.40	3873	3873	N/A	73,771

Safety Performance Area Data

Segment	Operating Environment	Segment Length (miles)	EB Fatal Crashes 2010-2014	WB Fatal Crashes 2010-2014	EB Incapacitating Injury Crashes	WB Incapacitating Injury Crashes	Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors
8-1	Urban 4 Lane Freeway	16	1	1	4	3	5
8-2	Rural 4 Lane Freeway with Daily Volume < 25,000	5	0	0	4	3	3
8-3	Rural 4 Lane Freeway with Daily Volume < 25,000	35	4	4	10	9	16
8-4	Rural 4 Lane Freeway with Daily Volume < 25,000	23	1	2	5	3	2
8-5	Rural 4 Lane Freeway with Daily Volume < 25,000	31	2	2	11	7	6
8-6	Rural 4 Lane Freeway with Daily Volume < 25,000	10	0	0	1	2	2
8-7	Rural 4 Lane Freeway with Daily Volume < 25,000	19	0	2	1	2	2
8-8	Rural 4 Lane Freeway with Daily Volume < 25,000	19	1	1	3	1	2
8-9	Rural 4 Lane Freeway with Daily Volume < 25,000	12	0	1	4	2	4

Segment	Operating Environment	Fatal + Incapacitating Injury Crashes Involving Trucks	Fatal + Incapacitating Injury Crashes Involving Motorcycles	Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Weighted 5-Year (2010-2014) Average EB AADT	Weighted 5-Year (2010-2014) Average WB AADT	Weighted 5-Year (2010-2014) Average Total AADT
8-1	Urban 4 Lane Freeway	1	1	1	15,648	15,764	31,411
8-2	Rural 4 Lane Freeway with Daily Volume < 25,000	0	2	0	7,863	7,397	15,260
8-3	Rural 4 Lane Freeway with Daily Volume < 25,000	6	4	1	5,775	5,435	11,210
8-4	Rural 4 Lane Freeway with Daily Volume < 25,000	1	1	0	5,186	4,608	9,793
8-5	Rural 4 Lane Freeway with Daily Volume < 25,000	2	0	0	6,656	5,519	12,175
8-6	Rural 4 Lane Freeway with Daily Volume < 25,000	1	0	0	4,052	3,705	7,756
8-7	Rural 4 Lane Freeway with Daily Volume < 25,000	0	0	0	2,928	2,662	5,590
8-8	Rural 4 Lane Freeway with Daily Volume < 25,000	2	0	0	2,683	2,574	5,257
8-9	Rural 4 Lane Freeway with Daily Volume < 25,000	0	1	0	4,004	3,382	7,386

HPMS Data

2010-2014 Weighted Average						2014			2013			2012			2011			2010		
SEGMENT	MP_FROM	MP_TO	WEIGHTED AVERAGE EB AADT	WEIGHTED AVERAGE WB AADT	WEIGHTED AVERAGE AADT	EB AADT	WB AADT	2014 AADT	EB AADT	WB AADT	2014 AADT	EB AADT	WB AADT	2014 AADT	EB AADT	WB AADT	2014 AADT	EB AADT	WB AADT	2014 AADT
8-1	0	16	13123	13071	26194	14580	14344	28925	13910	14024	27935	14341	14168	28509	11304	11304	22608	11477	11516	22993
8-2	16	21	6887	6553	13440	6859	5989	12848	6397	6397	12793	6816	6014	12830	7114	7114	14228	7250	7250	14500
8-3	21	57	5189	4916	10105	4987	4684	9671	5238	4847	10084	5409	4768	10177	5136	5109	10245	5175	5175	10349
8-4	57	80	5986	5566	11551	5485	5234	10719	5786	5565	11350	6484	5346	11830	6538	6538	13076	5637	5144	10781
8-5	80	110	6575	6044	12619	6704	6561	13265	7861	7093	14956	7539	6041	13581	5436	5335	10772	5333	5191	10524
8-6	110	120	3305	3069	6375	3309	3145	6455	3408	3343	6752	3509	3133	6643	3103	3028	6132	3197	2695	5892
8-7	120	148	2907	2562	5469	2772	2466	5238	2712	2413	5125	3351	2832	6183	2700	2700	5399	3000	2400	5400
8-8	148	167	2683	2574	5257	2876	2621	5497	2679	2679	5359	2710	2464	5174	2529	2427	4953	2619	2681	5300
8-9	167	178	3922	3436	7358	4861	3738	8599	4089	3828	7917	3687	3420	7107	3513	3143	6656	3462	3050	6511

Freight Performance Area Data

Segment	Length (miles)	# of closures	Total minutes of closures		Average Mins/Mile/Year	
			EB	WB	EB	WB
8-1	16.3	23	470.7	715.5	28.88	43.90
8-2	5.1	10	87.9	714.9	17.23	140.18
8-3	35.1	25	2565.2	986.2	73.08	28.10
8-4	23.4	8	121.6	179.7	5.20	7.68
8-5	30.5	16	276.7	605.2	9.07	19.84
8-6	9.6	6	234.5	210.2	24.43	21.89
8-7	27.6	12	365.8	315.2	13.25	11.42
8-8	19.0	6	119.6	478.4	6.29	25.18
8-9	11.8	7	318.8	18.1	27.01	1.53

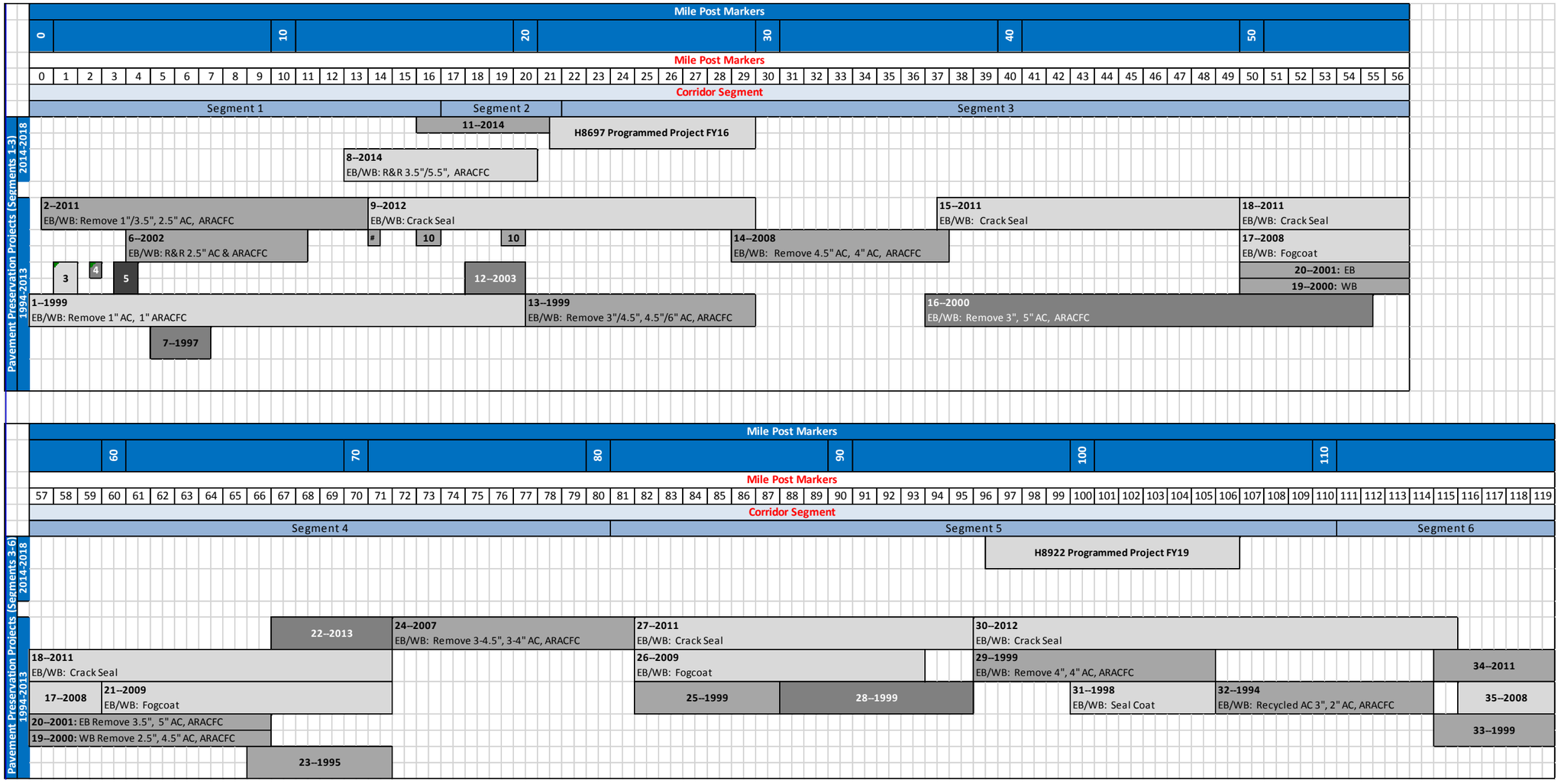
	ITIS Category Description											
	Closures		Incidents/Accidents		Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
Segment	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
8-1	0	0	12	11	0	0	0	0	0	0	0	0
8-2	0	0	3	7	0	0	0	0	0	0	0	0
8-3	0	0	16	9	0	0	0	0	0	0	0	0
8-4	0	0	3	5	0	0	0	0	0	0	0	0
8-5	0	0	5	12	0	0	0	0	0	0	0	0
8-6	0	0	2	3	0	0	0	0	0	0	0	0
8-7	0	0	5	7	0	0	0	0	0	0	0	0
8-8	0	0	2	4	0	0	0	0	0	0	0	0
8-9	0	0	6	1	0	0	0	0	0	0	0	0

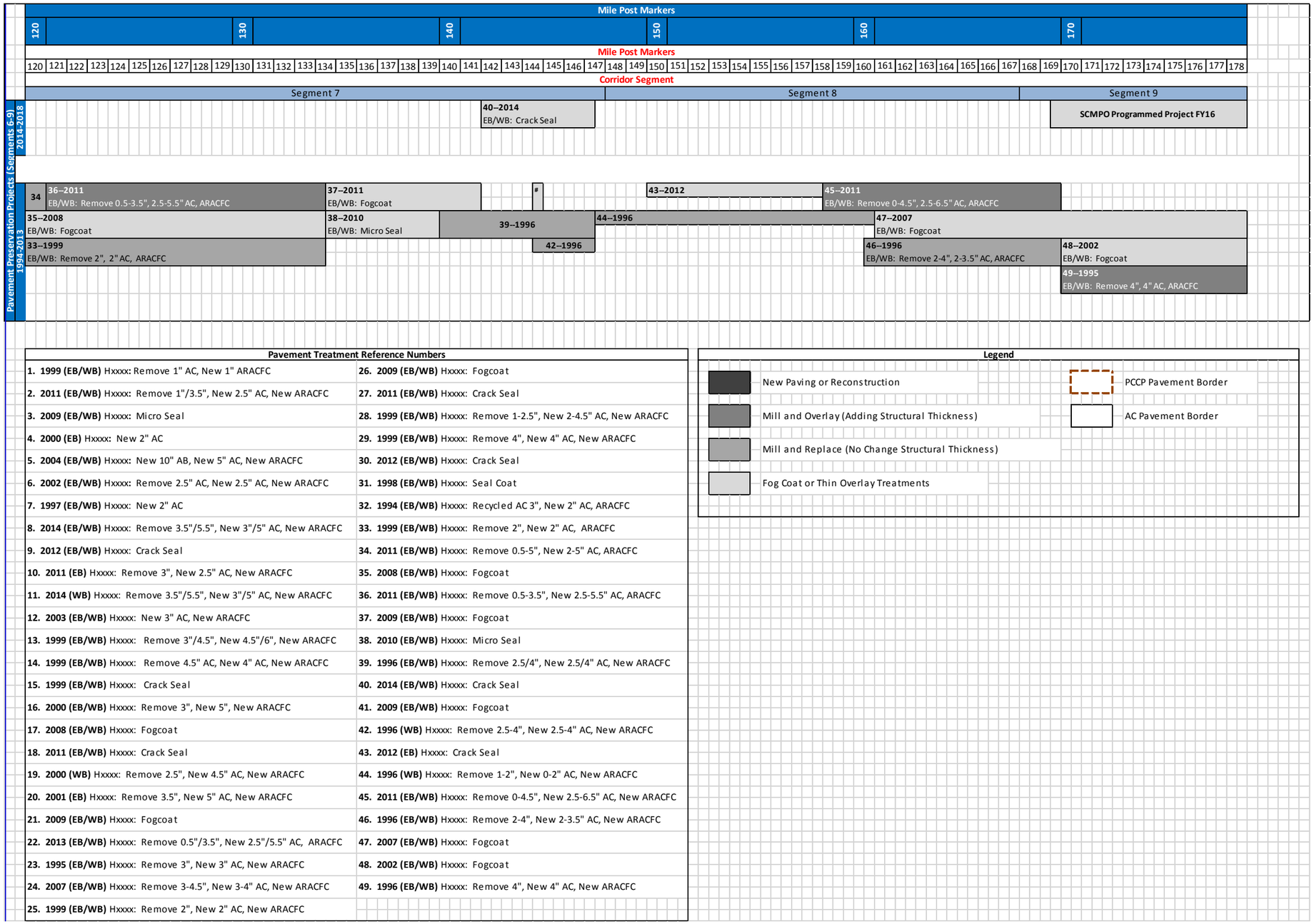
Appendix D: Needs Analysis Contributing Factors and Scores

Pavement Performance Needs Analysis

Segment	Segment Length (miles)	Segment Mileposts (MP)	Final Need	Historical Investment	PeCos History Investment	Contributing Factors and Comments
8-1	16.3	0 - 16.3	Low	High	Low	Hot spot 1 mile NB MP 177-178
8-2	5.05	16.3 - 21.4	None	Medium	Low	
8-3	35.08	21.4 - 56.5	Low	Medium	Low	Hot spot 5 miles SB MP 195-199, SB MP 200-201
8-4	23.36	56.5 - 79.6	Low	Medium	Medium	Hot spot 1 mile NB/SB MP 224-226
8-5	30.53	79.6 - 110.4	Medium	Medium	Low	
8-6	9.62	110.4 - 120	None	Medium	Low	
8-7	27.6	120 - 147.6	None	Medium	Low	
8-8	19	147.6 - 166.5	Low	Low	Low	
8-9	11.75	166.5 - 178.3	Low	Medium	Medium	

Pavement History





Pavement Treatment Reference Numbers

1. 1999 (EB/WB) Hxxxx: Remove 1" AC, New 1" ARACFC	**26. 2009 (EB/WB)** Hxxxx: Fogcoat
2. 2011 (EB/WB) Hxxxx: Remove 1"/3.5", New 2.5" AC, New ARACFC	**27. 2011 (EB/WB)** Hxxxx: Crack Seal
3. 2009 (EB/WB) Hxxxx: Micro Seal	**28. 1999 (EB/WB)** Hxxxx: Remove 1-2.5", New 2-4.5" AC, New ARACFC
4. 2000 (EB) Hxxxx: New 2" AC	**29. 1999 (EB/WB)** Hxxxx: Remove 4", New 4" AC, New ARACFC
5. 2004 (EB/WB) Hxxxx: New 10" AB, New 5" AC, New ARACFC	**30. 2012 (EB/WB)** Hxxxx: Crack Seal
6. 2002 (EB/WB) Hxxxx: Remove 2.5" AC, New 2.5" AC, New ARACFC	**31. 1998 (EB/WB)** Hxxxx: Seal Coat
7. 1997 (EB/WB) Hxxxx: New 2" AC	**32. 1994 (EB/WB)** Hxxxx: Recycled AC 3", New 2" AC, ARACFC
8. 2014 (EB/WB) Hxxxx: Remove 3.5"/5.5", New 3"/5" AC, New ARACFC	**33. 1999 (EB/WB)** Hxxxx: Remove 2", New 2" AC, ARACFC
9. 2012 (EB/WB) Hxxxx: Crack Seal	**34. 2011 (EB/WB)** Hxxxx: Remove 0.5-5", New 2-5" AC, ARACFC
10. 2011 (EB) Hxxxx: Remove 3", New 2.5" AC, New ARACFC	**35. 2008 (EB/WB)** Hxxxx: Fogcoat
11. 2014 (WB) Hxxxx: Remove 3.5"/5.5", New 3"/5" AC, New ARACFC	**36. 2011 (EB/WB)** Hxxxx: Remove 0.5-3.5", New 2.5-5.5" AC, ARACFC
12. 2003 (EB/WB) Hxxxx: New 3" AC, New ARACFC	**37. 2009 (EB/WB)** Hxxxx: Fogcoat
13. 1999 (EB/WB) Hxxxx: Remove 3"/4.5", New 4.5"/6", New ARACFC	**38. 2010 (EB/WB)** Hxxxx: Micro Seal
14. 1999 (EB/WB) Hxxxx: Remove 4.5" AC, New 4" AC, New ARACFC	**39. 1996 (EB/WB)** Hxxxx: Remove 2.5/4", New 2.5/4" AC, New ARACFC
15. 1999 (EB/WB) Hxxxx: Crack Seal	**40. 2014 (EB/WB)** Hxxxx: Crack Seal
16. 2000 (EB/WB) Hxxxx: Remove 3", New 5", New ARACFC	**41. 2009 (EB/WB)** Hxxxx: Fogcoat
17. 2008 (EB/WB) Hxxxx: Fogcoat	**42. 1996 (WB)** Hxxxx: Remove 2.5-4", New 2.5-4" AC, New ARACFC
18. 2011 (EB/WB) Hxxxx: Crack Seal	**43. 2012 (EB)** Hxxxx: Crack Seal
19. 2000 (WB) Hxxxx: Remove 2.5", New 4.5" AC, New ARACFC	**44. 1996 (WB)** Hxxxx: Remove 1-2", New 0-2" AC, New ARACFC
20. 2001 (EB) Hxxxx: Remove 3.5", New 5" AC, New ARACFC	**45. 2011 (EB/WB)** Hxxxx: Remove 0-4.5", New 2.5-6.5" AC, New ARACFC
21. 2009 (EB/WB) Hxxxx: Fogcoat	**46. 1996 (EB/WB)** Hxxxx: Remove 2-4", New 2-3.5" AC, New ARACFC
22. 2013 (EB/WB) Hxxxx: Remove 0.5"/3.5", New 2.5"/5.5" AC, ARACFC	**47. 2007 (EB/WB)** Hxxxx: Fogcoat
23. 1995 (EB/WB) Hxxxx: Remove 3", New 3" AC, New ARACFC	**48. 2002 (EB/WB)** Hxxxx: Fogcoat
24. 2007 (EB/WB) Hxxxx: Remove 3-4.5", New 3-4" AC, New ARACFC	**49. 1996 (EB/WB)** Hxxxx: Remove 4", New 4" AC, New ARACFC
25. 1999 (EB/WB) Hxxxx: Remove 2", New 2" AC, New ARACFC	

Legend

- New Paving or Reconstruction
- Mill and Overlay (Adding Structural Thickness)
- Mill and Replace (No Change Structural Thickness)
- Fog Coat or Thin Overlay Treatments
- PCCP Pavement Border
- AC Pavement Border

Segment Number																			
Value	Level	1		2		3		4		5		6		7		8		9	
		Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir
1	L1	6%	100%		83%		23%		13%		40%		56%		20%	43%	35%		82%
1			25%		58%		36%		50%		47%		44%		27%				100%
1			22%		100%		20%		63%		50%				16%				
1							20%				20%				2%				
1															52%				
3	L2	9%	78%	75%		20%	23%		42%		3%		44%	11%	27%	65%	38%		18%
3			47%	25%		20%	24%		42%		20%		56%	2%	52%				
3			3%	17%					25%		33%		56%		4%				
3			6%						38%		17%								
3																			
4	L3		16%		42%		53%		21%		27%				48%		48%		82%
4																			18%
4																			
4																			
4																			
6	L4		6%																
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6																			
6																			
6																			
Sub-Total		0.34	6.50	3.50	4.08	1.20	4.51	0.00	6.46	0.00	4.83	0.00	5.67	0.38	5.55	2.38	3.38	0.00	6.36
Total		**6.67**		**5.83**		**5.11**		**6.46**		**4.83**		**5.67**		**5.74**		**4.56**		**6.36**	

Pavement Historical Investment

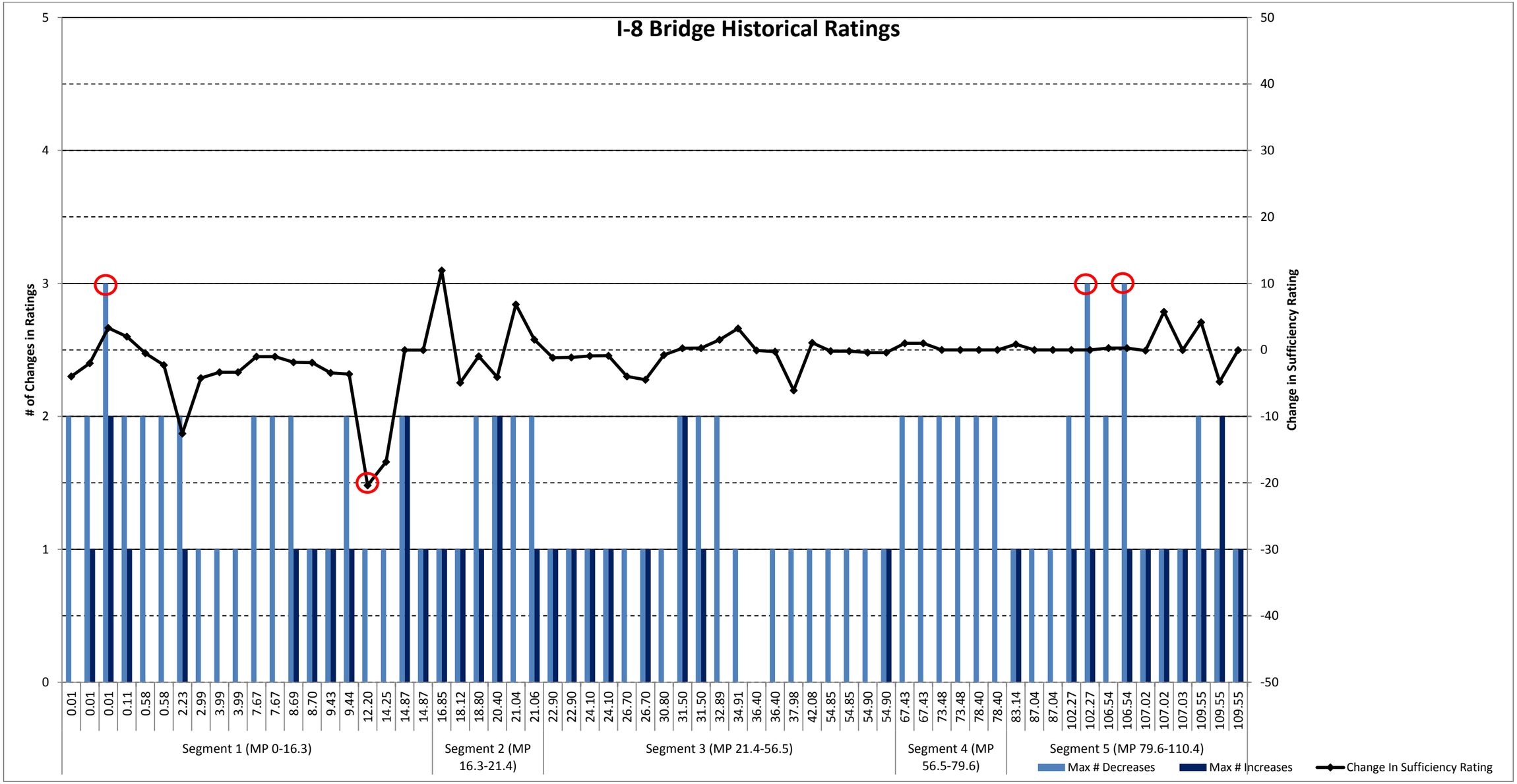
Route	Segment	Pavement History Value (bid projects)	Pavement History Score (bid projects)	Pavement History (bid projects)	PeCos ($/mile/yr)	PeCos Score	PeCos	Resulting Historical Investment
I-8	1	6.67	0.43	High	$1,005.87	-0.66	Low	High
	2	5.83	0.00	Medium	$337.70	-0.82	Low	Medium
	3	5.11	-0.36	Medium	$118.59	-0.87	Low	Medium
	4	6.46	0.32	Medium	$2,086.24	-0.40	Medium	Medium
	5	4.83	-0.50	Medium	$484.87	-0.78	Low	Medium
	6	5.67	-0.08	Medium	$529.78	-0.77	Low	Medium
	7	5.74	-0.04	Medium	$761.30	-0.72	Low	Medium
	8	4.56	-0.64	Low	$509.34	-0.78	Low	Low
	9	6.36	0.27	Medium	$1,200.60	-0.61	Medium	Medium

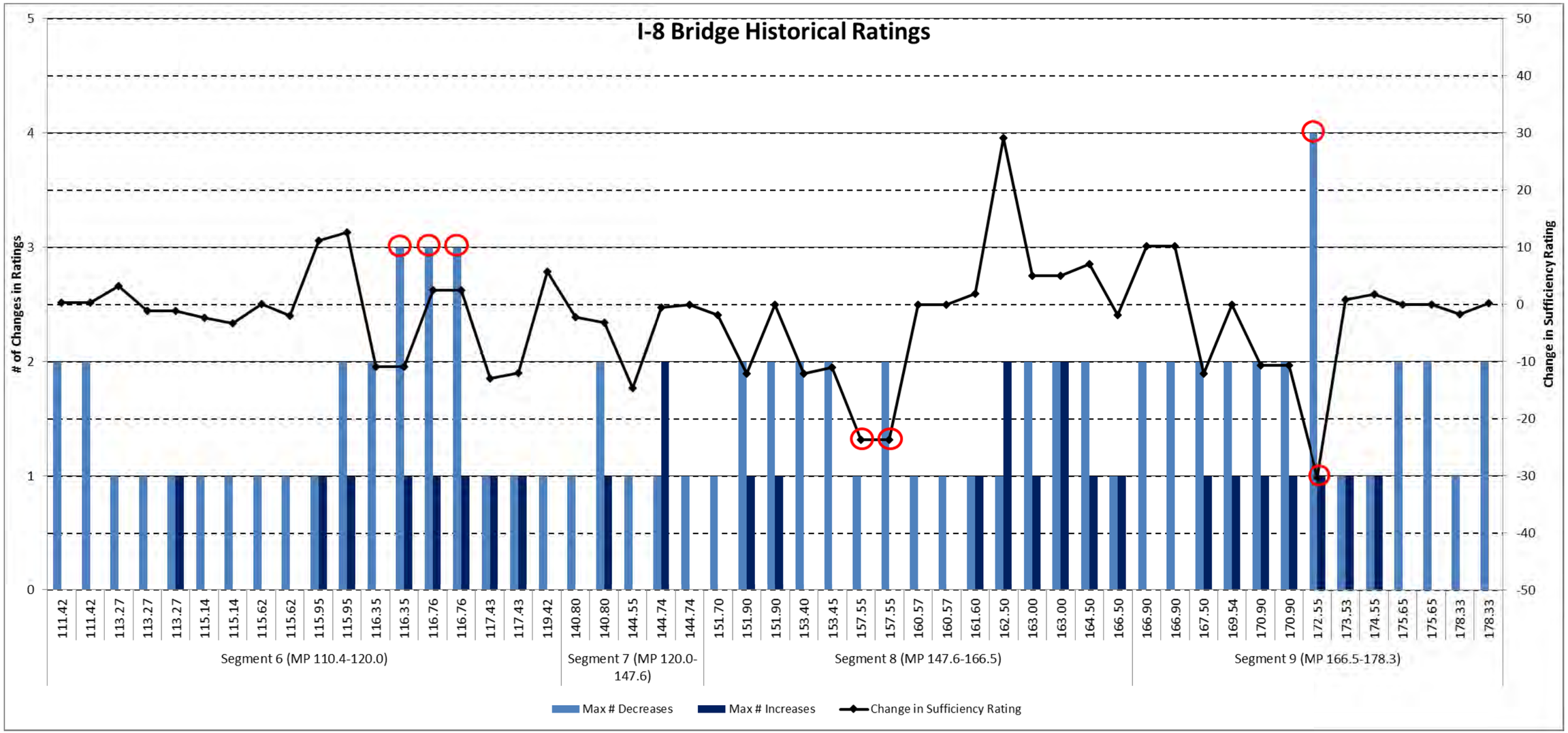
Bridge Performance Needs Analysis

Segment	Segment Length (Miles)	Segment Mileposts (MP)	# Bridges in Segment	# Functionally Obsolete Bridges	Final Need	Contributing Factors			Comments
						Bridge	Current Ratings 5 or Less	Historical Review	
8-1	16.3	0 - 16.3	19	4	Low	Colorado River Viaduct EB (No. 1700, MP 0.01)	Deck=4	Suff+; Identified through Historical Review	**Hot Spots:** Colorado River Viaduct EB, Fortuna SPRR OP EB/WB **Historical Review:** Colorado River Bridge, Fortuna Route TI UP **Structures with a 5 Rating:** 4th St TI OP EB; 4th St TI OP WB; Ave 2E UP; Araby Road TI OP EB; Araby Road TI OP WB; E Yuma TI OP EB; E Yuma TI OP WB **Note:** CALTRANS maintains and inspects Colorado River bridges. ADOT is responsible for 50% funding of bridge improvements.
						4th Street OP EB (No. 1322, MP 0.58)	Deck=5	Not identified through Historical Review	
						4th Street OP WB (No. 1323, MP 0.58)	Deck=5	Not identified through Historical Review	
						Ave 2E UP (No. 1381, MP 2.99)	Deck=5	Not identified through Historical Review	
						Araby Rd TI OP EB (No. 1277, MP 7.67)	Deck=5	Not identified through Historical Review	
						Araby Rd TI OP WB (No. 1278, MP 7.67)	Deck=5	Not identified through Historical Review	
						Fortuna SPRR OP EB (No. 1279, MP 8.69)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	
						Fortuna SPRR OP WB (No. 1280, MP 8.70)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	
						E Yuma TI OP EB (No. 1188, MP 9.43)	Deck=5	Not identified through Historical Review	
						E Yuma TI OP WB (No. 1281, MP 9.44)	Deck=5	Not identified through Historical Review	
8-2	5.1	16.3 - 21.4	6	0	Med	Dublin Wash EB (No. 1566, MP 16.85)	Evaluation=5	Not identified through Historical Review	**Structures with a 5 Rating:** Dublin Wash Br EB; Wash Br EB; Telpas OP WB Over EB; Telpas OP WB Over EB
						Wash Bridge EB (No. 303, MP 18.12)	Evaluation=5	Not identified through Historical Review	
						Telpas OP WB Over EB (No. 971, MP 18.80)	Deck=5	Not identified through Historical Review	
						Telpas OP WB Over EB (No. 972, MP 20.40)	Deck=5	Not identified through Historical Review	
8-3	35.1	21.4 - 56.5	19	8	Low	None			
8-4	23.1	56.5 - 79.6	6	6	Low	None			

