FINAL REPORT

I-40 East Corridor Profile Study

I-17 to Arizona/New Mexico State Line

PREPARED FOR ADOT JUNE 2022

ADOT WORK TASK NO.
MPD 022-21

ADOT CONTRACT NO.
17-171975

Prepared by
WILSON & COMPANY

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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
APS	Arizona Public Service
ASLD	Arizona State Land Department
AZTDM	Arizona Statewide Travel Demand Model
BLM	Bureau of Land Management
BQAZ	Building a Quality Arizona
CCTV	Closed Circuit Television
CPS	Corridor Profile Study
CR	Cracking Rating
CYMPO	Central Yavapai Metropolitan Planning Organization
DCR	Design Concept Report
DMS	Dynamic Message Sign
EB	Eastbound
FHWA	Federal Highway Administration
FMPO	Flagstaff Metropolitan Planning Organization
FY	Fiscal Year
HCRS	Highway Condition Reporting System
HPMS	Highway Performance Monitoring System
I	Interstate
INRIX	Real-time traffic conditions database
IRI	International Roughness Index
ITS	Intelligent Transportation System
LCCA	Life-Cycle Cost Analysis
LOTTR	Level of Travel Time Reliability
LOS	Level of Service
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
NACOG	Northern Arizona Council of Governments
Non-SOV	Non-Single Occupancy Vehicle
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
RWIS	Road Weather Information System
SATS	Small Area Transportation Study
SERI	Species of Economic and Recreational Importance
SHSP	Strategic Highway Safety Plan
SOV	Single Occupancy Vehicle
SR	State Route
TAC	Technical Advisory Committee
TI	Traffic Interchange
TTTR	Truck Travel Time Reliability
UP	Underpass
V/C	Volume-to-capacity Ratio
VMT	Vehicle-Miles Travelled
WB	Westbound
WIM	Weigh-in-Motion

Executive Summary

EXECUTIVE SUMMARY

INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of Interstate 40 (I-40) between Interstate 17 (I-17) and the New Mexico State Border. This study examines key performance measures relative to the I-40 East 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 has completed 21 original CPS within four separate groupings or rounds. In 2020, ADOT separated the previously studied corridors into six groupings to be updated and reassessed. The I-40 East Corridor, depicted in **Figure ES-1**, along with all CPS corridors, is one of the strategic statewide corridors identified and the subject of this CPS Update.

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. This purpose can be accomplished by following the process described below:

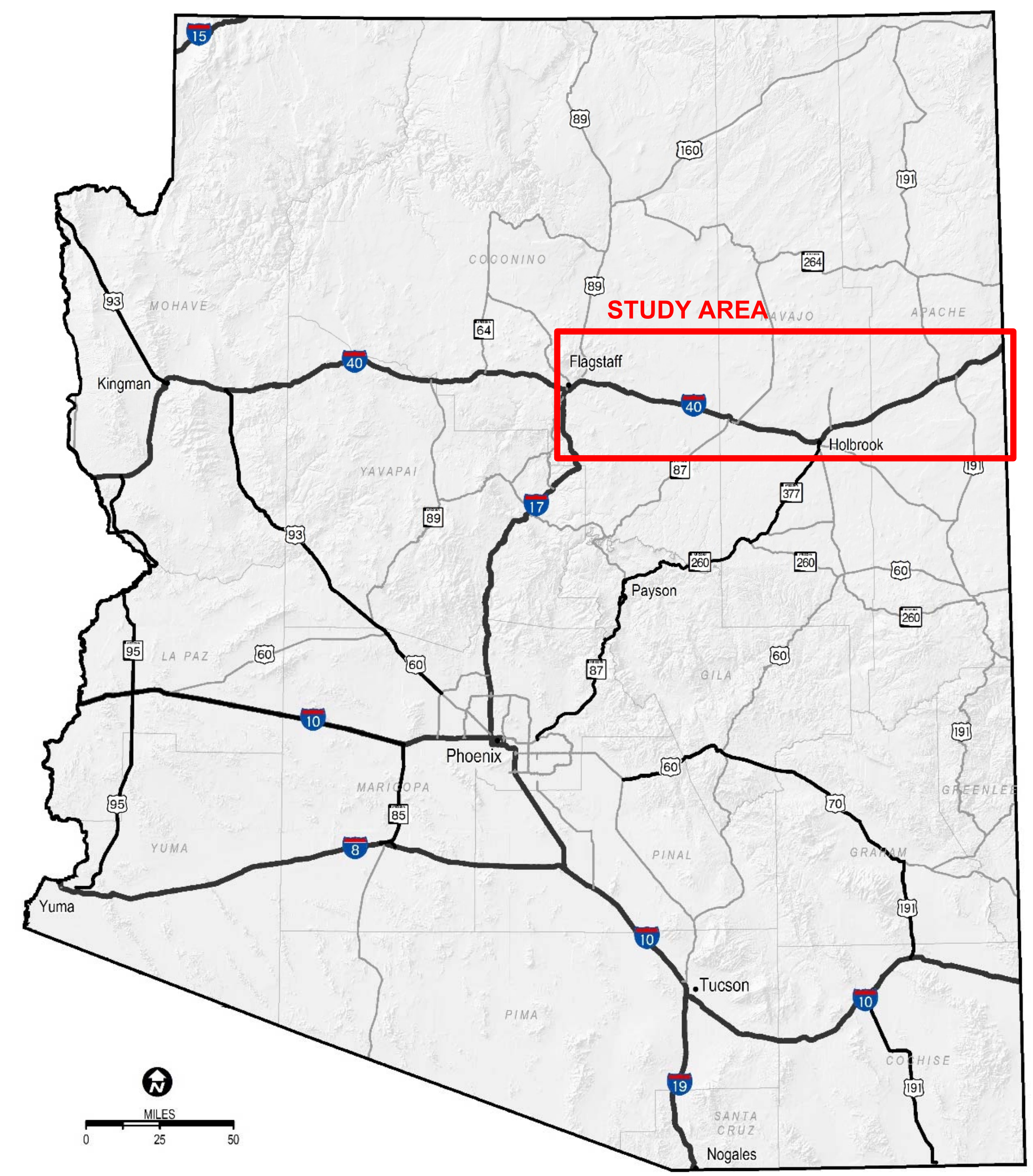
- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the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

The objective of 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-40 East 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

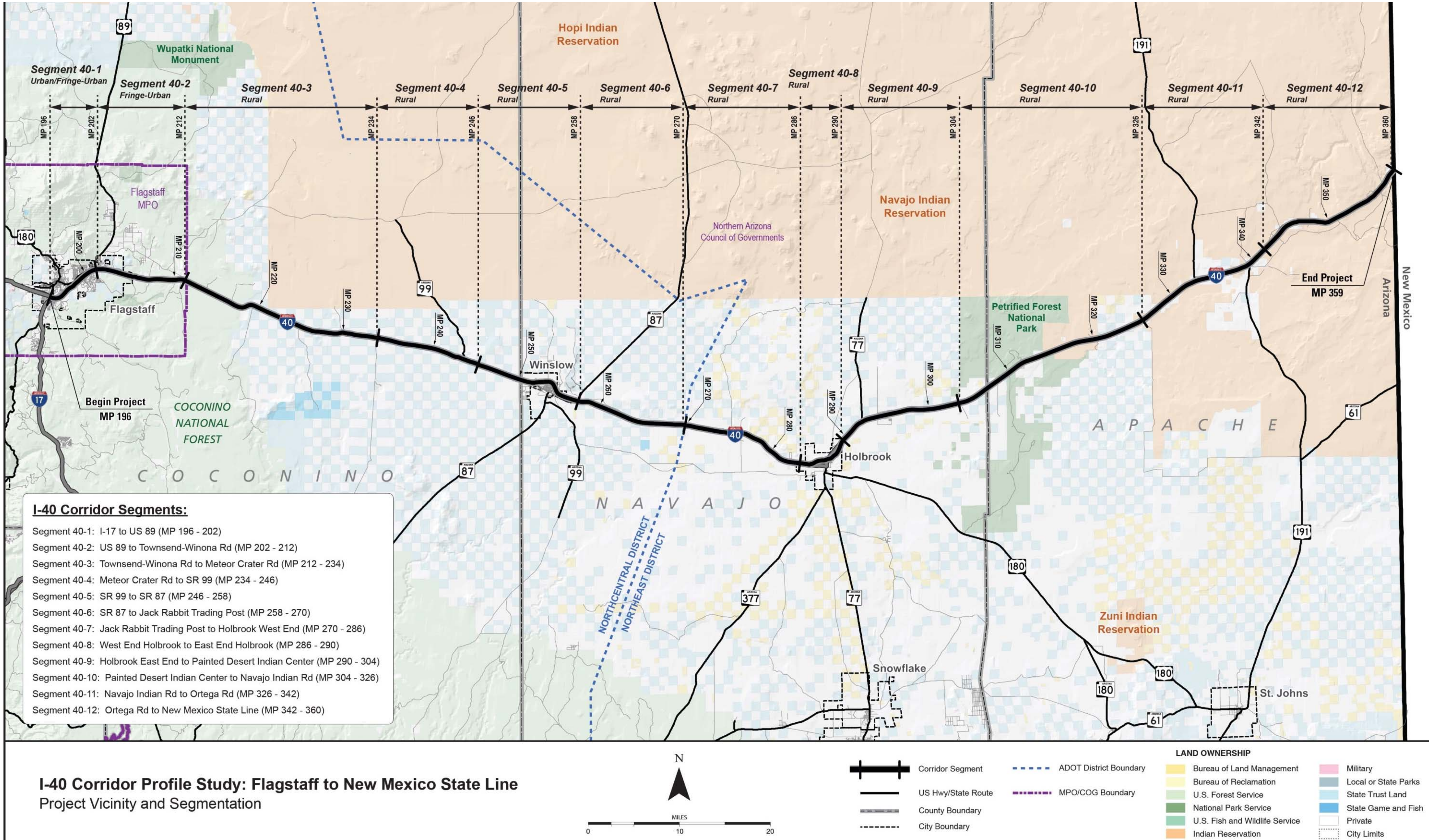
Figure ES-1: Corridor Study Area



Study Location and Corridor Segments

The I-40 East Corridor is divided into 12 planning segments for 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



CORRIDOR PERFORMANCE

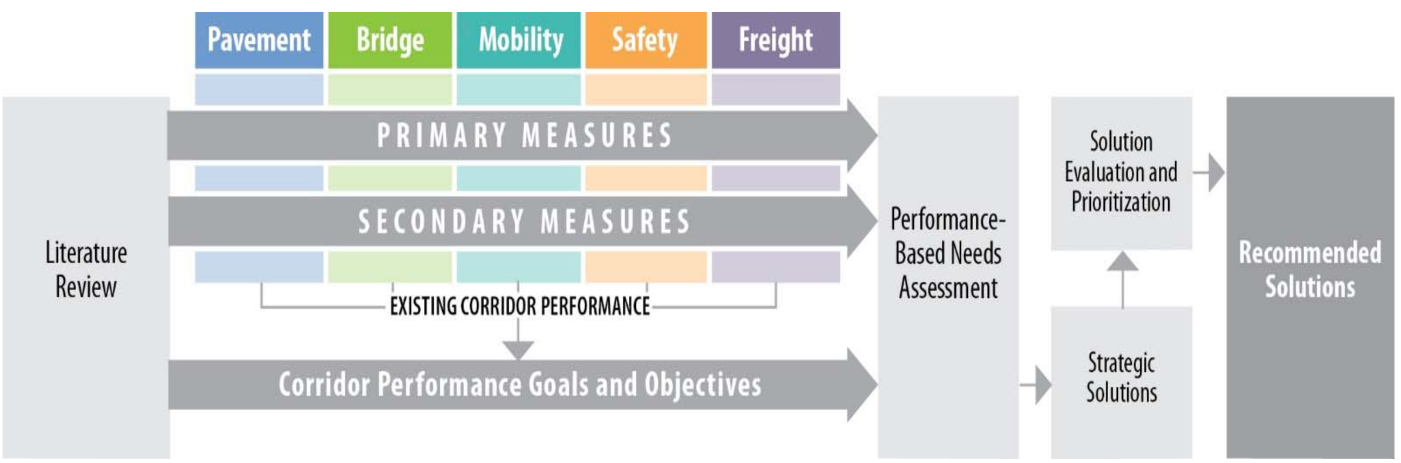
A series of performance measures is used to assess the I-40 East Corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

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, cracking, and rutting	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure and structural evaluation rating	• Bridge Sufficiency • 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 Traffic Safety Plan Emphasis Areas • Other Crash Unit Types • Safety Hot Spots
Freight	**Freight Index** Based on bi-directional truck travel time reliability	• Travel Time Reliability • 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 identified desirable/average range
Fair/Average Performance	– Rating is within identified desirable/average range
Poor/Below Average Performance	– Rating is below 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-40 East Corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary measure as shown in **Table ES-2**.

100% of the corridor show “good” performance in both the Mobility Index and Freight Index. Approximately 56% of the corridor show “good” performance in Pavement while 24% is “fair” and 20% is “poor” performance. The Bridge Index displays 88% of the corridor in “fair” condition, and 12% in “good” condition. In the Safety Index, approximately 45% of the corridor shows “below average” performance, while the other 41% and 13% are shown as “above average” and “average” performance, respectively.

Based on the results of the corridor performance evaluation, the following general observations could be made related to the performance of the I-40 East Corridor:

- The pavement generally has “good” performance with the exception of a few isolated locations
- The bridges generally have “fair” performance overall
- Segment I40E-8 has the worst Lowest Bridge Rating of 4
- The general mobility and freight indices along the corridor are displaying “good” performance where both are also showing very little recurring and non-recurring delays
- The closures along the corridor generally exceed or equal the statewide average for both the closure frequency and duration
- Segments have mixture of “above average,” “average,” and “below average” performance ratings for the Safety Index
- There are very few crash hot spots throughout the corridor

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

Segment #	Segment Length (miles)	Pavement Performance Area: Pavement Index	Directional PSR NB	Directional PSR SB	% Area Failure	Bridge Performance Area: Bridge Index	Sufficiency Rating	Lowest Bridge Rating	Mobility Performance Area: Mobility Index	Future Daily V/C	Existing Peak Hour V/C EB	Existing Peak Hour V/C WB	Closure Extent (instances/ milepost/year/mile) EB	Closure Extent (instances/ milepost/year/mile) WB	Directional Max LOTTR (all vehicles) EB	Directional Max LOTTR (all vehicles) WB	% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
I40E-1[a1]	6	3.03	2.88	2.97	33.3%	6.4	94.59	5	0.58	0.65	0.39	0.39	0.47	0.30	1.03	1.03	100%	16.3%
I40E-2[b1]	10	3.59	3.80	3.89	25.0%	5.9	93.47	5	0.36	0.40	0.25	0.25	0.22	0.22	1.02	1.03	100%	13.7%
I40E-3[b2]	22	1.96	4.26	4.26	18.2%	5.5	90.76	5	0.44	0.49	0.27	0.27	1.11	0.92	1.02	1.02	100%	6.6%
I40E-4[b2]	12	3.60	3.99	4.03	50.0%	6.1	95.50	5	0.44	0.49	0.24	0.24	0.10	0.08	1.03	1.04	100%	8.3%
I40E-5[a2]	12	1.77	4.15	4.25	13.0%	5.6	89.98	5	0.41	0.45	0.27	0.27	0.38	0.18	1.02	1.02	100%	12.8%
I40E-6[b2]	12	3.50	3.83	3.77	58.0%	5.5	89.91	5	0.33	0.36	0.17	0.17	0.13	0.10	1.03	1.03	100%	12.2%
I40E-7[b2]	16	2.36	3.95	3.95	34.0%	5.7	91.27	5	0.43	0.48	0.22	0.22	0.13	0.21	1.05	1.04	100%	16.1%
I40E-8[b2]	4	2.79	3.90	3.96	25.0%	5.5	81.09	4	0.46	0.51	0.34	0.34	0.35	0.20	1.03	1.02	100%	18.5%
I40E-9[b2]	14	2.25	4.26	4.30	0.0%	6.8	96.37	6	0.42	0.47	0.21	0.21	0.56	0.37	1.02	1.02	98%	13.7%
I40E-10[b2]	22	2.32	4.13	4.09	30.0%	5.6	88.06	5	0.39	0.43	0.25	0.25	0.53	0.27	1.02	1.02	100%	13.5%
I40E-11[b2]	16	3.56	4.03	3.94	47.0%	6.8	95.99	5	0.40	0.44	0.23	0.23	0.43	0.32	1.03	1.04	96%	10.3%
I40E-12[b2]	18	2.20	4.19	4.20	42.0%	5.8	89.65	5	0.46	0.51	0.25	0.25	0.59	1.09	1.03	1.03	90%	12.3%
Weighted Corridor Average		2.63	4.04	4.13	31%	5.7	90.78	4.86	0.42	0.47	0.25	0.25	0.47	0.42	1.03	1.03	98%	12%

SCALES

Performance Level	Interstate (Pavement Index, Directional PSR)	Interstate (% Area Failure)	All (Bridge Index)	All (Sufficiency Rating)	All (Lowest Bridge Rating)	Rural (Mobility Index, Future Daily V/C, Existing Peak Hour V/C)	All (Closure Extent)	All (Directional Max LOTTR)	All (% Bicycle Accommodation)	All (% Non-SOV Trips)
Good/Above Average Performance	> 3.75	< 5%	> 6.5	> 80	> 6	< 0.56	< 0.22	< 1.15	> 90%	> 17%
Fair/Average Performance	3.20 - 3.75	5% - 20%	5.0 - 6.5	50 - 80	5 - 6	0.56 - 0.76	0.22 - 0.62	1.15 - 1.5	60% - 90%	11% - 17%
Poor/Below Average Performance	< 3.20	> 20%	< 5.0	< 50	< 5	> 0.76	> .62	> 1.5	< 60%	< 11%

Performance Level	Urban and Fringe Urban
Good/Above Average Performance	< 0.71
Fair/Average Performance	0.71 - 0.89
Poor/Below Average Performance	> 0.89

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

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

Safety Performance Area										Freight Performance Area						
Segment #	Segment Length (miles)	Safety Index	Directional Safety Index		% of Fatal + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Segment Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Segment Fatal + Suspected Serious Injury Crashes Involving Bicycles	Freight TTTR	Directional Max TTTR		Combined Average Peak TTTR	Average Minutes Per Year Given Milepost Is Closed Per Segment Mile (NB/EB)		Bridge Vertical Clearance (feet)
			EB	WB							EB	WB		EB	WB	
I40E-1[a1]	6	1.73	2.29	1.17	Insufficient Data	45.5%	Insufficient Data	37.5%	Insufficient Data	1.12	1.12	1.12	1.12	116.62	53.05	16.67
I40E-2[b1]	10	1.08	1.11	1.06	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.09	1.08	1.10	1.09	87.10	67.26	16.00
I40E-3[b2]	22	1.48	1.64	1.32	Insufficient Data	81.5%	Insufficient Data	22.2%	Insufficient Data	1.06	1.06	1.06	1.06	398.89	346.15	15.96
I40E-4[b2]	12	0.15	0.11	0.18	Insufficient Data	45.5%	Insufficient Data	9.1%	Insufficient Data	1.10	1.10	1.11	1.10	35.45	24.73	16.15
I40E-5[a2]	12	1.11	1.27	0.95	Insufficient Data	66.7%	Insufficient Data	55.6%	Insufficient Data	1.06	1.06	1.06	1.06	96.93	39.20	16.26
I40E-6[b2]	12	1.29	1.46	1.12	Insufficient Data	81.3%	Insufficient Data	Insufficient Data	Insufficient Data	1.09	1.09	1.09	1.09	34.12	29.92	No UP
I40E-7[b2]	16	0.70	1.05	0.34	Insufficient Data	Insufficient Data	Insufficient Data	20.0%	Insufficient Data	1.13	1.13	1.14	1.13	41.79	56.74	16.01
I40E-8[b2]	4	2.03	2.74	1.33	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.06	1.07	1.06	1.06	127.25	58.75	16.96
I40E-9[b2]	14	1.24	0.83	1.65	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.06	1.06	1.06	1.06	209.81	124.11	16.12
I40E-10[b2]	22	0.00	0.00	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.06	1.06	1.06	1.06	211.27	89.35	15.96
I40E-11[b2]	16	1.42	1.57	1.26	Insufficient Data	62.5%	Insufficient Data	8.3%	Insufficient Data	1.11	1.11	1.11	1.11	175.96	102.71	16.06
I40E-12[b2]	18	0.83	0.39	1.33	Insufficient Data	53.8%	Insufficient Data	Insufficient Data	Insufficient Data	1.09	1.08	1.09	1.09	233.05	412.67	16.06
Weighted Corridor Average		0.97	1.02	0.92	Insufficient Data	64.85%	Insufficient Data	23.1%	Insufficient Data	1.09	1.08	1.09	1.09	171.45	144.21	No UP

SCALES							SCALES				
Performance Level	**Urban 4 Lane Freeway**						**Uninterrupted**			**All**	
Good/Above Average Performance	< 0.73	< 44%	< 60.6%	< 0.0%	< 6.9%	= 0.0%	< 1.15			< 44.18	> 16.5
Fair/Average Performance	0.73 - 1.27	44% - 54%	60.6% - 78.1%	0.0% - 4.9%	6.9% - 12.4%		1.15 - 1.35			44.18-124.86	16.0 - 16.5
Poor/Below Average Performance	> 1.27	> 54%	> 78.1%	> 4.9%	> 12.4%	> 0.0%	> 1.35			> 124.86	< 16.0
Performance Level	**Rural 4 Lane Freeway with Daily Volume < 25,000**						**Interrupted**				
Good/Above Average Performance	< 0.84	< 51%	< 72.8%	< 1.0%	< 19.0%	= 0.0%	< 1.45	< 1.45	< 1.45		
Fair/Average Performance	0.84 - 1.16	51% - 58%	72.8% - 76.4%	1.0% - 3.3%	19.0% - 22.5%	0.0% - 0.9%	1.45-1.85	1.45-1.85	1.45-1.85		
Poor/Below Average Performance	> 1.16	> 58%	> 76.4%	> 3.3%	> 22.5%	> 0.9%	> 1.85	> 1.85	> 1.85		

[a] Urban 4 Lane Freeway
[b] Rural 4 Lane Freeway < 25,000 vpd
[1]Urban or Fringe Urban Operating Environment
[2]Rural Operating Environment
Notes: "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

The I-40 East Corridor is part of I-40, a major east-west transcontinental interstate highway that connects the east coast (North Carolina) to the west coast (California). I-40 East is a major transportation artery route for freight as well as passenger vehicular traffic, connecting major metropolitan cities in the south-western United States. I-40 East is also the primary transportation route connecting the Phoenix metropolitan area to central and north-eastern parts of the country. I-40 East, together with I-17, plays a key role in the transportation infrastructure of northern Arizona, contributing to its economic success.