Segment	Segment Length (Miles)	Segment Mileposts (MP)	# Bridges in Segment	# Functionally Obsolete Bridges	Final Need	Contributing Factors			Comments
						Bridge	Current Ratings 5 or Less	Historical Review	
8-5	30.8	79.6 - 110.4	14	7	Med	Gillespie Canal Br EB (No. 489, MP 107.02)	Evaluation=5	Not identified through Historical Review	**Historical Review:** Painted Rock TI OP WB, Paloma Road TI OP EB **Structures with a 5 Rating:** Gillespie Canal Br EB and Gillespie Canal Br WB
						Gillespie Canal Br WB (No. 490, MP 109.55)	Evaluation=5	Not identified through Historical Review	
8-6	9.6	110.4 - 120	18	4	Low	Sauceda Wash Br EB (No. 442, MP 113.27)	Evaluation=5	Not identified through Historical Review	**Hot Spots:** TC & GBRR OP EB/WB, Sand Tanks Wash Br EB/WB **Historical Review:** TC & GB RR OP WB, County Road OP EB/WB **Structures with a 5 Rating:** Sauceda Wash Br EB
						TC & GBRR OP EB (No. 1339, MP 116.35)	Superstructure=5; Evaluation=5	Not identified through Historical Review	
						TC & GBRR OP WB (No. 1340, MP 116.35)	Superstructure=5; Evaluation=5	Could have a repetitive investment issue; Identified through Historical Review	
						Sand Tanks Wash Br EB (No. 1343, MP 117.43)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	
						Sand Tanks Wash Br WB (No. 1344, MP 117.43)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	
8-7	27.6	120 - 147.6	5	3	Low	none			**Historical Review**: Freeman TI OP EB, Vekol Wash Bridge WB
8-8	18.9	147.6 - 166.5	14	6	Low	Mendell Wash Br EB (No. 1064, MP 151.9)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	**Hot Spots:** Mendell Wash Br EB, Bridge EB/WB, Smith Road OP EB/WB **Historical Review:** Smith Road OP EB/WB, Murphy Road UP
						Bridge EB (No. 1066, MP 153.40)	Deck=5; Substructure=5; Super=5; Evaluation=5	Not identified through Historical Review	
						Bridge WB (No. 1067, MP 153.457)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	
						Smith Road OP EB (No. 1068, MP 157.55)	Deck=5; Substructure=5; Evaluation=5	Could have a repetitive investment issue; Identified through Historical Review	
						Smith Road OP WB (No. 1069, MP 157.55)	Deck=5; Substructure=5; Evaluation=5	Could have a repetitive investment issue; Identified through Historical Review	
8-9	11.75	166.5 - 178.3	14	9	Med	Montgomery Rd TI UP (No. 1140, MP 167.50)	Superstructure=5; Evaluation=5	Not identified through Historical Review	**Hot Spots:** Montgomery Rd TI UP, Santa Cruz Wash Br EB/WB, Thornton Rd TI UP **Historical Review:** Thornton Road TI UP **Note:** The identified previous projects do not address the initial need for this segment; therefore, the final need was not changed.
						Santa Cruz Wash Br EB (No. 1142, MP 170.90)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	
						Santa Cruz Wash Br WB (No. 1143, MP 170.90)	Deck=5; Substructure=5; Evaluation=5	Not identified through Historical Review	
						Thornton Rd TI UP (No. 1196, MP 172.55)	Substructure=4; Evaluation=4	Could have a repetitive investment issue; Identified through Historical Review	

Bridge Ratings History





O identifies the bridge indicated is of concern from a historical ratings perspective

Maximum # of Decreases: Maximum number of times that the Deck Rating, Substructure Rating, or Superstructure Rating decreased from 1997 to 2014. (Higher number could indicate a more dramatic decline in the performance of the bridge)

Maximum # of Increases: Maximum number of times that the Deck Rating, Substructure Rating, or Superstructure Rating increased from 1997 to 2014. (Higher number could indicate a higher level of investment)

Change in Sufficiency Rating: Cumulative change in Sufficiency Rating from 1997 to 2014. (Bigger negative number could indicate a more dramatic decline in the performance of the bridge

Mobility Performance Needs Analysis

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Roadway Variables								Traffic Variables					Relevant Mobility Related Existing Infrastructure
				Functional Classification	Environmental Type (Urban/Rural)	Terrain	# of Lanes/ Direction	Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2035 LOS	% Trucks	EB Buffer Index (PTI-TTI)	WB Buffer Index (PTI-TTI)	
8-1	0 - 16	16	Low	Interstate	Urban	Rolling	2	65	No	Divided	0%	A-C	A-C	16%	0.33	0.32	Port of Entry MP 0; Weigh-in-Motion Scale MP 1; Permanent Traffic Counter MP 3, 10.75, 13.75; DMS MP 11.25
8-2	16 - 21	5	Low	Interstate	Rural	Mountainous	2	55-65	No	Divided	0%	A-C	A-C	19%	0.45	0.12	Border Patrol Check Point MP 18
8-3	21 – 57	35	None	Interstate	Rural	Rolling	2	75	No	Divided	0%	A-C	A-C	24%	0.23	0.25	Rest Area MP 23.5
8-4	57 - 80	23	None	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	25%	0.22	0.20	Intermittent Border Patrol Check Point (Seasonal) MP 76
8-5	80 – 110	31	None	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	22%	0.26	0.22	Rest Area MP 85; Pavement Test Section MP 88-92.5
8-6	110 - 120	10	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A-C	A-C	30%	0.41	0.26	None
8-7	120 – 148	28	None	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	26%	0.27	0.26	Permanent Traffic Counter MP 121; DMS MP 122
8-8	148 – 167	19	None	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	27%	0.25	0.24	None
8-9	167 - 178	12	None	Interstate	Rural	Level	2	65-75	No	Divided	0%	A-C	A-C	25%	0.27	0.29	DMS MP 177

Mobility Performance Needs Analysis (continued)

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent							Non-Actionable Conditions	Contributing Factors
				Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related		
8-1	0 - 16	16	Low	23	22	96%	1	4%	0	0%	None	- Urbanized area of Yuma with significantly higher ADT on the urban four-lane freeway - Increase in traffic volumes on Friday compared to the other weekdays (Monday through Thursday) and the weekend (Saturday and Sunday), pertinent throughout all the seasons. - 96% of closures were related to incidents/accidents - Key characteristics of the incidents/accidents for this segment are: 44% involve collisions with other motor vehicles, 33% where speed was too fast, and 56% in daylight.
8-2	16 - 21	5	Low	10	10	100%	0	0%	0	0%	Border Patrol Checkpoint in WB direction	- Some reoccurring delay in EB direction due to mountainous grades - Approximately 60% of this segment has pavement failure - 100% of closures were related to incidents/accidents - Key characteristics of the incidents/accidents for this segment are: 80% involve a single vehicle, 60% driver inattention/distraction, 80% in daylight, and 60% ran off the road.
8-3	21 – 57	35	None	25	25	100%	0	0%	0	0%	None	- This segment also corresponds to a high number of fatal and serious injury crashes - One rest area is located at the base of Telegraph Pass - Terrain has little variation, with 4 TIs and few destinations along corridor - 100% of closures were related to incidents/accidents - Key characteristics of the incidents/accidents for this segment are: 78% involve a single vehicle, 63% overturned, 41% speed was too fast, 22% driver inattention/distraction, 74% in daylight, and 37% ran off the road.
8-4	57 - 80	23	None	8	7	88%	1	13%	0	0%	Intermittent Border Patrol Check Point (Seasonal) MP 76	- This segment includes one closed rest area - 88% of closures were related to incidents/accidents - Key characteristics of the incidents/accidents for this segment are: 42% involved overturning, 25% involved collision with a fixed object, 67% involved a single vehicle, and 42% involved dark-unlighted conditions.
8-5	80 – 110	31	None	16	16	100%	0	0%	0	0%	None	- This segment includes a rest area - 100% of closures were related to incidents/accidents - Key characteristics of the incidents/accidents for this segment are: 75% involved overturning, 90% involved a single vehicle, 45% ran off the road to the left and 20% ran off the road to the right.
8-6	110 - 120	10	Low	6	6	100%	0	0%	0	0%	None	- 100% of closures were related to incidents/accidents Key characteristics of the incidents/accidents for this segment are: 75% involved overturning, 90% involved a single vehicle, 45% ran off the road to the left and 20% ran off the road to the right.
8-7	120 – 148	28	None	12	12	100%	0	0%	0	0%	None	- Increase in traffic volumes on Friday compared to the other weekdays (Monday through Thursday) and the weekend (Saturday and Sunday), pertinent throughout all the seasons. - 100% closures were related to incidents/accidents
8-8	147.6 - 166.5	18.9	None	6	6	100%	0	0%	0	0%	None	- This segment includes a closed rest area - 100% of closures were related to incidents/accident - Key characteristics of the incidents/accidents for this segment are: 50% overturning, 83% involved single vehicle, 50% involved speeding, and 67% in dark-unlighted conditions.
8-9	166.5 - 178.3	11.75	None	7	7	100%	0	0%	0	0%	None	- 100% of closures were related to incidents/accidents - Key characteristics of the incidents/accidents for this segment are: 43% involved overturning, 57% involved single vehicles, 14% in wet conditions, and 43% ran off the road to the left.

Safety Performance Needs Analysis

Segment		8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9	Corridor-Wide Crash Characteristics
Milepost		0-16	16-21	21-57	57-80	80-110	110-120	120-148	148-167	167-178	
Final Need		Low	None	Low	None	None	None	None	None	Low	
Segment Crash Overview		2 Crashes were fatal 7 Crashes had incapacitating injuries 1 Crashes involve trucks 1 Crashes involve Motorcycles	0 Crashes were fatal 5 Crashes had incapacitating injuries 1 Crashes involve Motorcycles	6 Crashes were fatal 21 Crashes had incapacitating injuries 6 Crashes involve trucks 5 Crashes involve Motorcycles	4 Crashes were fatal 8 Crashes had incapacitating injuries 1 Crashes involve trucks 1 Crashes involve Motorcycles	3 Crashes were fatal 17 Crashes had incapacitating injuries 1 Crashes involve trucks	1 Crashes were fatal 3 Crashes had incapacitating injuries 2 Crashes involve trucks	2 Crashes were fatal 8 Crashes had incapacitating injuries	2 Crashes were fatal 4 Crashes had incapacitating injuries 2 Crashes involve trucks	1 Crashes were fatal 6 Crashes had incapacitating injuries 1 Crashes involve Motorcycles	21 Crashes were fatal 79 Crashes had incapacitating injuries 13 Crashes involve trucks 9 Crashes involve Motorcycles
Segment Crash Summaries (Fatal and Serious Injury Crashes)	First Harmful Event Type	44% Involve Collision with Motor Vehicle 11% Involve Collision with Pedestrian	60% Involve Collision with Fixed Object	63% Involve Overturning		75% Involve Overturning	50% Involve Collision with Motor Vehicle	90% Involve Overturning			59% Involve Overturning 17% Involve Collision with Motor Vehicle 14% Involve Collision with Fixed Object
	Collision Type	22% Involve Rear End 11% Involve Head On	80% Involve Single Vehicle 20% Involve Sideswipe (same)	78% Involve Single Vehicle 15% Involve Rear End	17% Involve Rear End 8% Involve Sideswipe (same)	90% Involve Single Vehicle	25% Involve Rear End 25% Involve Sideswipe (Same)	100% Involve Single Vehicle	83% Involve Single Vehicle 17% Involve Rear End	14% Involve Rear End 14% Involve Head On	76% Involve Single Vehicle 13% Involve Rear End 5% Involve Sideswipe (same)
	Violation or Behavior	33% Involve Speed too Fast for Conditions 11% Followed Too Closely 11% Drove in Opposing Lane	60% Involve Inattention/Distraction 40% Involve No Improper Action	41% Involve Speed too Fast for Conditions 22% Involve Inattention/ Distraction 11% Involve Other	42% Involve No Improper Action	40% Involve No Improper Action 15% Involve Inattention/Distraction	50% Involve Other 25% Involve Failure to Keep in Proper Lane	40% Involve No Improper Action 40% Speed too Fast for Conditions	50% Involve Speed too Fast for Conditions 17% Involve Failure to Keep in Proper Lane	29% Involve No Improper Action 29% Unknown	30% Involve Speed too Fast for Conditions 24% Involve No Improper Action 15% Involve Inattention/Distraction
	Lighting Conditions	56% Occur in Daylight Conditions 11% Occur in Dusk Conditions	80% Occur in Daylight Conditions	74% Occur in Daylight Conditions	42% Occur in Dark-Unlighted Conditions 8% Occur in Dusk Conditions	90% Occur in Daylight Conditions	25% Occur in Dusk Conditions 25% Occur in Dark-Unlighted Conditions	10% Occur in Dawn Conditions	67% Occur in Dark-Unlighted Conditions	14% Occur in Dark-Lighted Conditions	67% Occur in Daylight Conditions 26% Occur in Dark-Unlighted Conditions 4% Occur in Dusk Conditions

Segment		8-1		8-2		8-3		8-4		8-5		8-6		8-7		8-8		8-9		Corridor-Wide Crash Characteristics	
Milepost		0-16		16-21		21-57		57-80		80-110		110-120		120-148		148-167		167-178			
Final Need		Low		None		Low		None		None		None		None		None		Low			
Segment Crash Summaries (Fatal and Serious Injury Crashes)	Surface Conditions	100%	Involve Dry Conditions	100 %	Involve Dry Conditions	96%	Involve Dry Conditions	100%	Involve Dry Conditions	95%	Involve Dry Conditions	100%	Involve Dry Conditions	100%	Involve Dry Conditions	100 %	Involve Dry Conditions	14%	Involve Wet Conditions	97% 3%	Involve Dry Conditions Involve Wet Conditions
	First Unit Event	22% 22%	Involve a first unit event of Ran Off the Road (Right) Crossed Centerline	60%	Involve a first unit event of Ran Off the Road (Right)	37% 22%	Involve a first unit event of Ran Off the Road (Left) Involve a first unit event of Motor Vehicle in Transport	25% 17%	Involve a first unit event of Motor Vehicle in Transport Involve a first unit event of Equipment Failure	45% 20%	Involve a first unit event of Ran Off the Road (Left) Involve a first unit event of Ran Off the Road (Right)	50% 25%	Involve a first unit event of Motor Vehicle in Transport Overturn	60% 20% 20%	Involve a first unit event of Ran Off the Road (Left) Involve a first unit event of Ran Off the Road (Right) Equipment Failure	33% 17%	Involve a first unit event of Ran Off the Road (Right) Equipment Failure	43% 29% 14%	Involve a first unit event of Ran Off the Road (Left) Involve a first unit event of Motor Vehicle in Transport Involve a first unit event of Overturn	37% 19% 18%	Involve a first unit event of Ran Off the Road (Left) Involve a first unit event of Motor Vehicle in Transport Involve a first unit event of Ran Off the Road (Right)
	Driver Physical Condition	40% 20%	Under the Influence of Drugs or Alcohol Fatigued/Fell Asleep	100 %	No Apparent Influence	50%	Under the Influence of Drugs or Alcohol	75% 25%	Unknown Fatigued/Fell Asleep	67% 22%	Unknown Fatigued/Fell Asleep	33% 33%	Under the Influence of Drugs or Alcohol Fatigued/Fell Asleep	50%	Illness	100 %	Fatigued/Fell Asleep	40% 20%	Under the Influence of Drugs or Alcohol Fatigued/Fell Asleep	26% 21%	Under the Influence of Drugs or Alcohol Fatigued/Fell Asleep
	Safety Device Usage	11%	Helmet Used	20% 20%	Helmet Used Air Bag Deployed	22%	None Used	67% 8%	Shoulder And Lap Belt Used Child Restraint System Used	85% 5%	Shoulder And Lap Belt Used Unknown	100%	Shoulder And Lap Belt Used	70% 10%	Shoulder And Lap Belt Used Air Bag Deployed/Shoulder-Lap Belt	33% 17%	None Used Air Bag Deployed/Shoulder-Lap Belt	29% 14%	None Used Helmet Used	62% 17% 7%	Shoulder And Lap Belt Used None Used Helmet Used

Segment	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9
Milepost	0-16	16-21	21-57	57-80	80-110	110-120	120-148	148-167	167-178
Final Need	Low	None	Low	None	None	None	None	None	Low
Hot Spot Crash Summaries	No identified hot spot	No identified hot spot	No identified hot spot	No identified hot spot	No identified hot spot	N/A - Sample Size Too Small	No identified hot spot	No identified hot spot	No identified hot spot
Previously Completed Safety-Related Projects	Pavement project including guardrail and bridge barriers.	Pavement project including guardrail and bridge barriers.	None.	None.	None.	Pavement project including guardrail and bridge barriers.	Pavement project including guardrail and bridge barriers.	None.	Pavement project including guardrail and bridge barriers.
District Interviews/ Discussions	• TI's safety features need to be upgraded to current standards, such as guardrail.	• TI's safety features need to be upgraded to current standards, such as guardrail.	• TI's safety features need to be upgraded to current standards, such as guardrail.	• TI's safety features need to be upgraded to current standards, such as guardrail.	• TI's safety features need to be upgraded to current standards, such as guardrail.	• TI's safety features need to be upgraded to current standards, such as guardrail.	• TI's safety features need to be upgraded to current standards, such as guardrail. o i.e. Vekhol Rd (~MP 147) still has original guardrail from 1950's • MP 120-135 is a high drug traffic corridor, needs improved fencing. All fencing is 50+ years old	• TI's safety features need to be upgraded to current standards, such as guardrail.	• TI's safety features need to be upgraded to current standards, such as guardrail.
Contributing Factors	- collisions with other motor vehicles - speed was too fast - daylight conditions	- involve a single vehicle - driver inattention/ distraction - daylight conditions - ran off the road	- involve a single vehicle - overturned vehicle - speed was too fast - driver inattention/ distraction - daylight conditions - ran off the road	- overturned vehicle - collision with a fixed object - involve a single vehicle - involve dark-unlighted conditions	- overturned vehicle - involve a single vehicle - ran off the road to the left - ran off the road to the right	- involved collisions with motor vehicles - overturned vehicle - involve a single vehicle	- overturned vehicle - involve a single vehicle - ran off the road to the left	- overturned vehicle - involve a single vehicle - involve speeding - dark-unlighted conditions	- overturned vehicle - involve single vehicle - wet conditions - ran off the road to the left

Freight Performance Needs Analysis

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Roadway Variables								Traffic Variables					Relevant Freight Related Existing Infrastructure
				Functional Classification	Environmental Type (Urban/Rural)	Terrain	# of Lanes/ Direction	Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2035 LOS	% Trucks	NB/EB Buffer Index (TPTI-TTTI)	SB/WB Buffer Index (TPTI-TTTI)	
8-1	0 - 16.30	16.3	Low	Interstate	Urban	Rolling	2	65	No	Divided	0%	A-C	A-C	16%	0.28	0.29	DMS MP 11.5; POE MP 1; POE/Weigh Station MP-2
8-2	16.30 - 21.40	5.1	Low	Interstate	Rural	Mountainous	2	55-65	No	Divided	0%	A-C	A-C	19%	0.30	0.24	None
8-3	21.40 - 56.50	35.1	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A-C	A-C	24%	0.10	0.07	Rest Area MP 23.5
8-4	56.50 - 79.60	23.1	None	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	25%	0.09	0.08	None
8-5	79.60 - 110.40	30.8	None	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	22%	0.10	0.08	Rest Area MP 85
8-6	110.40 - 120.00	9.6	None	Interstate	Rural	Rolling	2	75	No	Divided	0%	A-C	A-C	30%	0.20	0.13	None
8-7	120.00 - 147.60	27.6	Low	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	26%	0.10	0.10	DMS MP 122
8-8	147.60 - 166.50	18.9	Low	Interstate	Rural	Level	2	75	No	Divided	0%	A-C	A-C	27%	0.10	0.09	None
8-9	166.50 - 178.3	11.75	Low	Interstate	Rural	Level	2	65-75	No	Divided	0%	A-C	A-C	25%	0.14	0.17	DMS MP 177

Freight Performance Needs Analysis (continued)

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent							Non-Actionable Conditions	Programmed and Planned Projects or Issues from Previous Documents Relevant to Final Need
				Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related		
8-1	0 - 16.30	16.3	Low	23	22	96%	1	4%	0	0%	None	I-8 WB Off Ramp & Giss Parkway intersection improvements MP 0.5; Araby Road TI Reconstruction (Roundabouts) MP 7
8-2	16.30 - 21.40	5.1	Low	10	10	100%	0	0%	0	0%	Border Patrol Check Point MP 18	Addition of eastbound climbing lane MP 18-20;
8-3	21.40 - 56.50	35.1	Low	25	25	100%	0	0%	0	0%	None	Dome Valley - Welton (Pavement Preservation) MP 21-29
8-4	56.50 - 79.60	23.1	None	8	7	88%	1	13%	0	0%	Intermittent Border Patrol Check Point (Seasonal) MP 76	Mohawk Rest Area Rehabilitation MP 56
8-5	79.60 - 110.40	30.8	None	16	16	100%	0	0%	0	0%	None	Pavement Preservation MP 96-106
8-6	110.40 - 120.00	9.6	None	6	6	100%	0	0%	0	0%	None	No projects identified
8-7	120.00 - 147.60	27.6	Low	12	12	100%	0	0%	0	0%	None	No projects identified
8-8	147.60 - 166.50	18.9	Low	6	6	100%	0	0%	0	0%	None	No projects identified
8-9	166.50 - 178.3	11.75	Low	7	7	100%	0	0%	0	0%	None	No projects identified

Needs Summary Table

Performance Area	Segment Number and Mileposts (MP)								
	8-1	8-2	8-3	8-4	8-5	8-6	8-7	8-8	8-9
	MP 0-16.3	MP 16.3-21.4	MP 21.4-56.5	MP 56.5-79.6	MP 79.6-110.4	MP 110.4-120	MP 120-147.6	MP 147.6-166.5	MP 166.5-178
Pavement	Low	None	Low	Low	Medium	None	None	Low	Low
Bridge	Low	Medium	Low	Low	Medium	Low	Low	Low	Medium
Mobility+	Low	Low	None	None	None	Low	None	None	None
Safety+	Low	None	Medium	None	None	None	None	None	Low
Freight+	Low	Low	Low	None	None	None	Low	Low	Low
Average Need	**1.00**	**0.77**	**1.00**	**0.31**	**0.62**	**0.38**	**0.38**	**0.54**	**0.92**

* Identified as an emphasis area for the SR 87/SR 260/SR 377 corridor
^ 40B-17 Pavement Need estimated based on field review
# N/A indicates insufficient or no data available to determine level of need
+ A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study

Level of Need	Average Need Range
None+	< 0.1
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

Appendix E: Life-Cycle Cost Analysis

Pavement Life-Cycle Cost Analysis Worksheet

Project Details			
Project title	Life-Cycle Cost Analysis for I-8 Corridor Profile Study: MP 0-1		
Route	I-8		
Milepost begin	0		
Milepost end	1		

Existing Roadway Characteristics			
Surface type (Asphalt or Concrete)	=	Concrete	<<Select from Pull-down List>>
# of directions of travel (1 = one-way; 2 = two-way)	=	2	
# of lanes (in one direction)	=	2	
Width of typical lane (ft)	=	12	
Left shoulder width (ft)	=	4	
Right shoulder width (ft)	=	10	
Total roadway analysis segment length (centerline miles)	=	1	
Current year	=	2016	
Elevation (> 4,000 ft or < 4,000 ft)?	=	< 4,000 ft	<<Select from Pull-down List>>
Roadway width (ft) [each direction lanes & shoulders]	=	38	
Total lane-miles [total traffic direction lanes & shoulders]	=	6.3	
Total square feet [total traffic direction lanes & shoulders]	=	401,280	
Total square yards [total traffic direction lanes & shoulders]	=	44,587	

LCCA Parameters		
Analysis period (years)	=	40
Year of net present value	=	2017
First year of improvements	=	2021
Discount rate (%) - low	=	3%
Discount rate (%) - high	=	7%

Design Alternatives (DA)

	Characteristics		Pavement Material Cost ($)		
Treatment Type	*Pavement Thickness*	*Typical Service Life (years)*	*Lane-miles*	*Square Feet*	*Square Yards*
Concrete Reconstruction	8"-12"	30-34	$350,000	$5.5	$50
Asphalt Reconstruction	8"-12"	26-30	$280,000	$4.4	$40
Concrete Medium Rehab	1"-3"	24-28	$75,000	$1.2	$11
Concrete Light Rehab	<1"	18-22	$50,000	$0.8	$7
Asphalt Medium Rehab	3"-8"	20-24	$105,000	$1.7	$15
Asphalt Light Rehab	<3"	14-18	$70,000	$1.1	$10

Reconstruction: Other Materials Cost Factor
1.60

Rehab: Other Materials Cost Factor
1.20

Total Cost Factor (e.g., includes design, mobilization, traffic control, contingency, etc.)
2.44

			Total Unit Cost ($) [includes material costs and indirect costs]			Total Bi-Directional Cost ($)
Treatment Type	Pavement Thickness	Typical Service Life (years)	Lane-miles	Square Feet	Square Yards	Total Cost
Concrete Reconstruction	8"-12"	30-34	$1,366,400	$21.6	$194	$8,653,867
Asphalt Reconstruction	8"-12"	26-30	$1,093,120	$17.3	$155	$6,923,093
Concrete Medium Rehab	1"-3"	24-28	$219,600	$3.5	$31	$1,390,800
Concrete Light Rehab	<1"	18-22	$146,400	$2.3	$21	$927,200
Asphalt Medium Rehab	3"-8"	20-24	$307,440	$4.9	$44	$1,947,120
Asphalt Light Rehab	<3"	14-18	$204,960	$3.2	$29	$1,298,080

Pavement Service Life, Intervals, and Sequence of Improvements

I-8 MP 0 - MP 1

Design Alternative	Typical Service Life Value	Typical Service Life Range	Average Historical Interval Value	Interval to Use in LCCA Before Reconstruction	Interval to Use in LCCA After Reconstruction
Concrete Reconstruction	32	30-34		-	16
Asphalt Reconstruction	28	26-30	22	-	14
Concrete Medium Rehab	26	24-28		13	13
Concrete Light Rehab	20	18-22	0	10	10
Asphalt Medium Rehab	22	20-24	0	11	11
Asphalt Light Rehab	16	14-18	12	8	8
None	0	0	-	-	-

Note: The typical service life values and ranges are determined based on the elevation of the roadway segment using the reference tables below. The typical service life values should be used as the intervals between improvements in the design alternatives except when historical frequency values are available based on the frequency and type of improvements in the past at this location. Historical frequency values should only be used if they are lower than the typical values and only up until reconstruction is implemented, after which typical service life values should be used.

Elevation Below 4000' (Desert Environment)

Design Alternative	Typical Service Life Value	Typical Service Life Range
Concrete Reconstruction	32	30-34
Asphalt Reconstruction	28	26-30
Concrete Medium Rehab	26	24-28
Concrete Light Rehab	20	18-22
Asphalt Medium Rehab	22	20-24
Asphalt Light Rehab	16	14-18
None	0	0

Elevation Above 4000' (Mountain Environment)

Design Alternative	Typical Service Life Value	Typical Service Life Range
Concrete Reconstruction	28	26-30
Asphalt Reconstruction	24	22-26
Concrete Medium Rehab	22	20-24
Concrete Light Rehab	16	14-18
Asphalt Medium Rehab	18	16-20
Asphalt Light Rehab	12	10-14
None	0	0

Assumed LCCA Sequence of Improvements Based on the Initial Design Alternative Improvement	
Concrete Reconstruction (CR):	CR, CLR, CMR, CLR, CR, CLR, CMR. . .
Asphalt Reconstruction (AR):	AR, ALR, AMR, ALR, AR, ALR, AMR. . .
Concrete Medium Rehab (CMR):	CMR, CLR, CR, CLR, CMR, CLR, CR. . .
Concrete Light Rehab (CLR):	CLR, CR, CLR, CMR, CLR, CR, CLR. . .
Asphalt Medium Rehab (AMR):	AMR, ALR, AR, ALR, AMR, ALR, AR. . .
Asphalt Light Rehab (ALR):	ALR, AR, ALR, AMR, ALR, AR, ALR. . .