Corridor Objectives

Statewide goals and performance measures were established by the ADOT Long-Range Transportation Plan (LRTP), 2010-2035 goals and objectives that were updated in 2017. Statewide performance goals that are relevant to I-40 East 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-40 East Corridor: Pavement, Bridge, and Safety.

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 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

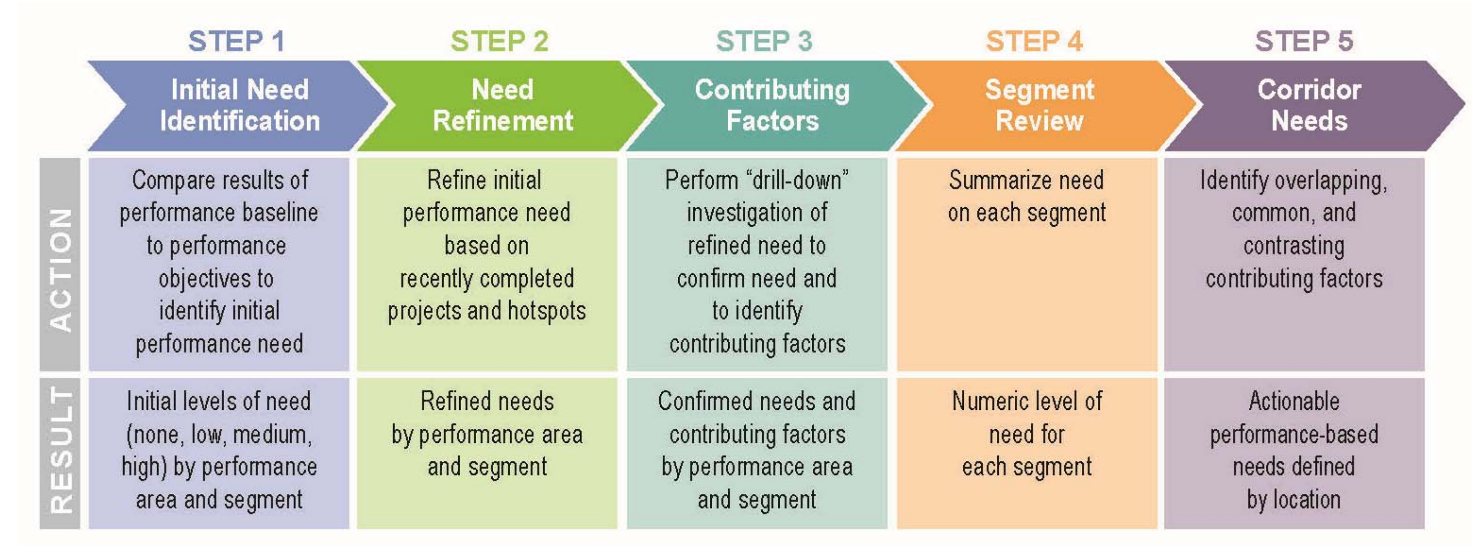


Figure ES-5: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need	Description
	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
6.5	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.*

Summary of Needs

Table ES-3 provides a summary of needs for each segment across all performance areas, with the average need score for each segment presented in the last row of the table. A weighting factor of 1.5 is applied to the need scores of the performance areas identified as emphasis areas (Pavement, Bridge, and Safety) for the I-40 East Corridor. There is one segment with a High average need, ten segments with a Medium average need, and one segment with a Low average need. More information on the identified final needs in each performance area is provided below.

Pavement Needs

- Pavement failure hot spots were identified on 22 miles of eastbound I-40 East and 21 miles of westbound I-40 East spread throughout the corridor.
- A high level of historical investment has occurred on approximately 62 miles (38% of centerline miles) of the corridor (MP 196-212, MP 246-270, MP 286-290, and MP 342-360) which may warrant further investigation or alternative solutions.

Bridge Needs

- Bridge needs were identified at 46 of the 112 bridges (38%).
- 16 bridges have current ratings of one 5.
- 16 bridges have current ratings of multiple 5's.
- 8 bridges have current ratings of 4 or less.
- 32 bridges have current deck ratings of 5 or less.
- 22 bridges have potential historical rating issues which may be candidates for life-cycle cost analysis to evaluate alternative solutions.

Mobility Needs

- A higher than average number of closures due to incidents/crashes occur from MP 196 to 234, MP 246 to 258 in the eastbound direction, MP 286 to 290 in the eastbound direction and MP 290 to 359.
- A higher than average extent of closures occurred from MP 212 to 234 and from MP 342 to 359 in the eastbound direction.

Safety Needs

- Safety needs were identified on 130 miles (79%) of the corridor.
- The highest levels of need have been identified from MP 196 to 202, MP 212 to 234, and from MP 258 to 270.
- Approximately 39% of the crashes along the corridor involved collision with motor vehicle, and 40% involved an overturning vehicle with 67% involves a first unit event of collision with pedestrian.
- Approximately 23% of the crashes involved under the influence of drugs or alcohol.
- MP 202-212 and MP 342-360 crashes involved a higher percentage of pedestrian and pedalcyclist crashes than similar operating environments.
- Crash hot spots near MP 195 to 196 and MP 288 to 290 may be weather related while crash hot spots near MP 218 to 220, MP 229, MP 240 to 242, and MP 262 to 265 may be lighting related.

Freight Needs

- Low freight needs exist on eleven of the twelve segments.
- Segments 40-3, 40-9, 40-10, 40-11, and 40-12 contain High closure duration needs primarily due to weather related accidents, incidents, obstructions, or hazards.
- Segments 40-3 and 4-10 contain a poor performance score for bridge clearance.

Overlapping Needs

This section identifies overlapping performance needs on I-40 East, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need (i.e., Medium or High). Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of overlapping needs that relate to locations with elevated levels of need is provided below:

- Segment 40-1 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-2 has a Medium need in the Safety performance area
- Segment 40-3 has a High need in the Pavement performance area, Medium need in the Bridge performance area and a High need in the Safety performance area
- Segment 40-5 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-6 has a High need in the Pavement performance area, Medium need in the Bridge performance area and a High need in the Safety performance area

- Segment 40-7 has a High need in the Pavement performance area
- Segment 40-8 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-9 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-10 has a High need in the Pavement performance area
- Segment 40-11 has a High need in the Safety performance area
- Segment 40-12 has a High need in the Pavement performance area

Table ES-3: Summary of Needs by Segment

Performance Area	40-1	40-2	40-3	40-4	40-5	40-6	40-7	40-8	40-9	40-10	40-11	40-12
	MP 196-202	MP 202-212	MP 212-234	MP 234-246	MP 246-258	MP 258-270	MP 270-286	MP 286-290	MP 290-304	MP 304-326	MP 326-342	MP 342-360
Pavement*	High	Low	High	Low	High	High	High	High	High	High	Low	High
Bridge*	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	Low	Low
Mobility	None	Low	Low	Low	Low	None	Low	None	Low	Low	None	Low
Safety*	High	Medium	High	Low	High	High	Low	High	High	None	High	Low
Freight	Low	Low	Low	Low	Low	None	Low	Low	Low	Low	Low	Low
Average Need (0-3)	1.77	1.23	2.15	1.00	1.92	1.85	1.60	1.77	1.60	1.23	1.31	1.46

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

*Identified as Emphasis Areas for I-40 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

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-40 East 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 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

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-40 East Corridor will be considered along with other candidate projects in the ADOT statewide programming process.

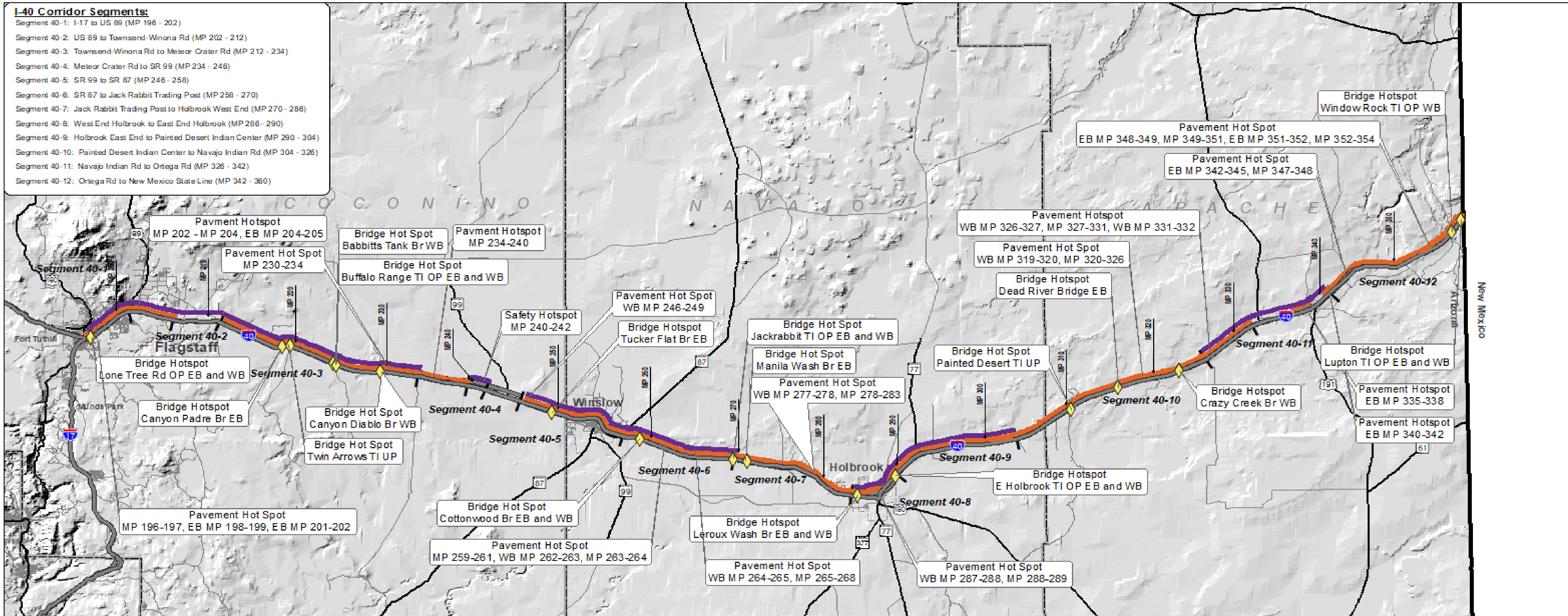
Candidate solutions should include some or all of the following characteristics:

- 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 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.

Figure ES-6: Strategic Investment Areas



Performance Area	40-1	40-2	40-3	40-4	40-5	40-6	40-7	40-8	40-9	40-10	40-11	40-12
	MP 196-202	MP 202-212	MP 212-234	MP 234-246	MP 246-258	MP 258-270	MP 270-286	MP 286-290	MP 290-304	MP 304-326	MP 326-342	MP 342-360
Pavement*	High	Hot Spot	High	Hot Spot	High	High	High	High	High	High	Hot Spot	High
Bridge*	Hot Spot	-	Medium	-	Hot Spot	Medium	Hot Spot	Hot Spot	-	Hot Spot	-	Hot Spot
Mobility	-	-	-	-	-	-	-	-	-	-	-	-
Safety*	High	Medium	High	Hot Spot	High	High	-	High	High	-	High	-
Freight	-	-	-	-	-	-	-	-	-	-	-	-

I-40 Corridor Profile Study: I-17 to New Mexico State Line
Strategic Investment Areas

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 is 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 can eliminate options from further consideration and identify which options should be carried forward for further evaluation.

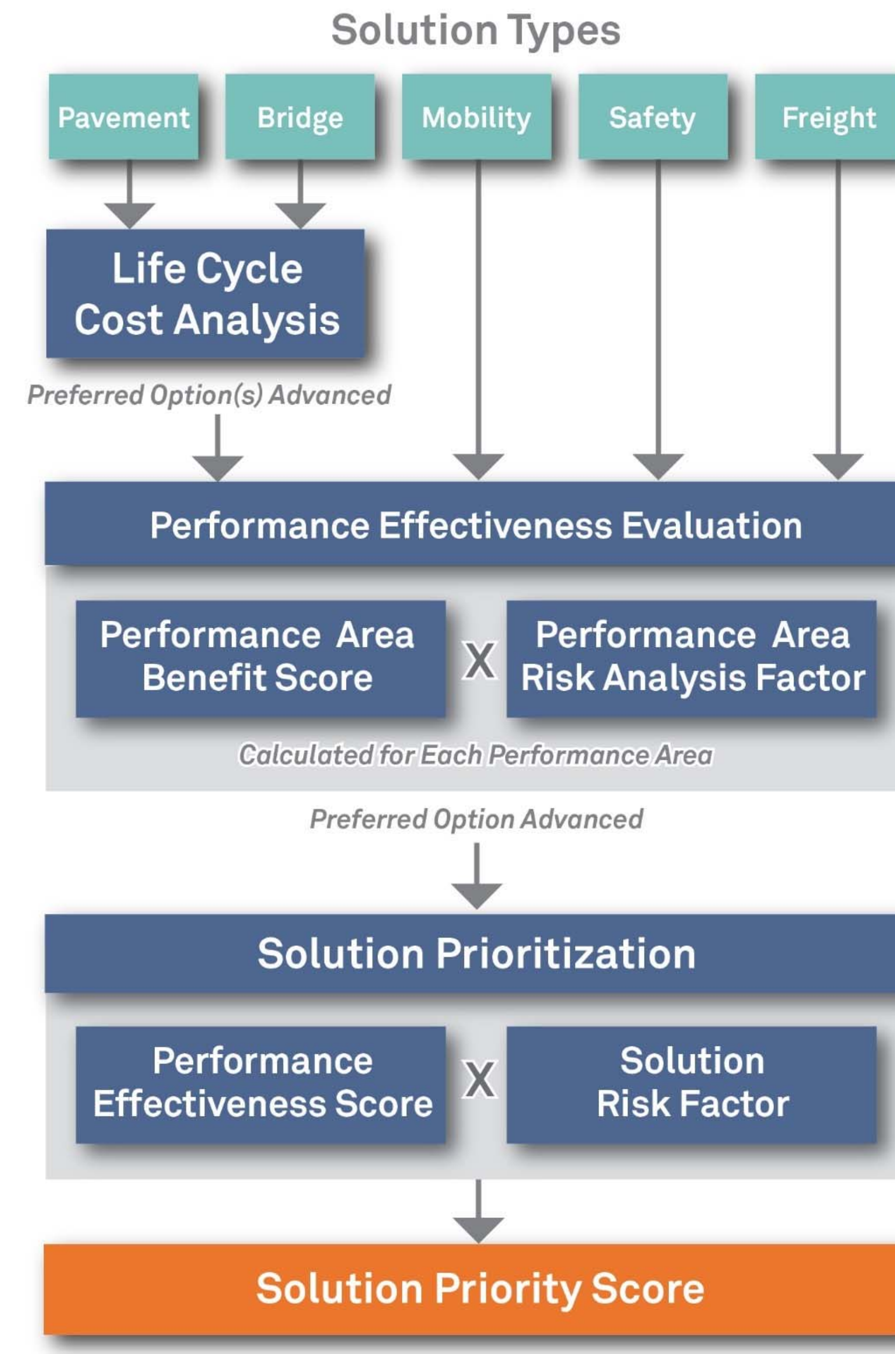
When multiple independent candidate solutions are developed for Mobility, Safety, or Freight strategic investment areas, these candidate solution options advance directly to the Performance Effectiveness Evaluation without an LCCA.

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 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

Prioritized Candidate Solution Recommendations

Table ES-4 and **Figure ES-8** show the prioritized candidate solutions recommended for the I-40 East 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-40 East Corridor. The following observations were noted about the prioritized solutions:

- One solution results in a Prioritization Score above 80 which shows that its performance benefits are much higher than its cost.
- The top solution includes the installation of lighting in locations where 50% of the fatal and serious injury crashes occur in dark unlit conditions.
- All five of the highest-ranking solutions are located where the Safety Index was the highest along the corridor.

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-40 East Corridor.

- When recommending future projects along the I-40 East Corridor, review historical ratings and levels of investment. According to data used for this study, the following pavement and bridge locations have exhibited high historical investment (pavement) or rating fluctuation (bridge) issues:
  - Pavement MP 196-202
  - Pavement MP 202-212
  - Pavement MP 246-258
  - Pavement MP 270-286
  - Pavement MP 286-290
  - Pavement MP 342-360
  - Canyon Padre Br EB (MP 218.73)
  - Twin Arrows TI UP MP219.53)
  - Canyon Diablo Br WB (MP 229.90)
  - Sunshine BNSF RR OP WB (MP 237.10)
  - Little Colo River Br EB/WB MP 256.95)
  - W Joseph City TI UP (#1893) (MP 274.76)
  - Hunt Rd TI UP (MP 280.64)
  - Navajo TI UP (MP 325.92)
  - McCarroll TI UP (MP 330.00)
  - Chambers TI UP (MP 333.41)
  - Ortega Rd TI UP (MP 341.81)
  - Black Creek Br EB (MP 347.90)

Policy and Initiatives 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 the I-40 East Corridor, 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 initial four CPS rounds:

- 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

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-40 East 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.

These 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.