Pavement Improvement Project History

I-8 MP 0 - MP 1

Year	Project Number	Tracs No.	Direction of Improvement	Treatment Type	Improvement Description	Thickness (inches)	Beg. MP	End MP	Length (miles)
1975	I-8-9(2)		EB/WB	Concrete Reconstruction	AB	3	0	0.57	0.57
					CTB	5.4	0	0.57	0.57
					PCCP	9	0	0.57	0.57
1977	I-8-1(62) Missing As-Builts		EB/WB	Asphalt Reconstruction	Select Material	12	0.57	2.42	1.85
					AC Asphaltic Concrete	4.5	0.57	2.42	1.85
					ACFC Asphaltic Concrete Friction Course	0.5	0.57	2.42	1.85
1999	Missing As-Builts		EB/WB	Asphalt Light Rehab	Remove and Replace 1" ACFC	1	0	20.4	20.4
2011	IM-ARRA-008-A(206)A	H7793	EB/WB - Lane 1	Asphalt Medium Rehab	Remove Existing Material	1	0.56	13.7	13.14
					Asphaltic Concrete	2.5	0.56	13.7	13.14
					AR-ACFC	0.5	0.56	13.7	13.14
2011	IM-ARRA-008-A(206)A	H7793	EB/WB - Lane 2	Asphalt Medium Rehab	Remove Existing Material	3.5	0.56	13.7	13.14
					Asphaltic Concrete	5	0.56	13.7	13.14
					AR-ACFC	0.5	0.56	13.7	13.14
									0

Interval between Improvements in Years		Treatment Type Options	Estimated Historical Interval Value between Improvements in Years
After Concrete Reconstruction:	22	Concrete Reconstruction	
After Asphalt Light Rehab:	12	Asphalt Reconstruction	22
Asphalt Medium Rehab:		Concrete Medium Rehab	
		Concrete Light Rehab	
		Asphalt Medium Rehab	
		Asphalt Light Rehab	12

Design Alternative # 1 - Concrete Reconstruction

I-8 MP 0 - MP 1

Enter Name of Design Alternative

Number of Years	Year	Concrete Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Concrete Reconstruction	$8,653,867	$7,688,848	$6,601,993
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	None	$0	$0	$0
9	2025	None	$0	$0	$0
10	2026	None	$0	$0	$0
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	None	$0	$0	$0
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	None	$0	$0	$0
17	2033	None	$0	$0	$0
18	2034	None	$0	$0	$0
19	2035	None	$0	$0	$0
20	2036	None	$0	$0	$0
21	2037	Concrete Light Rehab	$927,200	$513,368	$239,606
22	2038	None	$0	$0	$0
23	2039	None	$0	$0	$0
24	2040	None	$0	$0	$0
25	2041	None	$0	$0	$0
26	2042	None	$0	$0	$0
27	2043	None	$0	$0	$0
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	Concrete Medium Rehab	$1,390,800	$572,991	$182,705
32	2048	None	$0	$0	$0
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	None	$0	$0	$0
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	None	$0	$0	$0
39	2055	None	$0	$0	$0
40	2056	None	$0	$0	$0
41	2057	None	$0	$0	$0
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	Concrete Light Rehab	$927,200	$260,119	$50,544
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Concrete Light Rehab	$880,840	$239,916	$44,876
Enter Year of Last Used DA Improvement ››		2060	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$8,795,411	$7,029,973
AGENCY COST	$11,018,227	

Design Alternative # 2 - Asphalt Reconstruction

I-8 MP 0 - MP 1

Enter Name of Design Alternative

Number of Years	Year	Asphalt Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Asphalt Reconstruction	$6,923,093	$6,151,079	$5,281,595
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	None	$0	$0	$0
9	2025	None	$0	$0	$0
10	2026	None	$0	$0	$0
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	None	$0	$0	$0
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	None	$0	$0	$0
17	2033	None	$0	$0	$0
18	2034	None	$0	$0	$0
19	2035	Asphalt Light Rehab	$1,298,080	$762,485	$384,055
20	2036	None	$0	$0	$0
21	2037	None	$0	$0	$0
22	2038	None	$0	$0	$0
23	2039	None	$0	$0	$0
24	2040	None	$0	$0	$0
25	2041	None	$0	$0	$0
26	2042	None	$0	$0	$0
27	2043	Asphalt Medium Rehab	$1,947,120	$902,869	$335,285
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	None	$0	$0	$0
32	2048	None	$0	$0	$0
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	None	$0	$0	$0
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	Asphalt Light Rehab	$1,298,080	$434,835	$106,194
39	2055	None	$0	$0	$0
40	2056	None	$0	$0	$0
41	2057	None	$0	$0	$0
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	None	$0	$0	$0
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Asphalt Light Rehab	$730,170	$198,878	$37,200
Enter Year of Last Used DA Improvement ››		2054	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$8,052,390	$6,069,930
AGENCY COST	$10,736,203	

Design Alternative # 3 - Asphalt Medium Rehab

I-8 MP 0 - MP 1

Enter Name of Design Alternative

Number of Years	Year	Asphalt Medium Rehab Focus	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Asphalt Medium Rehab	$1,947,120	$1,729,991	$1,485,449
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	None	$0	$0	$0
9	2025	None	$0	$0	$0
10	2026	None	$0	$0	$0
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	None	$0	$0	$0
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	Asphalt Light Rehab	$1,298,080	$833,188	$470,484
17	2033	None	$0	$0	$0
18	2034	None	$0	$0	$0
19	2035	None	$0	$0	$0
20	2036	None	$0	$0	$0
21	2037	None	$0	$0	$0
22	2038	None	$0	$0	$0
23	2039	None	$0	$0	$0
24	2040	Asphalt Reconstruction	$6,923,093	$3,507,874	$1,460,405
25	2041	None	$0	$0	$0
26	2042	None	$0	$0	$0
27	2043	None	$0	$0	$0
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	None	$0	$0	$0
32	2048	None	$0	$0	$0
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	None	$0	$0	$0
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	Asphalt Light Rehab	$1,298,080	$434,835	$106,194
39	2055	None	$0	$0	$0
40	2056	None	$0	$0	$0
41	2057	None	$0	$0	$0
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	None	$0	$0	$0
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Asphalt Light Rehab	$730,170	$198,878	$37,200
Enter Year of Last Used DA Improvement ››		2054	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$6,307,010	$3,485,332
AGENCY COST	$10,736,203	

Design Alternative # 4 - Asphalt Light Rehab

I-8 MP 0 - MP 1

Enter Name of Design Alternative

Number of Years	Year	Asphalt Light Rehab Focus	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Asphalt Light Rehab	$1,298,080	$1,153,327	$990,299
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	None	$0	$0	$0
9	2025	None	$0	$0	$0
10	2026	None	$0	$0	$0
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	Asphalt Reconstruction	$6,923,093	$4,855,718	$3,073,936
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	None	$0	$0	$0
17	2033	None	$0	$0	$0
18	2034	None	$0	$0	$0
19	2035	None	$0	$0	$0
20	2036	None	$0	$0	$0
21	2037	None	$0	$0	$0
22	2038	None	$0	$0	$0
23	2039	None	$0	$0	$0
24	2040	None	$0	$0	$0
25	2041	None	$0	$0	$0
26	2042	None	$0	$0	$0
27	2043	Asphalt Light Rehab	$1,298,080	$601,913	$223,524
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	None	$0	$0	$0
32	2048	None	$0	$0	$0
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	Asphalt Medium Rehab	$1,947,120	$712,733	$195,139
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	None	$0	$0	$0
39	2055	None	$0	$0	$0
40	2056	None	$0	$0	$0
41	2057	None	$0	$0	$0
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	None	$0	$0	$0
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Asphalt Medium Rehab	$1,062,065	$289,277	$54,108
Enter Year of Last Used DA Improvement ››		2051	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$7,034,415	$4,428,789
AGENCY COST	$10,404,308	

Summary of LCCA Results

I-8 MP 0 - MP 1

	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehab Focus	Asphalt Light Rehab Focus
Net Present Value - 3%	$8,795,411	$8,052,390	$6,307,010	$7,034,415
Net Present Value - 7%	$7,029,973	$6,069,930	$3,485,332	$4,428,789
Agency Cost	$11,018,227	$10,736,203	$10,736,203	$10,404,308

Cost Ratio at 3% Discount Rate

1.39 Ratio of Concrete Reconstruction to Lowest Cost Rehab

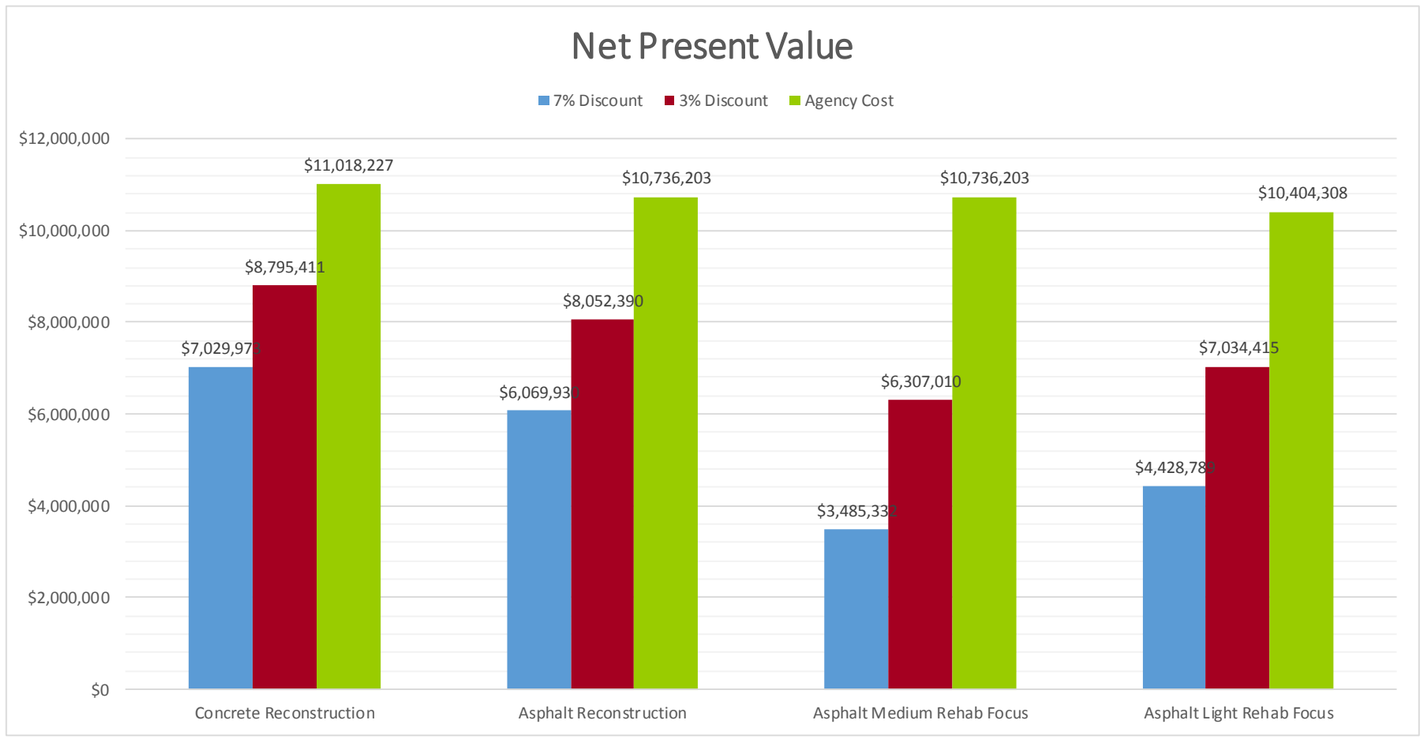
1.28 Ratio of Asphalt Reconstruction to Lowest Cost Rehab

Cost Ratio at 7% Discount Rate

2.02 Ratio of Concrete Reconstruction to Lowest Cost Rehab

1.74 Ratio of Asphalt Reconstruction to Lowest Cost Rehab

Note: A cost ratio < 1.15 means the Net Present Value (NPV) of reconstruction is within 15% of the NPV of the lowest cost rehab so reconstruction should likely be the initial improvement solution. A cost ratio > 1.15 means the NPV of reconstruction is more than 15% of the NPV of the lowest cost rehab so rehab should likely be the initial improvement solution.



Smith Road OP EB (#1068) / ROUTE I-8 / MP 157.55

Bridge Information	
Bridge Deck Area (A225)	3888 SF
Year Built (N27)	1962
Exp Service Life	75 YR
Total Bridge Length (N49)	90 LF
Number of Spans (N45+N46)	3
Skew Angle (N34)	0 DEG
Average Elevation	1498.60 FT
Max Pier Height	19.28 FT
* Amount of Widening for Bridge	0 FT
Revised Deck Area (Bridge Replace)	3888 FT
**Scour Critical Rating (N113)	N

Deterioration Slope

Item	Deterioration Line Equation			Year Drop
	Slope =	Days	Years	
Substr	y =	-0.000224x	-0.082x	12.23
Superstr	y =	-0.000554x	-0.202x	4.95
Deck	y =	-0.000277x	-0.101x	9.89

***Input 0 if no widening. Input should include widening on both sides of bridge if applicable.**
****If scour critical rating is 3 or lower, Option 2 should consider the implementation of scour countermeasures.**

Notes:
1. Widening is intended only to correct lane and/or shoulder width deficiencies. It is not intended for adding traffic capacity (i.e. adding general purpose lanes).

Cost Multipliers		
Elevation > 4000ft	1499	1.00
Pier Height > 30ft	19	1.00
Length to # span ratio	30.00	1.25
Skew > 30degrees	0.00	1.00
Project Cost Multiplier	All Options	2.20

L to # Span Multiplier	
L/ # Span Ratio	Multiplier
=>100	1.00
=>60	1.10
<60	1.25

Skew Multiplier	
Skew	Multiplier
<30	1.00
=>30	1.10

Adjusted Bridge Replace Cost	
Base Bridge Replacement Cost (Per SF)	$125.00
Bridge Replacement Cost w/ Multipliers (Per SF)	$156.25

Elevation Multiplier	
Elev	Multiplier
<4000	1.00
=>4000	1.25

Pier H Multiplier	
Pier H	Multiplier
<30	1.00
=>30	1.10

User input cell
Only manipulate cell value after consulting with team

Bridge History (Inspections/As-builts)

Description	Category	Year
Original bridge was built in 1962 (I-8-2(27)).		
Latest deck inspection shows that deck top has transverse hairline and map cracking moderate to extensive density. Hairline to narrrow Longitudinal		
cracks.		
Supertstructure slab fascia has vertical cracks. Superstructure soffit has hairline longitudinal and random cracks. Minor underdeck efflorescence.		
Substructure elements have minor hairline vertical and horizontal cracks.		
No repairs or rehabs		

Replace / Rehab / Repair Information

BRIDGE DECK				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Deck)	Full Deck Replacement	$78.13	25	Rating = 8
Rehab (Deck Concrete Overlay)	Overlay (Concrete)	$10.00	15	+ 2
Rehab (Deck Epoxy Overlay)	Overlay (Epoxy)	$5.00	10	+ 1
Repair (Deck)	Patch Spalls / Seal Cracks	$3.00	See Deterioration Slope	+ 0
Replace (Bridge)	Full Bridge Replacement	$156.25	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 0
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 0

SUPERSTRUCTURE - STEEL				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Supr - Stl)	Full SuperStr Replacement	$78.13	50	Rating = 8
Rehab (Supr - Stl)	Weld New Structural Components	$39.06	15	+ 2
Repair (Supr - Stl)	Weld Repair / Crack Relief	$5.00	See Deterioration Slope	+ 1

SUPERSTRUCTURE - CONCRETE				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Supr - Conc)	Full SuperStr Replacement	$78.13	50	Rating = 8
Rehab (Supr - Conc)	Replace Structural Component	$39.06	15	+ 2
Repair (Supr - Conc)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1
Replace (Bridge)	Full Bridge Replacement	$156.25	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 1
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 1

SUBSTRUCTURE - STRUCTURAL				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Substr)	Full SubStr Replacement	$78.13	75	Rating = 8
Rehab (Substr)	Replace Structural Component	$39.06	50	+ 2
Repair (Substr)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1

SUBSTRUCTURE - SCOUR				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Rehab (Substr - Scour)	Add scour protection slabs	$39.06	50	+ 2
Repair (Substr - Scour)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1
Replace (Bridge)	Full Bridge Replacement	$156.25	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 1
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 1

Notes:

1. Individual replacements assume 50% of total bridge replacement costs

2. Individual rehabs (in cells that are not highlighted) assume 25% of total bridge replacement costs

3. When superstructure replacement is selected, either deck replacement or deck rehab should be selected as well.

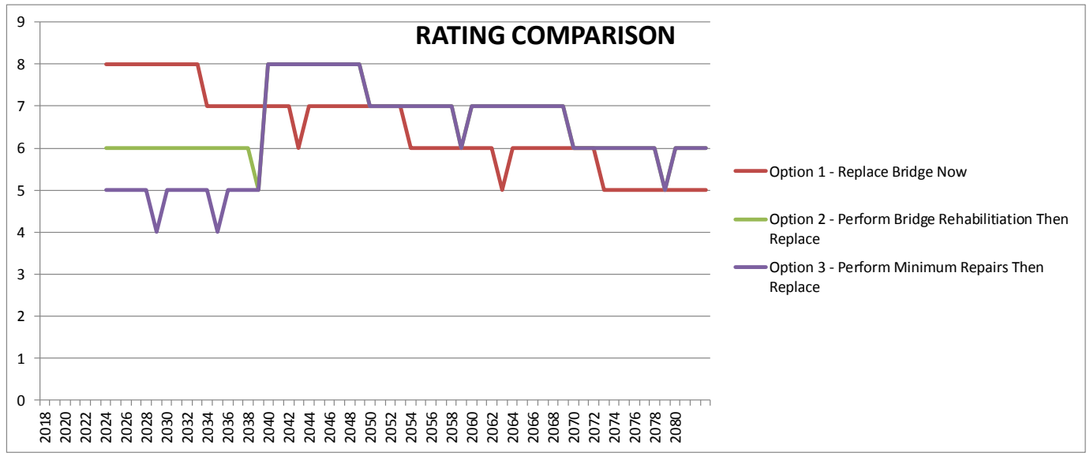
Smith Road OP EB (#1068) / ROUTE I-8 / MP 157.55

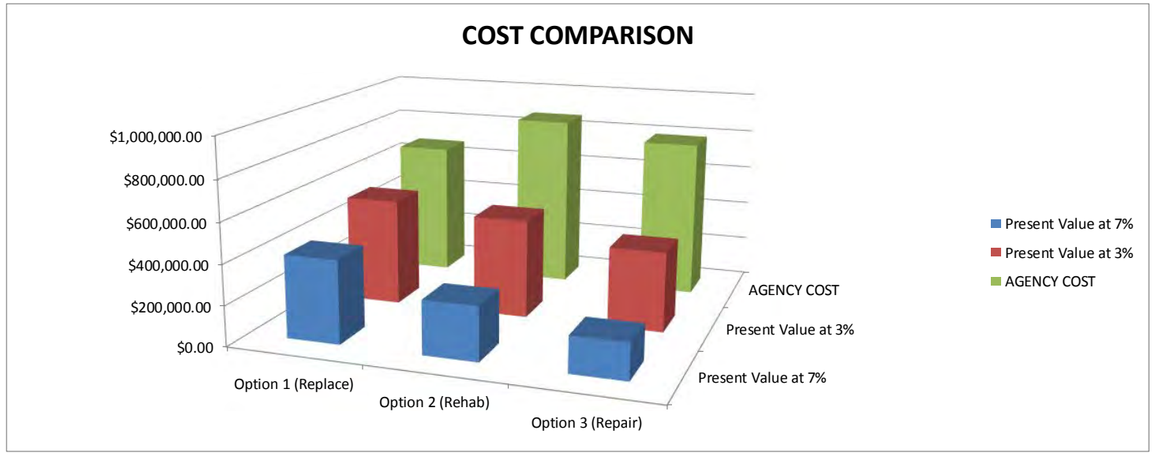
COST COMPARISON Present Value 2015 Dollars - Raw Costs			
OPTION	AGENCY COST	3%	7%
Option 1 (Replace)	$ 677,484.00	$533,981.02	$412,385.46
Option 2 (Rehab)	$ 868,239.00	$492,513.62	$266,797.33
Option 3 (Repair)	$ 790,236.00	$398,099.50	$179,003.81

Comparison to Replacement			
Option	Agency Cost	3%	7%
2 (Rehab)	78.03%	108.42%	154.57%
3 (Repair)	85.73%	134.13%	230.38%

COST COMPARISON Present Value 2015 Dollars - Fully Loaded Costs			
OPTION	AGENCY COST	3%	7%
Option 1 (Replace)	$1,490,465	$1,174,758	$907,248
Option 2 (Rehab)	$1,910,126	$1,083,530	$586,954
Option 3 (Repair)	$1,738,519	$875,819	$393,808

Bridge Ratings Per Option		
OPTION	AVG RATING	END RATING
Option 1 (Replace)	6.45	5
Option 2 (Rehab)	6.62	6
Option 3 (Repair)	6.33	6





	Present Value at 7%	Present Value at 3%	AGENCY COST
Option 1 (Replace)	$412,385.46	$533,981.02	$ 677,484.00
Option 2 (Rehab)	$266,797.33	$492,513.62	$ 868,239.00
Option 3 (Repair)	$179,003.81	$398,099.50	$ 790,236.00

Smith Road OP WB (#1069) / ROUTE I-8 / MP 157.55

Bridge Information	
Bridge Deck Area (A225)	3888 SF
Year Built (N27)	1962
Exp Service Life	75 YR
Total Bridge Length (N49)	90 LF
Number of Spans (N45+N46)	3
Skew Angle (N34)	0 DEG
Average Elevation	1495.60 FT
Max Pier Height	16.33 FT
* Amount of Widening for Bridge	0 FT
Revised Deck Area (Bridge Replace)	3888 FT
**Scour Critical Rating (N113)	N

Deterioration Slope				
Item	Deterioration Line Equation			Year
	Slope =	Days	Years	Drop
Substr	y =	-0.000224x	-0.082x	12.23
Superstr	y =	-0.000461x	-0.168x	5.94
Deck	y =	-0.000238x	-0.087x	11.51

***Input 0 if no widening. Input should include widening on both sides of bridge if applicable.**
****If scour critical rating is 3 or lower, Option 2 should consider the implementation of scour countermeasures.**

Notes:
1. Widening is intended only to correct lane and/or shoulder width deficiencies. It is not intended for adding traffic capacity (i.e. adding general purpose lanes).

Cost Multipliers		
Elevation > 4000ft	1496	1.00
Pier Height > 30ft	16	1.00
Length to # span ratio	30.00	1.25
Skew > 30degrees	0.00	1.00
Project Cost Multiplier	All Options	2.20

L to # Span Multiplier	
L/ # Span Ratio	Multiplier
=>100	1.00
=>60	1.10
<60	1.25

Skew Multiplier	
Skew	Multiplier
<30	1.00
=>30	1.10

Adjusted Bridge Replace Cost	
Base Bridge Replacement Cost (Per SF)	$125.00
Bridge Replacement Cost w/ Multipliers (Per SF)	$156.25

Elevation Multiplier	
Elev	Multiplier
<4000	1.00
=>4000	1.25

Pier H Multiplier	
Pier H	Multiplier
<30	1.00
=>30	1.10

User input cell
Only manipulate cell value after consulting with team

Bridge History (Inspections/As-builts)

Description	Category	Year
Original bridge was built in 1962 (I-8-2(27)).		
Latest deck inspection shows that deck top has transverse hairline and map cracking moderate to extensive density. Hairline to narrrow Longitudinal		
cracks. Several deck spalls.		
Supertstructure slab fascia has vertical cracks. Superstructure soffit has hairline longitudinal and random cracks. Minor underdeck efflorescence.		
Substructure elements have minor hairline vertical and horizontal cracks.		
No repairs or rehabs		

Replace / Rehab / Repair Information

BRIDGE DECK				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Deck)	Full Deck Replacement	$78.13	25	Rating = 8
Rehab (Deck Concrete Overlay)	Overlay (Concrete)	$10.00	15	+ 2
Rehab (Deck Epoxy Overlay)	Overlay (Epoxy)	$5.00	10	+ 1
Repair (Deck)	Patch Spalls / Seal Cracks	$3.00	See Deterioration Slope	+ 0
Replace (Bridge)	Full Bridge Replacement	$156.25	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 0
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 0

SUPERSTRUCTURE - STEEL				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Supr - Stl)	Full SuperStr Replacement	$78.13	50	Rating = 8
Rehab (Supr - Stl)	Weld New Structural Components	$39.06	15	+ 2
Repair (Supr - Stl)	Weld Repair / Crack Relief	$5.00	See Deterioration Slope	+ 1

SUPERSTRUCTURE - CONCRETE				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Supr - Conc)	Full SuperStr Replacement	$78.13	50	Rating = 8
Rehab (Supr - Conc)	Replace Structural Component	$39.06	15	+ 2
Repair (Supr - Conc)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1
Replace (Bridge)	Full Bridge Replacement	$156.25	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 1
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 1

SUBSTRUCTURE - STRUCTURAL				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Substr)	Full SubStr Replacement	$78.13	75	Rating = 8
Rehab (Substr)	Replace Structural Component	$39.06	50	+ 2
Repair (Substr)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1

SUBSTRUCTURE - SCOUR				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Rehab (Substr - Scour)	Add scour protection slabs	$39.06	50	+ 2
Repair (Substr - Scour)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1
Replace (Bridge)	Full Bridge Replacement	$156.25	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 1
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 1

Notes:

1. Individual replacements assume 50% of total bridge replacement costs

2. Individual rehabs (in cells that are not highlighted) assume 25% of total bridge replacement costs

3. When superstructure replacement is selected, either deck replacement or deck rehab should be selected as well.

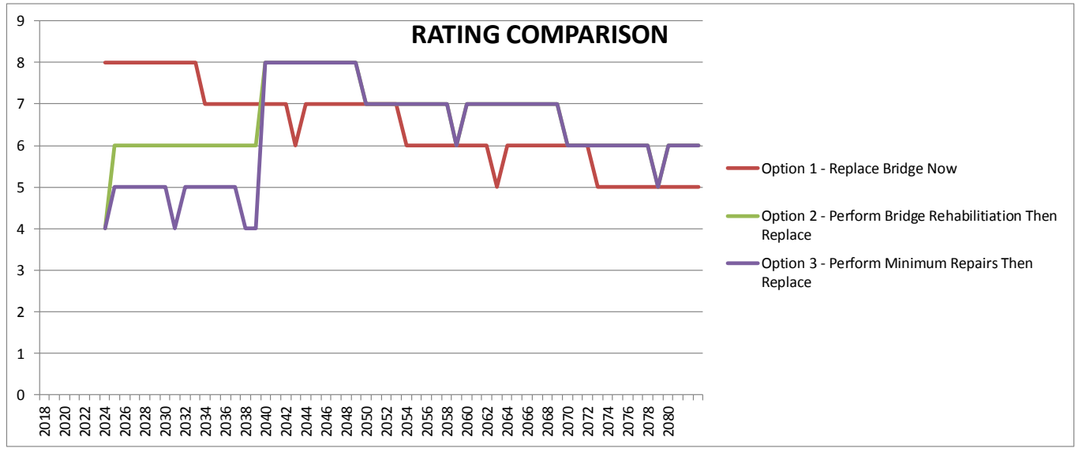
Smith Road OP WB (#1069) / ROUTE I-8 / MP 157.55

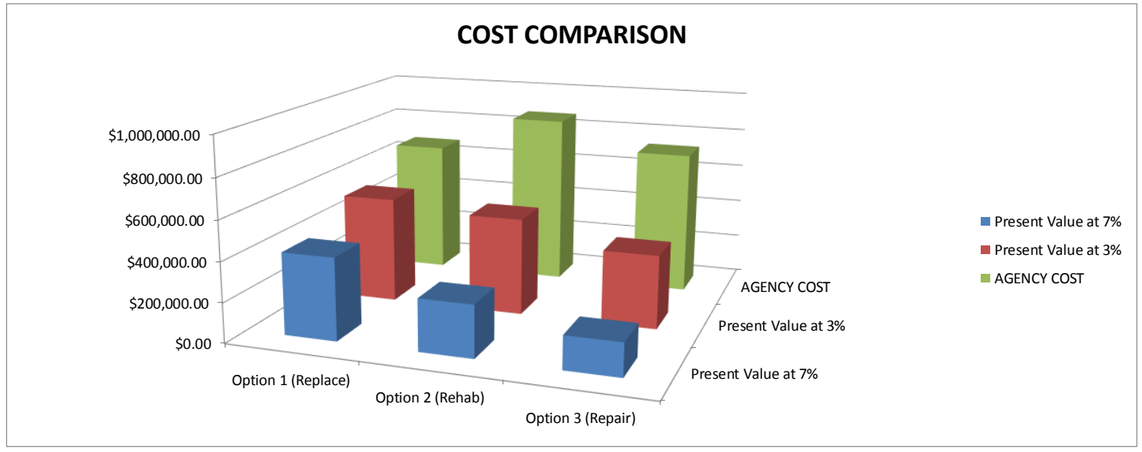
COST COMPARISON Present Value 2015 Dollars - Raw Costs			
OPTION	AGENCY COST	3%	7%
Option 1 (Replace)	$ 677,484.00	$533,981.02	$412,385.46
Option 2 (Rehab)	$ 868,239.00	$488,808.98	$260,176.73
Option 3 (Repair)	$ 728,028.00	$370,568.34	$165,443.82

Comparison to Replacement			
Option	Agency Cost	3%	7%
2 (Rehab)	78.03%	109.24%	158.50%
3 (Repair)	93.06%	144.10%	249.26%

COST COMPARISON Present Value 2015 Dollars - Fully Loaded Costs			
OPTION	AGENCY COST	3%	7%
Option 1 (Replace)	$1,490,465	$1,174,758	$907,248
Option 2 (Rehab)	$1,910,126	$1,075,380	$572,389
Option 3 (Repair)	$1,601,662	$815,250	$363,976

Bridge Ratings Per Option		
OPTION	AVG RATING	END RATING
Option 1 (Replace)	6.45	5
Option 2 (Rehab)	6.60	6
Option 3 (Repair)	6.30	6





	Present Value at 7%	Present Value at 3%	AGENCY COST
Option 1 (Replace)	$412,385.46	$533,981.02	$ 677,484.00
Option 2 (Rehab)	$260,176.73	$488,808.98	$ 868,239.00
Option 3 (Repair)	$165,443.82	$370,568.34	$ 728,028.00

Thornton Rd TI UP (#1196) / ROUTE I-8 / MP 172.55

Bridge Information	
Bridge Deck Area (A225)	10794 SF
Year Built (N27)	1967
Exp Service Life	75 YR
Total Bridge Length (N49)	262 LF
Number of Spans (N45+N46)	4
Skew Angle (N34)	0 DEG
Average Elevation	1432 FT
Max Pier Height	23.5 FT
* Amount of Widening for Bridge	0 FT
Revised Deck Area (Bridge Replace)	10794 FT
**Scour Critical Rating (N113)	N

Deterioration Slope				
Item	Deterioration Line Equation			Year Drop
	Slope =	Days	Years	
Substr	y =	Infinity	#VALUE!	#VALUE!
Superstr	y =	-0.000749x	-0.273x	3.66
Deck	y =	-0.000236x	-0.086x	11.61

***Input 0 if no widening. Input should include widening on both sides of bridge if applicable.**
****If scour critical rating is 3 or lower, Option 2 should consider the implementation of scour countermeasures.**

Notes:
1. Widening is intended only to correct lane and/or shoulder width deficiencies. It is not intended for adding traffic capacity (i.e. adding general purpose lanes).

Cost Multipliers		
Elevation > 4000ft	1432	1.00
Pier Height > 30ft	24	1.00
Length to # span ratio	65.50	1.1
Skew > 30degrees	0.00	1.00
Project Cost Multiplier	All Options	2.20

L to # Span Multiplier	
L/ # Span Ratio	Multiplier
=>100	1.00
=>60	1.10
<60	1.25

Skew Multiplier	
Skew	Multiplier
<30	1.00
=>30	1.10

Adjusted Bridge Replace Cost	
Base Bridge Replacement Cost (Per SF)	$125.00
Bridge Replacement Cost w/ Multipliers (Per SF)	$137.50

Elevation Multiplier	
Elev	Multiplier
<4000	1.00
=>4000	1.25

Pier H Multiplier	
Pier H	Multiplier
<30	1.00
=>30	1.10

User input cell
Only manipulate cell value after consulting with team

Bridge History (Inspections/As-builts)

Description	Category	Year
Original bridge was built in 1967 (18-2(9)138RD).		
Bridge was rehabilitated in 2015 (NHPP-IM 008-B(208)T). Bridge rehabilitation consisted of:		
a. Steel Girder Repair (Crack Repair, Fastner Replacement)	Repair (Supr - Stl)	2015
b. Deck Joint Repair	Repair (Deck)	2015
c. Slope Protection Repair	Repair (Substr)	2015
Latest deck inspection shows that deck top has transverse hairline and map cracking throughout the bridge deck.		
Steel girders have collision damage and some bolts missing. Additionally girder cracking and diaphragms cracks were notes. These got repaired.		
Slope protection cracking is also noted in the Inspection Report. This was repaired with the bridge rehabilitation.		

Replace / Rehab / Repair Information

BRIDGE DECK				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Deck)	Full Deck Replacement	$68.75	25	Rating = 8
Rehab (Deck Concrete Overlay)	Overlay (Concrete)	$10.00	15	+ 2
Rehab (Deck Epoxy Overlay)	Overlay (Epoxy)	$5.00	10	+ 1
Repair (Deck)	Patch Spalls / Seal Cracks	$3.00	See Deterioration Slope	+ 0
Replace (Bridge)	Full Bridge Replacement	$137.50	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 0
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 0

SUPERSTRUCTURE - STEEL				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Supr - Stl)	Full SuperStr Replacement	$68.75	50	Rating = 8
Rehab (Supr - Stl)	Weld New Structural Components	$34.38	15	+ 2
Repair (Supr - Stl)	Weld Repair / Crack Relief	$5.00	See Deterioration Slope	+ 1

SUPERSTRUCTURE - CONCRETE				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Supr - Conc)	Full SuperStr Replacement	$68.75	50	Rating = 8
Rehab (Supr - Conc)	Replace Structural Component	$34.38	15	+ 2
Repair (Supr - Conc)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1
Replace (Bridge)	Full Bridge Replacement	$137.50	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 1
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 1

SUBSTRUCTURE - STRUCTURAL				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Replace (Substr)	Full SubStr Replacement	$68.75	75	Rating = 8
Rehab (Substr)	Replace Structural Component	$34.38	50	+ 2
Repair (Substr)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1

SUBSTRUCTURE - SCOUR				
ITEM	**DESCRIPTION**	**UNIT COST (Per SF)**	**LIFE (YRS)**	**RATING BENEFIT**
Rehab (Substr - Scour)	Add scour protection slabs	$34.38	50	+ 2
Repair (Substr - Scour)	Patch Spalls / Seal Cracks	$5.00	See Deterioration Slope	+ 1
Replace (Bridge)	Full Bridge Replacement	$137.50	75	Rating = 8
Repair (After Bridge Replace)	Patch Spalls / Seal Cracks	$3.00	20	+ 1
Repair (After Rehab)	Patch Spalls / Seal Cracks	$3.00	10	+ 1

Notes:

1. Individual replacements assume 50% of total bridge replacement costs

2. Individual rehabs (in cells that are not highlighted) assume 25% of total bridge replacement costs

3. When superstructure replacement is selected, either deck replacement or deck rehab should be selected as well.

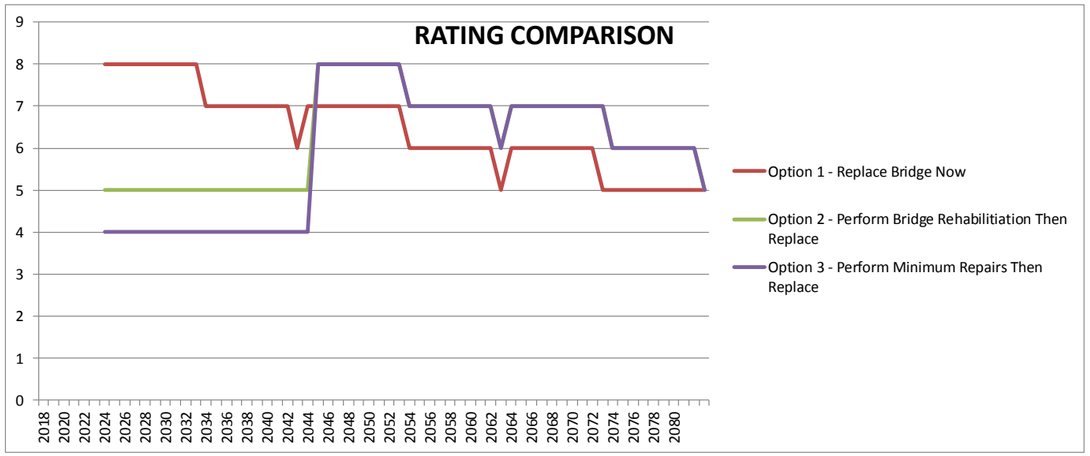
Thornton Rd TI UP (#1196) / ROUTE I-8 / MP 172.55

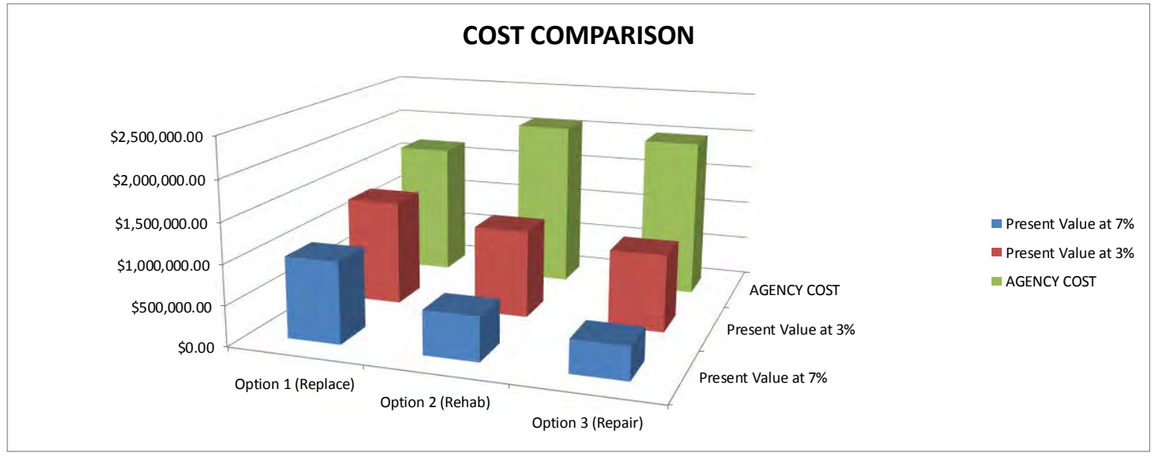
COST COMPARISON Present Value 2015 Dollars - Raw Costs			
OPTION	AGENCY COST	3%	7%
Option 1 (Replace)	$ 1,678,467.00	$1,312,960.21	$1,010,019.43
Option 2 (Rehab)	$ 2,092,686.75	$1,097,479.64	$546,708.58
Option 3 (Repair)	$ 1,991,493.00	$962,354.01	$406,842.70

Comparison to Replacement			
Option	Agency Cost	3%	7%
2 (Rehab)	80.21%	119.63%	184.75%
3 (Repair)	84.28%	136.43%	248.26%

COST COMPARISON Present Value 2015 Dollars - Fully Loaded Costs			
OPTION	AGENCY COST	3%	7%
Option 1 (Replace)	$3,692,627	$2,888,512	$2,222,043
Option 2 (Rehab)	$4,603,911	$2,414,455	$1,202,759
Option 3 (Repair)	$4,381,285	$2,117,179	$895,054

Bridge Ratings Per Option		
OPTION	AVG RATING	END RATING
Option 1 (Replace)	6.45	5
Option 2 (Rehab)	6.25	5
Option 3 (Repair)	5.90	5





	Present Value at 7%	Present Value at 3%	AGENCY COST
Option 1 (Replace)	$1,010,019.43	$1,312,960.21	$ 1,678,467.00
Option 2 (Rehab)	$546,708.58	$1,097,479.64	$ 2,092,686.75
Option 3 (Repair)	$406,842.70	$962,354.01	$ 1,991,493.00

Appendix F: Crash Modification Factors and Factored Unit Construction Costs

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
REHABILITATION							
Rehabilitate Pavement (AC)	$276,500	Mile	2.20	$610,000	Mill and replace 1"-3" AC pvmt; accounts for 38' width; for one direction of travel on two lane roadway; includes pavement, striping, delineators, RPMs, rumble strips	0.70	Combination of rehabilitate pavement (0.92), striping, delineators, RPMs (0.77 for combination), and rumble strips (0.89) = 0.70
Rehabilitate Bridge	$65	SF	2.20	$140	Based on deck area; bridge only - no other costs included	0.95	Assumed - should have a minor effect on crashes at the bridge
GEOMETRIC IMPROVEMENT							
Re-profile Roadway	$974,500	Mile	2.20	$2,140,000	Includes excavation of approximately 3", pavement replacement (AC), striping, delineators, RPMs, rumble strips, for one direction of travel of 2-lane roadway (38' width)	0.70	Assumed - this is similar to rehab pavement. This solution is intended to address vertical clearance at bridge, not profile issue; factor the cost as a ratio of needed depth to 3".
Realign Roadway	$2,960,000	Mile	2.20	$6,510,000	All costs per direction except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.50	Based on CalTrans and NC DOT
Improve Skid Resistance	$675,000	Mile	2.20	$1,490,000	Average cost of pvmt replacement and variable depth paving to increase super-elevation; for one direction of travel on two lane roadway; includes pavement, striping, delineators, RPMs, rumble strips	0.66	Combination of avg of 5 values from clearinghouse (0.77) and calculated value from HSM (0.87) for skid resistance; striping, delineators, RPMs (0.77 for combination), and rumble strips (0.89) = 0.66
INFRASTRUCTURE IMPROVEMENT							
Reconstruct to Urban Section	$1,000,000	Mile	2.20	$2,200,000	Includes widening by 16' total (AC = 12'+2'+2') to provide median, curb & gutter along both side of roadway, single curb for median, striping (doesn't include widening for additional travel lane).	0.88	From HSM
Construct Auxiliary Lanes (AC)	$914,000	Mile	2.20	$2,011,000	For addition of aux lane (AC) in one direction of travel; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.78	Average of 4 values from clearinghouse
Construct Climbing Lane (High)	$3,000,000	Mile	2.20	$6,600,000	In one direction; all costs except bridges; applicable to areas with large fills and cuts, retaining walls, rock blasting, steep slopes on both sides of road	0.75	From HSM
Construct Climbing Lane (Medium)	$2,250,000	Mile	2.20	$4,950,000	In one direction; all costs except bridges; applicable to areas with medium or large fills and cuts, retaining walls, rock blasting, steep slopes on one side of road	0.75	From HSM
Construct Climbing Lane (Low)	$1,500,000	Mile	2.20	$3,300,000	In one direction; all costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.75	From HSM
Construct Reversible Lane (Low)	$2,400,000	Lane-Mile	2.20	$5,280,000	All costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a conc barrier

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Reversible Lane (High)	$4,800,000	Lane-Mile	2.20	$10,560,000	All costs except bridges; applicable to areas with large fills and cuts, retaining walls, rock blasting, mountainous terrain	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a conc barrier
Construct Passing Lane	$1,500,000	Mile	2.20	$3,300,000	In one direction; all costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.63	Average of 3 values from clearinghouse
Construct Entry/Exit Ramp	$730,000	Each	2.20	$1,610,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, typical earthwork & drainage; does not include any major structures or improvements on crossroad	1.09	Average of 16 values on clearinghouse; for adding a ramp not reconstructing. CMF applied to crashes 0.25 miles upstream/downstream from the gore.
Relocate Entry/Exit Ramp	$765,000	Each	2.20	$1,680,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, typical earthwork , drainage and demolition of existing ramp; does not include any major structures or improvements on crossroad	1.00	Assumed to not add any crashes since the ramp is simply moving and not being added. CMF applied to crashes 0.25 miles upstream/downstream from the gore.
Construct Turn Lanes	$42,500	Each	2.20	$93,500	Includes 14' roadway widening (AC) for one additional turn lane (250' long) on one leg of an intersection; includes AC pavement, curb & gutter, sidewalk, ramps, striping, and minor signal modifications	0.81	Avg of 7 values from HSM; CMF applied to intersection related crashes; this solution also applies when installing a deceleration lane
Modify Entry/Exit Ramp	$445,000	Each	2.20	$979,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, minor earthwork, & drainage; For converting existing ramp to parallel-type configuration	0.21	Average of 4 values from clearinghouse (for exit ramps) and equation from HSM (for entrance ramp). CMF applied to crashes within 1/8 mile upstream/downstream from the gore.
Widen & Modify Entry/Exit Ramp	$619,000	Each	2.20	$1,361,800	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, minor earthwork, & drainage; For converting 1-lane ramp to 2-lane ramp and converting to parallel-type ramp	0.21	Will be same as "Modify Ramp"
Replace Pavement (AC) (with overexcavation)	$1,446,500	Mile	2.20	$3,180,000	Accounts for 38' width; for one direction of travel on two lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	Same as rehab
Replace Pavement (PCCP) (with overexcavation)	$1,736,500	Mile	2.20	$3,820,000	Accounts for 38' width; for one direction of travel on two lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	Same as rehab
Replace Bridge (Short)	$125	SF	2.20	$280	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing small washes	0.95	Assumed - should have a minor effect on crashes at the bridge
Replace Bridge (Medium)	$160	SF	2.20	$350	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing over the mainline freeway, crossroads, or large washes	0.95	Assumed - should have a minor effect on crashes at the bridge

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Replace Bridge (Long)	$180	SF	2.20	$400	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing large rivers or canyons	0.95	Assumed - should have a minor effect on crashes at the bridge
Widen Bridge	$175	SF	2.20	$390	Based on deck area; bridge only - no other costs included	0.90	Assumed - should have a minor effect on crashes at the bridge
Install Pedestrian Bridge	$135	SF	2.20	$300	Includes cost to construct bridge based on linear feet of the bridge. This costs includes and assumes ramps and sidewalks leading to the structure.	0.1 (ped only)	Assumed direct access on both sides of structure
Implement Automated Bridge De-icing	$115	SF	2.20	$250	Includes cost to replace bridge deck and install system	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice
Install Wildlife Crossing Under Roadway	$650,000	Each	2.20	$1,430,000	Includes cost of structure for wildlife crossing under roadway and 1 mile of fencing in each direction that is centered on the wildlife crossing	0.25 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Install Wildlife Crossing Over Roadway	$1,140,000	Each	2.20	$2,508,000	Includes cost of structure for wildlife crossing over roadway and 1 mile of fencing in each direction that is centered on the wildlife crossing	0.25 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Construct Drainage Structure - Minor	$280,000	Each	2.20	$616,000	Includes 3-36" pipes and roadway reconstruction (approx. 1,000 ft) to install pipes	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Intermediate	$540,000	Each	2.20	$1,188,000	Includes 5 barrel 8'x6' RCBC and roadway reconstruction (approx. 1,000 ft) to install RCBC	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Major	$8,000	LF	2.20	$17,600	Includes bridge that is 40' wide and reconstruction of approx. 500' on each approach	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Install Acceleration Lane	$127,500	Each	2.20	$280,500	For addition of an acceleration lane (AC) on one leg of an intersection that is 1,000' long plus a taper; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.85	Average of 6 values from the FHWA Desktop Reference for Crash Reduction Factors
OPERATIONAL IMPROVEMENT							
Implement Variable Speed Limits (Wireless, Overhead)	$718,900	Mile	2.20	$1,580,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors	0.92	From 1 value from clearinghouse
Implement Variable Speed Limits (Wireless, Ground-mount)	$169,700	Mile	2.20	$373,300	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors	0.92	From 1 value from clearinghouse
Implement Variable Speed Limits (Wireless, Solar, Overhead)	$502,300	Mile	2.20	$1,110,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors, solar power	0.92	From 1 value from clearinghouse
Implement Variable Speed Limits (Wireless, Solar, Ground-mount)	$88,400	Mile	2.20	$194,500	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors, solar power	0.92	From 1 value from clearinghouse
Implement Ramp Metering (Low)	$25,000	Each	2.20	$55,000	For each entry ramp location; urban area with existing ITS backbone infrastructure; includes signals, poles, timer, pull boxes, etc	0.64	From 1 value from clearinghouse; CMF applied to crashes 0.25 miles after gore

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Implement Ramp Metering (High)	$150,000	Mile	2.20	$330,000	Area without existing ITS backbone infrastructure; in addition to ramp meters, also includes conduit, fiber optic lines, and power	0.64	From 1 value from clearinghouse
Implement Signal Coordination	$140,000	Mile	2.20	$308,000	Includes conduit, conductors, and controllers for 4 intersections that span a total of approximately 2 miles	0.90	Assumed
Implement Left-Turn Phasing	$7,500	Each	2.20	$16,500	Includes four new signal heads (two in each direction) and associated conductors for one intersection	0.88 (protected) 0.98 (perm/prot or prot/perm)	From HSM; CMF = 0.94 for each protected approach and 0.99 for each perm/prot or prot/perm approach. CMFs of different approaches should be multiplied together. CMF applied to crashes within intersection
ROADSIDE DESIGN							
Install Guardrail	$130,000	Mile	2.20	$286,000	One side of road	0.62 (ROR)	0.62 is avg of 2 values from clearinghouse
Install Cable Barrier	$80,000	Mile	2.20	$176,000	In median	0.81	0.81 is average of 5 values from clearinghouse
Widen Shoulder (AC)	$256,000	Mile	2.20	$563,000	Assumes 10' of existing shoulder (combined left and right), includes widening shoulder by a total of 4'; new pavement for 4' width and mill and replace existing 10' width; includes pavement, minor earthwork, striping edge lines, RPMs, high-visibility delineators, safety edge, and rumble strips	0.68 (1-4') 0.64 (>= 4')	0.86 is avg of 5 values from clearing house for widening shoulder 1-4'. 0.76 is calculated from HSM for widening shoulder >= 4'. (Cost needs to be updated if dimension of existing and widened shoulder differ from Description.)
Rehabilitate Shoulder (AC)	$113,000	Mile	2.20	$249,000	One direction of travel (14' total shldr width-4' left and 10' right); includes paving (mill and replace), striping, high-visibility delineators, RPMs, safety edge, and rumble strips for both shoulders	0.72	0.98 is average of 34 values on clearinghouse for shldr rehab/replace; include striping, delineators, RPMs (0.77 combined CMF), and rumble strips (0.89). (Cost needs to be updated if dimension of existing shoulder differs from Description.)
Replace Shoulder (AC)	$364,000	Mile	2.20	$801,000	One direction of travel (14' total shldr width-4' left and 10' right); includes paving (full reconstruction), striping, high-visibility delineators, RPMs, safety edge, and rumble strips for both shoulders	0.72	0.98 is average of 34 values on clearinghouse for shldr rehab/replace; include striping, delineators, RPMs (0.77 combined CMF), and rumble strips (0.89). (Cost needs to be updated if dimension of existing shoulder differs from Description.)
Install Rumble Strip	$5,500	Mile	2.20	$12,000	Both edges - one direction of travel; includes only rumble strip; no shoulder rehab or paving or striping	0.89	Average of 75 values on clearinghouse and consistent with HSM
Install Centerline Rumble Strip	$2,800	Mile	2.20	$6,000	Includes rumble strip only; no pavement rehab or striping	0.85	From HSM
Install Wildlife Fencing	$340,000	Mile	2.20	$748,000	Fencing only plus jump outs for 1 mile (both directions)	0.50 (wildlife)	Assumed
Remove Tree/Vegetation	$200,000	Mile	2.20	$440,000	Intended for removing trees that shade the roadway to allow sunlight to help melt snow and ice (see Increase Clear Zone CMF for general tree/vegetation removal in clear zone)	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Increase Clear Zone	$59,000	Mile	2.20	$130,000	In one direction; includes widening the clear zone by 10' to a depth of 3'	0.71	Median of 14 values from FHWA Desktop Reference for Crash Reduction Values
Install Access Barrier Fence	$15	LF	2.20	$33	8' fencing along residential section of roadway	0.10 (ped only)	Equal to ped overpass
Install Rock-Fall Mitigation - Wire Mesh	$1,320,000	Mile	2.20	$2,904,000	Includes wire mesh and rock stabilization (one direction)	0.75 (debris)	Assumed
Install Rock-Fall Mitigation - Containment Fence & Barrier	$2,112,000	Mile	2.20	$4,646,000	Includes containment fencing, concrete barrier, and rock stabilization (one direction)	0.75 (debris)	Assumed
Install Raised Concrete Barrier in Median	$650,000	Mile	2.20	$1,430,000	Includes concrete barrier with associated striping and reflective markings; excludes lighting in barrier (one direction)	0.90 (Cross-median and head on crashes eliminated completely)	All cross median and head-on fatal or incapacitating injury crashes are eliminated completely; all remaining crashes have 0.90 applied
Formalize Pullout (Small)	$7,500	Each	2.20	$17,000	Includes paving and signage (signs, posts, and foundations) - approximately 4,200 sf	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
Formalize Pullout (Medium)	$27,500	Each	2.20	$61,000	Includes paving and signage (signs, posts, and foundations) - approximately 22,500 sf	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
Formalize Pullout (Large)	$80,500	Each	2.20	$177,100	Includes paving and signage (signs, posts, and foundations) - approximately 70,000 sf	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
INTERSECTION IMPROVEMENTS							
Construct Traffic Signal	$150,000	Each	2.20	$330,000	4-legged intersection; includes poles, foundations, conduit, controller, heads, luminaires, mast arms, etc.	0.95	From HSM; CMF applied to crashes within intersection only
Improve Signal Visibility	$35,000	Each	2.20	$77,000	4-legged intersection; signal head size upgrade, installation of new back-plates, and installation of additional signal heads on new poles.	0.85	Avg of 7 values from clearinghouse; CMF applied to crashes within intersection only
Install Raised Median	$360,000	Mile	2.20	$792,000	Includes removal of 14' wide pavement and construction of curb & gutter; does not include cost to widen roadway to accommodate the median; if the roadway needs to be widened, include cost from New General Purpose Lane	0.83	Avg from HSM
Install Transverse Rumble Strip/Pavement Markings	$3,000	Each	2.20	$7,000	Includes ped markings and rumble strips only across a 30' wide travelway; no pavement rehab or other striping	0.95	Avg of 17 values from clearinghouse; CMF applied to crashes within 0.5 miles after the rumble strips and markings

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Single-Lane Roundabout	$1,500,000	Each	2.20	$3,300,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.22	From HSM; CMF applied to crashes within intersection only
Construct Double-Lane Roundabout	$1,800,000	Each	2.20	$3,960,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.40	From HSM; CMF applied to crashes within intersection only
ROADWAY DELINEATION							
Install High-Visibility Edge Line Striping	$10,800	Mile	2.20	$23,800	2 edge lines and lane line - one direction of travel	0.77	Avg of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install High-Visibility Delineators	$6,500	Mile	2.20	$14,300	Both edges - one direction of travel		Avg of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install Raised Pavement Markers	$2,000	Mile	2.20	$4,400	Both edges - one direction of travel		Avg of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install In-Lane Route Markings	$6,000	Each	2.20	$13,200	Installation of a series of three in-lane route markings in one lane	0.95	Assumed; CMF applied to crashes within 1.0 mile before the gore
IMPROVED VISIBILITY							
Cut Side Slopes	$80	LF	2.20	$200	For small grading to correct sight distance issues; not major grading	0.85	Intent of this solution is to improve sight distance. Most CMF's are associated with vehicles traveling on slope. Recommended CMF is based on FDOT and NCDOT but is more conservative.
Install Lighting (connect to existing power)	$270,000	Mile	2.20	$594,000	One side of road only; offset lighting, not high-mast; does not include power supply; includes poles, luminaire, pull boxes, conduit, conductor	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM
Install Lighting (solar powered LED)	$10,000	Pole	2.20	$22,000	Offset lighting, not high-mast; solar power LED; includes poles, luminaire, solar panel	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM
DRIVER INFORMATION/WARNING							
Install Dynamic Message Sign (DMS)	$250,000	Each	2.20	$550,000	Includes sign, overhead structure, and foundations; wireless communication; does not include power supply	1.00	Not expected to reduce crashes
Install Dynamic Weather Warning Beacons	$40,000	Each	2.20	$88,000	Assumes solar operation and wireless communication or connection to existing power and communication; ground mounted; includes posts, foundations, solar panel, and dynamic sign	0.80 (weather related)	Avg of 3 values from FHWA Desktop Reference for Crash Reduction Factors; CMF applies to crashes within 0.25 miles after a sign

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Dynamic Speed Feedback Signs	$25,000	Each	2.20	$55,000	Assumes solar operation and no communication; ground mounted; includes regulatory sign, posts, foundations, solar panel, and dynamic sign	0.94	Average of 2 clearinghouse values; CMF applies to crashes within 0.50 miles after a sign
Install Chevrons	$18,400	Mile	2.20	$40,500	On one side of road - includes signs, posts, and foundations	0.79	Average of 11 clearinghouse values
Install Curve Warning Signs	$2,500	Each	2.20	$5,500	Includes 2 signs, posts, and foundations	0.83	Average of 4 clearinghouse values; CMF applies to crashes within 0.25 miles after a sign
Install Traffic Control Device Warning Signs (e.g., stop sign ahead, signal ahead, etc.)	$2,500	Each	2.20	$5,500	Includes 2 signs, posts, and foundations	0.85	FHWA Desktop Reference for Crash Reduction Factors; CMF applies to crashes within 0.25 miles after a sign
Install Other General Warning Signs (e.g., intersection ahead, wildlife in area, slow vehicles, etc.)	$2,500	Each	2.20	$5,500	Includes 2 signs, posts, and foundations	0.97	Assumed; CMF applies to crashes within 0.25 miles after a sign
Install Wildlife Warning System	$162,000	Each	2.20	$356,400	Includes wildlife detection system at a designated wildlife crossing, flashing warning signs (assumes solar power), advance signing, CCTV (solar and wireless), game fencing for approximately 0.25 miles in each direction - centered on the wildlife crossing, and regular fencing for 1.0 mile in each direction - centered on the wildlife crossing.	0.50 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Install Warning Sign with Beacons	$15,000	Each	2.20	$33,000	In both directions; includes warning sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.75	FHWA Desktop Reference for Crash Reduction Factors for Installing Flashing Beacons as Advance Warning; CMF applies to crashes within 0.25 miles after a sign
Install Larger Stop Sign with Beacons	$10,000	Each	2.20	$22,000	In one direction; includes large stop sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.85/0.81	Use 0.85 for adding beacons to an existing sign; 0.81 for installing a larger sign with flashing beacons; CMF applies to intersection related crashes
DATA COLLECTION							
Install Roadside Weather Information System (RWIS)	$60,000	Each	2.20	$132,000	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	Not expected to reduce crashes
Install Closed Circuit Television (CCTV) Camera	$25,000	Each	2.20	$55,000	Assumes connection to existing ITS backbone or wireless communication; does not include fiber-optic backbone infrastructure; includes pole, camera, etc	1.00	Not expected to reduce crashes
Install Vehicle Detection Stations	$15,000	Each	2.20	$33,000	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	Not expected to reduce crashes
Install Flood Sensors (Activation)	$15,000	Each	2.20	$33,000	Sensors with activation cabinet to alert through texting (agency)	1.00	Not expected to reduce crashes
Install Flood Sensors (Gates)	$100,000	Each	2.20	$220,000	Sensors with activation cabinet to alert through texting (agency) and beacons (public) plus gates	1.00	Not expected to reduce crashes

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
WIDEN CORRIDOR							
Construct New General Purpose Lane (PCCP)	$1,740,000	Mile	2.20	$3,830,000	For addition of 1 GP lane (PCCP) in one direction; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.90	North Carolina DOT uses 0.90 and Florida DOT uses 0.87
Construct New General Purpose Lane (AC)	$1,200,000	Mile	2.20	$2,640,000	For addition of 1 GP lane (AC) in one direction; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.90	North Carolina DOT uses 0.90 and Florida DOT uses 0.88
Convert a 2-Lane undivided highway to a 5-Lane highway	$1,576,000	Mile	2.20	$3,467,200	For expanding a 2-lane undivided highway to a 5-lane highway (4 through lanes with TWLTL), includes standard shoulder widths but no curb, gutter, or sidewalks	0.60	Assumed to be slightly lower than converting from a 4-lane to a 5-lane highway
Install Center Turn Lane	$1,053,000	Mile	2.20	$2,316,600	For adding a center turn lane (i.e., TWLTL); assumes symmetrical widening on both sides of the road; includes standard shoulder widths but no curb, gutter, or sidewalk	0.75	From FHWA Desktop Reference for Crash Reduction Factors, CMF Clearinghouse, and SR 87 CPS comparison
Construct 4-Lane Divided Highway (Using Existing 2-Lane Road for one direction)	$3,000,000	Mile	2.20	$6,600,000	In both directions; one direction uses existing 2-lane road; other direction assumes addition of 2 new lanes (AC) with standard shoulders; includes all costs except bridges	0.67	Assumed
Construct 4-Lane Divided Highway (No Use of Existing Roads)	$6,000,000	Mile	2.20	$13,200,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.67	Assumed
Construct Bridge over At-Grade Railroad Crossing	$10,000,000	Each	2.20	$22,000,000	Assumes bridge width of 4 lanes (AC) with standard shoulders; includes abutments and bridge approaches; assumes vertical clearance of 23'4" + 6'8" superstructure	0.72 (All train-related crashes eliminated)	Removes all train-related crashes at at-grade crossing; all other crashes CMF = 0.72
Construct Underpass at At-Grade Railroad Crossing	$15,000,000	Each	2.20	$33,000,000	Assumes underpass width of 4 lanes (AC) with standard shoulders; includes railroad bridge with abutments and underpass approaches; assumes vertical clearance of 16'6" + 6'6" superstructure	0.72 (All train-related crashes eliminated)	Removes all train-related crashes at at-grade crossing; all other crashes CMF = 0.72
Construct High-Occupancy Vehicle (HOV) Lane	$900,000	Mile	2.20	$1,980,000	For addition of 1 HOV lane (AC) in one direction with associated signage and markings; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.95	Similar to general purpose lane
ALTERNATE ROUTE							
Construct Frontage Roads	$2,400,000	Mile	2.20	$5,280,000	For 2-lane AC frontage road; includes all costs except bridges; for generally at-grade facility with minimal walls	0.90	Assumed - similar to new general purpose lane
Construct 2-Lane Undivided Highway	$3,000,000	Mile	2.20	$6,600,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.90	Assuming new alignment for a bypass

^ Factor accounts for traffic control, erosion control, construction surveying and quality control, mobilization, construction engineering, contingencies, indirect cost allocation, and miscellaneous work

Appendix G: Performance Area Risk Factors

Pavement Performance Area

- Elevation
- Mainline Daily Traffic Volume
- Mainline Daily Truck Volume

Elevation

Variance above 4000' divided by 1000; (Elev-4000)/1000

Score	Condition
0	< 4000’
0-5	4000’- 9000’
5	> 9000’

Mainline Daily Traffic Volume

Exponential equation; score = $5-(5*e^{(ADT*-0.000039)})$

Score	Condition
0	< 6,000
0-5	6,000 – 160,000
5	>160,000

Mainline Daily Truck Volume

Exponential equation; score = $5-(5*e^{(ADT*-0.00025)})$

Score	Condition
0	<900
0-5	900-25,000
5	>25,000

Bridge Performance Area

- Mainline Daily Traffic Volume
- Elevation
- Carries Mainline Traffic
- Detour Length
- Scour Critical Rating
- Vertical Clearance

Mainline Daily Traffic Volume

Exponential equation; score = $5-(5*e^{(ADT*-0.000039)})$

Score	Condition
0	<6,000
0-5	6,000-160,000
5	>160,000

Elevation

Variance above 4000' divided by 1000; (Elev-4000)/1000

Score	Condition
0	< 4000’
0-5	4000’- 9000’
5	> 9000’