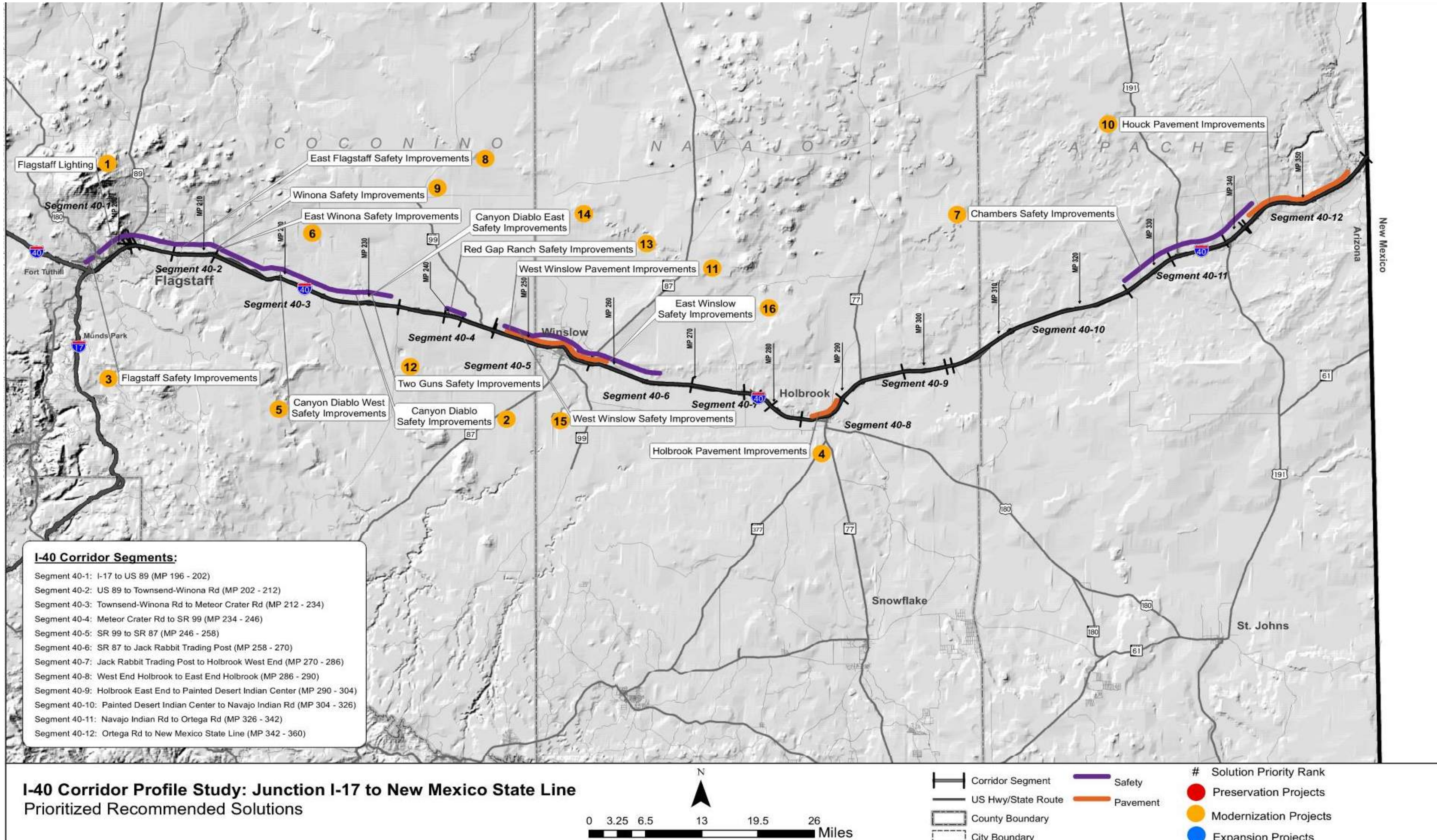
Table ES-4: Prioritized Recommended Solutions

Rank	Candidate Solution #	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P] Modernization [M] Expansion [E])	Prioritization Score
1	CS40.04	Flagstaff Lighting (MP 196 – 202)	Install offset lighting along I-40 between MP's 196 and 202 by connecting to existing power. This includes light poles, luminaires, pull boxes, conduit, and conductors.	$8.06	M	**140.0**
2	CS40.11	Canyon Diablo Safety Improvements (MP 220-229)	Rehabilitate shoulder and widen the inside shoulder.	$8.81	M	**78.3**
3	CS40.03	Flagstaff Safety Improvements (MP 196 – 200)	Rehabilitate shoulder and widen the inside shoulder. Implement variable speed limits using a wireless ground mount construction. Install in-lane route pavement markings for the westbound I-40/I-17 interchange. Install a Roadside Weather Information System (RWIS) and rock-fall mitigation (wire mesh) near MP 199.	$22.93	M	**64.5**
4	CS40.18	Holbrook Pavement Improvements (286-290)	Replace pavement in both directions between MP 286 and 290.	$50.08	M	**60.1**
5	CS40.10	Canyon Diablo West Safety Improvements (218-220)	For the entire length of the project (MP 218 – 220) improve skid resistance by reconstructing pavement, increasing super-elevation, or mill and replace. Install chevrons and curve warning signs. Install a dynamic speed feedback system near MP 218 eastbound and MP 220 westbound.	$12.27	M	**42.2**
6	CS40.09	East Winona Safety Improvements (MP 212-218)	Rehabilitate shoulder and widen the inside shoulder. Improve skid resistance from MP 212 to 218 by reconstructing pavement, increasing super-elevation, or mill and replace. Install high visibility striping and delineators. Implement variable speed limits using a wireless ground-mount construction.	$54.48	M	**20.7**
7	CS40.19	Chambers Safety Improvements (MP 326-342)	Rehabilitate shoulder, widen the inside shoulder, and include rumble strips. Install high visibility striping and delineators.	$31.84	M	**17.8**
8	CS40.05	East Flagstaff Safety Improvements (MP 200 – 207)	Improve skid resistance from MP 200 to 202 by reconstructing pavement, increasing super-elevation, or mill and replace. Install chevrons and curve warning signs from MP 200 to 202. Rehabilitate shoulder and widen the inside shoulder. Implement variable speed limits using a wireless ground-mount construction.	$53.54	M	**16.2**
9	CS40.06	Winona Safety Improvements (MP 207-212)	Improve skid resistance from MP 207 to 208 and from MP 210 to 212 by reconstructing pavement, increasing super-elevation, or mill and replace. Install chevrons and curve warning signs from MP 207 to 208 and from MP 210 to 212. Install high visibility striping, delineators, and rumble strips. Rehabilitate shoulder and widen the inside shoulder. Implement variable speed limits using a wireless ground-mount construction. Install RWIS and a new eastbound Dynamic Message Sign (DMS) near MP 212.1 with attached CCTV nearby.	$40.84	M	**14.8**
10	CS40.20	Houck Pavement Improvements (MP 342-360)	Replace pavement in both directions between MP 342 and 360.	$225.37	M	**13.0**

Table ES-4: Prioritized Recommended Solutions (continued)

Rank	Candidate Solution #	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P] Modernization [M] Expansion [E])	Prioritization Score
11	CS40.15	West Winslow Pavement Improvements (246-258)	Replace pavement in both directions between MP 246 and 258.	$150.25	M	**12.6**
12	CS40.13	Two Guns Safety Improvements (MP 230-234)	Rehabilitate shoulder and widen the inside shoulder. Install high visibility striping, delineators, and rumble strips.	$3.91	M	**11.6**
13	CS40.14	Red Gap Ranch (240-242)	Rehabilitate shoulder and widen the inside shoulder. Install high visibility striping, delineators, and rumble strips. Install dynamic speed feedback system.	$6.78	M	**7.1**
14	CS40.12	Canyon Diablo East Safety Improvements (MP 229 – 230)	Rehabilitate shoulder and widen the inside shoulder. Install a dynamic speed feedback system near MP 229 eastbound and MP 230 westbound. Retrofit RWIS at the Two Guns TI at MP 230. Install high visibility striping and delineators.	$3.46	M	**7.0**
15	CS40.16	West Winslow Safety Improvements (246-258)	Widen the inside shoulder and improve skid resistance from MP 248 to 251 by reconstructing pavement, increasing super-elevation, or mill and replace.	$373.31	M	**2.1**
16	CS40.17	East Winslow Safety Improvements (MP 258 – 266)	Improve skid resistance from MP 258 to 260 by reconstructing pavement, increasing super-elevation, or mill and replace. Install dynamic speed feedback systems near MP 258 eastbound and MP 260 westbound.	$11.82	M	**0.8**

Figure ES-8: Prioritized Recommended Solutions



Final Report

Final Report

1.0 INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of Interstate 40 (I-40) between I-17 and New Mexico State Line. The study examines key performance measures relative to the I-40 East 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 has completed 21 original CPS within four separate groupings or rounds. In 2020, ADOT separated the previously studied corridors into six groupings to be updated and reassessed: Northeast, Northcentral, Northwest, Southeast, Southcentral, and Southwest. The 12 corridor studies within the three northern groupings began in Spring 2021 and include:

Northeast

- I-40: I-17 to New Mexico State Line
- SR 77: US 60 to SR 377
- SR 87: SR 202L to SR 260; SR 260: SR 87 to SR 277; SR 277: SR 260 to SR 377; SR 377: SR 277 to SR-40B; SR-40B: SR 377 to I-40
- SR 260: SR 277 to SR 73 and US 60: SR 260 to New Mexico State Line

Northcentral

- I 17: SR 69 to I-40
- US 89: Flagstaff to Utah State Line
- US 160: US 89 to New Mexico State Line
- SR 64: I-40 to Grand Canyon National Park
- SR 179: I-17 to SR 89A; SR 89A: SR 179 to I-17; and SR 260: SR 89A to I-17

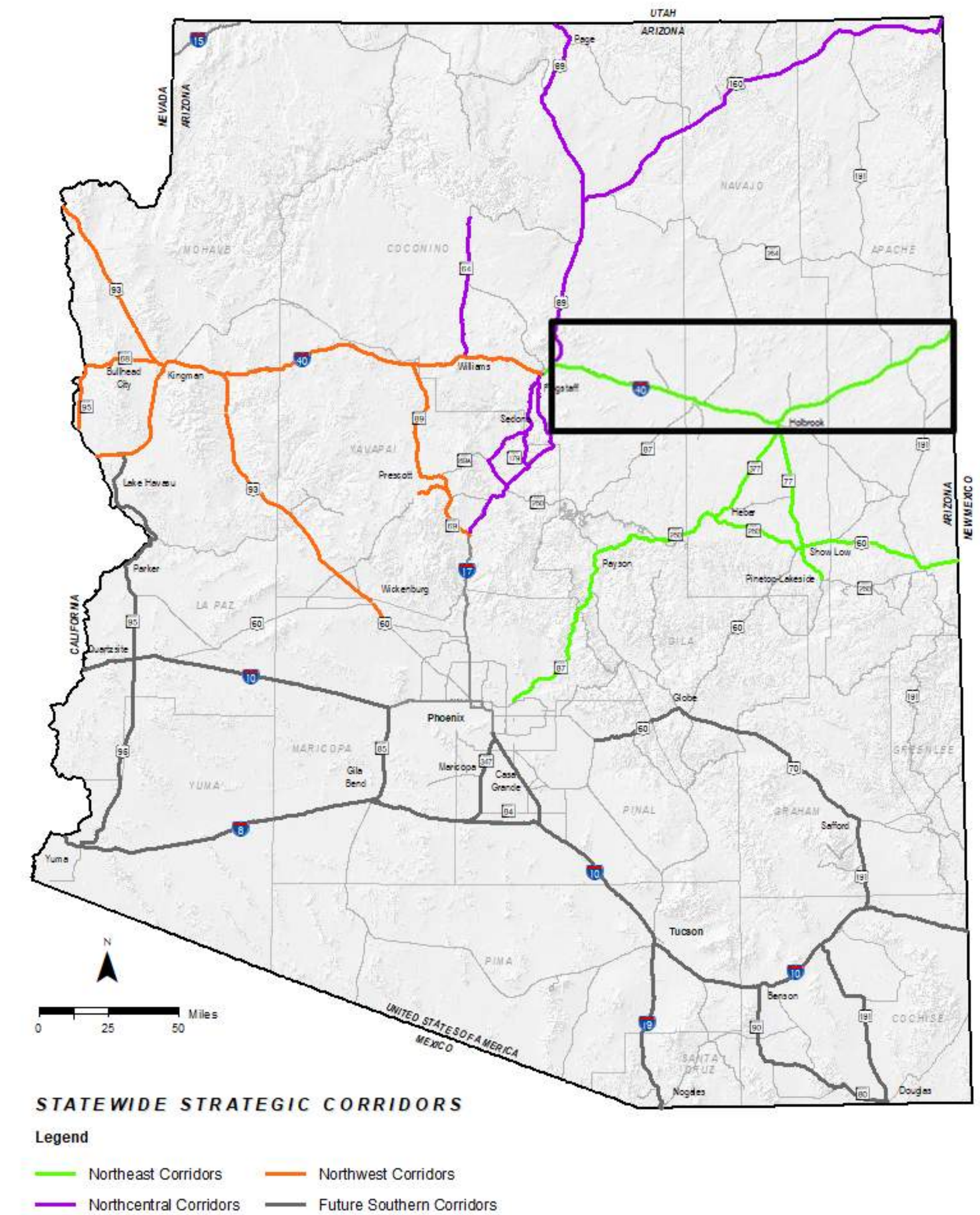
Northwest

- I-40: California State Line to I-17
- US 60: SR 74 to US 93; US 93: US 60 to Nevada State Line
- SR 68: SR 95 North to US 93 and SR 95 North: California State Line to Nevada State Line
- SR 69: I-17 to SR 89; Fain Rd: SR 69 to SR 89A; SR 89A: Fain Rd to SR 89; SR 89: SR 89A to I-40

The 9 corridor studies within the three southern groupings are proposed to begin in Spring 2022.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-40 East Corridor, depicted in **Figure 1** along with all CPS corridors**,** is one of the strategic statewide corridors identified and the subject of this CPS Update.

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. This purpose can be 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-40 East 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-40 East Corridor. Proposed actions are compared based on their likelihood of achieving desired performance levels, life-cycle costs, and cost-effectiveness 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

The I-40 East Corridor is part of I-40, a major east-west transcontinental interstate highway that connects the east coast (North Carolina) to the west coast (California). I-40 East is a major transportation artery route for freight as well as passenger vehicular traffic, connecting major metropolitan cities in the south-western United States. I-40 East is also the primary transportation route connecting the Phoenix metropolitan area to central and north-eastern parts of the country. I-40 East, together with I-17, plays a key role in the transportation infrastructure of northern Arizona, contributing to its economic success.

I-40 provides the most direct and fastest link between Flagstaff (and Grand Canyon National Park), central and north-eastern United States to the east, and major California cities to the west (Figure 1). I-40 provides a principal road link for freight traffic from the ports in California. This study builds on earlier planning efforts in developing and applying a performance-based process for prioritizing improvements to meet present and future needs in the corridor.

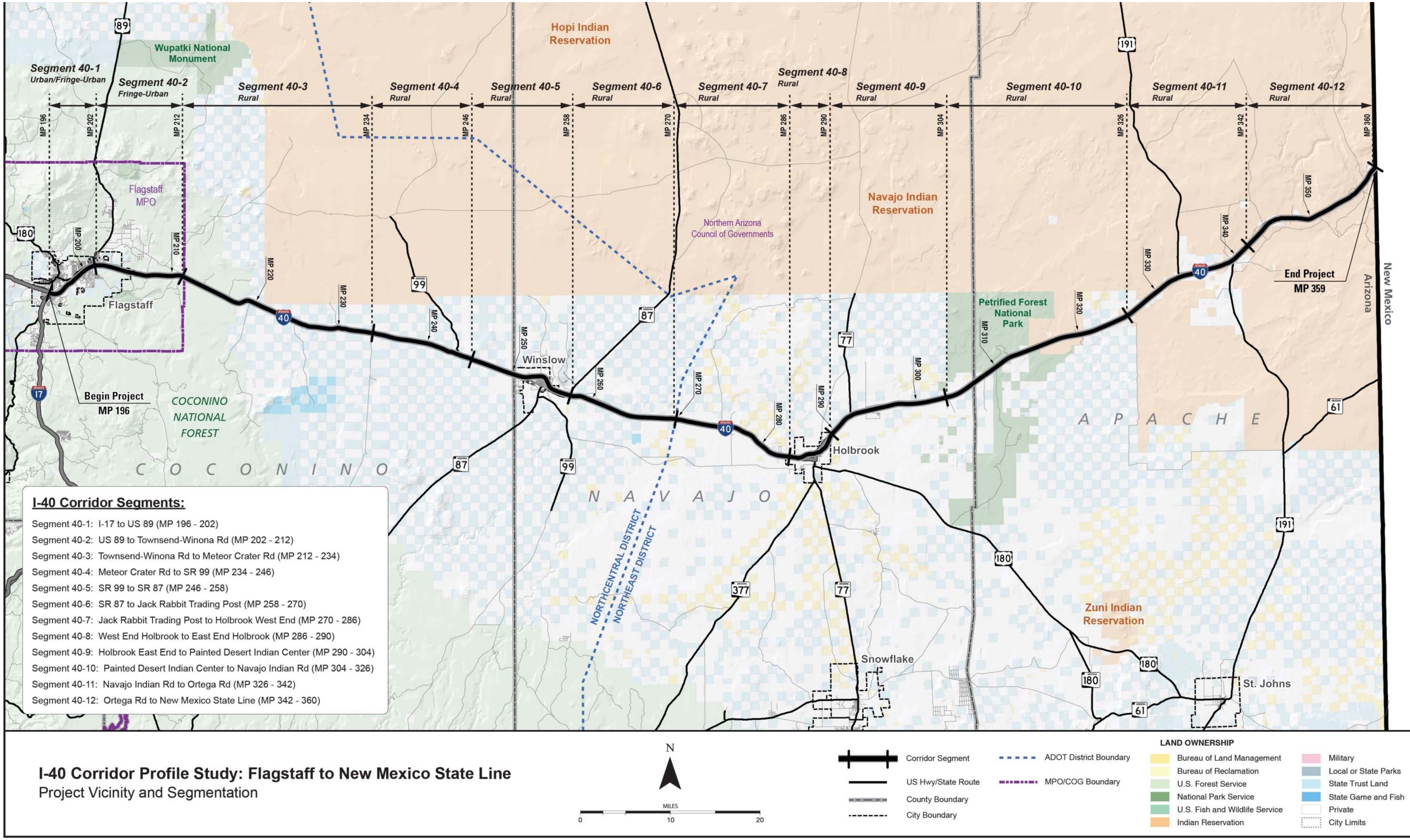
1.4 Corridor Segments

The I-40 East Corridor is divided into 12 planning segments to allow for an appropriate level of detailed needs analysis, performance evaluation, and comparison between different segments of the corridor. 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 described in **Table 1** and shown in **Figure 2**.

Table 1: I-40 East Corridor Segments

Segment	Begin	End	Approx. Begin Milepost	Approx. End Milepost	Approx. Length (miles)	Typical Through Lanes (EB, WB)	2018/2040 Average Annual Daily Traffic Volume (vpd)	Character Description
40-1	I-17	US 89	196	202	6	2, 2	37,800/47,600	This segment is generally urban/fringe-urban in nature, includes three interchanges, and is within the urbanized limits of the Flagstaff Metropolitan Area in Coconino County.
40-2	US 89	Townsend-Winona Road	202	212	10	2, 2	22,400/27,900	This segment is urban-fringe in nature, includes three interchanges, and is within Coconino County.
40-3	Townsend-Winona Road	Meteor Crater Road	212	234	22	2, 2	20,300/25,200	This segment is generally rural in nature, includes four interchanges, and is within Coconino County.
40-4	Meteor Crater Road	SR 99	234	246	12	2, 2	20,100/25,000	This segment is rural in nature, includes two interchanges, and within Coconino County.
40-5	SR 99	SR 87	246	258	12	2, 2	19,900/24,800	This segment is rural in nature, includes four interchanges, and spans Coconino and Navajo Counties. This segment passes through Winslow.
40-6	SR 87	Jack Rabbit Trading Post	258	270	12	2, 2	20,800/25,800	This segment is rural in nature, includes two interchanges, and is located within Navajo County.
40-7	Jack Rabbit Trading Post	Holbrook West End	270	286	16	2, 2	20,500/25,500	This segment is rural in nature, includes four interchanges, and is located within Navajo County.
40-8	Holbrook West End	Holbrook East End	286	290	4	2, 2	23,000/28,700	This segment is rural in nature, includes three interchanges, and is located within Navajo County. This segment passes through Holbrook.
40-9	Holbrook East End	Painted Desert Indian Center	290	304	14	2, 2	20,200/25,200	This segment is rural in nature, includes four interchanges, and is located within Navajo County.
40-10	Painted Desert Indian Center	Navajo Indian Road	304	326	22	2, 2	18,200/22,700	This segment is rural in nature, includes three interchanges, and spans Navajo and Apache Counties.
40-11	Navajo Indian Road	Ortega Road	326	342	16	2, 2	18,600/23,200	This segment is rural in nature, includes three interchanges, and is located within Apache County.
40-12	Ortega Road	New Mexico State Line	342	359	18	2, 2	22,200/27,700	This segment is rural in nature, includes seven interchanges, and is located within Apache County.

Figure 2: Corridor Location and Segments



1.5 Corridor Characteristics

The I-40 East Corridor between Flagstaff and the New Mexico Border was originally designated as US Route 66 and generally followed the alignment of the transcontinental railroad. I-40 East in its current alignment was built between 1960 and 1980.

A majority of the existing traffic interchanges (TIs) and other grade separations were built concurrently with the original freeway. In recent years, ADOT investments have focused primarily on preservation projects, including bridge and pavement rehabilitation. Modernization or expansion projects have been limited to the reconstruction of two TIs.

National Context

The I-40 Corridor is a major east-west transcontinental interstate highway that connects the west coast (California) to the east coast (North Carolina). It serves as a major artery for commercial trucks as well as passenger vehicular traffic. I-40, together with I-17, plays a key role in connecting central and northern Arizona to the rest of the country. It is a significant factor in the economic success of the region and the nation.

Regional Connectivity

I-40 East crosses the mostly rural and rolling terrain of northeastern Arizona. It provides the most direct and fastest link between Flagstaff (and Grand Canyon National Park), New Mexico, and Texas (Figure 1). I-40 East connects to southern California via the I-40 West segment west of Flagstaff, included in its own corridor profile study. The corridor offers a principal interstate highway link for freight traffic from the ports in California to the Southwest, eventually terminating on the East Coast in North Carolina.

I-40 East connects to I-17 in Flagstaff, the principal route from northern Arizona to the Phoenix metropolitan area. Other major north-south highways crossing the corridor include SR 87, SR 77, and US 191.

Total traffic volumes (AADT 2019) are approximately 18,000 to 23,000 throughout the length of the corridor, with the exception of the Flagstaff metropolitan area where daily volumes approach 40,000. The Arizona Travel Demand Model (AZTDM2) projects that traffic will more than double by 2040.

Commercial Truck Traffic

Arizona is primarily a pass-through state for freight traffic coming from the ports of Los Angeles and Long Beach and going east to the central U.S. for distribution. ADOT conducted an extensive stakeholder outreach program during the Arizona Multimodal Freight Analysis Study. One of the primary concerns raised by stakeholders was the increasing volume of through trucks traveling from southern California through Flagstaff and other northern Arizona communities. Federal safety regulations that restrict the time truck drivers can operate without a rest period force them to stop and park when they time out. As a result, an increasing number of trucks park along highways and in neighborhoods throughout communities in northern Arizona and elsewhere. The traffic mix includes significant commercial truck traffic, about 30% of the total volume. ADOT operates a Port of Entry at Sanders, near the New Mexico State Line.

The U.S. Department of Transportation, under Section 167(c) of title 23 United States Code (U.S.C.), created by Section 1115 of the Moving Ahead for Progress in the 21st Century Act (MAP–21), is directed to establish a National Freight Network (NFN) to assist States in strategically directing resources toward improved system performance for efficient movement of freight on the highway portion of the Nation’s freight transportation system. I-40 has been designated by ADOT as part of the National Primary Freight Network.