Carries Mainline Traffic

Score	Condition
0	Does not carry mainline traffic
5	Carries mainline traffic

Detour Length

Divides detour length by 10 and multiplies by 2.5

Score	Condition
0	0 miles
0-5	0-20 miles
5	> 20 miles

Scour Critical Rating

Variance below 8

Score	Condition
0	Rating > 8
0-5	Rating 8 - 3
5	Rating < 3

Vertical Clearance

Variance below 16’ x 2.5; (16 –Clearance) x 2.5

Score	Condition
0	>16’
0-5	16’-14’
5	<14’

Mobility Performance Area

- Mainline VMT
- Buffer Index (PTI-TTI)
- Detour Length
- Outside Shoulder Width

Mainline VMT

Exponential equation; score = 5-(5*e(ADT*-0.0000139))

Score	Condition
0	<16,000
0-5	16,000-400,000
5	>400,000

Buffer Index

Buffer Index x 10

Score	Condition
0	Buffer Index = 0.00
0-5	Buffer Index 0.00-0.50
5	Buffer Index > 0.50

Detour Length

Score	Condition
0	Detour < 10 miles
5	Detour > 10 miles

Outside Shoulder Width

Variance below 10', if only 1 lane in each direction

Score	Condition
0	10' or above or >1 lane in each direction
0-5	10'-5' and 1 lane in each direction
5	5' or less and 1 lane in each direction

Safety Performance Area

- Mainline Daily Traffic Volume
- Interrupted Flow
- Elevation
- Outside Shoulder Width
- Vertical Grade

Mainline Daily Traffic Volume

Exponential equation; score = 5-(5*$e^{(ADT*-0.000039)}$)

Score	Condition
0	<6,000
0-5	6,000-160,000
5	>160,000

Interrupted Flow

Score	Condition
0	Not interrupted flow
5	Interrupted Flow

Elevation

Variance above 4000' divided by 1000; (Elev-4000)/1000

Score	Condition
0	< 4000'
0-5	4000'- 9000'
5	> 9000'

Outside Shoulder Width

Variance below 10'

Score	Condition
0	10' or above
0-5	10' - 5'
5	5' or less

Grade

Variance above 3% x 1.5

Score	Condition
0	< 3%
0-5	3% - 6.33%
5	>6.33%

Freight Performance Area

- Mainline Daily Truck Volume
- Detour Length
- Truck Buffer Index (TPTI-TTTI)
- Outside Shoulder Width

Mainline Daily Truck Volume

Exponential equation; score = 5-(5*$e^{(ADT*-0.00025)}$)

Score	Condition
0	<900
0-5	900-25,000
5	>25,000

Detour Length

Score	Condition
0	Detour < 10 miles
5	Detour > 10 miles

Truck Buffer Index

Truck Buffer Index x 10

Score	Condition
0	Buffer Index = 0.00
0-5	Buffer Index 0.00-0.50
5	Buffer Index > 0.50

Outside Shoulder Width

Variance below 10', if only 1 lane in each direction

Score	Condition
0	10' or above or >1 lane in each direction
0-5	10'-5' and 1 lane in each direction
5	5' or less and 1 lane in each direction

Performance Area Risk Factors

Solution Number	Mainline Traffic Vol (vpd) (2-way)	Solution Length (miles)	Bridge Detour Length (miles) (N19)	Elevation (ft)	Scour Critical Rating (0-9)	Carries Mainline Traffic (Y/N)	Bridge Vert. Clear (ft)	Mainline Truck Vol (vpd) (2-way)	Detour Length > 10 miles (Y/N)	Truck Buffer Index	Non-Truck Buffer Index	Grade (%)	Interrupted Flow (Y/N)	Outside/ Right Shoulder Width (ft)	1-lane each direction
2A	12,848	0.2		1,000				3,340	n	0.24	0.169	1	n	10	n
2B	12,848	0.25	20	1,000	8	n	16.23	3,340	n	0.24	0.169	1	n	10	n
3A	5,238	0.4		1,000				1,676	n	0.10	0.244	1	n	10	n
3B	5,238	0.25	10	1,000	8	n	16.19	1,676	n	0.10	0.244	1	n	10	n
6A	5,497	0.5		1,000				1,814	n	0.09	0.222	1	n	10	n
6B	5,497	0.25	4	1,000	8	n	16.09	1,814	n	0.09	0.222	1	n	10	n
7A	5,497	0.4		1,000				1,814	n	0.09	0.222	1	n	10	n
7B	5,497	0.25	4	1,000	8	n	16.19	1,814	n	0.09	0.222	1	n	10	n
8A	8,599	0.7	2	1,000	8	n	15.86	2,838	n	0.15	0.276	1	n	10	n
8B	8,599	0.25	2	1,000	8	n	15.86	2,838	n	0.15	0.276	1	n	10	n
9A	8,599	0.6		1,000				2,838	n	0.15	0.276	1	n	10	n
9B	8,599	0.25	4	1,000	8	n	16.04	2,838	n	0.15	0.276	1	n	10	n
10	9,671	34		1,000				3,191	n	0.08	0.158	1	n	10	n

Solution Number	Bridge	Pavement	Mobility	Safety	Freight	Risk Score (0 to 10)				
						Bridge	Pavement	Mobility	Safety	Freight
2A	n	y	y	y	y	0.00	3.20	0.93	0.78	2.62
2B	y	n	y	y	y	2.32	0.00	0.95	0.78	2.62
3A	n	y	y	y	y	0.00	1.76	1.29	0.37	1.36
3B	y	n	y	y	y	1.97	0.00	1.27	0.37	1.36
6A	n	y	y	y	y	0.00	1.86	1.20	0.38	1.37
6B	y	n	y	y	y	0.99	0.00	1.16	0.38	1.37
7A	n	y	y	y	y	0.00	1.86	1.19	0.38	1.37
7B	y	n	y	y	y	0.99	0.00	1.16	0.38	1.37
8A	y	y	y	y	y	0.92	2.64	1.58	0.57	2.03
8B	y	y	y	y	y	0.92	2.64	1.45	0.57	2.03
9A	n	y	y	y	y	0.00	2.64	1.55	0.57	2.03
9B	y	n	y	y	y	1.14	0.00	1.45	0.57	2.03
10	n	n	y	y	y	0.00	0.00	3.26	0.62	1.78

Appendix H: Candidate Solution Cost Estimates

Candidate #	Name	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Option	Scope	BMP	EMP	Unit	Quantity	Unit Cost	Construction Cost	Factored Construction Cost	Preliminary Engineering Cost (3%)	Design Cost (10%)	Right-of-Way Cost	Total Cost
CS8.1	CA Border to MP 1 Pavement	P	A	Rehabilitate Pavement	0	1	mi	1	LCCA	LCCA	$6,307,010	$189,210	$630,701	$0	$7,126,921
				Option A: Solution Total								**$189,210**	**$630,701**	**$0**	**$7,126,921**
			B	Replace Pavement	0	1	mi	1	LCCA	LCCA	$8,795,411	$263,862	$879,541	$0	$9,938,814
				Option B: Solution Total								**$263,862**	**$879,541**	**$0**	**$9,938,814**
CS8.2	Dome Valley Rd TI UP (#1325) WB Bridge Vertical Clearance Mitigation	M	A	Reprofile Mainline	21.0	21.11	mi	0.1	$968,000	$96,800	$212,960	$6,389	$21,296	$0	$240,645
				Option A: Solution Total								**$6,389**	**$21,296**	**$0**	**$240,645**
		M	B	Replace Bridge	21.06	21.06	SF	5673	$125	$709,125	$1,560,075	$46,802	$156,008	$0	$1,762,885
				Option B: Solution Total								**$46,802**	**$156,008**	**$0**	**$1,762,885**
CS8.3	Vekol Road TI UP (#550) WB&EB Bridge Vertical Clearance Mitigation	M	A	Reprofile Mainline	144.49	144.61	mi	0.24	$968,000	$232,320	$511,104	$15,333	$51,110	$0	$577,548
				Option A: Solution Total								**$15,333**	**$51,110**	**$0**	**$577,548**
		M	B	Replace Bridge	144.55	144.55	SF	6960	$125	$870,000	$1,914,000	$57,420	$191,400	$0	$2,162,820
				Option B: Solution Total								**$57,420**	**$191,400**	**$0**	**$2,162,820**
CS8.4	Smith Road OP EB (#1068) Bridge	M	A	Rehabilitate Bridge	157.55	157.55	SF	1	LCCA	LCCA	$854,791	$25,644	$85,479	$0	$965,914
				Option A: Solution Total								**$25,644**	**$85,479**	**$0**	**$965,914**
			B	Replace Bridge	157.55	157.55	SF	1	LCCA	LCCA	$1,174,758	$35,243	$117,476	$0	$1,327,477
				Option B: Solution Total								**$35,243**	**$117,476**	**$0**	**$1,327,477**
CS8.5	Smith Road OP WB (#1068) Bridge	M	A	Rehabilitate Bridge	157.55	157.55	SF	1	LCCA	LCCA	$846,582	$25,397	$84,658	$0	$956,638
				Option A: Solution Total								**$25,397**	**$84,658**	**$0**	**$956,638**
			B	Replace Bridge	157.55	157.55	SF	1	LCCA	LCCA	$1,175,351	$35,261	$117,535	$0	$1,328,147
				Option B: Solution Total								**$35,261**	**$117,535**	**$0**	**$1,328,147**
CS8.6	Stanfield Rd TI UP (#1090) WB&EB Bridge Vertical Clearance Mitigation	M	A	Reprofile Mainline	161.52	161.68	mi	0.32	$968,000	$309,760	$681,472	$20,444	$68,147	$0	$770,063
				Option A: Solution Total								**$20,444**	**$68,147**	**$0**	**$770,063**
			B	Replace Bridge	161.6	161.6	SF	6960	$125	$870,000	$1,914,000	$57,420	$191,400	$0	$2,162,820
				Option B: Solution Total								**$57,420**	**$191,400**	**$0**	**$2,162,820**
CS8.7	Murphy Rd UP (#1091) Bridge WB&EB Vertical Clearance Mitigation	M	A	Reprofile Mainline	162.44	162.56	mi	0.24	$968,000	$232,320	$511,104	$15,333	$51,110	$0	$577,548
				Option A: Solution Total								**$15,333**	**$51,110**	**$0**	**$577,548**
			B	Replace Bridge	162.5	162.5	SF	8499	$125	$1,062,375	$2,337,225	$70,117	$233,723	$0	$2,641,064
				Option B: Solution Total								**$70,117**	**$233,723**	**$0**	**$2,641,064**
CS8.8	Thornton Rd TI UP (#1196) WB&EB Rehab Bridge and Reprofile Mainline	M	A	Reprofile Mainline	172.43	172.67	mi	0.48	$975,000	$468,000	$1,029,600	$30,888	$102,960	$0	$1,163,448
				Rehab Bridge	172.55	172.55	SF	10794	$65	$701,610	$1,543,542	$46,306	$154,354	$0	$1,744,202
				Option A: Solution Total								**$77,194**	**$257,314**	**$0**	**$2,907,650**
	Thornton Rd TI UP (#1196) WB&EB Replace Bridge	M	B	Replace Bridge	172.55	172.55	SF	10794	$125	$1,349,250	$2,968,350	$89,051	$296,835	$0	$3,354,236
				Option B: Solution Total								**$89,051**	**$296,835**	**$0**	**$3,354,236**
CS8.9	Chuichu Rd UP (#1197) WB&EB Bridge Vertical Clearance Mitigation	M	A	Reprofile Mainline	173.44	173.62	mi	0.36	$968,000	$348,480	$766,656	$23,000	$76,666	$0	$866,321
				Option A: Solution Total								**$23,000**	**$76,666**	**$0**	**$866,321**
			B	Replace Bridge	173.53	173.53	SF	8448	$125	$1,056,000	$2,323,200	$69,696	$232,320	$0	$2,625,216
				Option B: Solution Total								**$69,696**	**$232,320**	**$0**	**$2,625,216**
CS8.10	Wellton - Mohawk Safety Improvements	M	-	Speed Feedback Signs (EB MP 28, EB MP 40, EB MP 45, EB MP 53.75, WB MP 23, WB MP 31.5, WB MP 44, WB MP 56.5)	22	56	Each	8	$25,000	$200,000	$440,000	$13,200	$44,000	$0	$497,200
				Install Lighting (WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99)	22	56	mi	3.45	$270,000	$931,500	$2,049,300	$61,479	$204,930	$0	$2,315,709
				Solution Total								**$74,679**	**$248,930**	**$0**	**$2,812,909**

Appendix I: Performance Effectiveness Scores

I-8 Candidate Solution Need Benefit Scoring

				Solution #	8-2A	8-2B	8-3A	8-3B	8-6A	8-6B	8-7A	8-7B	8-8 A	8-8 B	8-9A	8-9B	8-10
				Description	Dome Valley Rd TI WB UP (#1325) Reprofile	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	Vekol Road TI UP (#550) Reprofile	Vekol Road TI UP (#550) Bridge Replacement	Stanfield Rd TI UP (#1090) Reprofile	Stanfield Rd TI UP (#1090) Bridge Replacement	Murphy Rd UP (#1091) Reprofile	Murphy Rd UP (#1091) Bridge Replacement	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	Thornton Rd TI UP (#1196) Bridge Replacement	Chuichu Rd UP (#1197) Reprofile	Chuichu Rd UP (#1197) Bridge Replacement	Wellton - Mohawk Safety Improvements
	LEGEND:			Project Beg MP	21	21.06	144.5	144.55	161.5	161.6	162.4	162.5	172.4	172.55	173.4	173.53	22
		- user entered value		Project End MP	21.2	21.06	144.7	144.55	161.7	161.6	162.7	162.5	172.7	172.55	173.7	173.53	56
		- calculated value for reference only		Project Length (miles)	0.2	0	0.2	0	0.2	0	0.3	0	0.3	0	0.3	0	34
		- calculated value for entry/use in other spreadsheet		Segment Beg MP	16.3	16.3	120	120	147.6	147.6	147.6	147.6	166.5	166.5	166.5	166.5	21.4
		- for input into Performance Effectiveness Score spreadsheet		Segment End MP	21.4	21.4	147.6	147.6	166.5	166.5	166.5	166.5	178	178	178	178	56.5
		- assumed values (do not modify)		Segment Length (miles)	5.1	5.1	27.6	27.6	18.9	18.9	18.9	18.9	11.5	11.5	11.5	11.5	35.1
				Segment #	8-2	8-2	8-7	8-7	8-8	8-8	8-8	8-8	8-9	8-9	8-9	8-9	8-3
				Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	4
				Project Type (one-way or two-way)	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
				Additional Lanes (one-way)													
				Pro-Rated # of Lanes	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	4.00
		Notes and Directions	**Description**														
SAFETY	**DIRECTIONAL SAFETY**	Input current value from performance system (direction 1)	Orig Segment Directional Safety Index (WB)		0.250	0.250	1.320	1.320	0.680	0.680	0.680	0.680	0.980	0.980	0.980	0.980	0.970
		Input current value from performance system (direction 1)	Orig Segment Directional Fatal Crashes (direction 1)		0	0	2	2	1	1	1	1	1	1	1	1	4
		Input current value from performance system (direction 1)	Orig Segment Directional Incap Crashes (direction 1)		3	3	2	2	1	1	1	1	2	2	2	2	9
		Input current value from performance system (direction 1)	Original Fatal Crashes in project limits (direction 1)		0	0	0	0	0	0	0	0	0	0	0	0	4
		Input current value from performance system (direction 1)	Original Incap Crashes in project limits (direction 1)		1	1	0	0	0	0	0	0	0	0	0	0	9
		Input CMF value (direction 1) - If no CMF enter 1.0	CMF 1 (direction 1)		0.7	0.95	0.7	0.95	0.7	0.95	0.7	0.95	0.7	0.95	0.7	0.95	Calculated in Separate Worksheet
		Input CMF value (direction 1) - If no CMF enter 1.0	CMF 2 (direction 1)		1	1	1	1	1	1	1	1	0.95	1	1	1	
		Input CMF value (direction 1) - If no CMF enter 1.0	CMF 3 (direction 1)		1	1	1	1	1	1	1	1	1	1	1	1	
		Calculated Value (direction 1)	Total CMF (direction 1)		0.700	0.950	0.700	0.950	0.700	0.950	0.700	0.950	0.665	0.950	0.700	0.950	See Worksheet
		Calculated Value (direction 1)	Fatal Crash reduction (direction 1)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.810
		Calculated Value (direction 1)	Incap Crash reduction (direction 1)		0.300	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.370
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 1)	Post-Project Segment Directional Fatal Crashes (direction 1)		0.000	0.000	2.000	2.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	3.190
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 1)	Post-Project Segment Directional Incap Crashes (direction 1)		2.700	2.950	2.000	2.000	1.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	8.630
		Input value from updated Safety Index spreadsheet (direction 1)	Post-Project Segment Directional Safety Index (direction 1)		0.230	0.248	1.320	1.320	0.680	0.680	0.680	0.680	0.980	0.980	0.980	0.980	0.790
		Enter in Safety Needs spreadsheet to calculate new segment level Safety Need (direction 1)	Post-Project Segment Directional Safety Index (direction 1)		0.230	0.248	1.320	1.320	0.680	0.680	0.680	0.680	0.980	0.980	0.980	0.980	0.790
		Input current value from performance system (direction 2)	Orig Segment Directional Safety Index (EB)		0.330	0.330	0.040	0.040	0.680	0.680	0.680	0.680	0.210	0.210	0.210	0.210	0.950
		Input current value from performance system (direction 2)	Orig Segment Directional Fatal Crashes (direction 2)		0	0	0	0	1	1	1	1	0	0	0	0	4
		Input current value from performance system (direction 2)	Orig Segment Directional Incap Crashes (direction 2)		4	4	1	1	3	3	3	3	4	4	4	4	10
		Input current value from performance system (direction 2)	Original Fatal Crashes in project limits (direction 2)		0	0	0	0	0	0	0	0	0	0	0	0	4
		Input current value from performance system (direction 2)	Original Incap Crashes in project limits (direction 2)		0	0	0	0	0	0	0	0	1	1	1	1	10
		Input CMF value (direction 2) - If no CMF enter 1.0	CMF 1 (direction 2)		1	0.95	0.7	0.95	0.7	0.95	0.7	0.95	0.7	0.95	0.7	0.95	Calculated in Separate Worksheet
		Input CMF value (direction 2) - If no CMF enter 1.0	CMF 1 (direction 2)		1	1	1	1	1	1	1	1	0.95	1	1	1	
		Input CMF value (direction 2) - If no CMF enter 1.0	CMF 1 (direction 2)		1	1	1	1	1	1	1	1	1	1	1	1	
		Calculated Value (direction 2)	Total CMF (direction 2)		1.000	0.950	0.700	0.950	0.700	0.950	0.700	0.950	0.665	0.950	0.700	0.950	See Worksheet
		Calculated Value (direction 2)	Fatal Crash reduction (direction 2)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060
		Calculated Value (direction 2)	Incap Crash reduction (direction 2)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.335	0.050	0.300	0.050	0.180
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 2)	Post-Project Segment Directional Fatal Crashes (direction 2)		0.000	0.000	0.000	0.000	1.000	1.000	1.000	1.000	0.000	0.000	0.000	0.000	3.940
		Enter in Safety Index spreadsheet to calculate new Safety Index (direction 2)	Post-Project Segment Directional Incap Crashes (direction 2)		4.000	4.000	1.000	1.000	3.000	3.000	3.000	3.000	3.665	3.950	3.700	3.950	9.820
		Input value from updated Safety Index spreadsheet (direction 2)	Post-Project Segment Directional Safety Index (direction 2)		0.330	0.330	0.040	0.040	0.680	0.680	0.680	0.680	0.190	0.209	0.196	0.209	0.930
		Enter in Safety Needs spreadsheet to calculate new segment level Safety Need (direction 2)	Post-Project Segment Directional Safety Index (direction 2)		0.330	0.330	0.040	0.040	0.680	0.680	0.680	0.680	0.190	0.209	0.196	0.209	0.930
	SAFETY INDEX	Calculated Value - verify that it matches current performance system	Current Safety Index		0.290	0.290	0.680	0.680	0.710	0.710	0.710	0.710	0.595	0.595	0.595	0.595	0.960
		Enter in Safety Needs spreadsheet to calculate new segment level Safety Need	Post-Project Safety Index		0.280	0.287	0.680	0.680	0.680	0.680	0.680	0.680	0.585	0.593	0.587	0.585	0.860
	Needs	User entered value from Safety Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Safety Need		0.191	0.191	0.588	0.588	0.469	0.469	0.469	0.469	0.426	0.426	0.426	0.426	1.409
		User entered value from Safety Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Safety Need		0.184	0.189	0.588	0.588	0.469	0.469	0.469	0.469	0.419	0.425	0.421	0.425	1.077

			Solution #	8-2A	8-2B	8-3A	8-3B	8-6A	8-6B	8-7A	8-7B	8-8 A	8-8 B	8-9A	8-9B	8-10
			Description	Dome Valley Rd TI WB UP (#1325) Reprofile	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	Vekol Road TI UP (#550) Reprofile	Vekol Road TI UP (#550) Bridge Replacement	Stanfield Rd TI UP (#1090) Reprofile	Stanfield Rd TI UP (#1090) Bridge Replacement	Murphy Rd UP (#1091) Reprofile	Murphy Rd UP (#1091) Bridge Replacement	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	Thornton Rd TI UP (#1196) Bridge Replacement	Chuichu Rd UP (#1197) Reprofile	Chuichu Rd UP (#1197) Bridge Replacement	Wellton - Mohawk Safety Improvements
	LEGEND:		Project Beg MP	21	21.06	144.5	144.55	161.5	161.6	162.4	162.5	172.4	172.55	173.4	173.53	22
		- user entered value	Project End MP	21.2	21.06	144.7	144.55	161.7	161.6	162.7	162.5	172.7	172.55	173.7	173.53	56
		- calculated value for reference only	Project Length (miles)	0.2	0	0.2	0	0.2	0	0.3	0	0.3	0	0.3	0	34
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	16.3	16.3	120	120	147.6	147.6	147.6	147.6	166.5	166.5	166.5	166.5	21.4
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	21.4	21.4	147.6	147.6	166.5	166.5	166.5	166.5	178	178	178	178	56.5
		- assumed values (do not modify)	Segment Length (miles)	5.1	5.1	27.6	27.6	18.9	18.9	18.9	18.9	11.5	11.5	11.5	11.5	35.1
			Segment #	8-2	8-2	8-7	8-7	8-8	8-8	8-8	8-8	8-9	8-9	8-9	8-9	8-3
			Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	4
			Project Type (one-way or two-way)	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)													
			Pro-Rated # of Lanes	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	4.00
		Notes and Directions	**Description**													
MOBILITY	**MOBILITY INDEX**	Input current value from performance system	Original Segment Mobility Index	0.320	0.320	0.080	0.080	0.090	0.090	0.090	0.090	0.140	0.140	0.140	0.140	0.170
		Enter in Mobility Index Spreadsheet to determine new segment level Mobility Index	Post-Project # of Lanes (both directions)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	4.00
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Mobility Index	0.32	0.32	0.08	0.08	0.09	0.09	0.09	0.09	0.14	0.14	0.14	0.14	0.17
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Mobility Index	0.320	0.320	0.080	0.080	0.090	0.090	0.090	0.090	0.140	0.140	0.140	0.140	0.170
	FUT V/C	Input current value from performance system	Original Segment Future V/C	0.360	0.360	0.090	0.090	0.110	0.110	0.110	0.110	0.160	0.160	0.160	0.160	0.190
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Future V/C	0.360	0.360	0.090	0.090	0.110	0.110	0.110	0.110	0.160	0.160	0.160	0.160	0.190
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Future V/C	0.360	0.360	0.090	0.090	0.110	0.110	0.110	0.110	0.160	0.160	0.160	0.160	0.190
	PEAK HOUR V/C	Input current value from performance system (direction 1)	Original Segment Peak Hour V/C (WB)	0.230	0.230	0.080	0.080	0.080	0.080	0.080	0.080	0.100	0.100	0.100	0.100	0.090
		Input current value from performance system (direction 2)	Original Segment Peak Hour V/C (EB)	0.260	0.260	0.090	0.090	0.090	0.090	0.090	0.090	0.130	0.130	0.130	0.130	0.090
		***If One-Way project,** enter in Mobility Index Spreadsheet to determine new segment level Peak Hour V/C. **If Two-Way project,** disregard	Adjusted total # of Lanes for use in directional peak hr	2.00	2.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Input value from updated Mobility Index spreadsheet (direction 1)	Post-Project Segement Peak Hr V/C (WB)	0.23	0.23	0.08	0.08	0.08	0.08	0.08	0.08	0.10	0.10	0.10	0.10	0.09
		Input value from updated Mobility Index spreadsheet (direction 2)	Post-Project Segement Peak Hr V/C (EB)	0.26	0.26	0.09	0.09	0.09	0.09	0.09	0.09	0.13	0.13	0.13	0.13	0.09
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Peak Hr V/C (direction 1)	0.230	0.230	0.080	0.080	0.080	0.080	0.080	0.080	0.100	0.100	0.100	0.100	0.090
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Peak Hr V/C (direction 2)	0.260	0.260	0.090	0.090	0.090	0.090	0.090	0.090	0.130	0.130	0.130	0.130	0.090
	TTI AND PTI	Calculated Value (both directions)	Safety Reduction Factor	0.966	0.990	1.000	1.000	0.958	0.958	0.958	0.958	0.983	0.997	0.987	0.983	0.896
		Calculated Value (both directions)	Safety Reduction	0.034	0.010	0.000	0.000	0.042	0.042	0.042	0.042	0.017	0.003	0.013	0.017	0.104
		Calculated Value (both directions)	Mobility Reduction Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
		Calculated Value (both directions)	Mobility Reduction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Input current value from performance system (direction 1)	Original Directional Segment TTI (WB)	1.000	1.000	1.090	1.090	1.090	1.090	1.090	1.090	1.100	1.100	1.100	1.100	1.080
		Input current value from performance system (direction 1)	Original Directional Segment PTI (WB)	1.120	1.120	1.260	1.260	1.240	1.240	1.240	1.240	1.330	1.330	1.330	1.330	1.250
		Input current value from performance system (direction 2)	Original Directional Segment TTI (EB)	1.050	1.050	1.100	1.100	1.080	1.080	1.080	1.080	1.070	1.070	1.070	1.070	1.080
		Input current value from performance system (direction 2)	Original Directional Segment PTI (EB)	1.450	1.450	1.270	1.270	1.250	1.250	1.250	1.250	1.270	1.270	1.270	1.270	1.230
		Calculated Value (both directions)	Reduction Factor for Segment TTI	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Calculated Value (both directions)	Reduction Factor for Segment PTI	0.010	0.003	0.000	0.000	0.013	0.013	0.013	0.013	0.005	0.001	0.004	0.005	0.031
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 1)	Post-Project Directional Segment TTI (direction 1)	1.000	1.000	1.090	1.090	1.090	1.090	1.090	1.090	1.100	1.100	1.100	1.100	1.080
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 1)	Post-Project Directional Segment PTI (direction 1)	1.108	1.117	1.260	1.260	1.224	1.224	1.224	1.224	1.323	1.329	1.325	1.323	1.211
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 2)	Post-Project Directional Segment TTTI (direction 2)	1.050	1.050	1.100	1.100	1.080	1.080	1.080	1.080	1.070	1.070	1.070	1.070	1.080
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 2)	Post-Project Directional Segment TPTI (direction 2)	1.450	1.450	1.270	1.270	1.234	1.234	1.234	1.234	1.264	1.269	1.265	1.264	1.192
	CLOSURE EXTENT	Input current value from performance system (direction 1)	Orig Segment Directional Closure Extent (WB)	0.440	0.440	0.050	0.050	0.040	0.040	0.040	0.040	0.020	0.020	0.020	0.020	0.190
		Input current value from performance system (direction 2)	Orig Segment Directional Closure Extent (EB)	0.120	0.120	0.040	0.040	0.020	0.020	0.020	0.020	0.100	0.100	0.100	0.100	0.210
		Input value from HCRS	Segment Closures with fatalities/injuries	1	1	7	7	4	4	4	4	4	4	4	4	12
		Input value from HCRS	Total Segment Closures	10	10	12	12	6	6	6	6	7	7	7	7	19
		Calculated Value (both directions)	% Closures with Fatality/Injury	0.10	0.10	0.58	0.58	0.67	0.67	0.67	0.67	0.57	0.57	0.57	0.57	0.63
		Calculated Value (both directions)	Closure Reduction	0.003	0.001	0.000	0.000	0.028	0.028	0.028	0.028	0.010	0.002	0.008	0.010	0.066
		Calculated Value (both directions)	Closure Reduction Factor	0.997	0.999	1.000	1.000	0.972	0.972	0.972	0.972	0.990	0.998	0.992	0.990	0.934
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 1)	Post-Project Segment Directional Closure Extent (direction 1)	0.438	0.440	0.050	0.050	0.039	0.039	0.039	0.039	0.020	0.020	0.020	0.020	0.178
		Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 2)	Post-Project Segment Directional Closure Extent (direction 2)	0.120	0.120	0.040	0.040	0.019	0.019	0.019	0.019	0.099	0.100	0.099	0.099	0.196
	BICYCLE ACCOM	Input current value from performance system	Orig Segment Bicycle Accomodation %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		Input current value from performance system	Orig Segment Outside Shoulder width	10	10	10	10	10	10	10	10	10	10	10	10	10
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Outside Shoulder width	10	10	10	10	10	10	10	10	10	10	10	10	10
		Input value from updated Mobility Index spreadsheet	Post-Project Segment Bicycle Accomodation (%)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		Enter in Mobiity Needs spreadsheet to calculate new segment level Mobility Need	Post-Project Segment Bicycle Accomodation (%)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Needs	User entered value from Mobility Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Mobility Need	0.772	0.772	0.287	0.287	0.293	0.293	0.293	0.293	0.357	0.357	0.357	0.357	0.416
		User entered value from Mobility Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Mobility Need	0.770	0.770	0.287	0.287	0.293	0.293	0.293	0.293	0.356	0.356	0.356	0.356	0.411

			Solution #	8-2A	8-2B	8-3A	8-3B	8-6A	8-6B	8-7A	8-7B	8-8 A	8-8 B	8-9A	8-9B	8-10
			Description	Dome Valley Rd TI WB UP (#1325) Reprofile	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	Vekol Road TI UP (#550) Reprofile	Vekol Road TI UP (#550) Bridge Replacement	Stanfield Rd TI UP (#1090) Reprofile	Stanfield Rd TI UP (#1090) Bridge Replacement	Murphy Rd UP (#1091) Reprofile	Murphy Rd UP (#1091) Bridge Replacement	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	Thornton Rd TI UP (#1196) Bridge Replacement	Chuichu Rd UP (#1197) Reprofile	Chuichu Rd UP (#1197) Bridge Replacement	Wellton - Mohawk Safety Improvements
	LEGEND:		Project Beg MP	21	21.06	144.5	144.55	161.5	161.6	162.4	162.5	172.4	172.55	173.4	173.53	22
		- user entered value	Project End MP	21.2	21.06	144.7	144.55	161.7	161.6	162.7	162.5	172.7	172.55	173.7	173.53	56
		- calculated value for reference only	Project Length (miles)	0.2	0	0.2	0	0.2	0	0.3	0	0.3	0	0.3	0	34
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	16.3	16.3	120	120	147.6	147.6	147.6	147.6	166.5	166.5	166.5	166.5	21.4
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	21.4	21.4	147.6	147.6	166.5	166.5	166.5	166.5	178	178	178	178	56.5
		- assumed values (do not modify)	Segment Length (miles)	5.1	5.1	27.6	27.6	18.9	18.9	18.9	18.9	11.5	11.5	11.5	11.5	35.1
			Segment #	8-2	8-2	8-7	8-7	8-8	8-8	8-8	8-8	8-9	8-9	8-9	8-9	8-3
			Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	4
			Project Type (one-way or two-way)	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)													
			Pro-Rated # of Lanes	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	4.00
		Notes and Directions	**Description**													
FREIGHT	**TTI AND TPTI**	Input current value from performance system (direction 1)	Original Directional Segment TTTI (WB)	1.060	1.060	1.030	1.030	1.030	1.030	1.030	1.030	1.060	1.060	1.060	1.060	1.040
		Input current value from performance system (direction 1)	Original Directional Segment TPTI (WB)	1.230	1.230	1.130	1.130	1.110	1.110	1.110	1.110	1.230	1.230	1.230	1.230	1.110
		Input current value from performance system (direction 2)	Original Directional Segment TTTI (EB)	1.000	1.000	1.030	1.030	1.030	1.030	1.030	1.030	1.040	1.040	1.040	1.040	1.040
		Input current value from performance system (direction 2)	Original Directional Segment TPTI (EB)	1.300	1.300	1.130	1.130	1.130	1.130	1.130	1.130	1.190	1.190	1.190	1.190	1.140
		Calculated Value (both directions)	Reduction Factor for Segment TTTI (both directions)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		Calculated Value (both directions)	Reduction Factor for Segment TPTI (both directions)	0.005	0.002	0.000	0.000	0.006	0.006	0.006	0.006	0.003	0.001	0.002	0.003	0.016
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 1)	Post-Project Directional Segment TTTI (direction 1)	1.060	1.060	1.030	1.030	1.030	1.030	1.030	1.030	1.060	1.060	1.060	1.060	1.040
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 1)	Post-Project Directional Segment TPTI (direction 1)	1.224	1.228	1.130	1.130	1.103	1.103	1.103	1.103	1.227	1.229	1.228	1.227	1.093
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 2)	Post-Project Directional Segment TTTI (direction 2)	1.000	1.000	1.030	1.030	1.030	1.030	1.030	1.030	1.040	1.040	1.040	1.040	1.040
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 2)	Post-Project Directional Segment TPTI (direction 2)	1.300	1.300	1.130	1.130	1.123	1.123	1.123	1.123	1.187	1.189	1.188	1.187	1.122
	FREIGHT INDEX	Value from above	Original Segment TPTI (direction 1)	1.230	1.230	1.130	1.130	1.110	1.110	1.110	1.110	1.230	1.230	1.230	1.230	1.110
		Value from above	Original Segment TPTI (direction 2)	1.300	1.300	1.130	1.130	1.130	1.130	1.130	1.130	1.190	1.190	1.190	1.190	1.140
		Calculated Value	Original Segment Freight Index	0.791	0.791	0.885	0.885	0.893	0.893	0.893	0.893	0.826	0.826	0.826	0.826	0.889
		Calculated Value	Post-Project Segment TPTI (direction 1)	1.224	1.228	1.130	1.130	1.103	1.103	1.103	1.103	1.227	1.229	1.228	1.227	1.093
		Calculated Value	Post-Project Segment TPTI (direction 2)	1.300	1.300	1.130	1.130	1.123	1.123	1.123	1.123	1.187	1.189	1.188	1.187	1.122
		Enter in Freight Needs spreadsheet to update segment level Freight Need	Post-Project Segment Freight Index	0.793	0.791	0.885	0.885	0.899	0.899	0.899	0.899	0.829	0.827	0.828	0.829	0.903
	CLOSURE DURATION	Input current value from performance system (direction 1)	Orig Segment Directional Closure Duration (WB)	140.180	140.180	11.420	11.420	25.180	25.180	25.180	25.180	1.530	1.530	1.530	1.530	28.100
		Input current value from performance system (direction 2)	Orig Segment Directional Closure Duration (EB)	17.230	17.230	13.250	13.250	6.290	6.290	6.290	6.290	27.010	27.010	27.010	27.010	73.080
		Calculated Value	Segment Closures with fatalities	1	1	7	7	4	4	4	4	4	4	4	4	12
		Calculated Value	Total Segment Closures	10	10	12	12	6	6	6	6	7	7	7	7	19
		Calculated Value	% Closures with Fatality	0.10	0.10	0.58	0.58	0.67	0.67	0.67	0.67	0.57	0.57	0.57	0.57	0.63
		Calculated Value	Closure Reduction	0.003	0.001	0.000	0.000	0.028	0.028	0.028	0.028	0.010	0.002	0.008	0.010	0.066
		Calculated Value	Closure Reduction Factor	0.997	0.999	1.000	1.000	0.972	0.972	0.972	0.972	0.990	0.998	0.992	0.990	0.934
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 1)	Post-Project Segment Directional Closure Duration (direction 1)	139.697	140.035	11.420	11.420	24.471	24.471	24.471	24.471	1.515	1.527	1.518	1.515	26.251
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 2)	Post-Project Segment Directional Closure Duration (direction 2)	17.230	17.230	13.250	13.250	6.113	6.113	6.113	6.113	26.751	26.958	26.802	26.751	68.272
	VERT CLR	Input current value from performance system	Original Segment Vertical Clearance	16.23	16.23	16.19	16.19	16.09	16.09	16.09	16.09	15.86	15.86	15.86	15.86	16.20
		Input current value from performance system	Original vertical clearance for specific bridge	16.23	16.23	16.19	16.19	16.09	16.09	16.19	16.19	15.86	15.86	16.04	16.04	16.20
		Input post-project value (depends on solution)	Post-Project vertical clearance for specific bridge	16.75	16.75	16.75	16.50	16.75	16.50	16.75	16.50	16.75	16.50	16.75	16.50	16.20
		Input post-project value (depends on solution)(force segment clearance to equal this specific bridge)	Post-Project Segment Vertical Clearance	16.75	16.75	16.75	16.50	16.75	16.50	16.75	16.50	16.75	16.50	16.75	16.50	16.20
		Enter in Freight Needs spreadsheet to update segment level Freight Need	Post-Project Segment Vertical Clearance	16.75	16.75	16.75	16.50	16.75	16.50	16.75	16.50	16.75	16.50	16.75	16.50	16.20
	Needs	User entered value from Freight Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Freight Need	0.734	0.734	0.457	0.457	0.535	0.535	0.535	0.535	0.68	0.68	0.68	0.68	0.506
		User entered value from Freight Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Freight Need	0.493	0.493	0.185	0.185	0.189	0.189	0.189	0.189	0.195	0.195	0.195	0.195	0.494

		Solution #	8-2A	8-2B	8-3A	8-3B	8-6A	8-6B	8-7A	8-7B	8-8 A	8-8 B	8-9A	8-9B	8-10
		Description	Dome Valley Rd TI WB UP (#1325) Reprofile	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	Vekol Road TI UP (#550) Reprofile	Vekol Road TI UP (#550) Bridge Replacement	Stanfield Rd TI UP (#1090) Reprofile	Stanfield Rd TI UP (#1090) Bridge Replacement	Murphy Rd UP (#1091) Reprofile	Murphy Rd UP (#1091) Bridge Replacement	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	Thornton Rd TI UP (#1196) Bridge Replacement	Chuichu Rd UP (#1197) Reprofile	Chuichu Rd UP (#1197) Bridge Replacement	Wellton - Mohawk Safety Improvements
LEGEND:		Project Beg MP	21	21.06	144.5	144.55	161.5	161.6	162.4	162.5	172.4	172.55	173.4	173.53	22
	- user entered value	Project End MP	21.2	21.06	144.7	144.55	161.7	161.6	162.7	162.5	172.7	172.55	173.7	173.53	56
	- calculated value for reference only	Project Length (miles)	0.2	0	0.2	0	0.2	0	0.3	0	0.3	0	0.3	0	34
	- calculated value for entry/use in other spreadsheet	Segment Beg MP	16.3	16.3	120	120	147.6	147.6	147.6	147.6	166.5	166.5	166.5	166.5	21.4
	- for input into Performance Effectiveness Score spreadsheet	Segment End MP	21.4	21.4	147.6	147.6	166.5	166.5	166.5	166.5	178	178	178	178	56.5
	- assumed values (do not modify)	Segment Length (miles)	5.1	5.1	27.6	27.6	18.9	18.9	18.9	18.9	11.5	11.5	11.5	11.5	35.1
		Segment #	8-2	8-2	8-7	8-7	8-8	8-8	8-8	8-8	8-9	8-9	8-9	8-9	8-3
		Current # of Lanes (both directions)	2	2	2	2	2	2	2	2	2	2	2	2	4
		Project Type (one-way or two-way)	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
		Additional Lanes (one-way)													
		Pro-Rated # of Lanes	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	4.00
	Notes and Directions	**Description**													
BRIDGE INDEX	Input current value from performance system	Original Segment Bridge Index									4.00	4.00			
	Input current value from performance system	Original lowest rating for specific bridge									4	4			
	Input post-project value (For repair +1, rehab +2, replace=8)	Post-Project lowest rating for specific bridge									6	8			
	Enter in Bridge Index spreadsheet to calculate new Bridge Index	Post-Project lowest rating for specific bridge	0	0	0	0	0	0	0	0	6	8	0	0	0
	Input updated segment value from updated Bridge Index spreadsheet	Post-Project Segment Bridge Index									6.00	8.00			
	Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment Bridge Index	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	8.00	0.00	0.00	0.00
SUFF RATING	Input current value from performance system	Original Segment Sufficiency Rating									68.65	68.65			
	Input current value from performance system	Original Sufficiency Rating for specific bridge									68.65	68.65			
	Input post-project value (For repair +10, rehab +20, replace=98)	Post-Project Sufficiency Rating for specific bridge									88.65	98.00			
	Enter in Bridge Index spreadsheet to calculate new Bridge Index	Post-Project Sufficiency Rating for specific bridge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.65	98.00	0.00	0.00	0.00
	Input updated segment value from updated Bridge Index spreadsheet	Post-Project Segment Sufficiency Rating									88.65	98.00			
	Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment Sufficiency Rating	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.65	98.00	0.00	0.00	0.00
BR RTNG	Input current value from performance system	Original Segment Bridge Rating									4	4			
	Input updated segment value from updated Bridge Index spreadsheet	Post-Project Segment Bridge Rating									6	8			
	Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment Bridge Rating	0	0	0	0	0	0	0	0	6	8	0	0	0
% FUN OB	Input current value from performance system	Original Segment % Functionally Obsolete													
	Input updated value from updated Bridge Index spreadsheet (only remove bridge from FO if replace or rehab)	Post-Project Segment % Functionally Obsolete													
	Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment % Functionally Obsolete	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Needs	User entered value from Bridge Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Bridge Need	1.79	1.79	0.586	0.586	0.989	0.989	0.989	0.989	1.204	1.204	1.204	1.204	0.384
	User entered value from Bridge Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Bridge Need	1.79	1.79	0.586	0	0.989	0	0.989	0	0	0	1.204	0	0.384
PAVEMENT INDEX	Input current value from performance system	Original Segment Pavement Index	3.58	3.58	4.11		3.55		3.55		3.48		3.48		
	Input current value from performance system	Original Segment IRI in project limits	92	92	60		34		40		103		105		
	Input current value from performance system	Original Segment Cracking in project limits	2	2	12		0		0		5		15		
	Input post-project value (For rehab, increase to 45; for replace increase to 30)	Post-Project IRI in project limits	30	30	30		30		30		103		30		
	Enter in Pavement Index spreadsheet to calculate new Pavement Index	Post-Project IRI in project limits	30	30	30		30		30		103		30		0
	Input post-project value (Lower to 0 for rehab or replace)	Post-Project Cracking in project limits	0	0	0		0		0		5		0		
	Enter in Pavement Index spreadsheet to calculate new Pavement Index	Post-Project Cracking in project limits	0	0	0		0		0		5		0		0
	Input updated segment value from updated Pavement Index spreadsheet	Post-Project Segment Pavement Index	3.59	3.59	4.15		3.57		3.56		3.48		3.56		
	Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Pavement Index	3.59	3.59	4.15		3.57		3.56		3.48		3.56		0
DIRECTION PSR	Input current value from performance system (direction 1)	Original Segment Directional PSR (WB)	3.79	3.79	4.18		3.75		3.75		3.54		3.54		
	Input current value from performance system (direction 2)	Original Segment Directional PSR (EB)	3.74	3.74	4.16		3.83		3.83		3.4		3.4		
	Value from above	Original Segment IRI in project limits	92	92	60		34		40		103		105		0
	Value from above	Post-Project directional IRI in project limits	30	30	30		30		30		103		30		0
	Input updated segment value from updated Pavement Index spreadsheet (direction 1)	Post-Project Segment Directional PSR (WB)	3.81	3.81	4.2		3.8		3.79		3.54		3.63		
	Input updated segment value from updated Pavement Index spreadsheet (direction 2)	Post-Project Segment Directional PSR (EB)	3.74	3.74	4.17		3.84		3.84		3.54		3.49		
	Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (WB)	3.81	3.81	4.2		3.8		3.79		3.54		3.63		0
	Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (EB)	3.74	3.74	4.17		3.84		3.84		3.54		3.49		0
% FAIL	Input current value from performance system	Original Segment % Failure	12.5%	12.5%	5.4%		18.4%		18.4%		37.5%		37.5%		
	Input value from updated Pavement Index spreadsheet	Post-Project Segment % Failure	12.5%	12.5%	5.4%		18.4%		18.4%		37.5%		37.5%		
	Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment % Failure	12.5%	12.5%	5.4%		18.4%		18.4%		37.5%		37.5%		0.0%
Needs	User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Pavement Need	0.68	0.68	0.054	0.054	0.977	0.977	0.977	0.977	1.926	1.926	1.926	1.926	0.678
	User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Pavement Need	0.65	0.65	0.054	0.054	0.868	0.977	0.921	0.977	1.926	1.187	1.429	1.926	0.678

CMF APPLICATION

CS 8.10 (MP 22-56)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir
22	56	0.75	1	1	1	WB
22	56	0.94	1	1	1	EB
22	56	0.94	1	1	1	WB

*Dark only: WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99

*	Segment Crashes	WB	EB
	Fatal	4	4
	Incap	9	10

Crashes in Solution Limits	WB	EB
Fatal	4	4
Incap	9	10

Crash Reduction	WB	EB
Fatal	0.810	0.060
Incap	0.370	0.180

Post-Solution Crashes	WB	EB
Fatal	3.190	3.940
Incap	8.630	9.820

Performance Area Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Pavement					Bridge					Safety					Mobility					Freight					Total Risk Factored Performance Area Benefit
				Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	Existing Segment Need	Post-Solution Segment Need	Raw Score	Risk Factor	Factored Score	
CS8.2A	Dome Valley Rd TI WB UP (#1325) Reprofile	21.06	0.24	0.680	0.651	0.029	3.20	0.093	1.790	1.790	0.000	0.00	0.000	0.093	0.089	0.004	0.78	0.003	1.063	1.060	0.003	0.93	0.003	0.734	0.543	0.191	2.62	0.501	0.599
CS8.2B	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	21.06	1.76	0.680	0.680	0.000	0.00	0.000	1.790	1.300	0.490	2.32	1.136	0.093	0.089	0.004	0.78	0.003	1.063	1.060	0.003	0.95	0.003	0.734	0.543	0.191	2.62	0.501	1.643
CS8.3A	Vekol Road TI UP (#550) Reprofile	144.55	0.58	0.054	0.054	0.000	1.76	0.000	0.586	0.586	0.000	0.00	0.000	0.144	0.144	0.000	0.37	0.000	0.281	0.281	0.000	1.29	0.000	0.457	0.235	0.222	1.36	0.302	0.302
CS8.3B	Vekol Road TI UP (#550) Bridge Replacement	144.55	2.16	0.054	0.054	0.000	0.00	0.000	0.586	0.000	0.586	1.97	1.156	0.144	0.144	0.000	0.37	0.000	0.281	0.281	0.000	1.27	0.000	0.457	0.235	0.222	1.36	0.302	1.457
CS8.6A	Stanfield Rd TI UP (#1090) Reprofile	161.6	0.77	0.977	0.868	0.109	1.86	0.203	0.989	0.989	0.000	0.00	0.000	0.230	0.230	0.000	0.38	0.000	0.288	0.288	0.000	1.20	0.000	0.535	0.239	0.296	1.37	0.404	0.607
CS8.6B	Stanfield Rd TI UP (#1090) Bridge Replacement	161.6	2.16	0.977	0.977	0.000	0.00	0.000	0.989	0.520	0.469	0.99	0.462	0.230	0.230	0.000	0.38	0.000	0.288	0.288	0.000	1.16	0.000	0.535	0.239	0.296	1.37	0.404	0.866
CS8.7A	Murphy Rd UP (#1091) Reprofile	162.5	0.58	0.977	0.921	0.056	1.86	0.104	0.989	0.989	0.000	0.00	0.000	0.230	0.230	0.000	0.38	0.000	0.288	0.288	0.000	1.19	0.000	0.535	0.239	0.296	1.37	0.404	0.508
CS8.7B	Murphy Rd UP (#1091) Bridge Replacement	162.5	2.64	0.977	0.977	0.000	0.00	0.000	0.989	0.450	0.539	0.99	0.531	0.230	0.230	0.000	0.38	0.000	0.288	0.288	0.000	1.16	0.000	0.535	0.239	0.296	1.37	0.404	0.935
CS8.8A	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	172.55	2.91	1.926	1.187	0.739	2.64	1.953	1.684	0.840	0.844	0.92	0.777	0.679	0.678	0.001	0.57	0.001	0.352	0.351	0.001	1.58	0.002	0.680	0.245	0.435	2.03	0.881	3.613
CS8.8B	Thornton Rd TI UP (#1196) Bridge Replacement	172.55	3.35	1.926	1.926	0.000	2.64	0.000	1.684	0.520	1.164	0.92	1.072	0.679	0.678	0.001	0.57	0.001	0.352	0.351	0.001	1.45	0.001	0.680	0.245	0.435	2.03	0.881	1.955
CS8.9A	Chuichu Rd UP (#1197) Reprofile	173.53	0.87	1.926	1.429	0.497	2.64	1.313	1.684	1.684	0.000	0.00	0.000	0.679	0.678	0.001	0.57	0.001	0.352	0.351	0.001	1.55	0.002	0.680	0.245	0.435	2.03	0.881	2.196
CS8.9B	Chuichu Rd UP (#1197) Bridge Replacement	173.53	2.62	1.926	1.926	0.000	0.00	0.000	1.684	0.900	0.784	1.14	0.892	0.679	0.678	0.001	0.57	0.001	0.352	0.351	0.001	1.45	0.001	0.680	0.245	0.435	2.03	0.881	1.775
CS8.10	Wellton-Mohawk Safety Improvements	22-56	2.81	0.678	0.678	0.000	0.00	0.000	0.384	0.384	0.000	1.14	0.000	1.409	1.077	0.332	0.57	0.189	0.416	0.411	0.005	1.45	0.007	0.506	0.494	0.012	2.03	0.024	0.221

I-8 Performance Effectiveness Scoring Results

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Safety Emphasis Area						Mobility Emphasis Area						Freight Emphasis Area					
				Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score	Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score	Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score
CS8.2A	Dome Valley Rd TI WB UP (#1325) Reprofile	21.06	0.24	0.156	0.155	0.001	0.78	1.50	0.001	0.139	0.139	0.000	0.93	1.50	0.000	0.051	0.051	0.000	2.62	1.50	0.000
CS8.2B	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	21.06	1.76	0.156	0.155	0.001	0.78	1.50	0.001	0.139	0.139	0.000	0.95	1.50	0.000	0.051	0.051	0.000	2.62	1.50	0.000
CS8.3A	Vekol Road TI UP (#550) Reprofile	144.55	0.58	0.156	0.156	0.000	0.37	1.50	0.000	0.139	0.139	0.000	1.29	1.50	0.000	0.051	0.051	0.000	1.36	1.50	0.000
CS8.3B	Vekol Road TI UP (#550) Bridge Replacement	144.55	2.16	0.156	0.156	0.000	0.37	1.50	0.000	0.139	0.139	0.000	1.27	1.50	0.000	0.051	0.051	0.000	1.36	1.50	0.000
CS8.6A	Stanfield Rd TI UP (#1090) Reprofile	161.6	0.77	0.156	0.156	0.000	0.38	1.50	0.000	0.139	0.139	0.000	1.20	1.50	0.000	0.051	0.051	0.000	1.37	1.50	0.000
CS8.6B	Stanfield Rd TI UP (#1090) Bridge Replacement	161.6	2.16	0.156	0.156	0.000	0.38	1.50	0.000	0.139	0.139	0.000	1.16	1.50	0.000	0.051	0.051	0.000	1.37	1.50	0.000
CS8.7A	Murphy Rd UP (#1091) Reprofile	162.5	0.58	0.156	0.156	0.000	0.38	1.50	0.000	0.139	0.139	0.000	1.19	1.50	0.000	0.051	0.051	0.000	1.37	1.50	0.000
CS8.7B	Murphy Rd UP (#1091) Bridge Replacement	162.5	2.64	0.156	0.156	0.000	0.38	1.50	0.000	0.139	0.139	0.000	1.16	1.50	0.000	0.051	0.051	0.000	1.37	1.50	0.000
CS8.8A	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	172.55	2.91	0.156	0.155	0.001	0.57	1.50	0.001	0.139	0.139	0.000	1.58	1.50	0.000	0.051	0.051	0.000	2.03	1.50	0.000
CS8.8B	Thornton Rd TI UP (#1196) Bridge Replacement	172.55	3.35	0.156	0.155	0.001	0.57	1.50	0.001	0.139	0.139	0.000	1.45	1.50	0.000	0.051	0.051	0.000	2.03	1.50	0.000
CS8.9A	Chuichu Rd UP (#1197) Reprofile	173.53	0.87	0.156	0.155	0.001	0.57	1.50	0.001	0.139	0.139	0.000	1.55	1.50	0.000	0.051	0.051	0.000	2.03	1.50	0.000
CS8.9B	Chuichu Rd UP (#1197) Bridge Replacement	173.53	2.62	0.156	0.155	0.001	0.57	1.50	0.001	0.139	0.139	0.000	1.45	1.50	0.000	0.051	0.051	0.000	2.03	1.50	0.000
CS8.10	Wellton-Mohawk Safety Improvements	22-56	2.81	0.341	0.330	0.011	0.57	1.50	0.009	0.139	0.139	0.000	1.45	1.50	0.000	0.051	0.031	0.020	2.03	1.50	0.061

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Total Factored Benefit	VMT Factor	NPV Factor	Performance Effectiveness Score		miles	2014 ADT	1-way or 2-way	VMT
CS8.2A	Dome Valley Rd TI WB UP (#1325) Reprofile	21.06	0.24	0.600	0.04	20.2	2.2		0.10	12848	1	642.4
CS8.2B	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	21.06	1.76	1.644	0.09	30.6	2.5		0.20	12848	1	1284.8
CS8.3A	Vekol Road TI UP (#550) Reprofile	144.55	0.58	0.302	0.09	20.2	0.9		0.24	5238	2	1257.12
CS8.3B	Vekol Road TI UP (#550) Bridge Replacement	144.55	2.16	1.457	0.07	30.6	1.5		0.20	5238	2	1047.6
CS8.6A	Stanfield Rd TI UP (#1090) Reprofile	161.6	0.77	0.607	0.12	20.2	1.9		0.32	5497	2	1759.04
CS8.6B	Stanfield Rd TI UP (#1090) Bridge Replacement	161.6	2.16	0.866	0.08	30.6	0.9		0.20	5497	2	1099.4
CS8.7A	Murphy Rd UP (#1091) Reprofile	162.5	0.58	0.508	0.09	20.2	1.6		0.24	5497	2	1319.28
CS8.7B	Murphy Rd UP (#1091) Bridge Replacement	162.5	2.64	0.935	0.08	30.6	0.8		0.20	5497	2	1099.4
CS8.8A	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	172.55	2.91	3.614	0.28	20.2	7.0		0.48	8599	2	4127.52
CS8.8B	Thornton Rd TI UP (#1196) Bridge Replacement	172.55	3.35	1.956	0.12	30.6	2.1		0.20	8599	2	1719.8
CS8.9A	Chuichu Rd UP (#1197) Reprofile	173.53	0.87	2.197	0.21	20.2	10.7		0.36	8599	2	3095.64
CS8.9B	Chuichu Rd UP (#1197) Bridge Replacement	173.53	2.62	1.776	0.12	30.6	2.4		0.20	8599	2	1719.8
CS8.10	Wellton-Mohawk Safety Improvements	22-56	2.81	0.291	4.95	8.8	4.5		34.00	9671	2	328814

Appendix J: Solution Prioritization Scores

Performance Evaluation Risk Factors and Prioritization

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Pavement		Bridge		Safety		Mobility		Freight		Total Factored Score	Risk Factors					Weighted Risk Factor	Segment Need	Prioritization Score
				Score	%	Score	%	Score	%	Score	%	Score	%		Pavement	Bridge	Safety	Mobility	Freight			
CS8.2A	Dome Valley Rd TI WB UP (#1325) Reprofile	21.06	0.24	0.093	15.4%	0.000	0.0%	0.004	0.7%	0.003	0.5%	0.501	83.4%	0.600	1.14	1.51	1.78	1.36	1.36	1.329	0.77	**2.30**
CS8.2B	Dome Valley Rd TI WB UP (#1325) Bridge Replacement	21.06	1.76	0.000	0.0%	1.136	69.1%	0.004	0.3%	0.003	0.2%	0.501	30.4%	1.644	1.14	1.51	1.78	1.36	1.36	1.465	0.77	**2.85**
CS8.3A	Vekol Road TI UP (#550) Reprofile	144.55	0.58	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.302	100.0%	0.302	1.14	1.51	1.78	1.36	1.36	1.360	0.38	**0.47**
CS8.3B	Vekol Road TI UP (#550) Bridge Replacement	144.55	2.16	0.000	0.0%	1.156	79.3%	0.000	0.0%	0.000	0.0%	0.302	20.7%	1.457	1.14	1.51	1.78	1.36	1.36	1.479	0.38	**0.84**
CS8.6A	Stanfield Rd TI UP (#1090) Reprofile	161.6	0.77	0.203	33.4%	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.404	66.6%	0.607	1.14	1.51	1.78	1.36	1.36	1.287	0.54	**1.34**
CS8.6B	Stanfield Rd TI UP (#1090) Bridge Replacement	161.6	2.16	0.000	0.0%	0.462	53.3%	0.000	0.0%	0.000	0.0%	0.404	46.7%	0.866	1.14	1.51	1.78	1.36	1.36	1.440	0.54	**0.72**
CS8.7A	Murphy Rd UP (#1091) Reprofile	162.5	0.58	0.104	20.5%	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.404	79.5%	0.508	1.14	1.51	1.78	1.36	1.36	1.315	0.54	**1.14**
CS8.7B	Murphy Rd UP (#1091) Bridge Replacement	162.5	2.64	0.000	0.0%	0.531	56.8%	0.000	0.0%	0.000	0.0%	0.404	43.2%	0.935	1.14	1.51	1.78	1.36	1.36	1.445	0.54	**0.64**
CS8.8A	Thornton Rd TI UP (#1196) Bridge Rehab & Reprofile	172.55	2.91	1.953	54.0%	0.777	21.5%	0.001	0.0%	0.002	0.0%	0.881	24.4%	3.614	1.14	1.51	1.78	1.36	1.36	1.274	0.92	**8.19**
CS8.8B	Thornton Rd TI UP (#1196) Bridge Replacement	172.55	3.35	0.000	0.0%	1.072	54.8%	0.001	0.1%	0.001	0.1%	0.881	45.0%	1.956	1.14	1.51	1.78	1.36	1.36	1.443	0.92	**2.80**
CS8.9A	Chuichu Rd UP (#1197) Reprofile	173.53	0.87	1.313	59.8%	0.000	0.0%	0.001	0.1%	0.002	0.1%	0.881	40.1%	2.197	1.14	1.51	1.78	1.36	1.36	1.229	0.92	**12.14**
CS8.9B	Chuichu Rd UP (#1197) Bridge Replacement	173.53	2.62	0.000	0.0%	0.892	50.2%	0.001	0.1%	0.001	0.1%	0.881	49.6%	1.776	1.14	1.51	1.78	1.36	1.36	1.436	0.92	**3.24**
CS8.10	Wellton-Mohawk Safety Improvements	22-56	2.81	0.000	0.0%	0.000	0.0%	0.199	86.3%	0.007	3.1%	0.024	10.6%	0.230	1.14	1.51	1.78	1.36	1.36	1.722	1.00	**7.77**

Appendix K: Preliminary Scoping Reports for Prioritized Solutions

1.0 GENERAL PROJECT INFORMATION

Date: March 2017	**ADOT Project Manager:**
Project Name: Dome Valley Rd TI UP (#1325) Bridge Vertical Clearance Mitigation	
City/Town Name: Wellton	**County: Yuma**
Primary Route/Street: I-8	
Beginning Limit: MP 20.96	
End Limit: MP 21.16	
Project Length: 0.2 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town**;** ☐ County; ☒ ADOT ; ☐ Private ; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☒ Private; ☒ Federal; ☐ Tribal; ☐ Other: State Trust Land *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION

(If applicable)

LPA/Tribal Name:	
LPA/Tribal Contact:	
Email Address:	**Phone Number:**
Administration: ☐ ADOT Administered ☐ Self-Administered ☐ Certification Acceptance	

PROJECT NEED

Freight need: Increasing the vertical height clearance of the WB Dome Valley Road TI UP (#1325) Bridge to improve freight mobility. Special permitting is required for vertical clearance less than 16.5 ft.

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

For WB direction, increase the vertical clearance of the Dome Valley Road TI UP (#1325) Bridge from 16.23 ft to 16.5 ft. Options considered included A) Reprofile the roadway and B) Replace the bridge.