Commuter Traffic

Significant commuter traffic is present on I-40 East in the Flagstaff area, especially west of the intersection with US 89 in corridor segment 40-1. Traffic forecasts indicate that this segment will become severely congested by 2040 without capacity increases and other modifications to the current four-lane section. Other population centers along the corridor, including Holbrook and Winslow, experience intra-city commuter traffic on I-40 East to a much lesser degree.

Arizona Public Service (APS), a major utility company in the state, operates a large power station in Joseph City, located in segment 40-7. This major employment generator attracts commuter traffic to and from both directions on the corridor.

Recreation and Tourism

Arizona offers a variety of recreational opportunities for its citizens as well as the millions of visitors that travel to the state in search of warmer weather, outdoor adventure, and exploration opportunities. Arizona’s warm weather and natural beauty makes tourism one of the state’s top industries. According to the Arizona Office of Tourism, in 2013, 33.8 million people visited Arizona who collectively spent $19.8 billion in the state, which supports jobs and generates tax revenue.

Recreation and tourism is a key industry along the corridor, especially in the Flagstaff area. US 89 serves as the principal gateway to the Grand Canyon National Park, one of the most visited sites in the country, with over 4.7 million visitors last year. Other outdoor recreation opportunities include many sites in the Cococino National Forest and the Riordan Mansion State Historic Park near Flagstaff as well as Petrified Forest National Park, Painted Desert National Monument, and Homolovi State Park near Holbrook.

Multimodal Uses

Freight Rail

The BNSF Transcon Corridor includes 390 route miles of double-track in Arizona connecting the Port of Los Angeles/Port of Long Beach with Chicago. The Transcon Corridor handles two-thirds of BNSF’s intermodal container or trailer on flat car traffic nationally. The Transcon parallels I-40 the entire length of the corridor. Approximately 100 trains per day cross Arizona on the mainline, with nearly 300,000 carloads annually.

The Transcon provides transfer opportunities to the tourist rail service of the Grand Canyon Railway in Flagstaff. At-grade rail crossings through downtown Flagstaff lead to vehicular traffic congestion, although improvements are in progress. A short line operated by the BNSF Coronado & Springerville Subdivision intersects the main line near Coronado Junction and the Apache Railway intersects the main line near Holbrook. (rail information sourced from Arizona State Rail Plan, ADOT, March 2011)

Passenger Rail

Amtrak's Southwest Chief Chicago to Los Angeles route primarily serves long-distance tourist travel, with daily service. The Southwest Chief shares track on the BNSF Transcon and is subject to delays caused by freight traffic. It travels at an average speed of 63 m.p.h. across the State. Passenger stations are available in Gallup (New Mexico), Winslow, and Flagstaff.

Bicycles/Pedestrians

Interstate shoulders built to design standards averaging 8-10 feet in width to accommodate cyclists on I-40 East. Pedestrians are prohibited on the entire I-40 Corridor, but pedestrian crossings are provided at designated locations.

Bus/Transit

Greyhound operates intercity bus transit the length of the I-40 Corridor connecting Gallup, NM to Flagstaff, Kingman, and Las Vegas, with stops in Holbrook and Flagstaff. Local transit service by Mountain Line operates eight routes in Flagstaff.

Aviation

A number of airports are located with proximity to the I-40 East Corridor. These include the Flagstaff Pulliam Airport in Flagstaff, the Winslow-Lindbergh Regional Airport in Winslow, and the Holbrook Municipal Airport. The Pine Springs Airport is a historical airport located north of I-40 in Apache County.

Land Ownership, Land Uses, and Jurisdictions

As shown in **Figure 2**, I-40 East crosses multiple jurisdictions and land holdings throughout Coconino, Navajo, and Apache Counties. A majority of the land surrounding I-40 East in segments 40-1 and 40-2 is encompassed on the Coconino National Forest, owned by the U.S. Forest Service. A majority of the land both north and south of I-40 in segments 40-3 through 40-9 is a checkerboard of private and state trust land. Portions of that checkerboard in segments 40-7 through 40-9 include land ownership by the Bureau of Land Management. The portion of segment 40-10 that borders the Petrified Forest National Park is owned by the National Park Service. Beginning east of Petrified Forest National park and extending to the New Mexico border, the majority of the land surrounding I-40 is owned by the Navajo Nation. The Hopi and Zuni Indian Reservations are both in proximity to the corridor, but not immediately adjacent to I-40.

Population Centers

The I-40 East Corridor, through three counties, is mostly rural. The only major population center, Flagstaff, with a current population of 69,000 is the western end of the corridor. Significant growth is projected to continue in the Flagstaff metropolitan area. Winslow and Holbrook, the other larger towns on the corridor, have current populations of 9,700 and 5,200 respectively. **Table 2** shows current (2020) population by county and city along with projected future (2040) population and growth.

Table 2: Current and Future Population

Community	2010 Population	2020 Population	2040 Population	% Change 2010-2040	Total Growth
Coconino County	**134,421**	**148,376**	**161,771**	**20.35%**	**27,350**
Flagstaff	65,870	76,839	88,691	34.65%	22,821
Fredonia	1,314	1,324	1,289	-1.90%	-25
Page	7,247	7,754	8,158	12.57%	911
Sedona (part)	2,842	2,948	3,260	14.71%	418
Tusayan	558	592	576	3.23%	18
Williams	3,023	3,336	3,327	10.06%	304
Unincorporated	53,567	55,584	56,471	5.42%	2,904
Navajo County	**107,449**	**114,265**	**118,511**	**10.06%**	**10,834**
Holbrook	5,053	5,298	5,498	8.81%	445
Pinetop-Lakeside	4,282	4,663	5,199	21.42%	917
Show Low	10,660	12,132	14,973	40.46%	4,313
Snowflake	5,590	6,213	7,225	29.25%	1,635
Taylor	4,112	4,551	5,421	31.83%	1,309
Winslow	9,655	9,714	8,889	-7.93%	-766
Unincorporated	68,097	71,694	71,486	4.98%	3389
Apache County	**71,518**	**73,551**	**69,113**	**-3.36%**	**-2,405**
Eagar	4,885	5,118	5,906	20.90%	1,021
Saint Johns	3,480	3,696	4,283	23.07%	803
Springerville	1,961	2,079	2,395	22.13%	434
Unincorporated	61,192	62,658	56,528	-7.62%	-4,664

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

Major Traffic Generators

Much of the traffic on I-40 East results from interstate commercial and long distance personal travel. The City of Flagstaff and Grand Canyon National Park generate high volumes of traffic locally. Flagstaff serves as the principal gateway to the Park, accessed primarily by US 89 and SR 64 to the popular South Rim area. The Petrified Forest National Park and Painted Desert are also popular attractions along the corridor, but do not generate as much traffic.

The Joseph City Power Station, operated by APS, constitutes a major employment traffic generator for commuter traffic. The power station is located near Joseph City, between Winslow and Holbrook in segment 40-7. The power station attracts commuter traffic from both directions on the corridor.

Tribes

The Navajo Nation is a semi-autonomous Native American-governed territory covering 27,425 square miles, occupying portions of northeastern Arizona, southeastern Utah, and northwestern New Mexico in the United States. It is the largest land area retained by a U.S. tribe and is managed via agreements with the United States Congress as a sovereign Native-American nation. Over 180,000 people live on the Navajo Reservation across three states: Arizona, New Mexico, and Utah.

The Navajo Nation is one of the largest tribal governments of the North American Indian tribes. Its institutions include a judicial system, a legislative house, an executive office, a prominent law enforcement and social services apparatus, Health Services, Diné College, and other local educational trusts. (Source: http://www.navajo-nsn.gov/govt.htm)

Wildlife Linkages

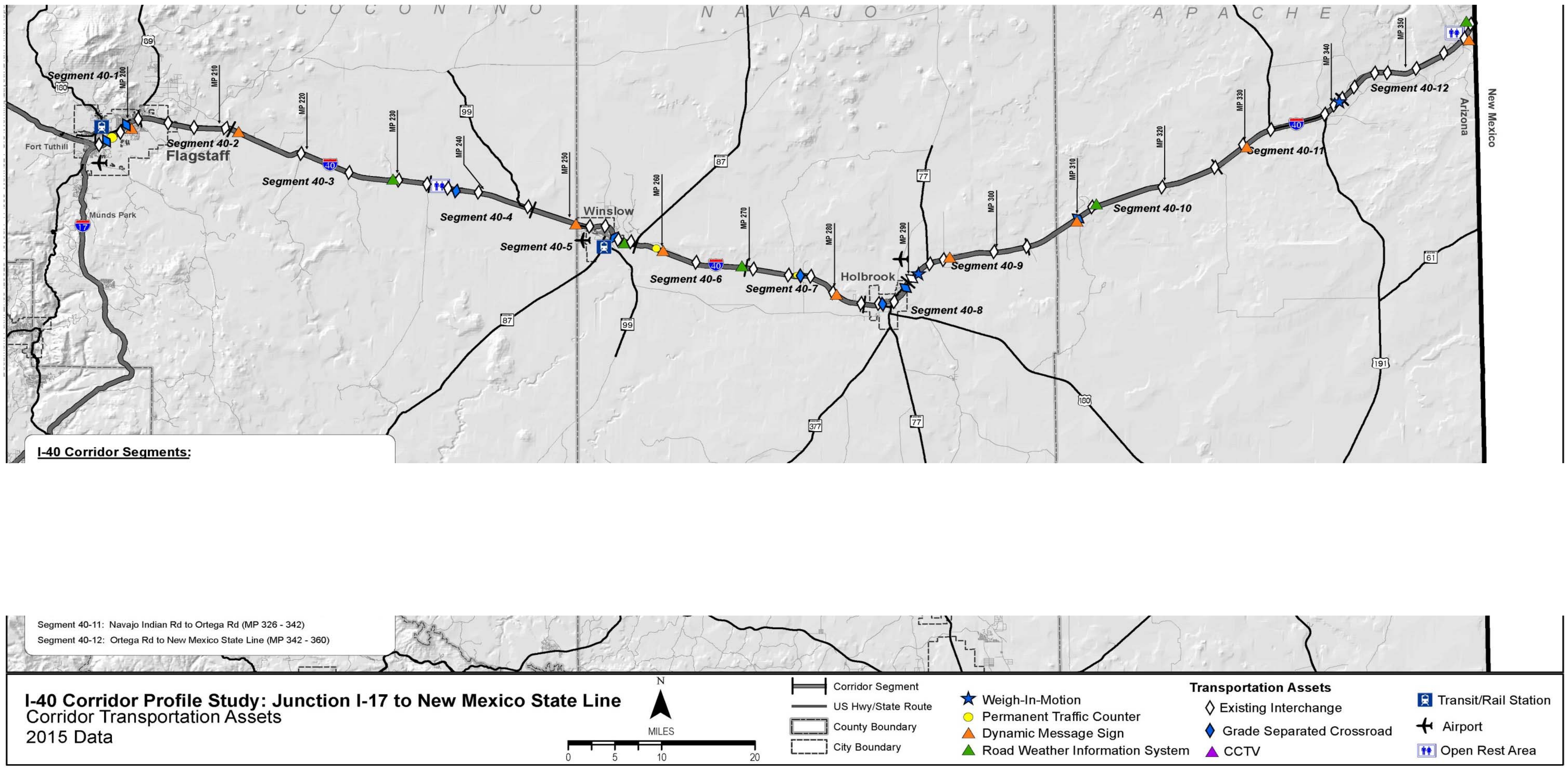
The Arizona State Wildlife Action Plan (SWAP) provides a 10-year vision for the entire state, identifying wildlife and habitats in need of conservation, insight regarding the stressors to those resources, and actions that can be taken to alleviate those stressors. Using the Habimap Tool that creates an interactive database of the information included in the SWAP, the following were identified in relation to the I-40 East Corridor:

- Wildlife waters to the south of I-40 between I-17 and Twin Arrows Road
- I-40 travels through U.S. Forest Service allotments from I-17 to approximately Twin Arrows Road, and through Arizona State Land Department allotments from Twin Arrows Road to just west of Chambers.
- Arizona Wildlife Linkages potential zones exist along I-40 between I-17 and approximately Navajo Road. Habitat fracture zones are identified intermittently from Flagstaff to Twin Arrows Road, and intermittently from the Apache/Navajo County border to the New Mexico border.
- Species and Habitat Conservation Guide indicates sensitive species southeast and northwest of Flagstaff throughout the National Forest, and along the Little Colorado River between Winslow and Holbrook.
- Species of Greatest Conservation need are identified continuously along the corridor between I-17 and the Painted Desert area, and intermittently between the Painted Desert and New Mexico border. Highest concentrations are located near Flagstaff.
- A high level of Species of Economic and Recreational Importance are identified southeast of Flagstaff. A low level is identified throughout the corridor from I-17 to the Painted Desert area.
- A recent report on Elk movements completed by Arizona Game and Fish Department identified the area roughly corresponding to segments 40-1 and 40-2 as high priority for elk crossings. The research recommended 8 wildlife passage structures between MP 195 and MP 215: 2 existing structures, 1 new overpass, and 5 new underpasses.

Corridor Assets

Corridor transportation assets are summarized in **Figure 3**. A freight weigh station is located near the New Mexico Border in Sanders, Arizona. There are 7 grade separated road crossings on the corridor. Two are located in Flagstaff, one in Winslow, one in Joseph City, two in Holbrook, and one at the Petrified Forest National Park. In addition, there is one grade-separated railroad crossing of the BNSF Railroad in segment 40-4, west of the Meteor Crater rest area. There are three permanent traffic counters located along the I-40 East Corridor.

Figure 3: Corridor Transportation Assets



1.6 Corridor Stakeholders and Input Process

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

Key stakeholders identified for this study included:

- ADOT Northcentral District
- ADOT Northwest District
- Central Yavapai Metropolitan Planning Organization (CYMPO)
- Maricopa Association of Governments (MAG)
- MetroPlan, formerly known as Flagstaff Metropolitan Planning Organization (FMPO)
- Northern Arizona Council of Governments (NACOG)
- 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 study identified recommendations from previous studies, plans, and preliminary design documents. Studies, plans, and programs pertinent to the I-40 East Corridor were reviewed to understand the full context of future planning and design efforts within and around the study area. These studies are organized below into four categories: Framework and Statewide Studies, Regional Planning Studies, Planning Assistance for Rural Areas (PARAs) and Small Area Transportation Studies (SATS), and Design Concept Reports (DCRs) and Project Assessments (PAs).

Framework and Statewide Studies

- ADOT Bicycle and Pedestrian Plan Update (2013) ADOT Pedestrian Safety Action Plan (2017)
- ADOT Five-Year Transportation Facilities Construction Program (2021-2025)
- ADOT Climbing and Passing Lane Prioritization Study (2015)
- ADOT Arizona Key Commerce Corridors (2014)
- ADOT Arizona Multimodal Freight Analysis Study (2009)
- ADOT Arizona Ports of Entry Study (2021)
- ADOT Arizona State Airport Systems Plan (2008)
- ADOT Arizona State Freight Plan (2017)
- ADOT Arizona State Rail Plan (2011)
- AGFD Arizona State Wildlife Action Plan (2012)
- AGFD Arizona Wildlife Linkages Assessment (2006)
- ADOT Arizona Statewide Dynamic Message Sign Master Plan (2011)
- ADOT Arizona Statewide Intelligent Transportation System (ITS) Architecture (2018)
- ADOT Arizona Statewide Rail Framework Study (2010)
- ADOT Arizona Statewide Rest Area Study (2011)
- ADOT Arizona Statewide Shoulders Study (2015)
- ADOT Arizona Strategic Traffic Safety Plan (2019)
- ADOT Arizona Roadway Departure Safety Implementation Plan (RDSIP) (2014)
- ADOT AASHTO U.S. Bicycle Route System (2015)
- ADOT Low Volume State Routes Study (2017)
- ADOT Statewide Stormwater & Erosion Control Study (2020)
- ADOT Statewide Transportation Planning Framework – Building a Quality Arizona (BQAZ) (2009)
- ADOT Transportation Asset Management Plan (2019)
- ADOT What Moves You Arizona? Long-Range Transportation Plan (2016-2040)

Regional Planning Studies

- What Moves You Arizona; Long-Range Transportation Plan, 2011, ADOT
- Flagstaff Pathways 2030 Regional Transportation Plan
- Arizona's State Wildlife Action Plan 2012-2022, 2012, Arizona Game & Fish Department

Planning Assistance for Rural Areas and Small Area Transportation Studies

- No PARAs or SATS were completed in the I-40 East Corridor

Design Concept Reports and Project Assessments

- I-40/North Park Drive Traffic Interchange Final Design Concept Report
- I-40 Lupton Traffic Interchange Final Design Concept Report
- I-40, Bellemont to Winona, Draft Final Design Concept Report

Summary of Prior Recommendations

Various studies and plans, including several DCRs, have recommended improvements to the I-40 East Corridor as shown in **Table 3** and **Figure 4**. They include, but are not limited to:

- Widening the entire I-40 East Corridor to create one additional general purpose lane in each direction
- Bridge replacement or widening to support the additional mainline travel lanes
- Rehabilitating existing TI's with minor improvements in the following locations:
  - Country Club Drive TI
  - Cosnino Road TI
- Reconstructing existing TI's with major improvements at the following locations:
  - Butler Avenue TI
  - Walnut Canyon Road TI

- Winona Ranch Road TI
- Lupton (BIA 12) TI
- Construction of a new TI on I-40 at Lone Tree Road
- Modernization/ infrastructure improvements at Sanders/Chambers Port of Entry

Table 3: Corridor Recommendations from Previous Studies

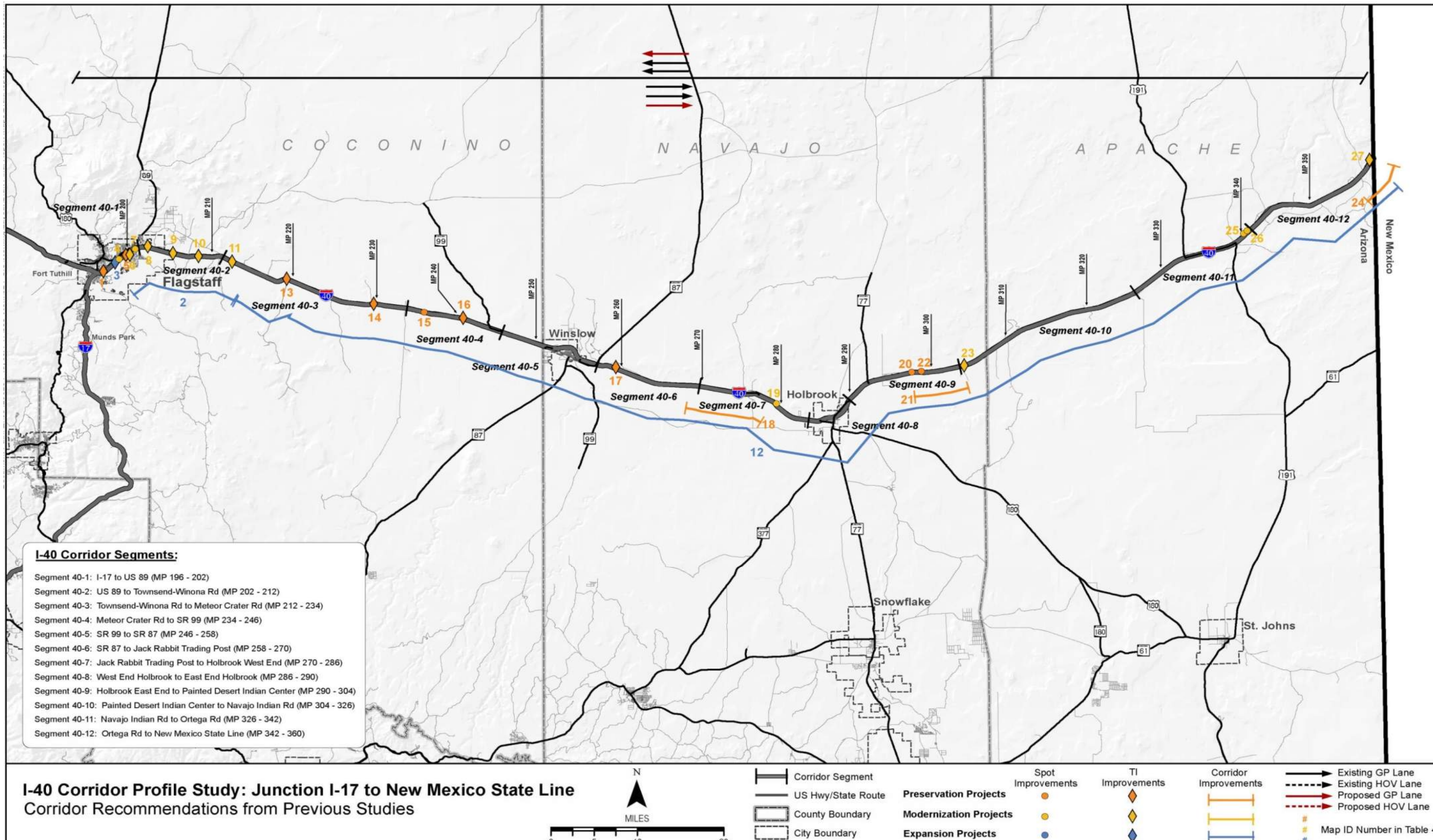
Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization[M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N)?	
1	195	-	-	Bridge Replacement and rehabilitation at I-17/I-40 Interchange	√			2017	H877501C	N	2016-2020 Five-Year Transportation Facilities and Construction Program
2	195	205.2	10.2	Pavement Rehabilitation	√			2021	F018501C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program
3	196	214	18	Mainline expansion, Flagstaff to Winona • Widen the mainline to three lanes in each direction (inside widening) • Widen and Replace bridges • Address vertical sight distance, superelevation, and grade issues			√			Y*	I-40, Bellemont to Winona, Draft Final Design Concept Report
4	196.7	-	-	Construct new TI at Lone Tree Road			√			Y*	I-40, Bellemont to Winona, Draft Final Design Concept Report
5	198	-	-	Bridge replacement and rehabilitation at 4th Street Overpass	√					N	2016-2020 Five-Year Transportation Facilities and Construction Program
6	198.28	-	-	Reconstruct the existing Butler TI		√				N	2016-2020 Five-Year Transportation Facilities and Construction Program
7	199.8	-	-	Install new Dynamic Message Signs on I-40 westbound, between 4th Street and Country Club		√				N	Statewide Dynamic Message Sign (DMS) Master Plan
8	201.1	-	-	Minor improvements to the existing Country Club TI		√				Y*	I-40, Bellemont to Winona, Draft Final Design Concept Report
9	204.8	-	-	Reconstruct the existing Walnut Canyon TI		√				Y*	I-40, Bellemont to Winona, Draft Final Design Concept Report
10	207.24	-	-	Minor improvements to the existing Cosnino TI		√				Y*	I-40, Bellemont to Winona, Draft Final Design Concept Report
11	211.16	-	-	Reconstruct the existing Winona TI		√				Y*	I-40, Bellemont to Winona, Draft Final Design Concept Report
12	214	359	145	Widen all interstate Highways, include I-40, to six lanes in Rural Arizona			√			N	AZ Statewide Transportation Planning Framework Study
13	219	-	-	Bridge rehabilitation at Twin Arrows TI Underpass	√					N	2016-2020 Five-Year Transportation Facilities and Construction Program
14	229	-	-	Bridge rehabilitation at Canyon Diablo Bridges EB and WB	√					N	2016-2020 Five-Year Transportation Facilities and Construction Program
15	235	-	-	Rest area preservation at Painted Cliffs and Meteor Crater rest areas	√			2018	H821401D	N	2016-2020 Five-Year Transportation Facilities and Construction Program
16	239	-	-	Bridge rehabilitation at Meteor City TI Overpass EB and WB	√			2019	H873501C	N	2016-2020 Five-Year Transportation Facilities and Construction Program
17	245	246	1	Design/Construct Bridge deck replacement	√			2021	F015301D, F015301C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program

Table 3: Corridor Recommendations from Previous Studies (continued)

18	259	-	-	Bridge rehabilitation at Cottonwood Bridge EB and WB	√			2018	H872201C	N	2016-2020 Five-Year Transportation Facilities and Construction Program
19	259	267.5	8.5	1” Thin Bond Overlay with Mill & 2” Replace Spot RPR	√			2022	F0408	N	ADOT Pavement Preservation Projects
20	268	278	10	Pavement preservation from Jackrabbit Road (MP 268) to Joseph City (MP 278)	√			2020	H893801C	N	2016-2020 Five-Year Transportation Facilities and Construction Program
21	277.58	282.8	5.22	Pavement Rehabilitation	√			2023		N	2021-2025 Five-Year Transportation Facilities and Construction Program
22	279.2	279.7	0.5	Rockfall mitigation along I-40		√				N	2016-2020 Five-Year Transportation Facilities and Construction Program
23	282.8	290.3	7.5	Mill & Replace with Bonded Overlay & Partial Rehab	√			2022	F0470	N	ADOT Pavement Preservation Projects
24	286	287	1	Bridge Rehabilitation	√			2024	01D, 01C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program
25	288	289	1	Design/Construct Bridge Rehabilitation	√			2021	F023001D, F023001C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program
26	297	-	-	Sign rehabilitation at Goodwater – Yellowhorse	√					N	2016-2020 Five-Year Transportation Facilities and Construction Program
27	297	303	6	Pavement preservation from Sun Valley Road to Washboard Road	√					N	2016-2020 Five-Year Transportation Facilities and Construction Program
28	298	-	-	CBC extension at Utility Overpass	√					N	2016-2020 Five-Year Transportation Facilities and Construction Program
29	303	-	-	Design drainage improvements at Adamana TI		√		2017	H803601C	N	2016-2020 Five-Year Transportation Facilities and Construction Program
30	316	317	1	Bridge Rehabilitation	√			2024	01D, 01C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program
31	354	360	6	Pavement preservation from Allentown Road to State Line	√					N	2016-2020 Five-Year Transportation Facilities and Construction Program
32	340	-	-	Technology and physical infrastructure improvements at the Sanders/Chambers Port of Entry		√				N	Arizona Ports of Entry Study
33	340.4	-	-	Install new Dynamic Message Sign on I-40 westbound, east of US 191		√				N	Statewide Dynamic Message Sign (DMS) Master Plan
34	351	352	1	Bridge Rehabilitation	√			2025	01D, 01C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program
35	357.53	358.53	1	Bridge Rehabilitation	√			2025	01D, 01C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program
36	359.21	-	-	Reconstruct the Lupton TI • Construct new diamond TI approximately 800 ft west of the existing TI • Construct two new overpass bridge structures • Modify the alignment of the frontage road • Build a new drainage system Build a new crossroad to provide the desired vertical clearance		√				Y*	I-40 Lupton Traffic Interchange Final Design Concept Report
37	359.1	360.21	1	Bridge Rehabilitation	√			2025	01D, 01C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program
38	Various Locations	-	-	Variable Speed Limit Signs and Supporting ITS Infrastructure		√		2021	F028101D, F028101C	N	ADOT 2021-2025 Five-Year Transportation Facilities and Construction Program

* Draft Environmental Assessment (EA) on file

Figure 4: Corridor Recommendations from Previous Studies



2.0 CORRIDOR PERFORMANCE

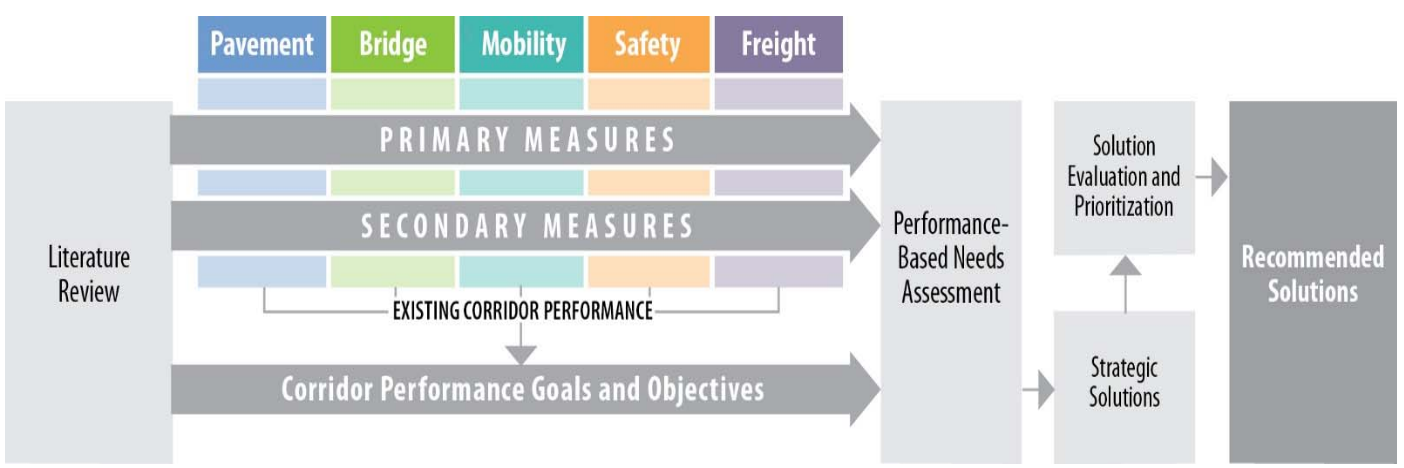
This chapter describes the evaluation of the existing performance of the I-40 East Corridor. A series of performance measures is used to assess the corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

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

In 2015, the *Fixing America's Surface Transportation Act* (FAST Act) was passed. The FAST Act continued to emphasize the performance management approach identified in MAP-21 but included additional provisions for meeting established performance targets.

The MAP-21 and FAST Act performance areas were considered in the development of ADOT's P2P process, which integrates transportation planning with capital improvement programming and project delivery. Because the P2P program requires the preparation of annual transportation system performance reports using the five performance areas, consistency is achieved among various ADOT processes by using these same performance areas.

While these performance areas were established prior to the earlier rounds of the CPS program, several related federal and ADOT reporting measures and targets were not yet in place at that time. These measures and targets have since been established (subsequent to completion of the prior CPS rounds). As such, it became necessary to revisit and revise the CPS performance measures to be more consistent with the latest federal and ADOT reporting measures and targets.

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

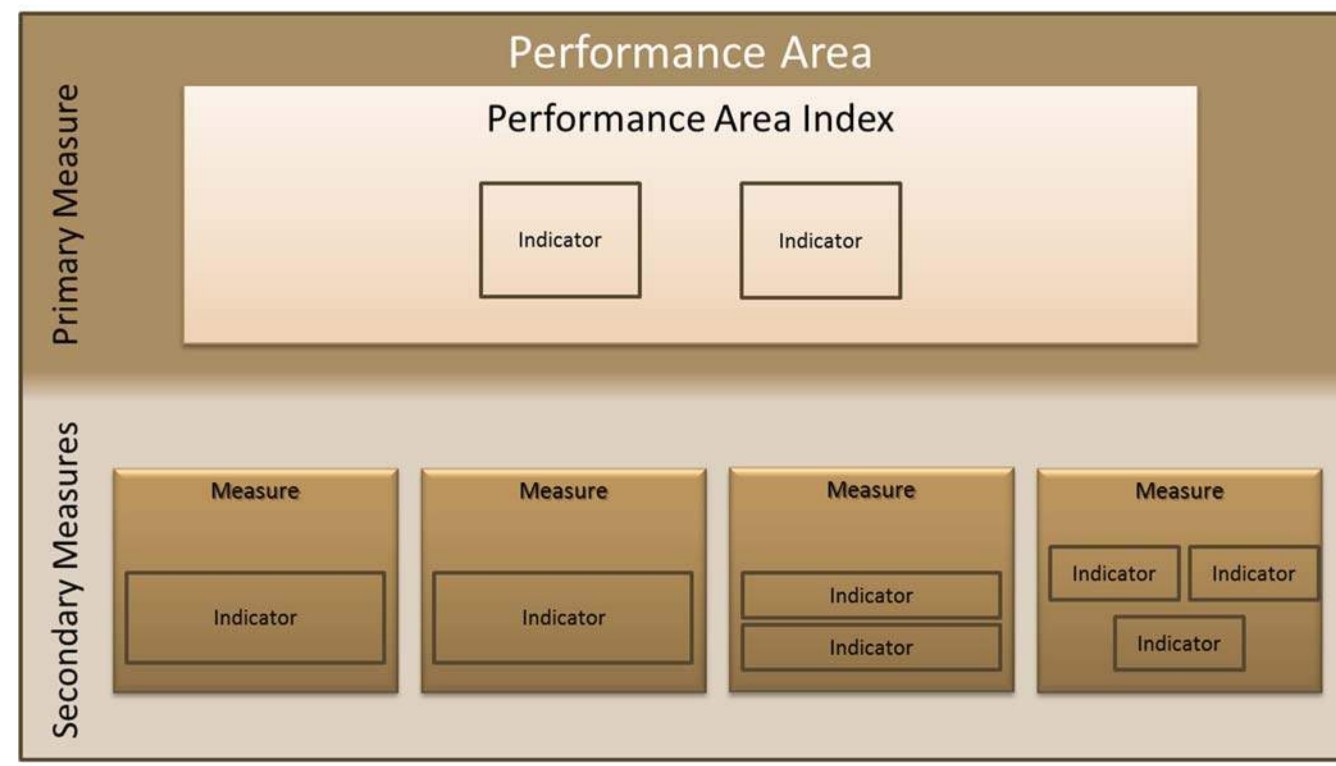
Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index, cracking, and rutting	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure and structural evaluation rating	• Bridge Sufficiency • 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 suspected serious injury crashes	• Directional Safety Index • Strategic Traffic Safety Plan Emphasis Areas • Other Crash Unit Types • Safety Hot Spots
Freight	**Freight Index** Based on bi-directional truck travel time reliability	• Travel Time Reliability • 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

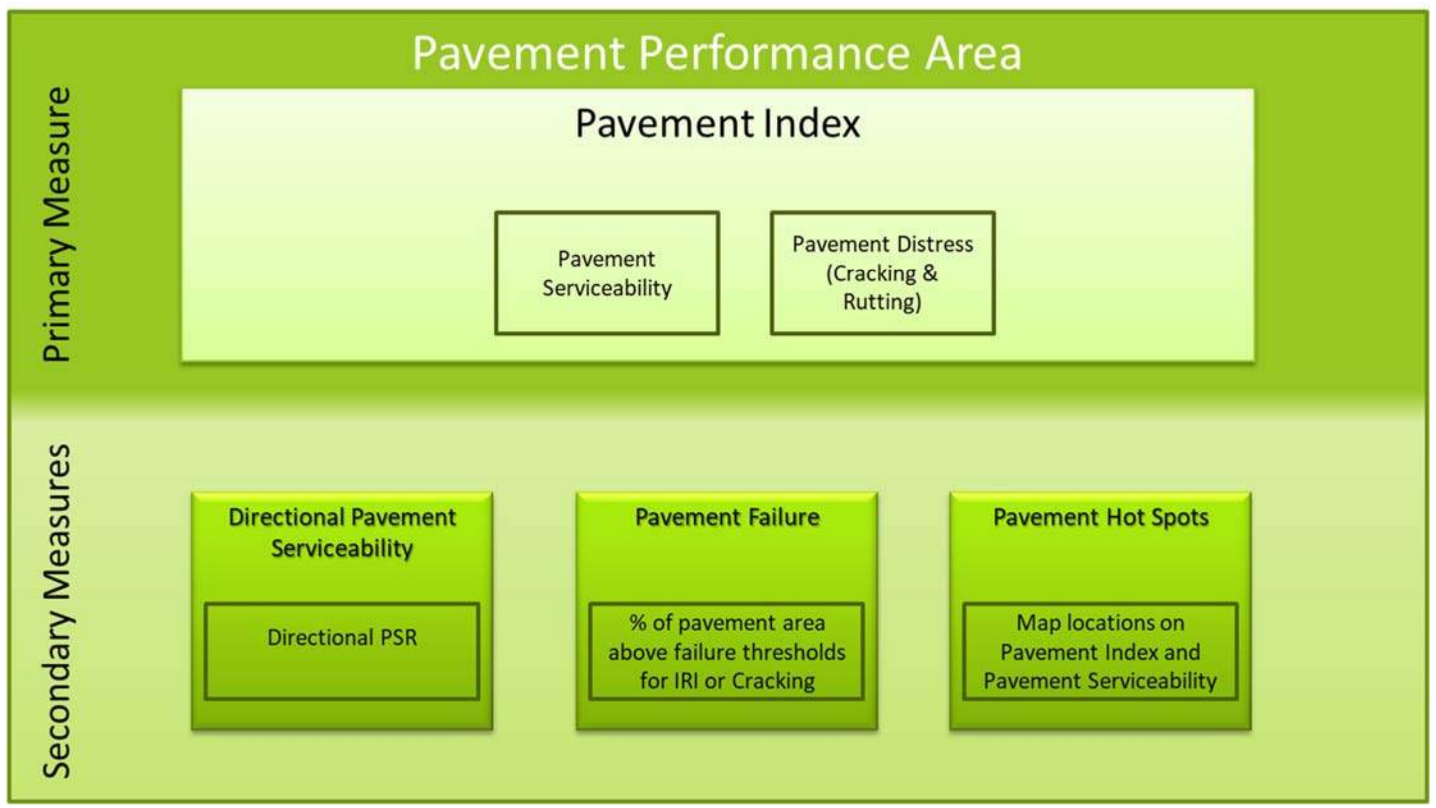


2.2 Pavement Performance Area

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-40 East 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.**

This CPS is an update to a previously completed report. The performance measures and performance thresholds have been revised from the previous version. For the Pavement performance area, the new methodology includes the use of Rutting data and the performance thresholds have been slightly modified.

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) and Rutting Rating, field-measured samples 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-40 East Corridor, the following operating environment was identified:

- Interstate: all segments

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, Cracking, or Rutting

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 this analysis, the following observations were made:

- Overall, based on the weighted average of the Pavement Index, the pavement is in "fair" condition
- According to the Pavement index, segments include a mix of "good," "fair," and "poor" performance conditions

- Pavement hot spots along the corridor include:
  - Segment 40-1 MP 196-197, 198-199, 201-202
  - Segment 40-2 MP 202-205
  - Segment 40-3 MP 230-234
  - Segment 40-4 MP 234-240
  - Segment 40-6 MP 259-261, 264-268
  - Segment 40-7 MP 278-283
  - Segment 40-10 MP 320-326
  - Segment 40-12 MP 348-354
- The eastbound and westbound pavements are nearly equal in condition, with the exception of a "poor" pavement PSR in westbound segment I40E-7
- The weighted average of the % Area Failure is in "poor" condition

Table 5 summarizes the pavement performance for the I-40 East Corridor. **Figure 8** illustrates the primary Pavement Index performance and locations of Pavement hot spots along the I-40 East Corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 5: Pavement Performance

Segment #	Segment Length (miles)	Pavement Performance Area			
		Pavement Index	Directional PSR		% Area Failure
			EB	WB	
I40E-1	6	3.03	2.88	2.97	33.3%
I40E-2	10	3.59	3.80	3.89	25.0%
I40E-3	22	1.96	4.26	4.26	18.2%
I40E-4	12	3.60	3.99	4.03	50.0%
I40E-5	12	1.77	4.15	4.25	13.0%
I40E-6	12	3.50	3.83	3.77	58.0%
I40E-7	16	2.36	3.95	3.95	34.0%
I40E-8	4	2.79	3.90	3.96	25.0%
I40E-9	14	2.25	4.26	4.30	0.0%
I40E-10	22	2.32	4.13	4.09	30.0%
I40E-11	16	3.56	4.03	3.94	47.0%
I40E-12	18	2.20	4.19	4.20	42.0%
Weighted Corridor Average		3.62	4.04	4.13	20%

SCALES		
Performance Level	**Interstate**	
Good/Above Average Performance	> 3.75	< 5%
Fair/Average Performance	3.20 - 3.75	5% - 20%
Poor/Below Average Performance	< 3.20	> 20%

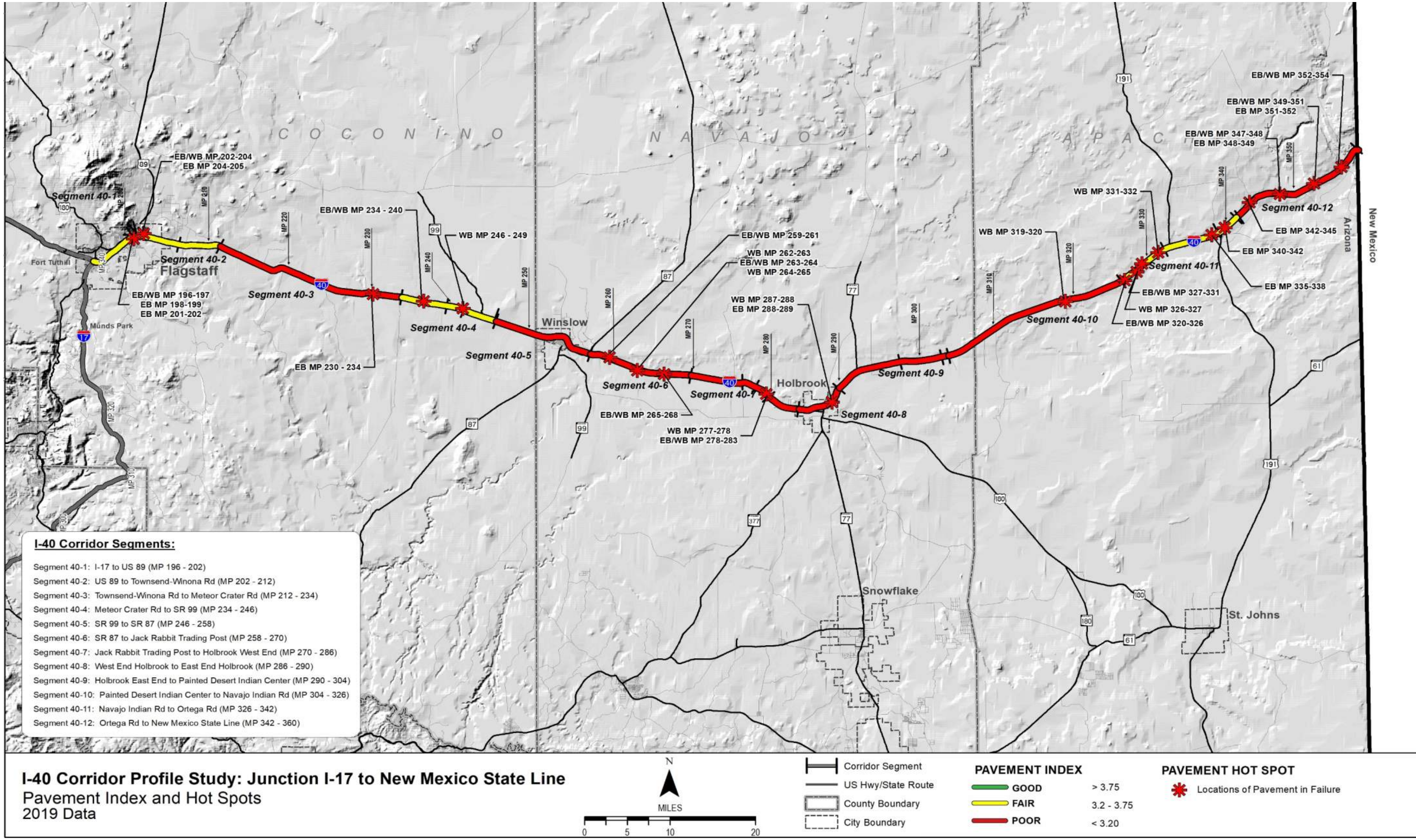
Statewide Transportation Asset Management Plan

Moving Ahead for Progress in the 21st Century Act of 2012 (MAP-21), identified national transportation system goals. The transportation asset management regulations associated with the infrastructure condition goals required the development of a Transportation Asset Management Plan (TAMP) covering National Highway System (NHS) bridges and pavements. As part of the statewide TAMP, ADOT developed pavement performance metrics and thresholds in compliance with federal tracking and reporting requirements, as shown in **Table 6**. The thresholds shown in Table 6 are the basis for the TAMP and ADOT's federal reporting and are different than those used in this CPS, which are based on ADOT's Pavement Management System, as shown in Table 5. The TAMP reports asset condition information in the aggregate at the statewide level and applying the thresholds shown in Table 6 would result in different segment-level performance than shown in Table 5.