PROJECT TYPE

Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☐ :		

PROJECT RISKS

Check any risks identified that may impact the project's scope, schedule, or budget:

☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:

Risk Description: *(If a box is checked above, briefly explain the risk)*

FUNDING SOURCE(S)

Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

COST ESTIMATE

Preliminary Engineering	Design	Right-of-Way	Construction	Total
Option A: $7,000 Option B: $47,000	Option A: $22,000 Option B: $156,000	$ 0	Option A: $213,000 Option B: $1,560,000	Option A: $242,000 Option B: $1,763,000

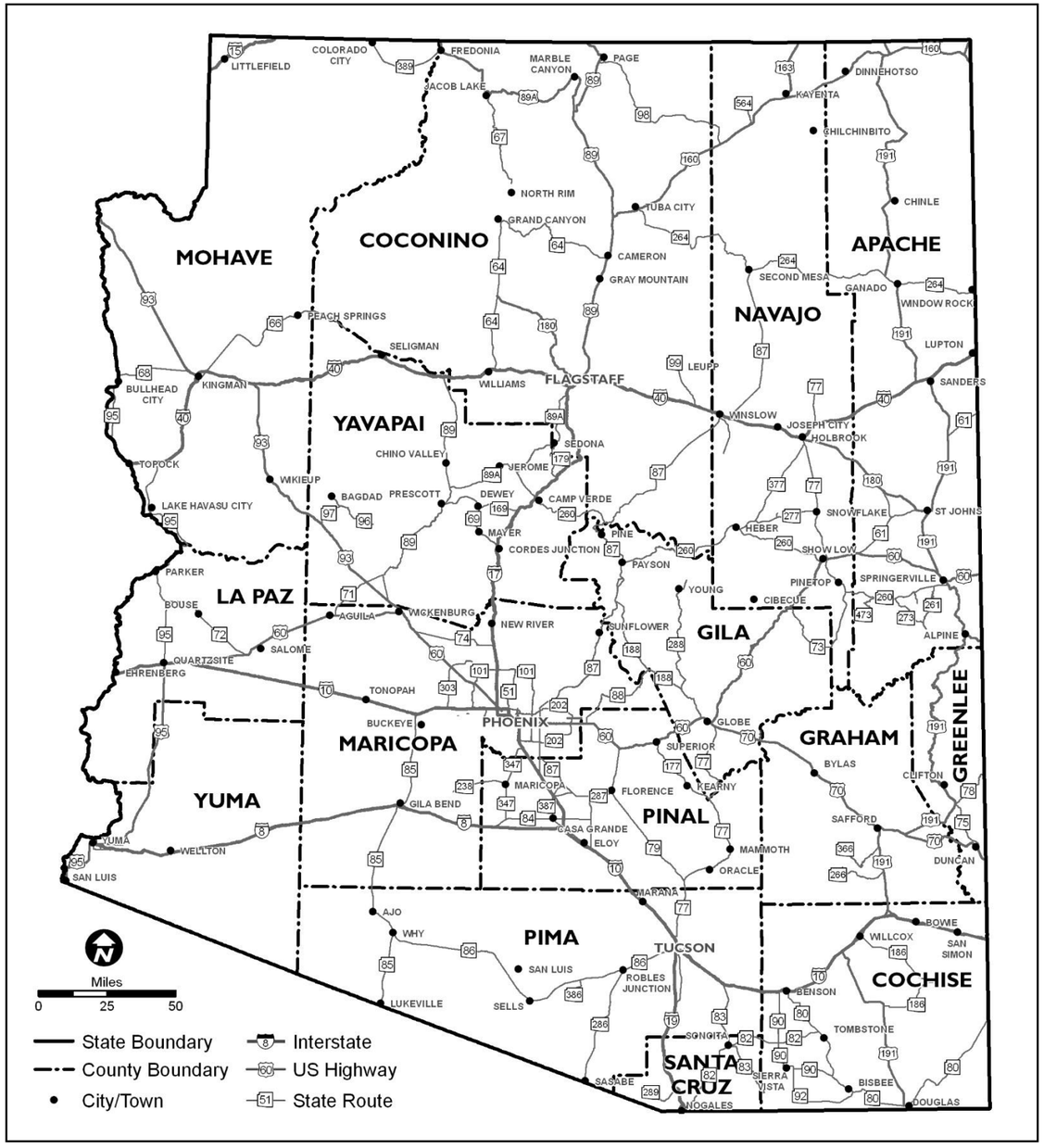
PROJECT DELIVERY

Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

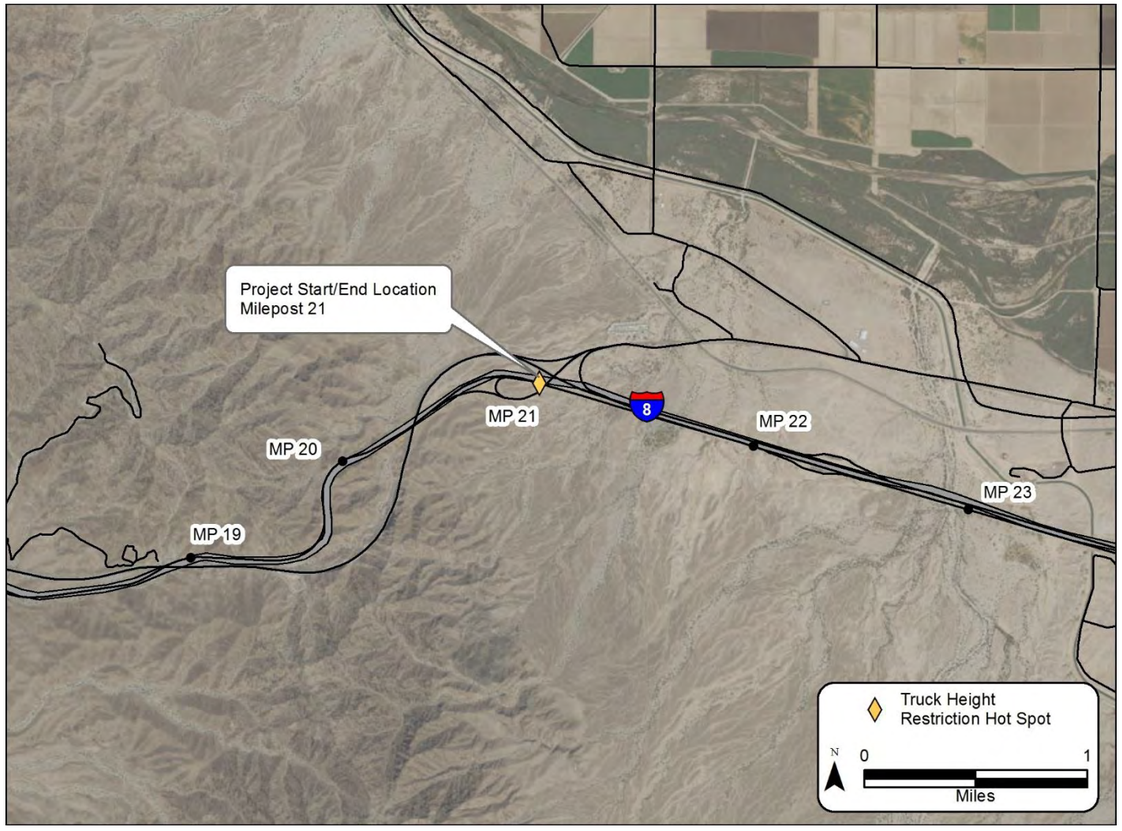
ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**
4) **Project Schedule**
5) **Itemized Cost Estimate**
6) **15% Design Plan Sheets (as needed)**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
(Provide a detailed breakdown of the project's scope of work using bullet format) • Option A: Reprofile mainline • Option B: Replace bridge

2.0 GENERAL PROJECT INFORMATION	
Date: March 2017	**ADOT Project Manager:**
Project Name: Vekol Road TI UP (#550) Bridge Vertical Clearance Mitigation	
City/Town Name: Casa Grande	**County: Maricopa**
Primary Route/Street: I-8	
Beginning Limit: MP 144.34	
End Limit: MP 144.76	
Project Length: 0.42 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town**;** ☐ County; ☒ ADOT ; ☐ Private ; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☒ Private; ☒ Federal; ☐ Tribal; ☐ Other: State Trust Land *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*	
LPA/Tribal Name:	
LPA/Tribal Contact:	
Email Address:	**Phone Number:**
Administration: ☐ ADOT Administered ☐ Self-Administered ☐ Certification Acceptance	

PROJECT NEED
Freight need: Increasing the vertical clearance of the Vekol Road TI UP (#550) Bridge to improve freight mobility. Special permitting is required for vertical clearance less than 16.5 ft.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
For both EB and WB directions, increase the vertical clearance of the Vekol Road TI UP (#550) Bridge from 16.19 ft to 16.5 ft to improve freight mobility. Options considered included A) Reprofile the roadway and B) Replace the bridge.			

PROJECT TYPE		
Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☐ :		

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

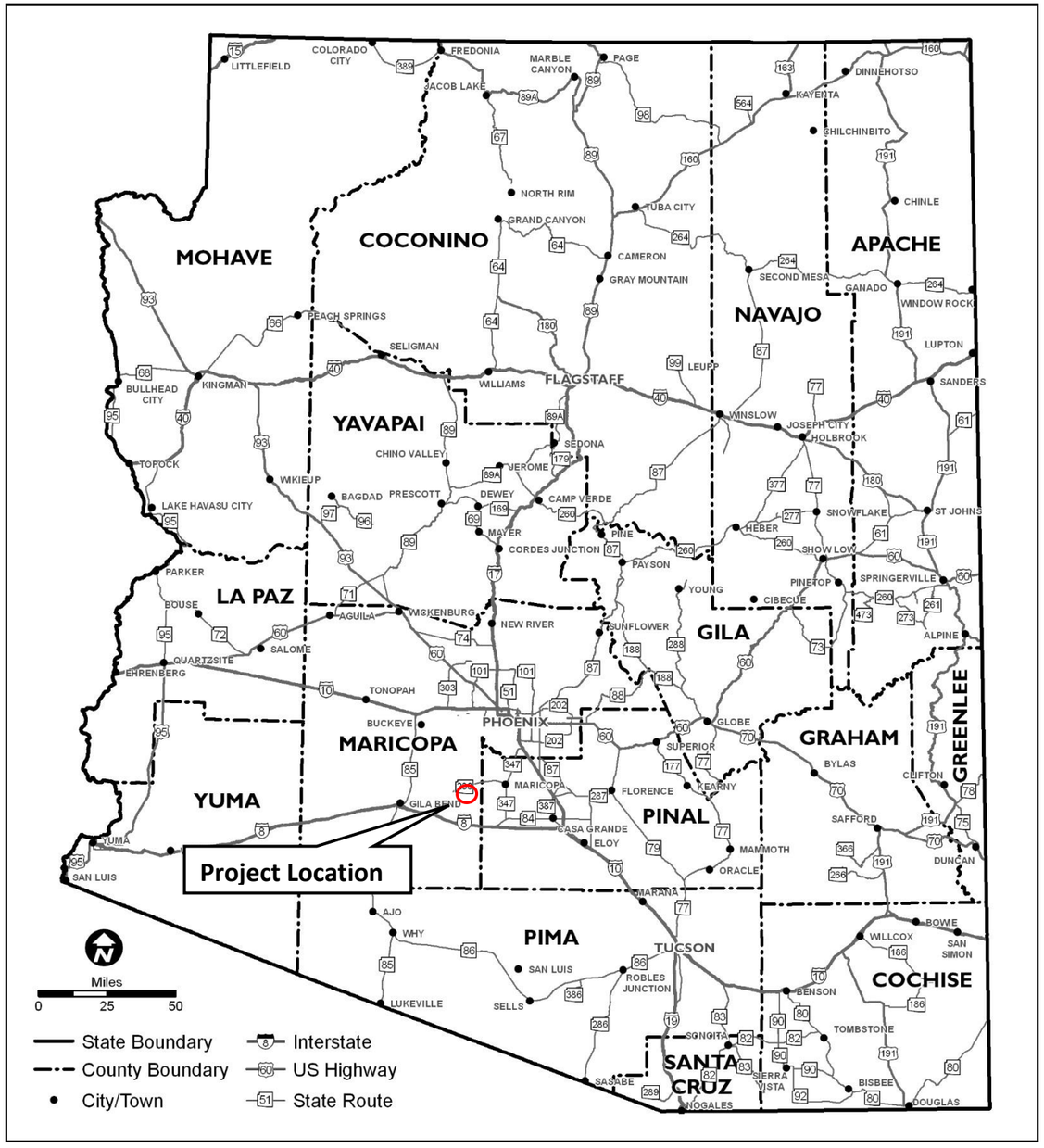
FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

COST ESTIMATE				
Preliminary Engineering Option A: $15,000 Option B: $57,000	Design Option A: $51,000 Option B: $191,000	Right-of-Way $ 0	Construction Option A: $511,000 Option B: $1,914,000	Total Option A: $ 577,000 Option B: $ 2,162,000

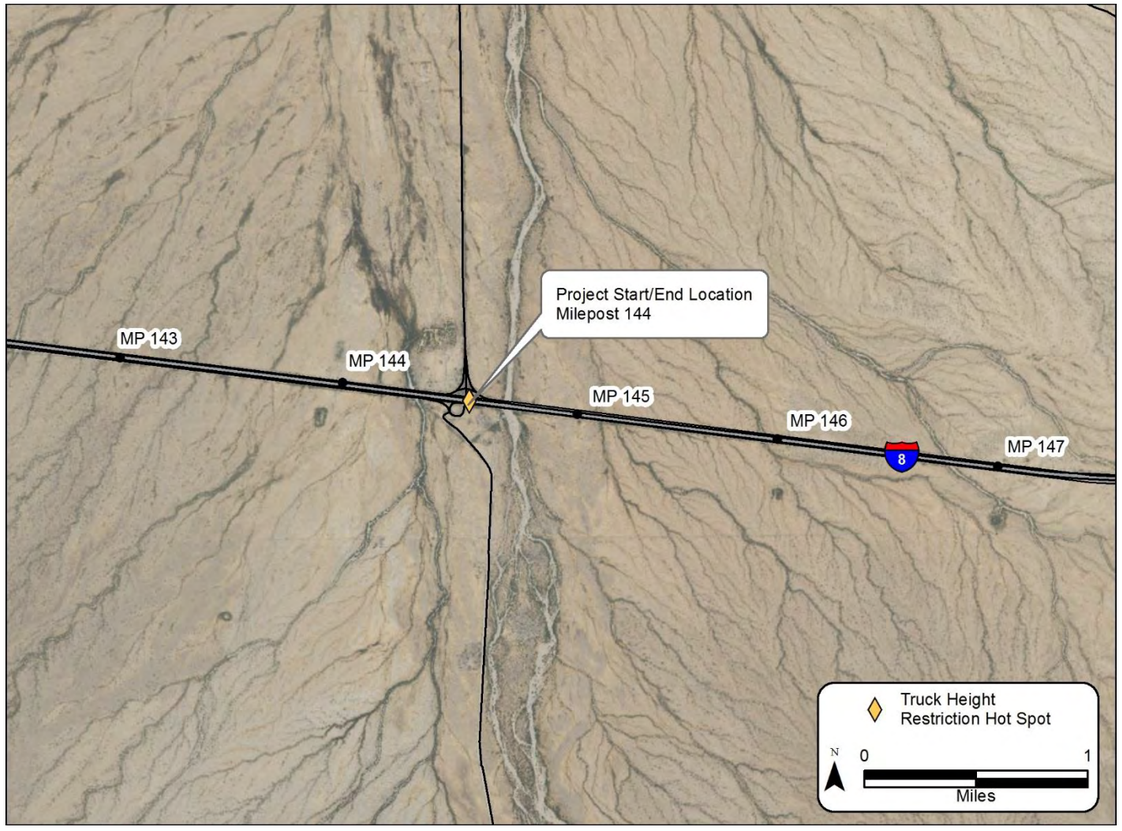
PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS
1) State Location Map
2) Project Vicinity Map
3) Project Scope of Work
4) Project Schedule
5) Itemized Cost Estimate
6) 15% Design Plan Sheets (as needed)

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



SCOPE OF WORK
(Provide a detailed breakdown of the project's scope of work using bullet format) • Option A: Reprofile mainline • Option B: Replace bridge

3.0 GENERAL PROJECT INFORMATION

Date: March 2017	**ADOT Project Manager:**
Project Name: Stanfield Rd TI UP (#1090) Bridge Vertical Clearance Mitigation	
City/Town Name: Casa Grande	**County: Maricopa**
Primary Route/Street: I-8	
Beginning Limit: MP 161.35	
End Limit: MP 161.85	
Project Length: 0.5 miles	

Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)*

☐ City/Town**;** ☐ County; ☒ ADOT ; ☐ Private ; ☐ Federal; ☐ Tribal; ☐ Other:

Adjacent Land Ownership(s): *(Check all that apply)*

☐ City/Town; ☐ County; ☐ ADOT; ☒ Private; ☐ Federal; ☐ Tribal; ☐ Other: State Trust Land

http://gis.azland.gov/webapps/parcel/

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION

(If applicable)

LPA/Tribal Name:	
LPA/Tribal Contact:	
Email Address:	**Phone Number:**

Administration: ☐ ADOT Administered ☐ Self-Administered ☐ Certification Acceptance

PROJECT NEED

Freight need: Increasing the vertical clearance of the Stanfield Rd TI UP (#1090) Bridge to improve freight mobility. Special permitting is required for vertical clearance less than 16.5 ft.

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

For both EB and WB directions, increase the vertical height clearance of the Stanfield Rd TI UP (#1090) Bridge from 16.09 ft to 16.5 ft to improve freight mobility. Options considered included A) Reprofile the roadway and B) Replace the bridge.

PROJECT TYPE

Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☐ :		

PROJECT RISKS

Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:

Risk Description: *(If a box is checked above, briefly explain the risk)*

FUNDING SOURCE(S)

Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

COST ESTIMATE

Preliminary Engineering	Design	Right-of-Way	Construction	Total
Option A: $20,000 Option B: $57,000	Option A: $68,000 Option B: $191,000	$ 0	Option A: $681,000 Option B: $1,914,000	Option A: $769,000 Option B: $2,162,000

PROJECT DELIVERY

Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:

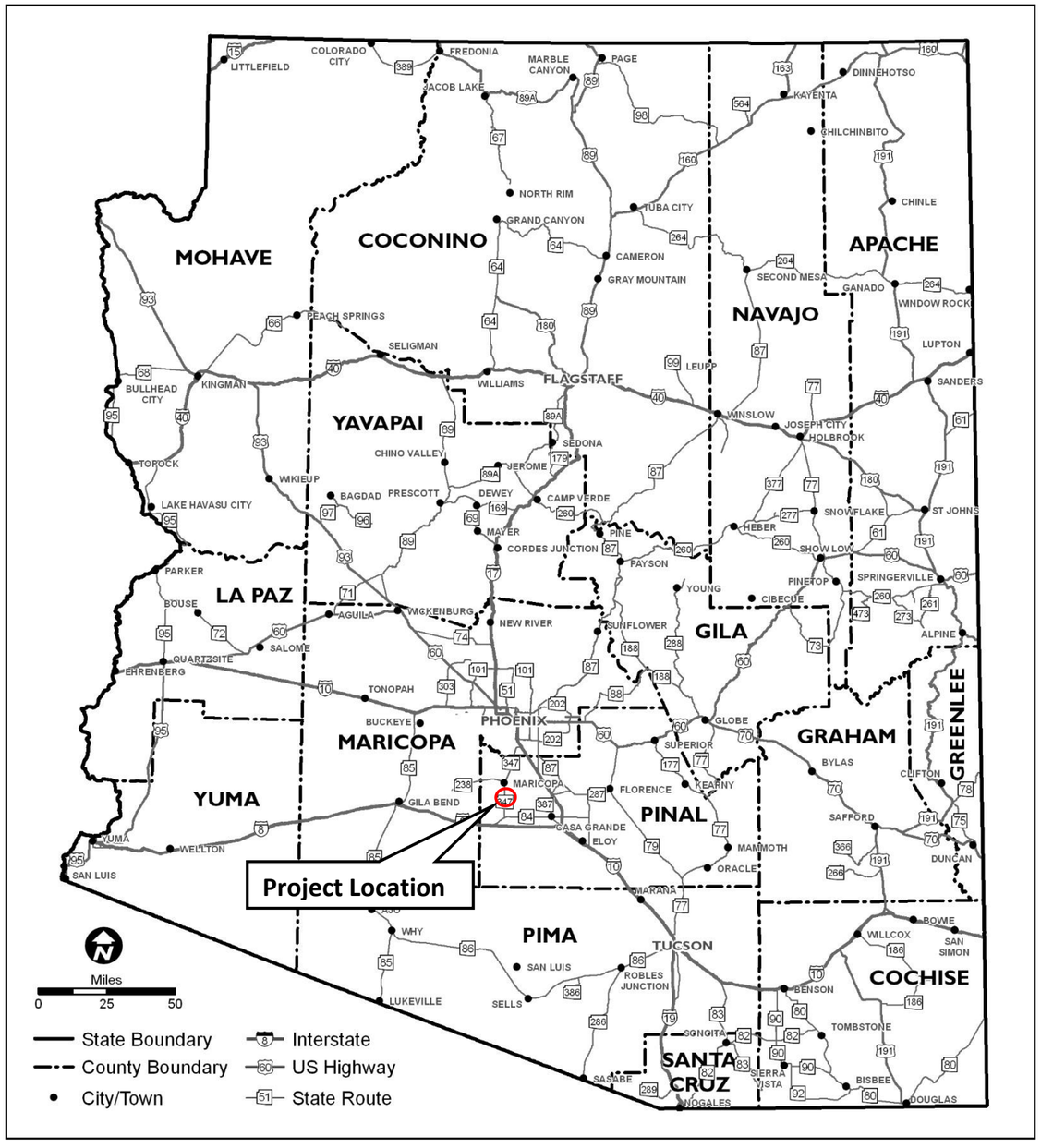
Design Program Year: FY

Construction Program Year: FY

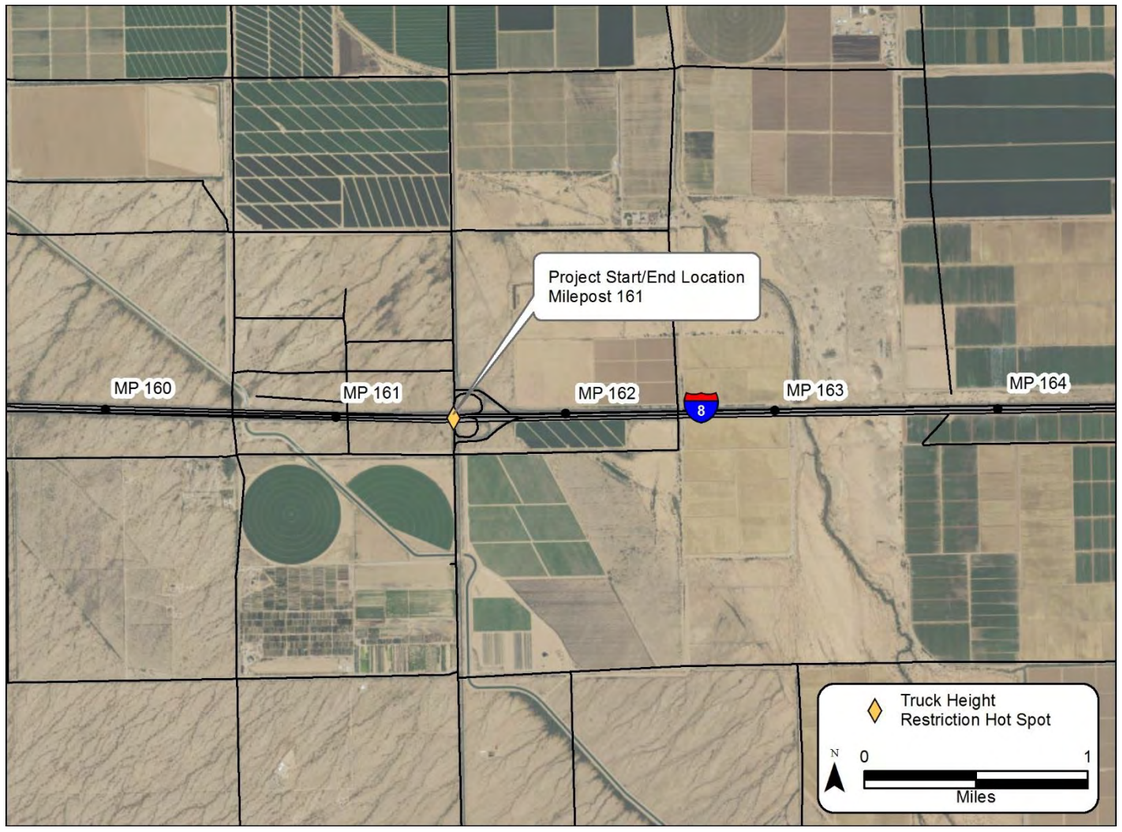
ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**
4) **Project Schedule**
5) **Itemized Cost Estimate**
6) **15% Design Plan Sheets (as needed)**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
(Provide a detailed breakdown of the project's scope of work using bullet format) • Option A: Reprofile mainline • Option B: Replace bridge

4.0 GENERAL PROJECT INFORMATION

Date: March 2017	**ADOT Project Manager:**
Project Name: Murphy Rd UP (#1091) Bridge Vertical Clearance Mitigation	
City/Town Name: Casa Grande	**County: Maricopa**
Primary Route/Street: I-8	
Beginning Limit: MP 162.29	
End Limit: MP 162.71	
Project Length: 0.42 miles	

Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)*

☐ City/Town**;** ☐ County; ☒ ADOT ; ☐ Private ; ☐ Federal; ☐ Tribal; ☐ Other:

Adjacent Land Ownership(s): *(Check all that apply)*

☐ City/Town; ☐ County; ☐ ADOT; ☒ Private; ☐ Federal; ☐ Tribal; ☐ Other: State Trust Land

http://gis.azland.gov/webapps/parcel/

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION

(If applicable)

LPA/Tribal Name:	
LPA/Tribal Contact:	
Email Address:	**Phone Number:**

Administration: ☐ ADOT Administered ☐ Self-Administered ☐ Certification Acceptance

PROJECT NEED

Freight need: Increasing the vertical clearance of the Murphy Rd UP (#1091) Bridge to improve freight mobility. Special permitting is required for vertical clearance less than 16.5 ft.

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

For both EB and WB directions, increase the vertical height clearance of the Murphy Rd UP (#1091) Bridge from 16.19 ft to 16.5 ft to improve freight mobility. Options considered included A) Reprofile the roadway and B) Replace the bridge.

PROJECT TYPE

Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☐ :		

PROJECT RISKS

Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:

Risk Description: *(If a box is checked above, briefly explain the risk)*

FUNDING SOURCE(S)

Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

COST ESTIMATE

Preliminary Engineering	Design	Right-of-Way	Construction	Total
Option A: $15,000 Option B: $70,000	Option A: $51,000 Option B: $234,000	$ 0	Option A: $511,000 Option B: $2,337,000	Option A: $577,000 Option B: $2,641,000

PROJECT DELIVERY

Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:

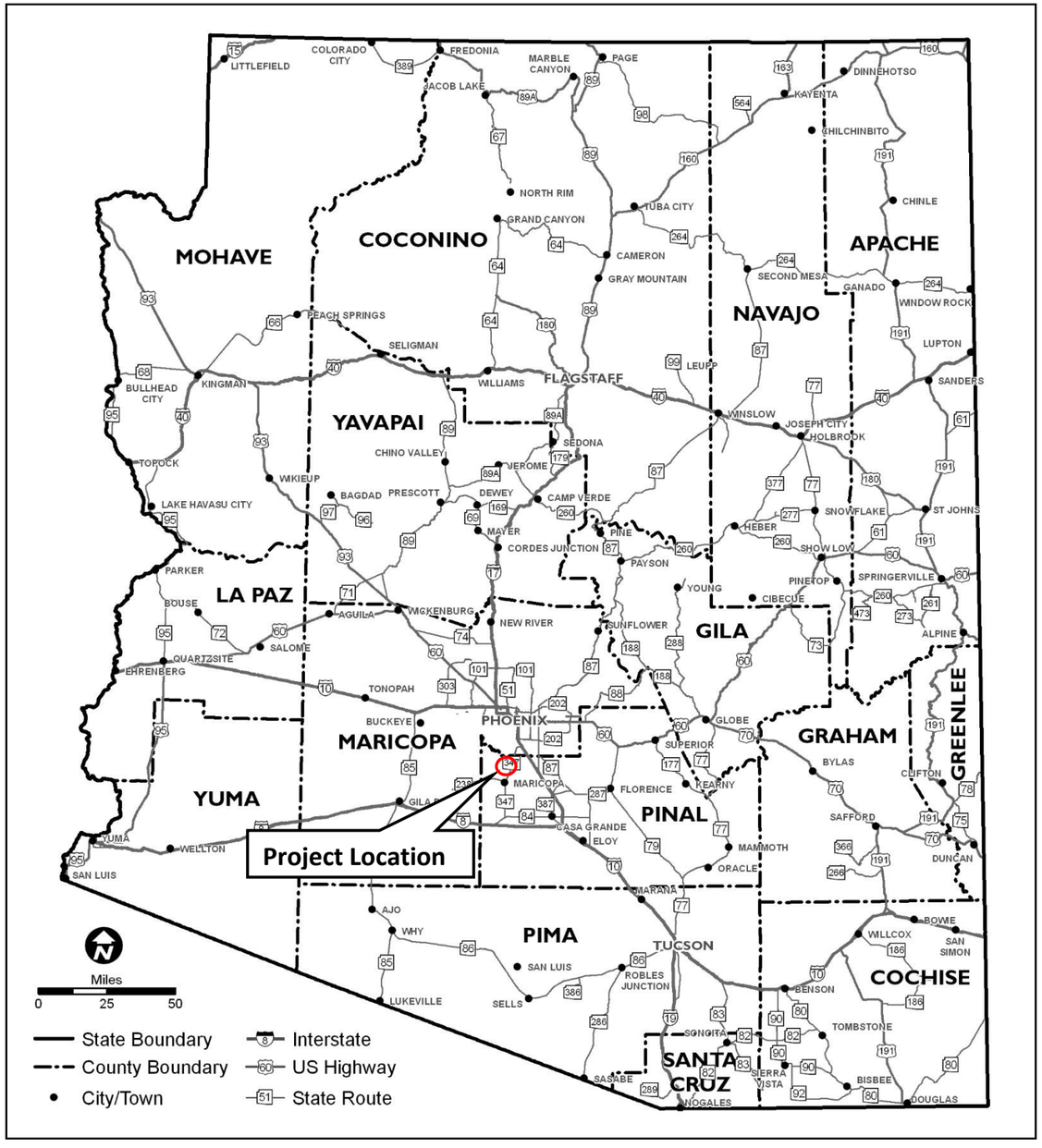
Design Program Year: FY

Construction Program Year: FY

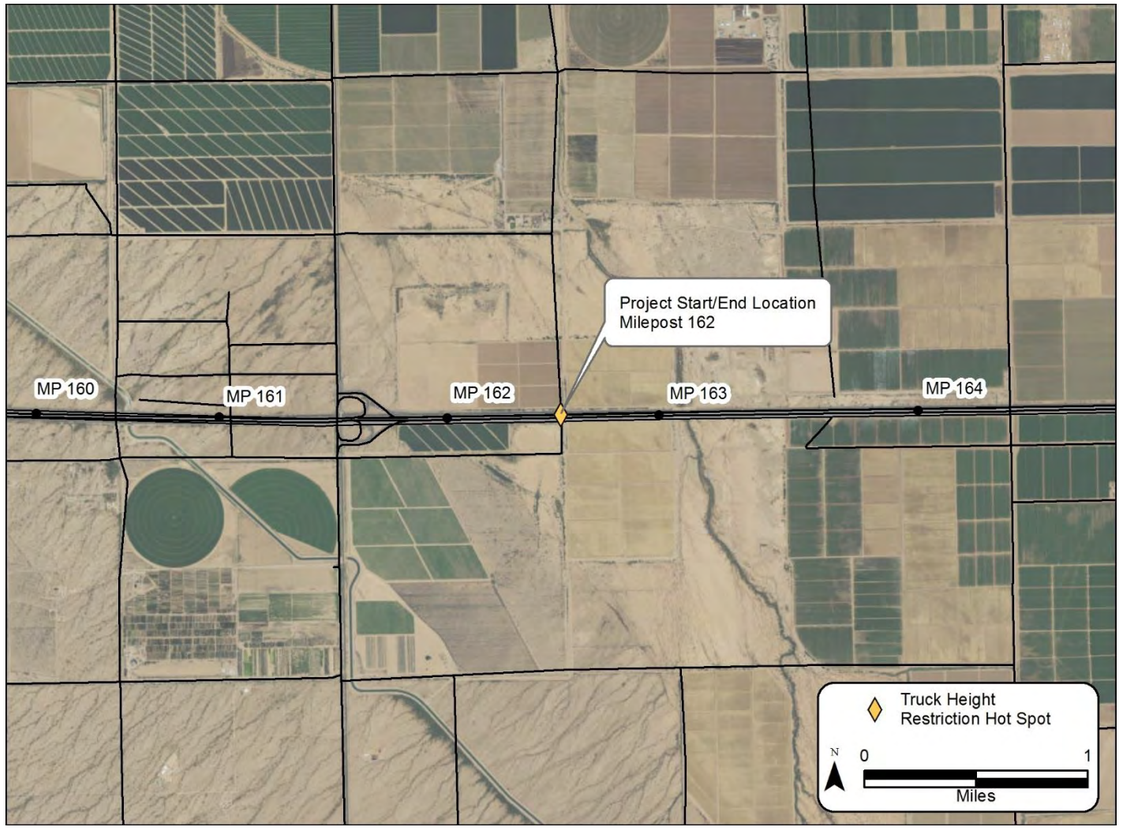
ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**
4) **Project Schedule**
5) **Itemized Cost Estimate**
6) **15% Design Plan Sheets (as needed)**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
(Provide a detailed breakdown of the project's scope of work using bullet format) • Option A: Reprofile mainline • Option B: Replace bridge

5.0 GENERAL PROJECT INFORMATION

Date: March 2017	**ADOT Project Manager:**
Project Name: Thornton Rd TI UP (#1196) Bridge Vertical Clearance Mitigation	
City/Town Name: Casa Grande	**County: Maricopa**
Primary Route/Street: I-8	
Beginning Limit: MP 172.21	
End Limit: MP 172.89	
Project Length: 0.67 miles	

Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)*

☐ City/Town**;** ☐ County; ☒ ADOT ; ☐ Private ; ☐ Federal; ☐ Tribal; ☐ Other:

Adjacent Land Ownership(s): *(Check all that apply)*

☐ City/Town; ☐ County; ☐ ADOT; ☒ Private; ☐ Federal; ☐ Tribal; ☒ Other: State Trust Land

http://gis.azland.gov/webapps/parcel/

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION

(If applicable)

LPA/Tribal Name:	
LPA/Tribal Contact:	
Email Address:	**Phone Number:**

Administration: ☐ ADOT Administered ☐ Self-Administered ☐ Certification Acceptance

PROJECT NEED

Bridge and Freight needs: Improving the structural ratings and increasing the vertical clearance of the Thornton Rd TI UP (#1196) Bridge to improve bridge performance and freight mobility. Special permitting is required for vertical clearance less than 16.5 ft.