Table 6: Statewide TAMP Metrics

Metric	Good	Fair	Poor
IRI (in./mile)	< 95	95-170	> 170
Cracking (%)	< 5	5-20 (asphalt) 5-15 (jointed concrete) 5-10 (cont. reinforced concrete)	> 20 > 15 > 10
Rutting (in.)	< 0.20	0.20–0.40	> 0.40
Faulting (in.)	<0.10	0.10-0.15	> 0.15

Figure 8: Pavement Performance

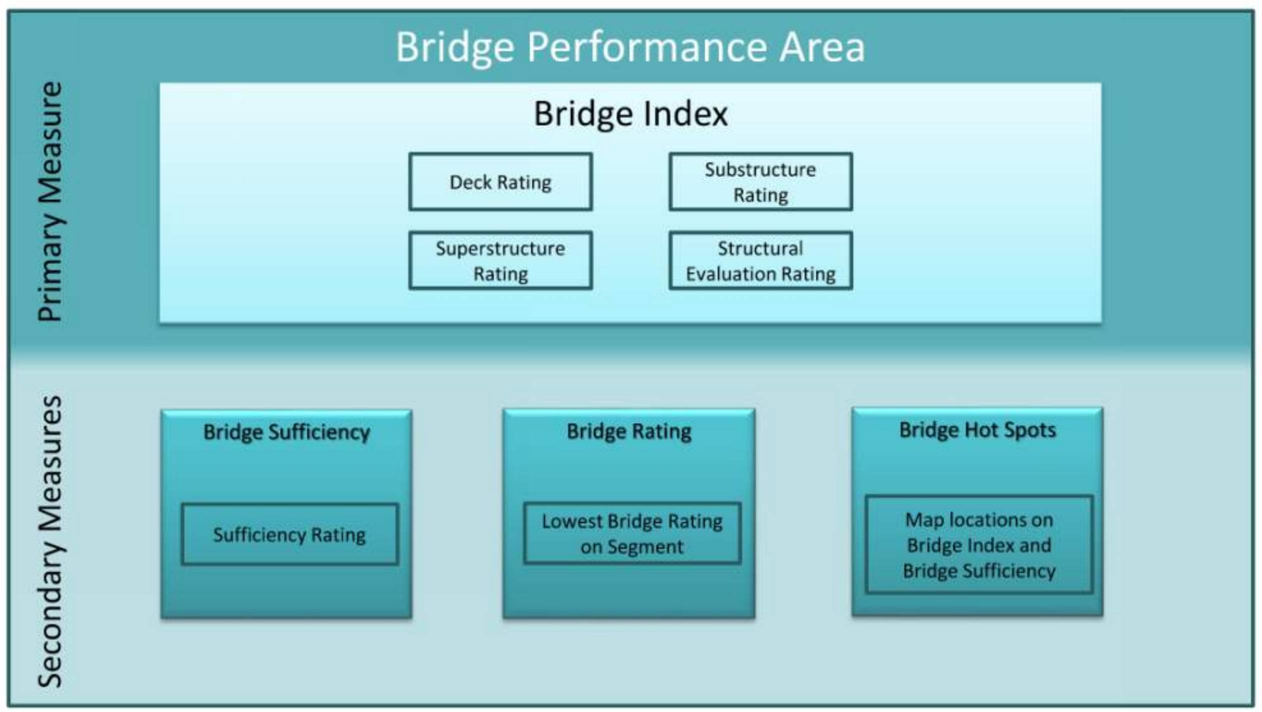


2.3 Bridge Performance Area

The Bridge Performance Area consists of a primary measure (Bridge Index) and three secondary measures, as shown in **Figure 9**. These measures assess the condition of the existing bridges along the I-40 East 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**.

This CPS is an update to a previously completed report. The performance measures and performance thresholds have been revised from the previous version. For the Bridge performance area, the new methodology does not include the performance metric related to Functionally Obsolete bridges, which was used in the previous methodology.

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

Three 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

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 high-level assessment of the structural condition of bridges for the corridor and for each segment. The four secondary measures provide more detailed information to assess bridge performance. Based on the results of this analysis, the following observations were made:

- Overall, based on the weighted average of the Bridge Index, the bridges are in "fair" condition
- According to the bridge index, nearly all of the bridges are in "fair" condition
- All bridges have a sufficiency rating of "good"
- Segment I40E-8 has a "poor" Lowest Bridge Rating
- Bridge hot spots along the corridor include:
  - Lone Tree Rd OP MP 196
  - Tucker Flat Br MP 248
  - Cemetery Wash Br MP 253
  - Little Colo Rv MP 256
  - Cottonwood Br MP 259
  - Jackrabbit TI OP MP 269
  - Manilla Wash Bridge MP 271
  - 8th Ave OP MP 286
  - E Holbrook TI OP MP 289
  - Dead River Bridge MP 316
  - Crazy Creek Bridge MP 323
  - Black Creek Br MP 347
  - Houck TI UP MP 348

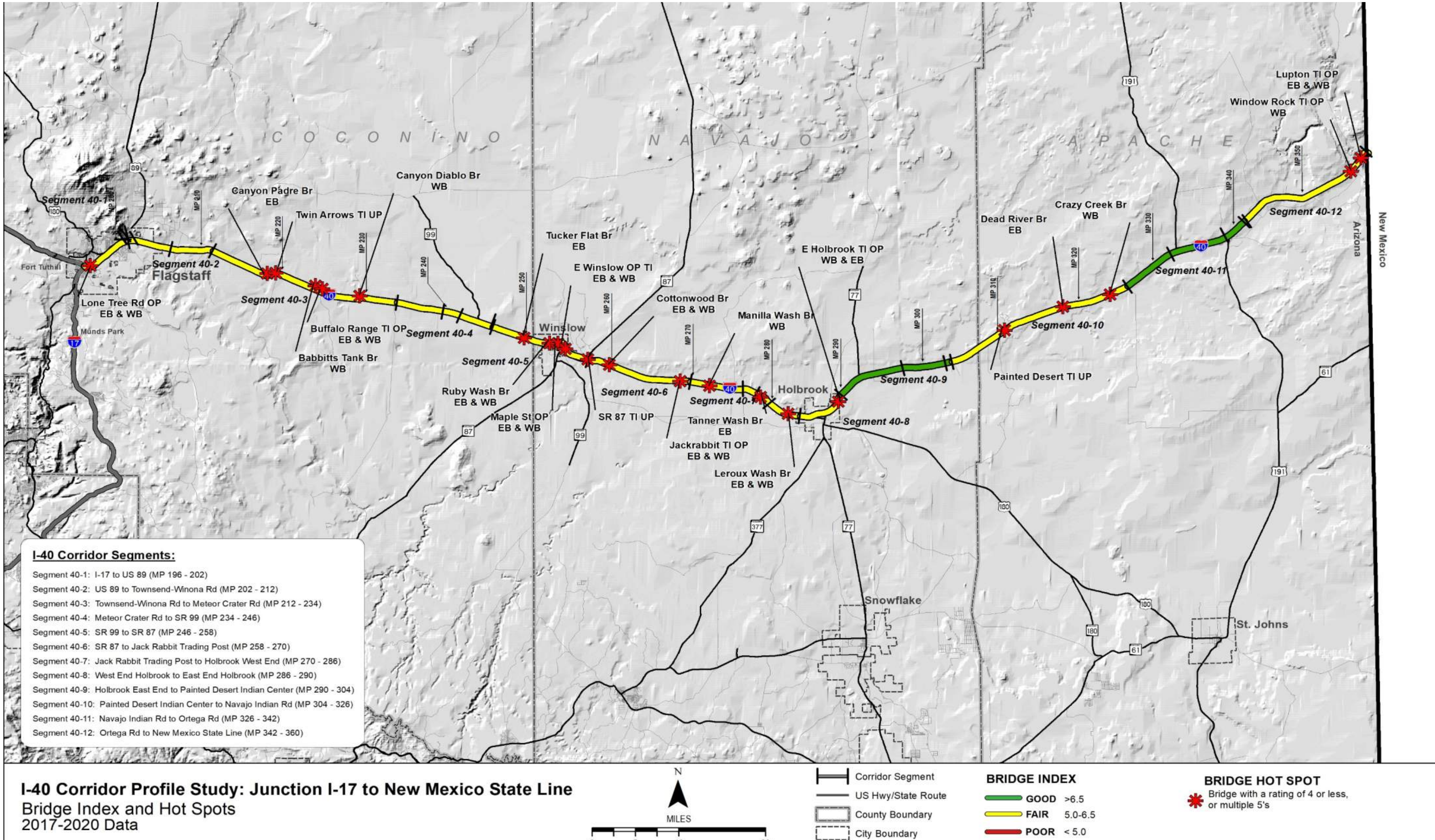
- Allentown TI UP MP 351
- Window Rock TI OP MP 357
- Lupton TI OP MP 359

Table 7 summarizes the bridge performance results for the I-40 East Corridor. Figure 10 illustrates the primary Bridge Index performance and locations of Bridge hot spots along the I-40 East Corridor. Maps for each secondary measure can be found in Appendix A.

Table 7: Bridge Performance

Segment #	Segment Length (miles)	Bridge Performance Area		
		Bridge Index	Sufficiency Rating	Lowest Bridge Rating
I40E-1	6	6.4	94.59	5
I40E-2	10	5.9	93.47	5
I40E-3	22	5.5	90.76	5
I40E-4	12	6.1	95.50	5
I40E-5	12	5.6	89.98	5
I40E-6	12	5.5	89.91	5
I40E-7	16	5.7	91.27	5
I40E-8	4	5.5	81.09	4
I40E-9	14	6.8	96.37	6
I40E-10	22	5.6	88.06	5
I40E-11	16	6.8	95.99	5
I40E-12	18	5.8	89.65	5
Weighted Corridor Average		5.7	90.78	4.86
SCALES				
Performance Level		**All**		
Good/Above Average Performance		> 6.5	> 80	> 6
Fair/Average Performance		5.0 - 6.5	50 - 80	5 - 6
Poor/Below Average Performance		< 5.0	< 50	< 5

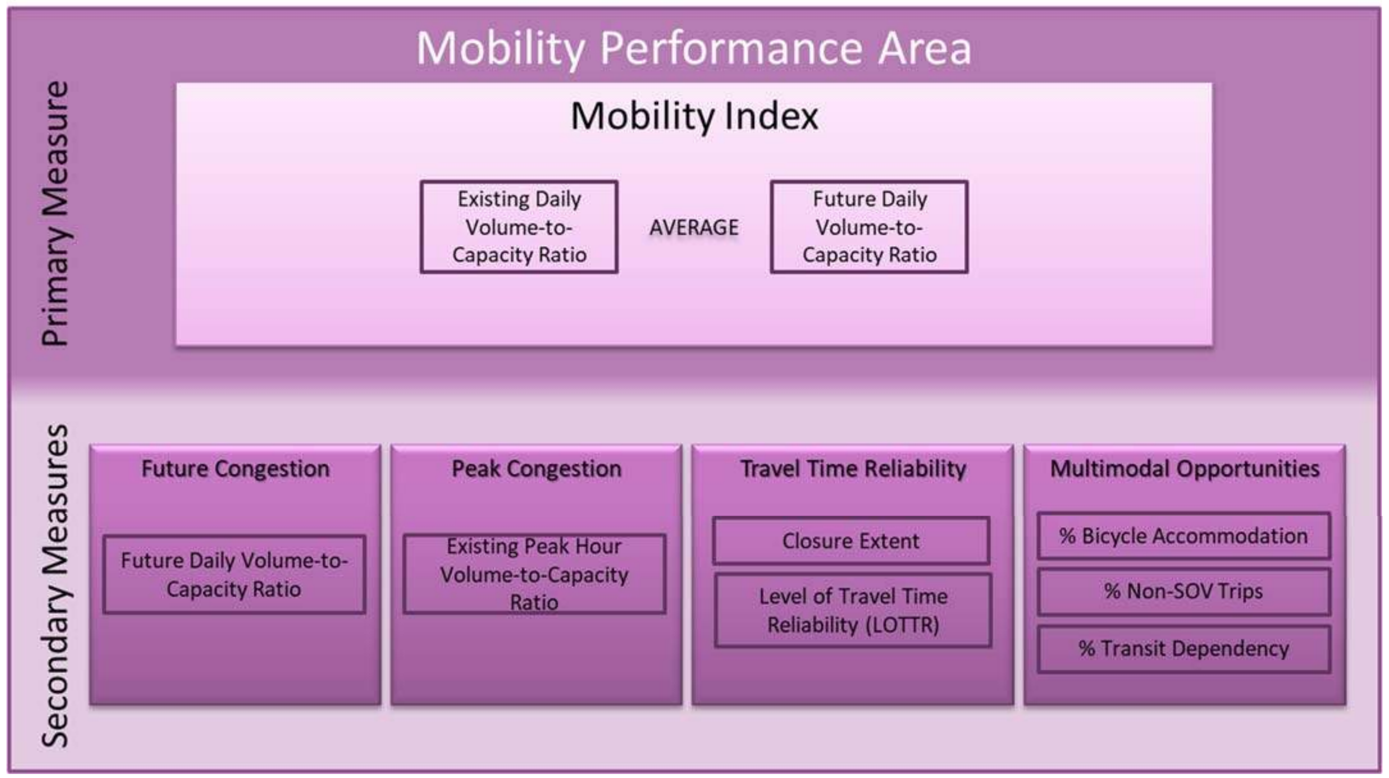
Figure 10: Bridge Performance



2.4 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-40 East 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

Primary Mobility Index

The Mobility Index is an average of the existing (2019) daily volume-to-capacity (V/C) ratio and the future (2040 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 (2030) 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. For the I-40 East Corridor, the following operating environment were identified:

- Urban or Urban Fringe Flow: Segments 40-1 and 40-2
- Rural Flow: Segments 4-3 through 40-12

Secondary Mobility Measures

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

Future Congestion – Future Daily V/C

- The future (2040 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 – Two 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
- Level of Travel Time Reliability (LOTTR):
  - The ratio of the 80th percentile travel time to average (50th percentile) travel time for a given corridor segment in a specific direction; as corridor segments were often comprised of multiple roadway sections for which LOTTR was reported, a weighted average was applied to each section based on the section length in order to arrive at the segment LOTTR
  - The LOTTR reflects how consistent or dependable the travel might be from day to day or during different times of day

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.

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

- Overall, based on the weighted average of the Mobility Index, the traffic operations are in “good” condition
- The existing peak hour traffic operations are “good”
- The future traffic operations are anticipated to perform with a “good” performance condition
- A majority of the segments show “fair” performance in the Closure performance measure in the eastbound direction of travel
- Segment I40E-3 has the highest number of closures
- The LOTTR measures show all segments perform with “good” performance conditions along the corridor
- A majority of the corridor shows “poor” or “fair” performance for non-SOV trips meaning that many vehicles carry only a single occupant
- All of the segments show a “good” performance for accommodation of bicycles

Table 8 summarizes the mobility performance results for the I-40 East Corridor. **Figure 12** illustrates the primary Mobility Index performance along the I-40 East Corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 8: Mobility Performance

Segment #	Segment Length (miles)	Mobility Performance Area									
		Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/ milepost/year/mile)		Directional Max LOTTR (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
				EB	WB	EB	WB	EB	WB		
I40E-1[1]	6	0.58	0.65	0.39	0.39	0.47	0.30	1.03	1.03	100%	16.3%
I40E-2[1]	10	0.36	0.40	0.25	0.25	0.22	0.22	1.02	1.03	100%	13.7%
I40E-3[2]	22	0.44	0.49	0.27	0.27	1.11	0.92	1.02	1.02	100%	6.6%
I40E-4[2]	12	0.44	0.49	0.24	0.24	0.10	0.08	1.03	1.04	100%	8.3%
I40E-5[2]	12	0.41	0.45	0.27	0.27	0.38	0.18	1.02	1.02	100%	12.8%
I40E-6[2]	12	0.33	0.36	0.17	0.17	0.13	0.10	1.03	1.03	100%	12.2%
I40E-7[2]	16	0.43	0.48	0.22	0.22	0.13	0.21	1.05	1.04	100%	16.1%
I40E-8[2]	4	0.46	0.51	0.34	0.34	0.35	0.20	1.03	1.02	100%	18.5%
I40E-9[2]	14	0.42	0.47	0.21	0.21	0.56	0.37	1.02	1.02	98%	13.7%
I40E-10[2]	22	0.39	0.43	0.25	0.25	0.53	0.27	1.02	1.02	100%	13.5%
I40E-11[2]	16	0.40	0.44	0.23	0.23	0.43	0.32	1.03	1.04	96%	10.3%
I40E-12[2]	18	0.46	0.51	0.25	0.25	0.59	1.09	1.03	1.03	90%	12.3%
Weighted Corridor Average		0.42	0.47	0.25	0.25	0.47	0.42	1.03	1.03	98%	12%

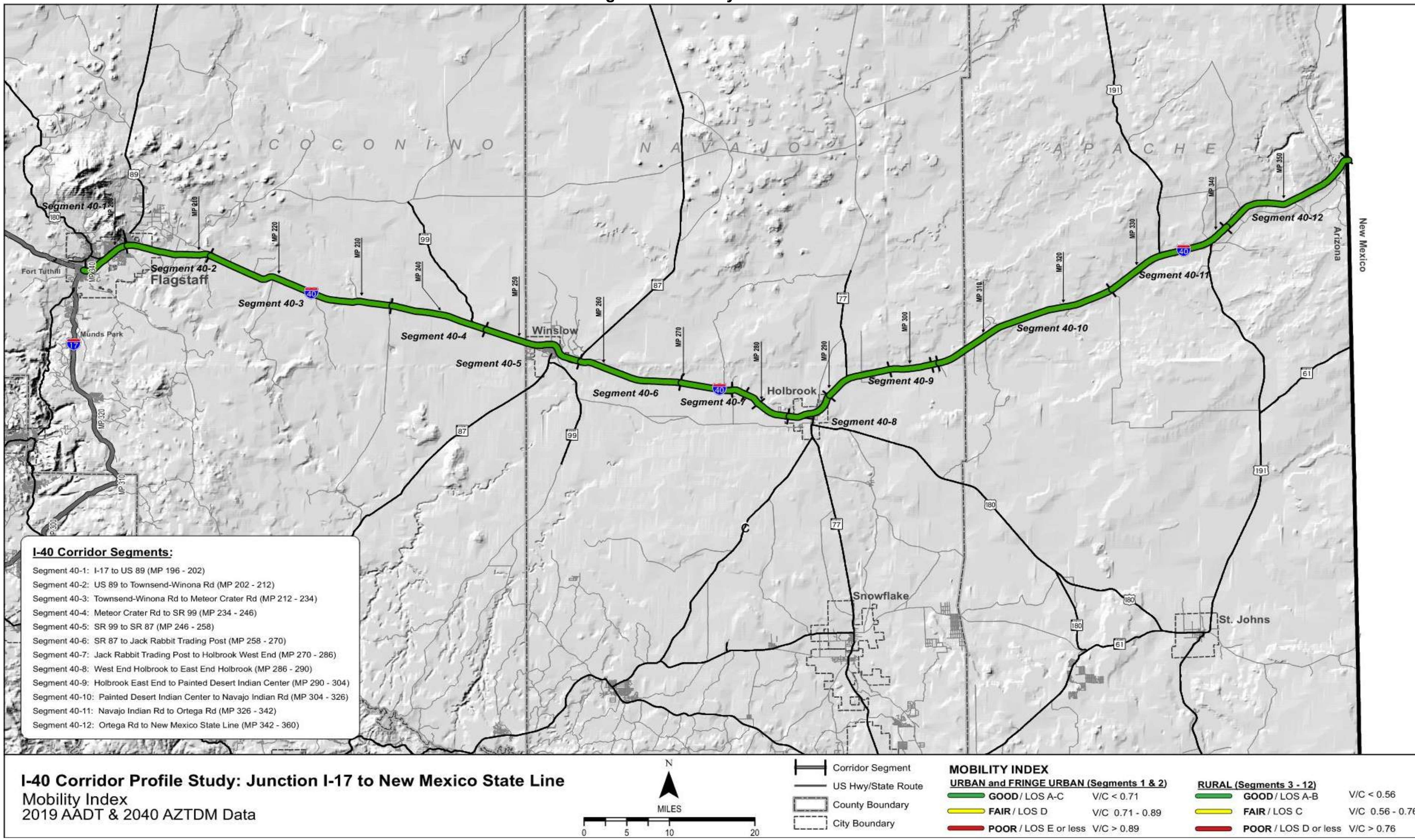
SCALES

Performance Level	Urban	All	All	All	
Good	< 0.71	< 0.22	< 1.15	> 90%	> 17%
Fair	0.71 - 0.89	0.22 - 0.62	1.15 - 1.5	60% - 90%	11% - 17%
Poor	> 0.89	> .62	> 1.5	< 60%	< 11%