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

For both EB and WB directions, replace or rehabilitate the existing bridge and increase the vertical clearance of the Thornton Rd TI UP (#1196) Bridge from 15.86 ft to 16.5 ft. Options considered included A) Reprofile the roadway; rehabilitate the bridge and B) Replace the bridge.

PROJECT TYPE

Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☐ :		

PROJECT RISKS

Check any risks identified that may impact the project's scope, schedule, or budget:

☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:

Risk Description: *(If a box is checked above, briefly explain the risk)*

FUNDING SOURCE(S)

Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

COST ESTIMATE

Preliminary Engineering	Design	Right-of-Way	Construction	Total
Option A: $77,000	Option A: $257,000	$ 0	Option A: $2,573,000	Option A: $2,907,000
Option B: $89,000	Option B: $297,000		Option B: $2,968,000	Option B: $3,354,000

PROJECT DELIVERY

Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:

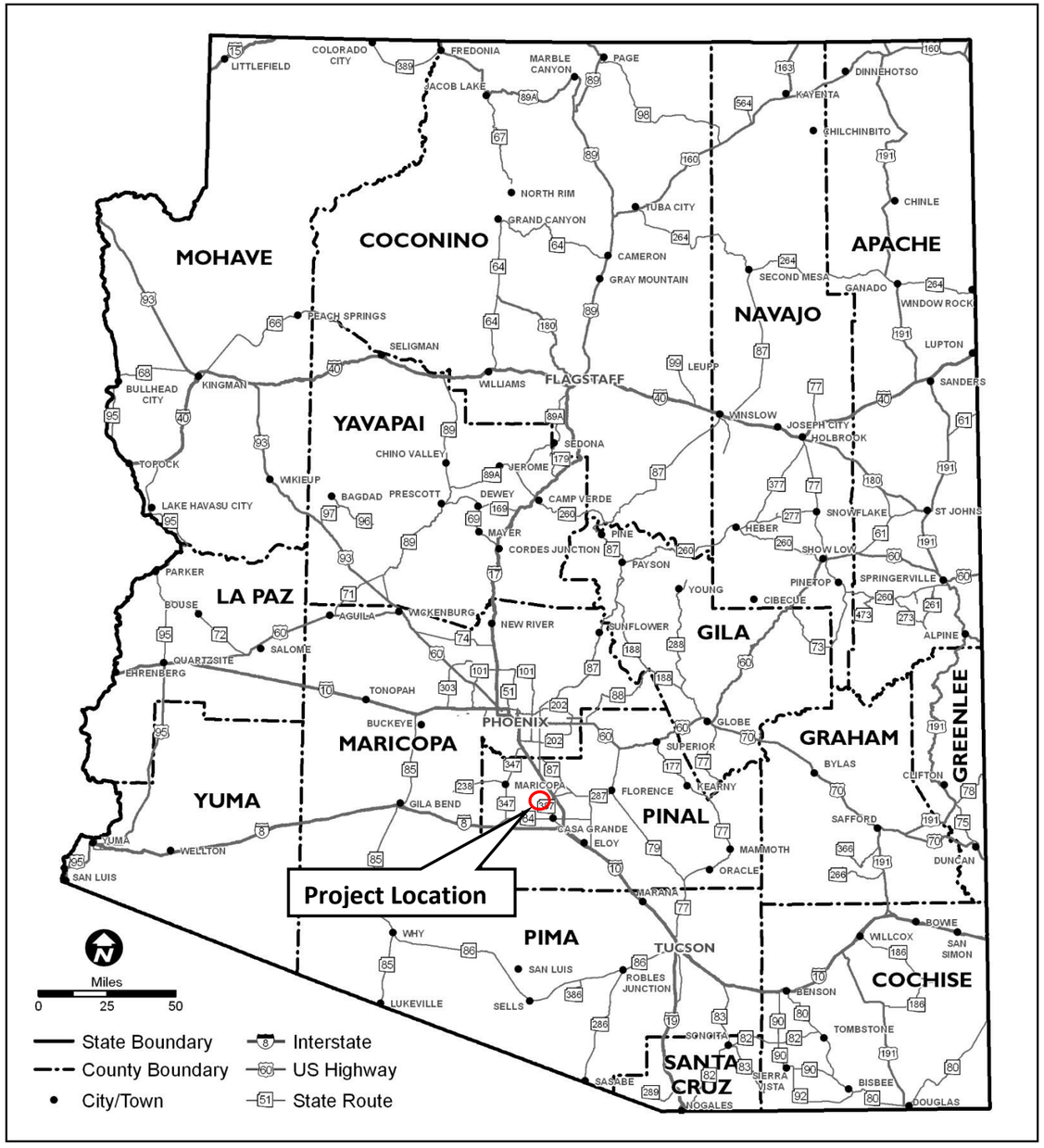
Design Program Year: FY

Construction Program Year: FY

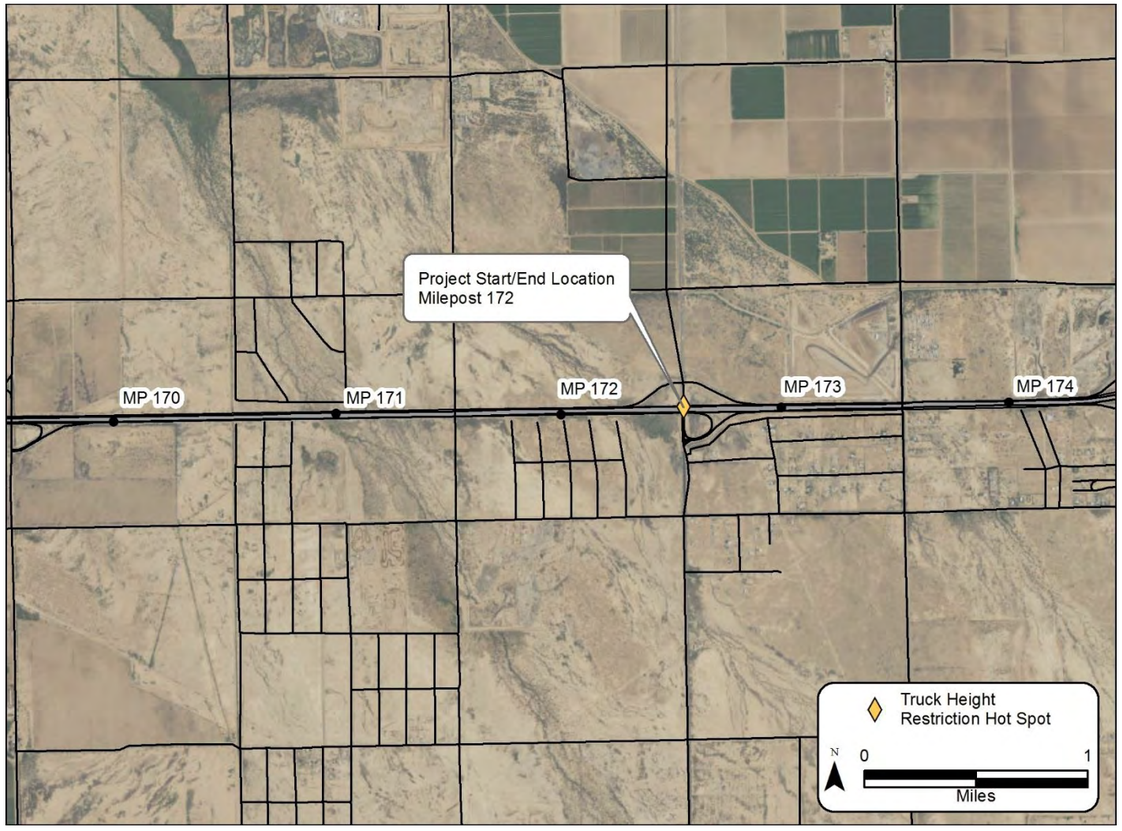
ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**
4) **Project Schedule**
5) **Itemized Cost Estimate**
6) **15% Design Plan Sheets (as needed)**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
(Provide a detailed breakdown of the project's scope of work using bullet format) • Option A: Rehabilitate bridge and reprofile mainline • Option B: Replace bridge

6.0 GENERAL PROJECT INFORMATION

Date: March 2017	**ADOT Project Manager:**
Project Name: Chuichu Rd UP (#1197) Bridge Vertical Clearance Mitigation	
City/Town Name: Casa Grande	**County: Maricopa**
Primary Route/Street: I-8	
Beginning Limit: MP 173.26	
End Limit: MP 173.80	
Project Length: 0.54 miles	

Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)*

☐ City/Town**;** ☐ County; ☒ ADOT ; ☐ Private ; ☐ Federal; ☐ Tribal; ☐ Other:

Adjacent Land Ownership(s): *(Check all that apply)*

☐ City/Town; ☐ County; ☐ ADOT; ☒ Private; ☐ Federal; ☐ Tribal; ☐ Other: State Trust Land

http://gis.azland.gov/webapps/parcel/

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION

(If applicable)

LPA/Tribal Name:	
LPA/Tribal Contact:	
Email Address:	**Phone Number:**

Administration: ☐ ADOT Administered ☐ Self-Administered ☐ Certification Acceptance

PROJECT NEED

Freight need: Increasing the vertical clearance of the Chuichu Rd UP (#1197) Bridge to improve freight mobility. Special permitting is required for vertical clearance less than 16.5 ft.

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

For both EB and WB directions, increase the vertical height clearance of the Chuichu Rd UP (#1197) Bridge from 16.04 ft to 16.5 ft to improve freight mobility. Options considered included A) Reprofile the roadway and B) Replace the bridge.

PROJECT TYPE

Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☐ :		

PROJECT RISKS

Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:

Risk Description: *(If a box is checked above, briefly explain the risk)*

FUNDING SOURCE(S)

Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

COST ESTIMATE

Preliminary Engineering	Design	Right-of-Way	Construction	Total
Option A: $23,000 Option B: $70,000	Option A: $77,000 Option B: $232,000	$ 0	Option A: $767,000 Option B: $2,323,000	Option A: $867,000 Option B: $2,625,000

PROJECT DELIVERY

Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:

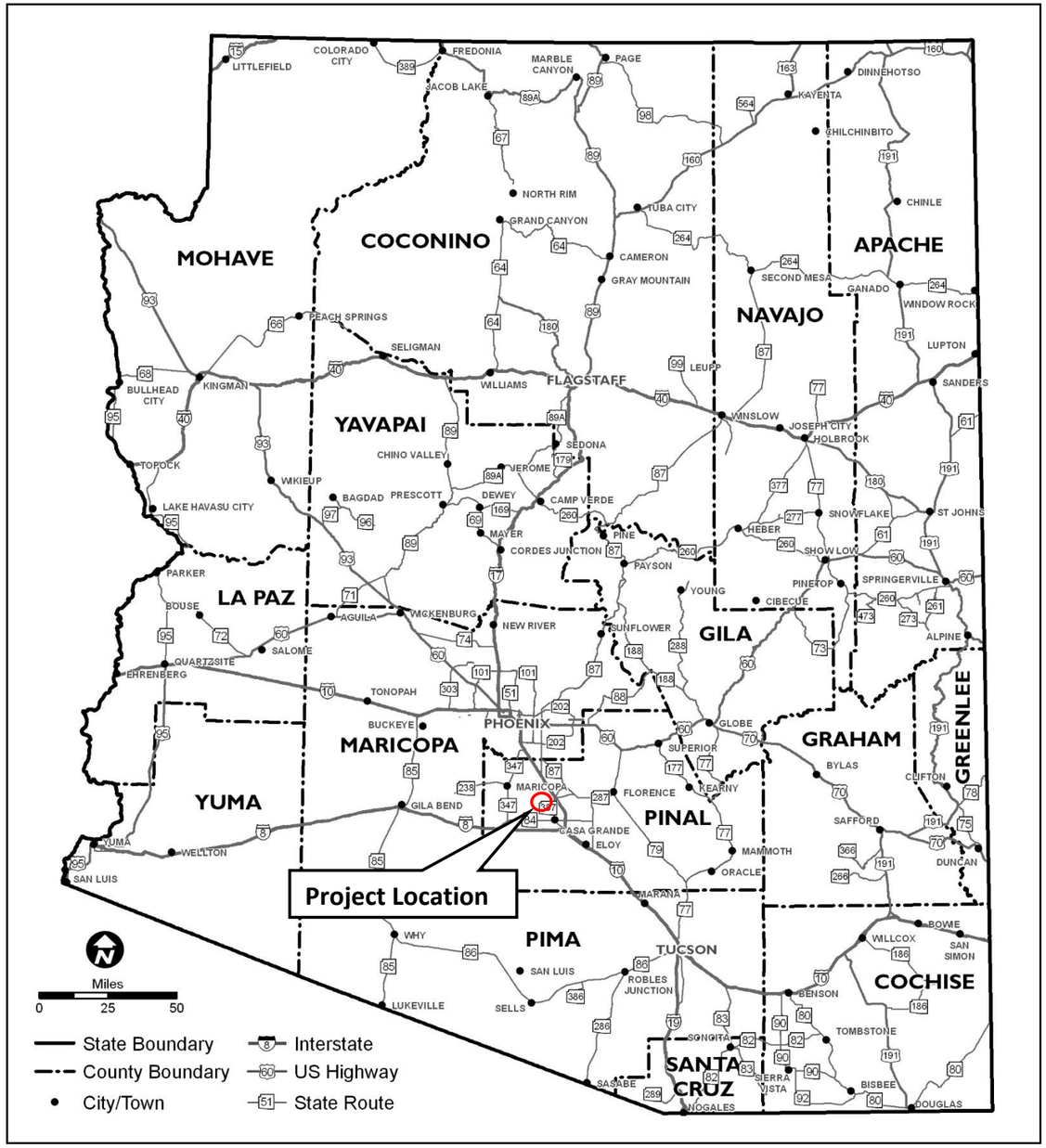
Design Program Year: FY

Construction Program Year: FY

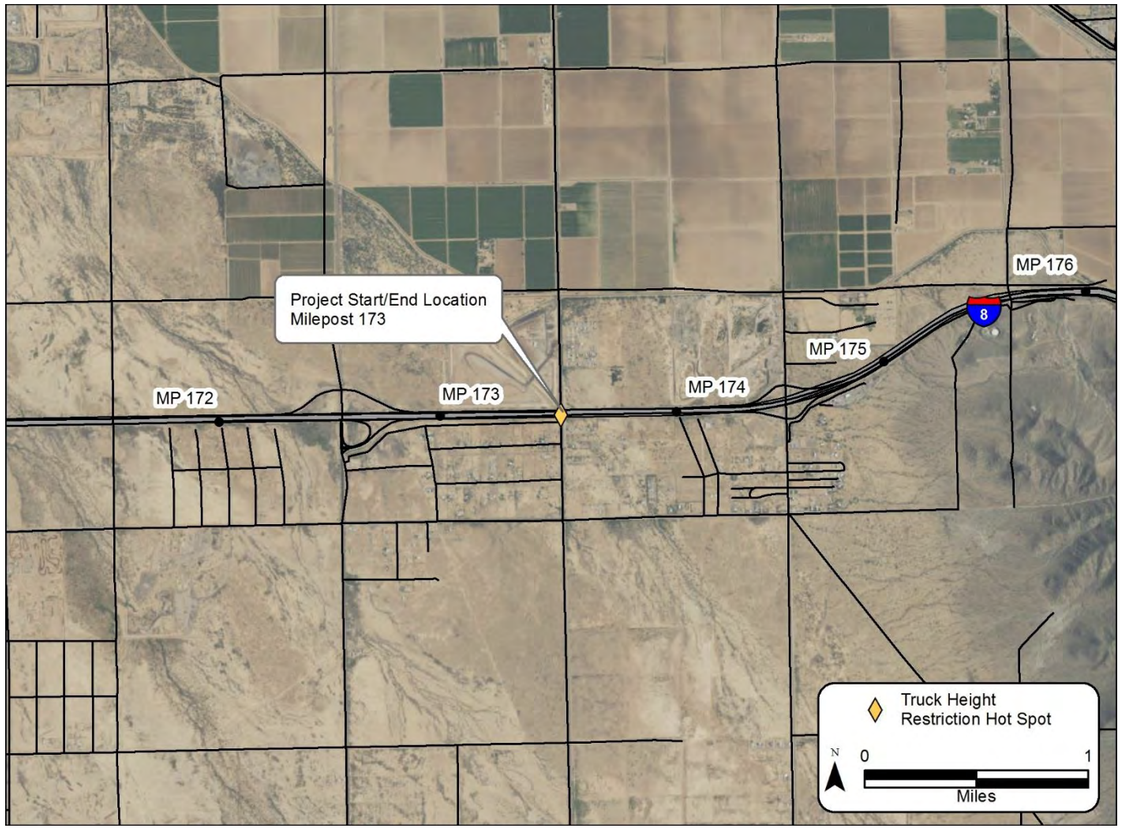
ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**
4) **Project Schedule**
5) **Itemized Cost Estimate**
6) **15% Design Plan Sheets (as needed)**

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
(Provide a detailed breakdown of the project's scope of work using bullet format) • Option A: Reprofile mainline • Option B: Replace bridge

7.0 GENERAL PROJECT INFORMATION	
Date: March 2017	**ADOT Project Manager:**
Project Name: Wellton-Mohawk Safety Improvements	
City/Town Name: : Wellton and Mohawk	**County: Maricopa**
Primary Route/Street: I-8	
Beginning Limit: MP 22	
End Limit: MP 56	
Project Length: 34 miles	
Right-of-Way Ownership(s) (where proposed project construction would occur)**:** *(Check all that apply)* ☐ City/Town**;** ☐ County; ☒ ADOT ; ☐ Private ; ☐ Federal; ☐ Tribal; ☐ Other:	
Adjacent Land Ownership(s): *(Check all that apply)* ☐ City/Town; ☐ County; ☐ ADOT; ☒ Private; ☒ Federal; ☐ Tribal; ☐ Other: State Trust Land *http://gis.azland.gov/webapps/parcel/*	

LOCAL PUBLIC AGENCY (LPA) or TRIBAL GOVERNMENT INFORMATION *(If applicable)*		
LPA/Tribal Name:		
LPA/Tribal Contact:		
Email Address:	**Phone Number:**	
Administration: ☐ ADOT Administered	☐ Self-Administered	☐ Certification Acceptance

PROJECT NEED
Safety need: MP 22-56 Outside the Yuma urbanized area, many incidents/crashes were involving a single vehicle and involved the vehicle overturning or running off the road to the left. In these cases, driver inattention/distraction and high speeds were typically related, as well as involving a vehicle in transport. Crash trends show single vehicle (78%), speed too fast for conditions (41%), ran off the road left (37%), ran off the road right (15%), and daylight conditions (74%).

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
For both EB and WB directions, install Speed Feedback Signs at:EB MP 28, EB MP 40, EB MP 45, EB MP 53.75, WB MP 23, WB MP 31.5, WB MP 44, WB MP 56.5. Also, install Lighting at: WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99.			

PROJECT TYPE		
Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☐ :		

PROJECT RISKS	
Check any risks identified that may impact the project's scope, schedule, or budget:	
☐ Access / Traffic Control / Detour Issues	☐ Right-of-Way
☐ Constructability / Construction Window Issues	☐ Environmental
☐ Stakeholder Issues	☐ Utilities
☐ Structures & Geotech	☐ Other:
Risk Description: *(If a box is checked above, briefly explain the risk)*	

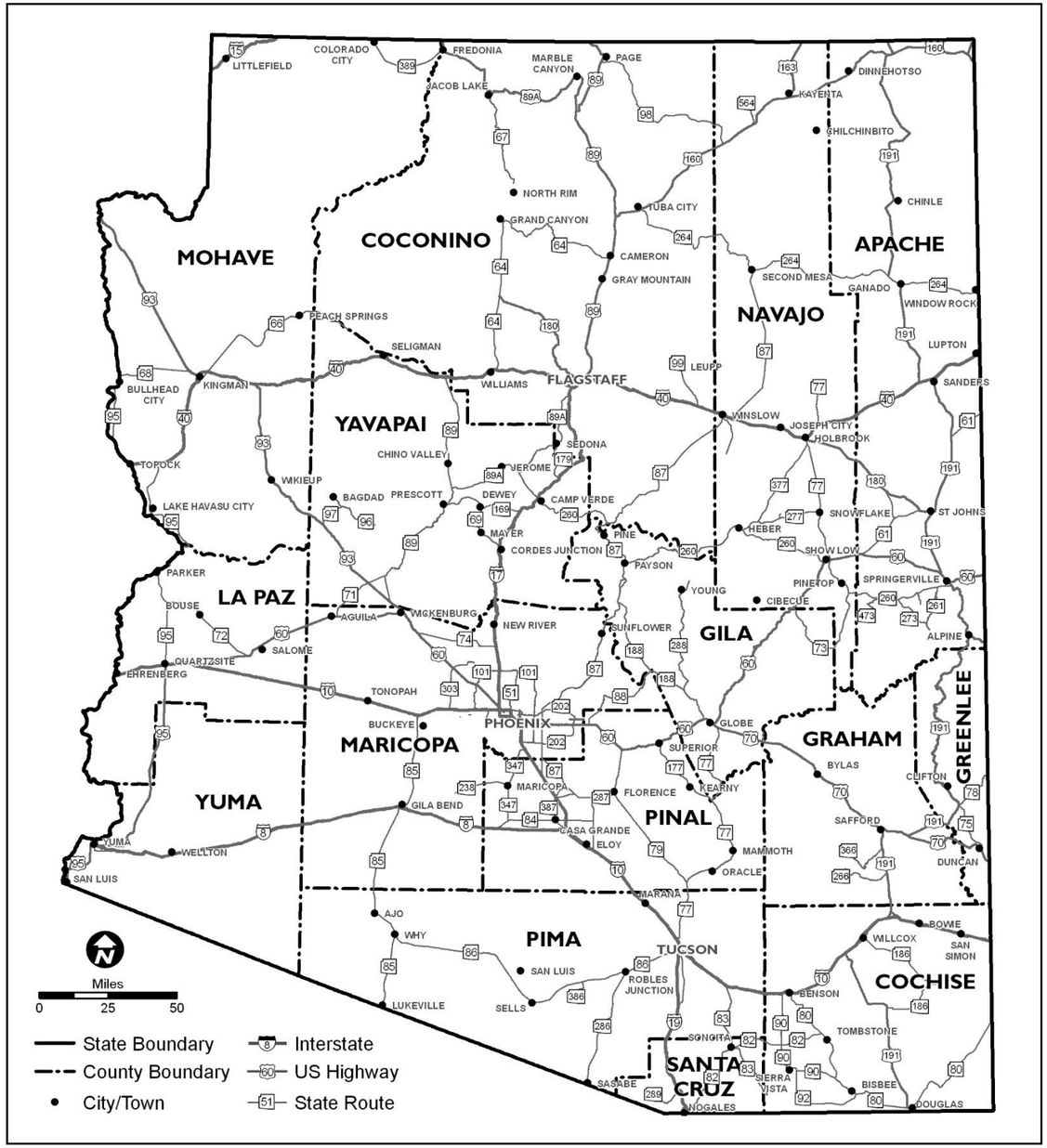
FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

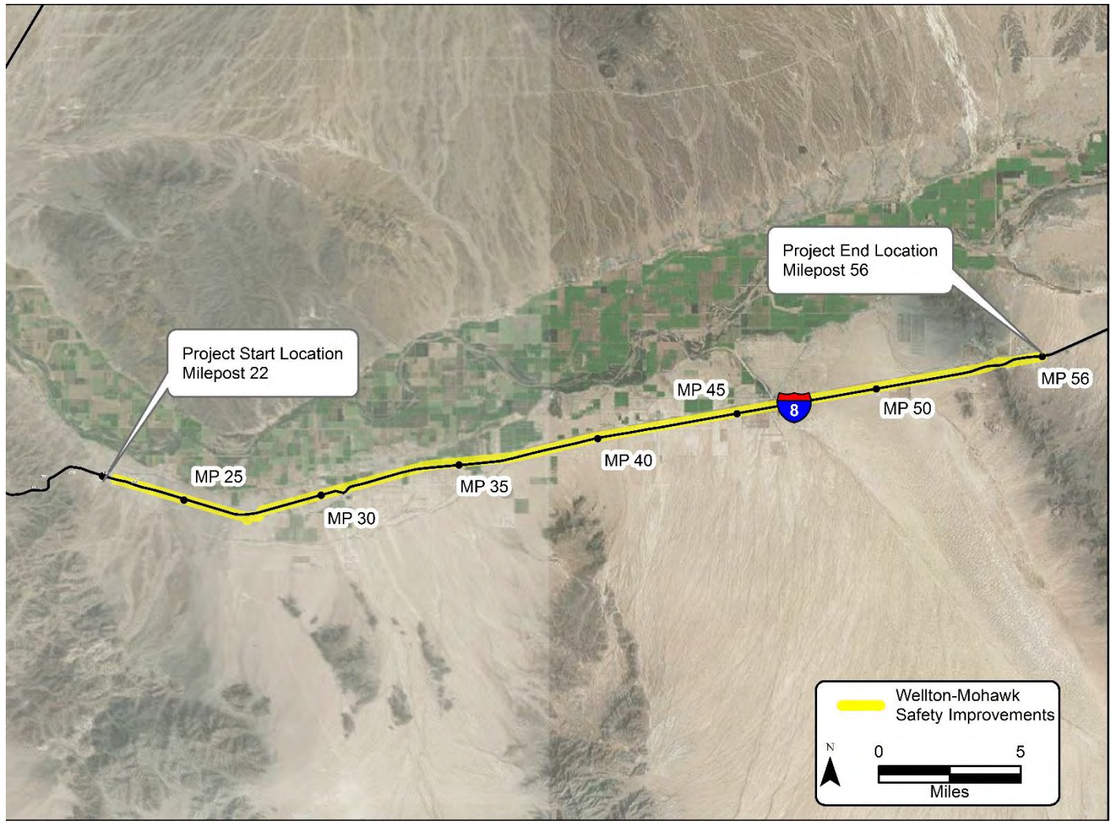
COST ESTIMATE				
Preliminary Engineering $ 75,000	Design $ 249,000	Right-of-Way $ 0	Construction $ 2,489,000	Total $ 2,813,000

PROJECT DELIVERY		
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:
Design Program Year: FY		
Construction Program Year: FY		

ATTACHMENTS
7) State Location Map
8) Project Vicinity Map
9) Project Scope of Work
10) Project Schedule
11) Itemized Cost Estimate
12) 15% Design Plan Sheets (as needed)

ATTACHMENT 1 – STATE LOCATION MAP





ATTACHMENT 2 – PROJECT VICINITY MAP

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
(Provide a detailed breakdown of the project's scope of work using bullet format) • Install speed feedback signs (EB MP 28, EB MP 40, EB MP 45, EB MP 53.75, WB MP 23, WB MP 31.5, WB MP 44, WB MP 56.5), • Install Lighting WB MP 25-25.49, WB MP 27.5-27.99, WB MP 32-33, WB MP 35 - 35.49, EB MP 26 - 26.49, WB MP 45.5-45.99