Performance Level	Rural
Good	< 0.56
Fair	0.56 - 0.76
Poor	> 0.76

[1]Urban or Fringe Urban Operating Environment [2]Rural Operating Environment

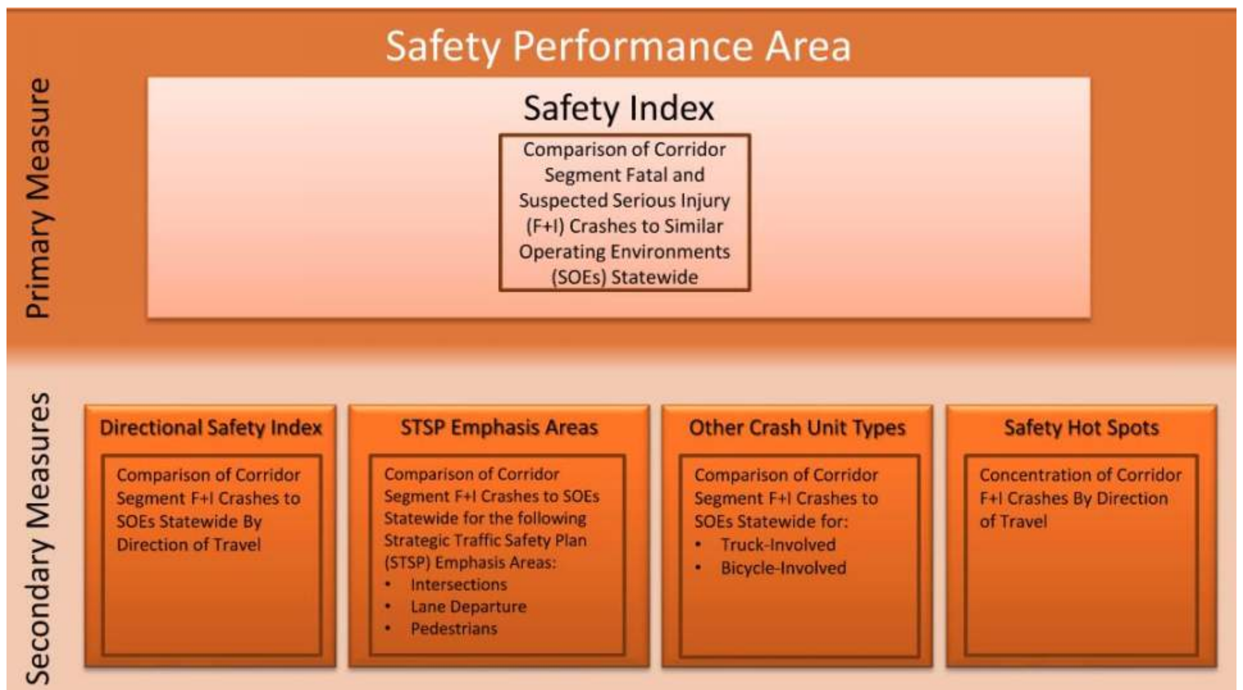
Figure 12: Mobility Performance



2.5 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 suspected serious injuries, as these types of crashes are the emphasis of the ADOT Strategic Traffic Safety Plan (STSP), 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 suspected serious injury crashes, the relative cost of those types of crashes, and crash occurrences on similar roadways in Arizona. According to ADOT's 2018 Highway Safety Improvement Program Application, fatal crashes have an estimated cost that is 17.3 times the estimated cost of incapacitating injury crashes ($9.5 million compared to $555,000).

Each corridor segment is rated on a scale by comparing the segment score with the average statewide score for similar operating environments. Because 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-40 East Corridor, the following operating environments were identified:

- Urban 4 Lane Freeway: Segments 40-1 and 40- 5
- Rural 4 Lane Freeway < 25,000: Segments 40-2 through 40-4, 40-6 through 40-12

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 suspected serious injury crashes

STSP Emphasis Areas

ADOT's 2019 STSP identified several emphasis areas for reducing fatal and suspected serious injury crashes. This measure compared rates of crashes in three STSP emphasis areas to other corridors with a similar operating environment. The three STSP emphasis areas related to crashes involving:

- Intersections
- Lane departures
- Pedestrians

Other Crash Unit Types

- The percentage of total fatal and suspected serious injury crashes that involves crash unit types of trucks and bicycles 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 suspected serious 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.

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

- Overall, based on the weighted average of the Safety Index, the corridor rates in "average performance" condition
- Segments perform with a mixture of "above average," "average," and "below average" performance in the Safety Index

- The % of Fatal + Suspected Serious Injury Crashes at intersections had insufficient data to generate reliable performance ratings for the SR 87/SR 260/SR 377 corridor
- The % of Fatal + Suspected Serious Injury Crashes Involving Pedestrians had insufficient data to generate reliable performance ratings for the SR 87/SR 260/SR 377 corridor
- The % of Fatal + Suspected Serious Injury Crashes Involving Trucks shows a weighted corridor average of “Below Average” performance.
- The % of Fatal + Suspected Serious Injury Crashes Involving Bicycles had insufficient data to generate reliable performance ratings for the SR 87/SR 260/SR 377 corridor
- The % of Fatal + Suspected Serious Injury Crashes Involving Lane Departures shows a weighted corridor average of “Above Average” performance.
- A total of 132 fatal and suspected serious injury crashes occurred along the SR 87/SR 260/SR 377 corridor in 2015 - 2019; of these crashes, 56 were fatal and 76 involved suspected serious injuries
- There are several locations of high crash frequency, including Segments I40E-1, I40E-3, I40E-6, I40E-8, I40E-9, and I40E-11
- Safety hot spots include:
    - Segment 40-1 MP 195-196
    - Segment 40-3 MP 218-220, 229
    - Segment 40-4 MP 240-242
    - Segment 40-6 MP 262-265
    - Segment 40-8 MP 262-265

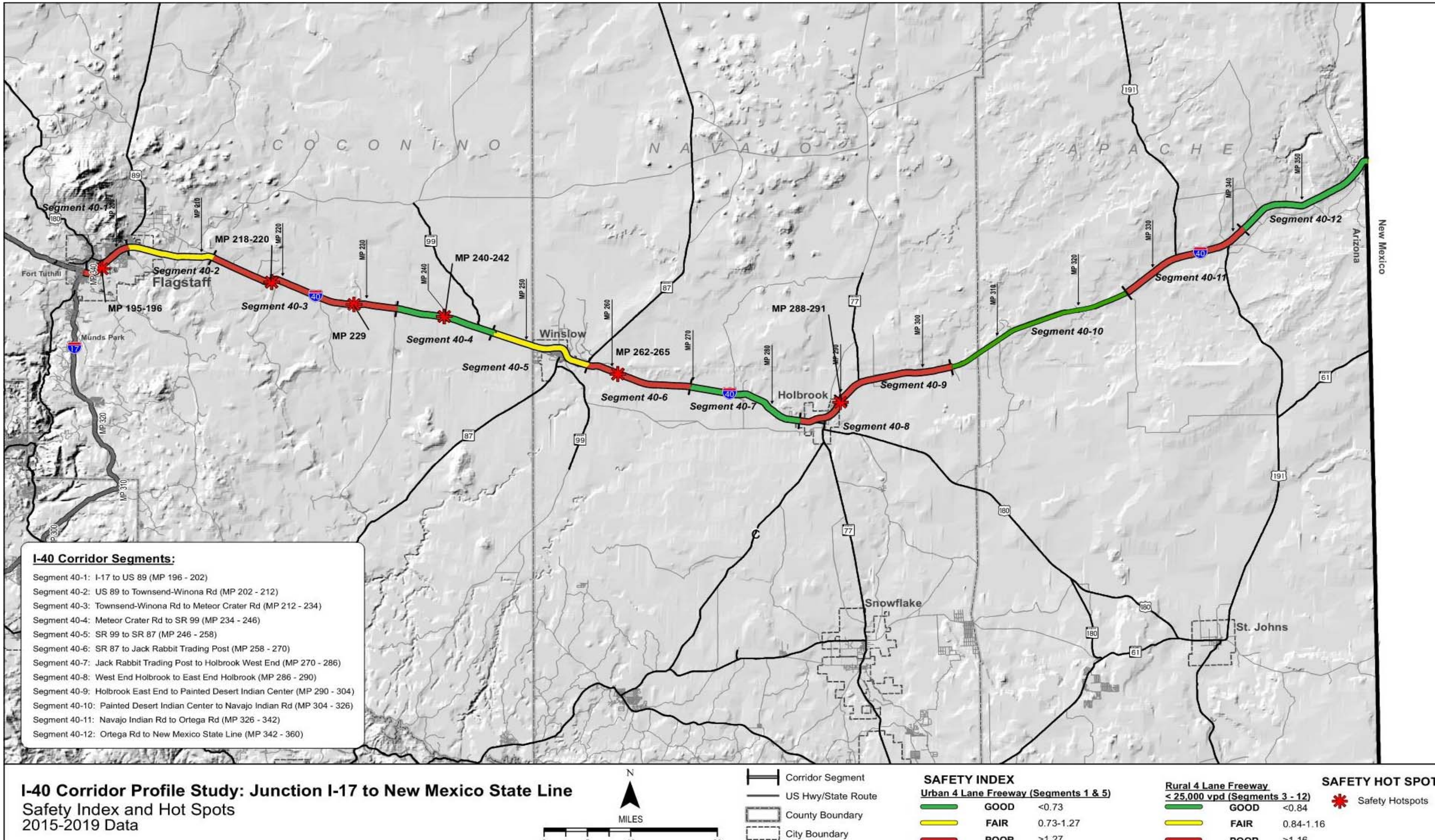
Table 9 summarizes the Safety performance results for the I-40 East Corridor. **Figure 14** illustrates the primary Safety Index performance and locations of Safety hot spots along the I-40 East Corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 9: Safety Performance

Segment #	Segment Length (miles)	Safety Performance Area: Safety Index	Directional Safety Index EB	Directional Safety Index WB	% of Fatal + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Segment Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Segment Fatal + Suspected Serious Injury Crashes Involving Bicycles
I40E-1[a]	6	1.73	2.29	1.17	Insufficient Data	45.5%	Insufficient Data	37.5%	Insufficient Data
I40E-2[b]	10	1.08	1.11	1.06	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
I40E-3[b]	22	1.48	1.64	1.32	Insufficient Data	81.5%	Insufficient Data	22.2%	Insufficient Data
I40E-4[b]	12	0.15	0.11	0.18	Insufficient Data	45.5%	Insufficient Data	9.1%	Insufficient Data
I40E-5[a]	12	1.11	1.27	0.95	Insufficient Data	66.7%	Insufficient Data	55.6%	Insufficient Data
I40E-6[b]	12	1.29	1.46	1.12	Insufficient Data	81.3%	Insufficient Data	Insufficient Data	Insufficient Data
I40E-7[b]	16	0.70	1.05	0.34	Insufficient Data	Insufficient Data	Insufficient Data	20.0%	Insufficient Data
I40E-8[b]	4	2.03	2.74	1.33	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
I40E-9[b]	14	1.24	0.83	1.65	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
I40E-10[b]	22	0.00	0.00	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
I40E-11[b]	16	1.42	1.57	1.26	Insufficient Data	62.5%	Insufficient Data	8.3%	Insufficient Data
I40E-12[b]	18	0.83	0.39	1.33	Insufficient Data	53.8%	Insufficient Data	Insufficient Data	Insufficient Data
Weighted Corridor Average		0.97	1.02	0.92	Insufficient Data	64.85%	Insufficient Data	23.1%	Insufficient Data
SCALES									
Performance Level		**Urban 4 Lane Freeway**							
Above Average		< 0.73			< 44%	< 60.6%	< 0.0%	< 6.9%	= 0.0%
Average		0.73 - 1.27			44% - 54%	60.6% - 78.1%	0.0% - 4.9%	6.9% - 12.4%	
Below Average		> 1.27			> 54%	> 78.1%	> 4.9%	> 12.4%	> 0.0%
Performance Level		**Rural 4 Lane Freeway with Daily Volume < 25,000**							
Above Average		< 0.84			< 51%	< 72.8%	< 1.0%	< 19.0%	= 0.0%
Average		0.84 - 1.16			51% - 58%	72.8% - 76.4%	1.0% - 3.3%	19.0% - 22.5%	0.0% - 0.9%
Below Average		> 1.16			> 58%	> 76.4%	> 3.3%	> 22.5%	> 0.9%

[a]Urban 4 Lane Freeway
[b]Rural 4 Lane Freeway < 25,000 vpd
Note: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings.

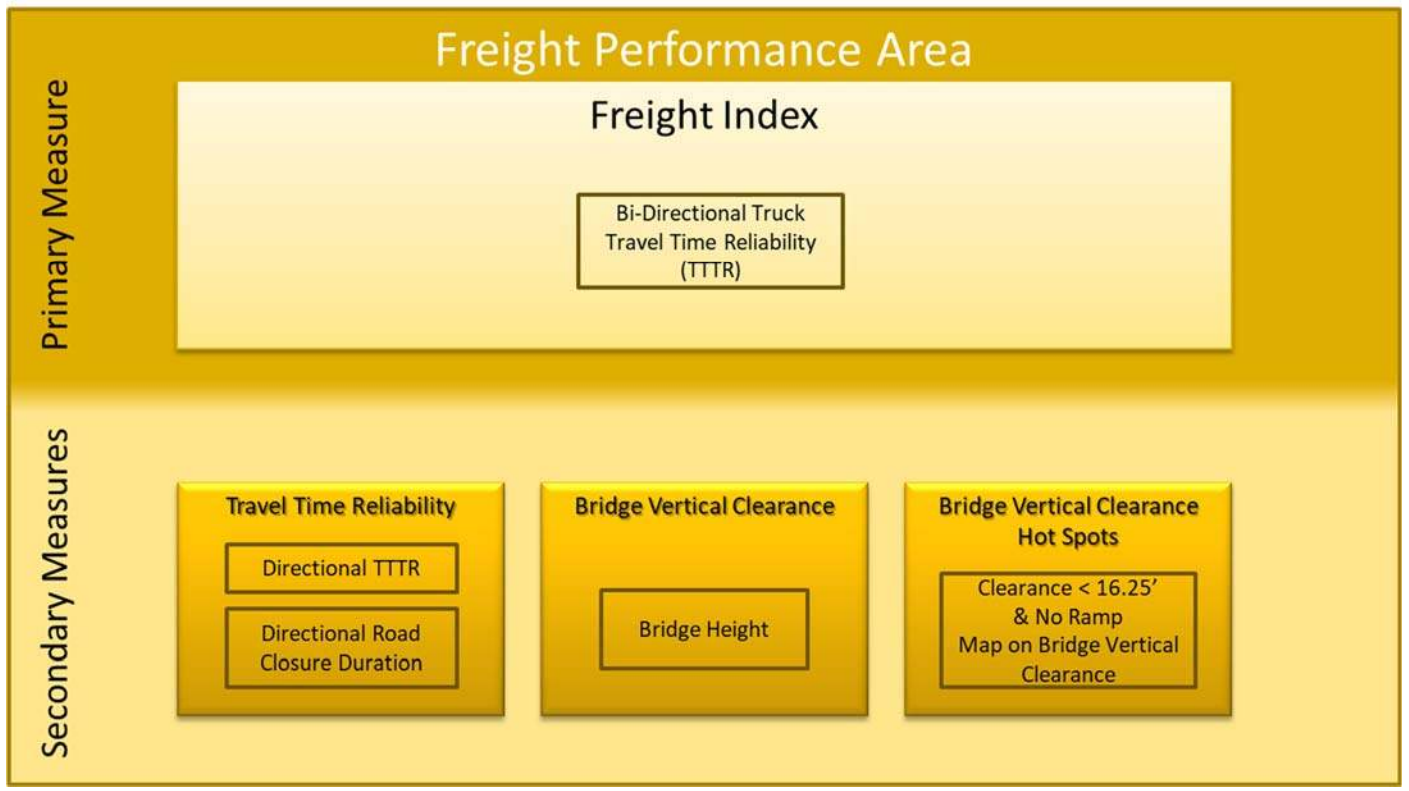
Figure 14: Safety Performance



2.6 Freight Performance Area

The Freight performance area consists of a single primary measure (Freight Index) and three secondary measures, as illustrated in **Figure 15**. All measures related to the reliability of truck travel are measured by observed truck travel time speed and delays to truck travel from road 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



<u>*Primary Freight Index*</u>

The Freight Index is a reliability performance measure based on the travel time reliability for truck travel. The Truck Travel Time Reliability (TTTR) is the ratio of the 95^{th} percentile truck travel time to average (50^{th} percentile) truck travel time. The TTTR reflects the extra buffer time needed for on-time delivery while accounting for delay resulting from circumstances such as recurring congestion, 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-40 East Corridor, the following operating environments were identified:

- Uninterrupted Flow: All Segments

<u>*Secondary Freight Measures*</u>

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

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

- Directional Truck Travel Time Reliability (TTTR):
  - o The ratio of the 95^{th} percentile truck travel time to average (50^{th} percentile) truck travel time for a given corridor segment in a specific direction; as corridor segments were often comprised of multiple roadway sections for which TTTR was reported, a weighted average was applied to each section based on the section length in order to arrive at the segment TTTR
- Directional Closure Duration
  - o 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

<u>*Freight Performance Results*</u>

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

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

- Overall, based on the weighted average of the Freight Index, the freight mobility is in "good" condition
- All of the segments show "good" performance in both directional and bidirectional TTTR

- Several segments show "fair" and "poor" performance in the closure performance measure
- Segments I40E-3 and I40E-12 have the longest duration of closures
- Segments I40E-3 and I40E-10 have "poor" Bridge Vertical Clearance performance ratings
- No bridge vertical clearance hot spots exist along the I-40 East Corridor

Table 10 summarizes the freight performance for the I-40 East Corridor. **Figure 16** illustrates the primary Freight Index performance and locations of Freight hot spots along the I-40 East Corridor. Maps for each secondary measure can be found in **Appendix A.**

Table 10: Freight Performance

Segment #	Segment Length (miles)	Freight Performance Area						
		Freight TTTR	Directional Max TTTR		Combined Average Peak TTTR	Average Minutes Per Year Given Milepost Is Closed Per Segment Mile (NB/EB)		Bridge Vertical Clearance (feet)
			EB	WB		EB	WB	
I40E-1^	6	1.12	1.12	1.12	1.12	116.62	53.05	16.67
I40E-2^	10	1.09	1.08	1.10	1.09	87.10	67.26	16.00
I40E-3^	22	1.06	1.06	1.06	1.06	398.89	346.15	15.96
I40E-4^	12	1.10	1.10	1.11	1.10	35.45	24.73	16.15
I40E-5^	12	1.06	1.06	1.06	1.06	96.93	39.20	16.26
I40E-6^	12	1.09	1.09	1.09	1.09	34.12	29.92	No UP
I40E-7^	16	1.13	1.13	1.14	1.13	41.79	56.74	16.01
I40E-8^	4	1.06	1.07	1.06	1.06	127.25	58.75	16.96
I40E-9^	14	1.06	1.06	1.06	1.06	209.81	124.11	16.12
I40E-10^	22	1.06	1.06	1.06	1.06	211.27	89.35	15.96
I40E-11^	16	1.11	1.11	1.11	1.11	175.96	102.71	16.06
I40E-12^	18	1.09	1.08	1.09	1.09	233.05	412.67	16.06
Weighted Corridor Average		1.09	1.08	1.09	1.09	171.45	144.21	No UP

SCALES

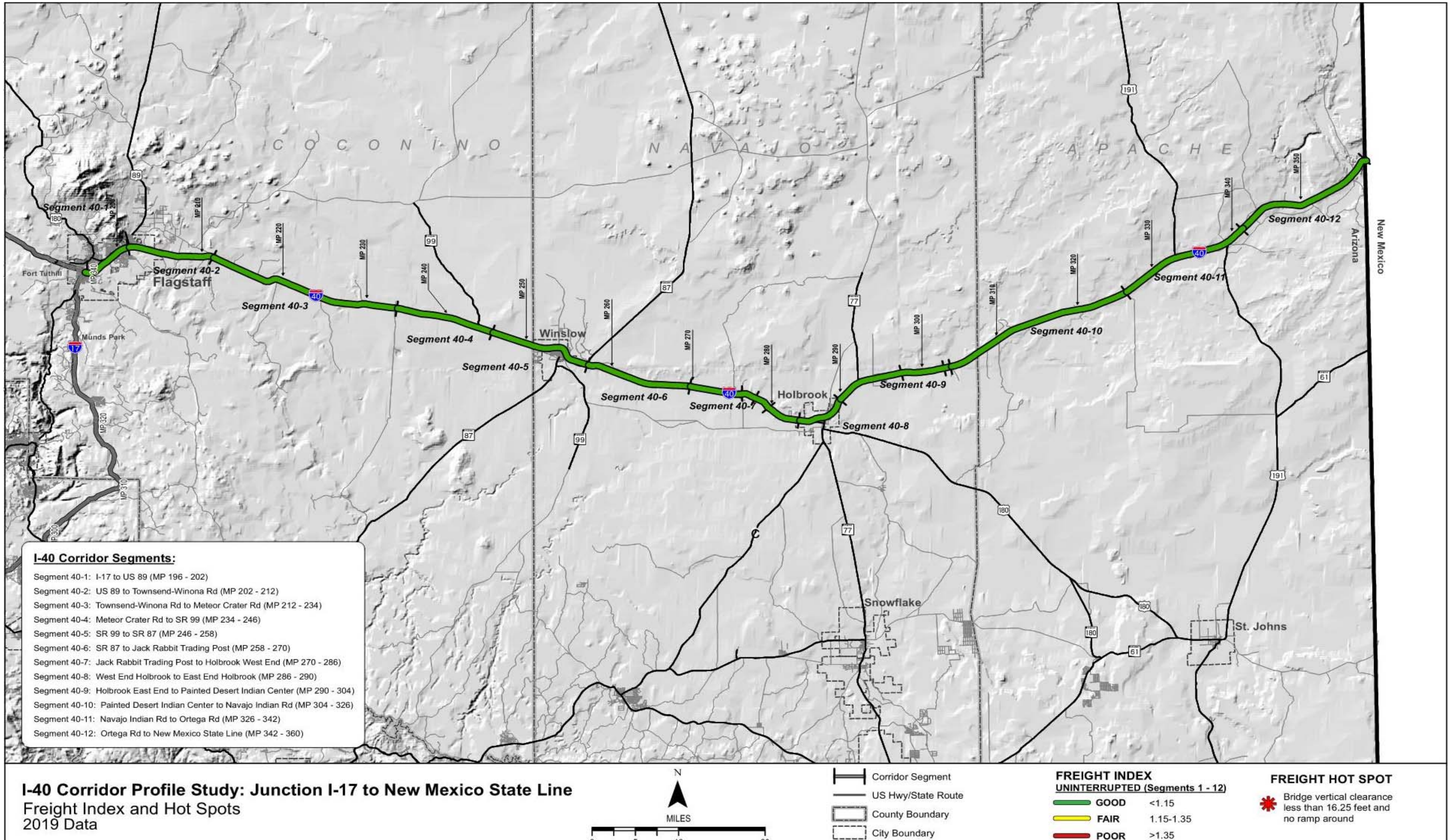
Performance Level	Uninterrupted	All	
Good	< 1.15	< 44.18	> 16.5
Fair/	1.15 - 1.35	44.18-124.86	16.0 - 16.5
Poor	> 1.35	> 124.86	< 16.0

Performance Level	Interrupted
Good	< 1.45
Fair/	1.45-1.85
Poor	> 1.85

^Uninterrupted Flow Facility

*Interrupted Flow Facility

Figure 16: Freight Performance



2.7 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-40 East Corridor:

- The pavement generally has "good" performance with the exception of a few isolated locations
- The bridges generally have "fair" performance overall
- Segment I40E-8 has the worst Lowest Bridge Rating of 4
- The general mobility and freight indices along the corridor are displaying "good" performance where both are also showing very little recurring and non-recurring delays
- The closures along the corridor generally exceed or equal the statewide average for both the closure frequency and duration
- Segments have mixture of "above average," "average," and "below average" performance ratings for the Safety Index
- There are very few crash hot spots throughout the corridor

Figure 17 shows the percentage of the I-40 East Corridor that rates either "good/above average", "fair/average" or "poor/below average" for each primary measure. 100% of the corridor show "good" performance in both the Mobility Index and Freight Index. Approximately 56% of the corridor show "good" performance in Pavement while 24% is "fair" and 20% is "poor" performance. The Bridge Index displays 88% of the corridor in "fair" condition, and 12% in "good" condition. In the Safety Index, approximately 45% of the corridor shows "below average" performance, while the other 41% and 13% are shown as "above average" and "average" performance, respectively.

The lowest performance along the I-40 East Corridor generally occurs in the Safety and Bridge Performance Areas with the Freight and Mobility Performance Areas showing the highest performance.

Table 11 shows a summary of corridor performance for all primary measures and secondary measure indicators for the I-40 East 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

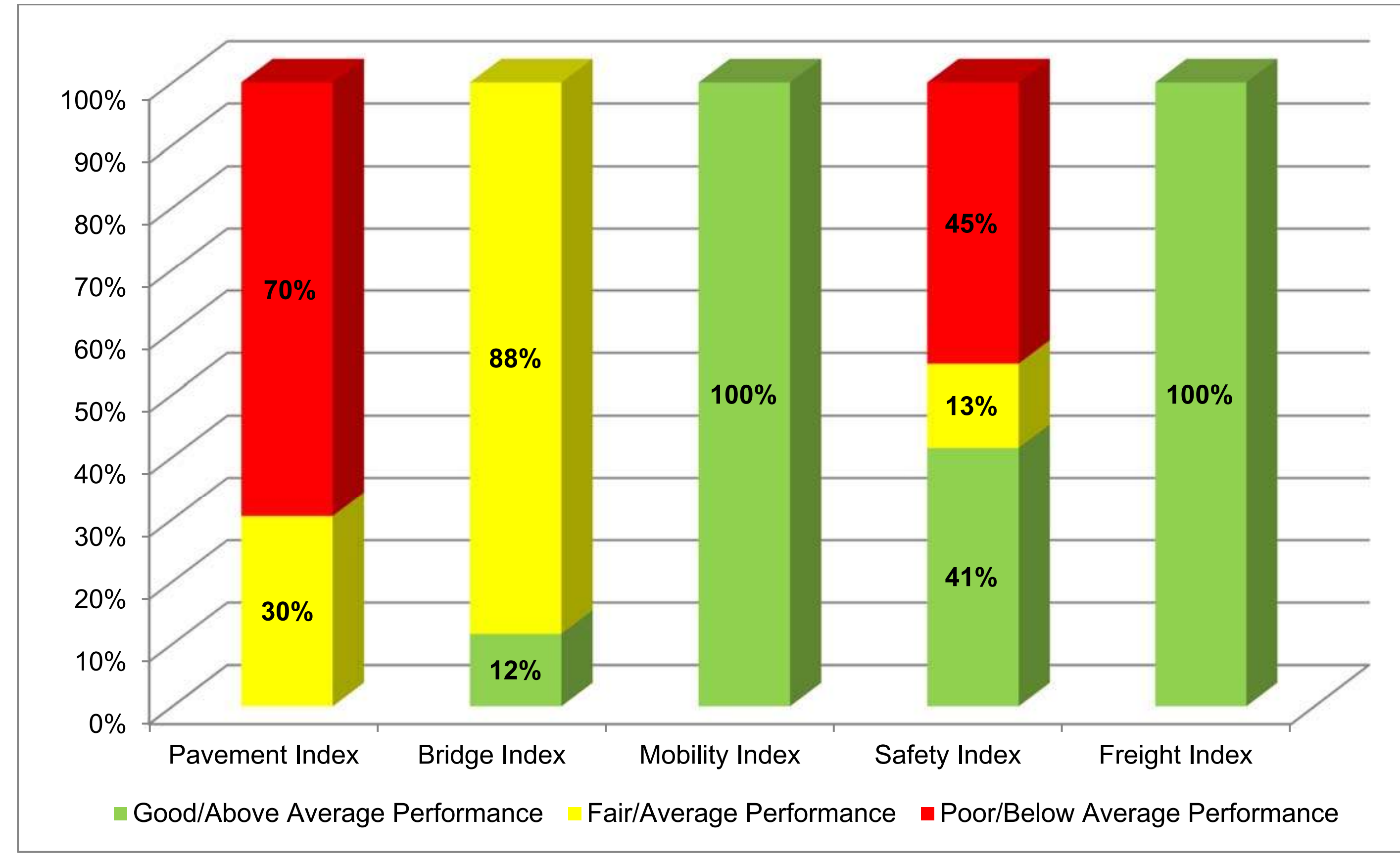


Figure 18: Corridor Performance Summary by Performance Measure

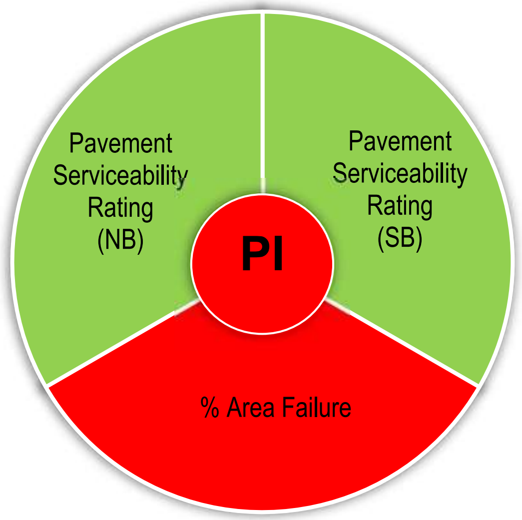
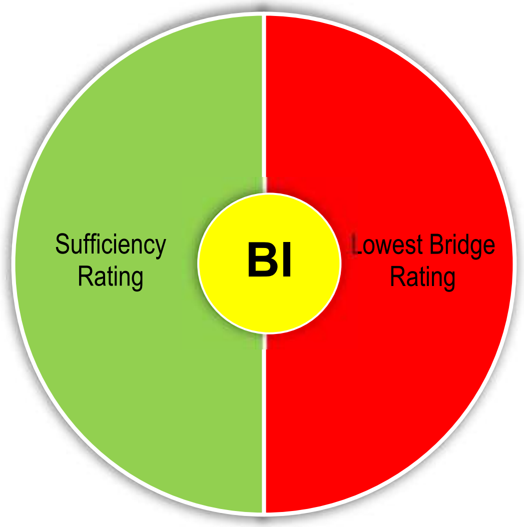
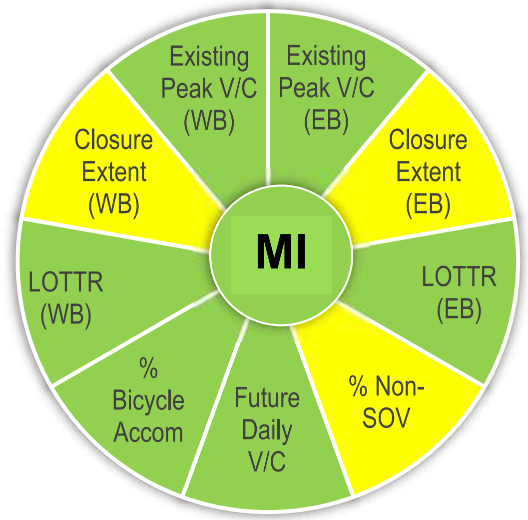
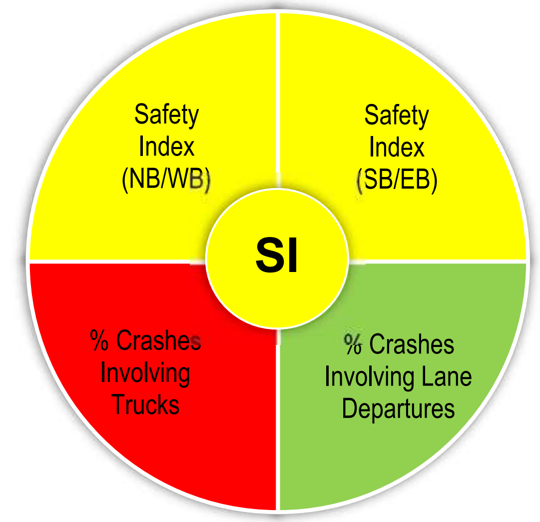
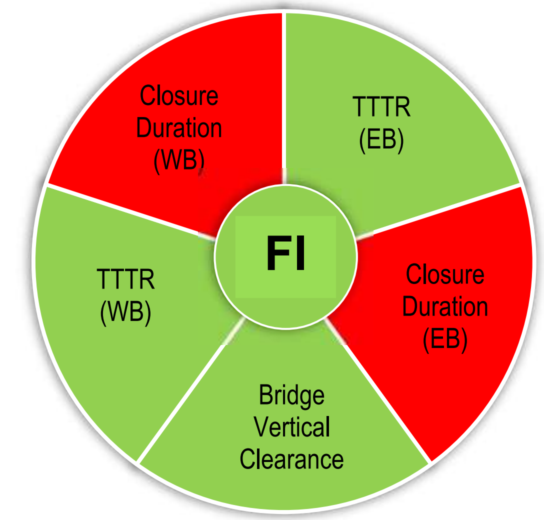
Pavement	Bridge	Mobility	Safety	Freight
				
Pavement Index (PI): based on three pavement condition ratings from the ADOT Pavement Database; the three ratings are the International Roughness Index (IRI), the Cracking Rating, and the Rutting Rating	**Bridge Index (BI):** based on four bridge condition 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 long-term future daily V/C ratio	**Safety Index (SI):** combines the bi-directional frequency and rate of fatal and suspected serious injury crashes, compared to crash occurrences on roads with similar operating environments in Arizona	**Freight Index (FI):** a reliability performance measure based on the bi-directional Truck Travel Time Reliability (TTTR) 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 ➢ **Lowest Bridge Rating** –the lowest rating of the four bridge condition ratings on each segment	➢ **Future Daily V/C** – the future daily 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 Level of Travel Time Reliability (LOTTR)** – the ratio of the 80th percentile peak period travel time to the 50th percentile peak period travel time for all vehicles ➢ **% 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 suspected serious injury crashes, compared to crash occurrences on roads with similar operating environments in Arizona ➢ **% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures** – the percentage of total fatal and suspected serious injury crashes involving lane departures compared to the statewide average percentage on roads with similar operating environments ➢ **% of Fatal + Suspected Serious Injury Crashes Involving Trucks** – the percentage of total fatal and suspected serious injury crashes involving trucks compared to the statewide average percentage on roads with similar operating environments	➢ **Directional TTTR** – the ratio of the 95th percentile peak period travel time to the 50th percentile peak period travel time for trucks ➢ **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 11: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area: Pavement Index	Directional PSR NB	Directional PSR SB	% Area Failure	Bridge Performance Area: Bridge Index	Sufficiency Rating	Lowest Bridge Rating	Mobility Performance Area: Mobility Index	Future Daily V/C	Existing Peak Hour V/C EB	Existing Peak Hour V/C WB	Closure Extent (instances/ milepost/year/mile) EB	Closure Extent (instances/ milepost/year/mile) WB	Directional Max LOTTR (all vehicles) EB	Directional Max LOTTR (all vehicles) WB	% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
I40E-1[a1]	6	3.03	2.88	2.97	33.3%	6.4	94.59	5	0.58	0.65	0.39	0.39	0.47	0.30	1.03	1.03	100%	16.3%
I40E-2[b1]	10	3.59	3.80	3.89	25.0%	5.9	93.47	5	0.36	0.40	0.25	0.25	0.22	0.22	1.02	1.03	100%	13.7%
I40E-3[b2]	22	1.96	4.26	4.26	18.2%	5.5	90.76	5	0.44	0.49	0.27	0.27	1.11	0.92	1.02	1.02	100%	6.6%
I40E-4[b2]	12	3.60	3.99	4.03	50.0%	6.1	95.50	5	0.44	0.49	0.24	0.24	0.10	0.08	1.03	1.04	100%	8.3%
I40E-5[a2]	12	1.77	4.15	4.25	13.0%	5.6	89.98	5	0.41	0.45	0.27	0.27	0.38	0.18	1.02	1.02	100%	12.8%
I40E-6[b2]	12	3.50	3.83	3.77	58.0%	5.5	89.91	5	0.33	0.36	0.17	0.17	0.13	0.10	1.03	1.03	100%	12.2%
I40E-7[b2]	16	2.36	3.95	3.95	34.0%	5.7	91.27	5	0.43	0.48	0.22	0.22	0.13	0.21	1.05	1.04	100%	16.1%
I40E-8[b2]	4	2.79	3.90	3.96	25.0%	5.5	81.09	4	0.46	0.51	0.34	0.34	0.35	0.20	1.03	1.02	100%	18.5%
I40E-9[b2]	14	2.25	4.26	4.30	0.0%	6.8	96.37	6	0.42	0.47	0.21	0.21	0.56	0.37	1.02	1.02	98%	13.7%
I40E-10[b2]	22	2.32	4.13	4.09	30.0%	5.6	88.06	5	0.39	0.43	0.25	0.25	0.53	0.27	1.02	1.02	100%	13.5%
I40E-11[b2]	16	3.56	4.03	3.94	47.0%	6.8	95.99	5	0.40	0.44	0.23	0.23	0.43	0.32	1.03	1.04	96%	10.3%
I40E-12[b2]	18	2.20	4.19	4.20	42.0%	5.8	89.65	5	0.46	0.51	0.25	0.25	0.59	1.09	1.03	1.03	90%	12.3%
Weighted Corridor Average		2.63	4.04	4.13	31%	5.7	90.78	4.86	0.42	0.47	0.25	0.25	0.47	0.42	1.03	1.03	98%	12%

SCALES

Performance Level	Pavement Index / Directional PSR (Interstate)	% Area Failure (Interstate)	Bridge Index (All)	Sufficiency Rating (All)	Lowest Bridge Rating (All)	Mobility Index / Future Daily V/C / Existing Peak Hour V/C (Rural)	Closure Extent (All)	Directional Max LOTTR (All)	% Bicycle Accommodation (All)	% Non-SOV Trips (All)
Good/Above Average Performance	> 3.75	< 5%	> 6.5	> 80	> 6	< 0.56	< 0.22	< 1.15	> 90%	> 17%
Fair/Average Performance	3.20 - 3.75	5% - 20%	5.0 - 6.5	50 - 80	5 - 6	0.56 - 0.76	0.22 - 0.62	1.15 - 1.5	60% - 90%	11% - 17%
Poor/Below Average Performance	< 3.20	> 20%	< 5.0	< 50	< 5	> 0.76	> .62	> 1.5	< 60%	< 11%

Performance Level	Urban and Fringe Urban
Good/Above Average Performance	< 0.71
Fair/Average Performance	0.71 - 0.89
Poor/Below Average Performance	> 0.89

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

Table 11: 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 + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Segment Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Segment Fatal + Suspected Serious Injury Crashes Involving Bicycles	Freight TTTR	Directional Max TTTR		Combined Average Peak TTTR	Average Minutes Per Year Given Milepost Is Closed Per Segment Mile (NB/EB)		Bridge Vertical Clearance (feet)
			EB	WB							EB	WB		EB	WB	
I40E-1[a1]	6	1.73	2.29	1.17	Insufficient Data	45.5%	Insufficient Data	37.5%	Insufficient Data	1.12	1.12	1.12	1.12	116.62	53.05	16.67
I40E-2[b1]	10	1.08	1.11	1.06	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.09	1.08	1.10	1.09	87.10	67.26	16.00
I40E-3[b2]	22	1.48	1.64	1.32	Insufficient Data	81.5%	Insufficient Data	22.2%	Insufficient Data	1.06	1.06	1.06	1.06	398.89	346.15	15.96
I40E-4[b2]	12	0.15	0.11	0.18	Insufficient Data	45.5%	Insufficient Data	9.1%	Insufficient Data	1.10	1.10	1.11	1.10	35.45	24.73	16.15
I40E-5[a2]	12	1.11	1.27	0.95	Insufficient Data	66.7%	Insufficient Data	55.6%	Insufficient Data	1.06	1.06	1.06	1.06	96.93	39.20	16.26
I40E-6[b2]	12	1.29	1.46	1.12	Insufficient Data	81.3%	Insufficient Data	Insufficient Data	Insufficient Data	1.09	1.09	1.09	1.09	34.12	29.92	No UP
I40E-7[b2]	16	0.70	1.05	0.34	Insufficient Data	Insufficient Data	Insufficient Data	20.0%	Insufficient Data	1.13	1.13	1.14	1.13	41.79	56.74	16.01
I40E-8[b2]	4	2.03	2.74	1.33	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.06	1.07	1.06	1.06	127.25	58.75	16.96
I40E-9[b2]	14	1.24	0.83	1.65	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.06	1.06	1.06	1.06	209.81	124.11	16.12
I40E-10[b2]	22	0.00	0.00	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	1.06	1.06	1.06	1.06	211.27	89.35	15.96
I40E-11[b2]	16	1.42	1.57	1.26	Insufficient Data	62.5%	Insufficient Data	8.3%	Insufficient Data	1.11	1.11	1.11	1.11	175.96	102.71	16.06
I40E-12[b2]	18	0.83	0.39	1.33	Insufficient Data	53.8%	Insufficient Data	Insufficient Data	Insufficient Data	1.09	1.08	1.09	1.09	233.05	412.67	16.06
Weighted Corridor Average		0.97	1.02	0.92	Insufficient Data	64.85%	Insufficient Data	23.1%	Insufficient Data	1.09	1.08	1.09	1.09	171.45	144.21	No UP

SCALES

Performance Level	Urban 4 Lane Freeway							Uninterrupted			All	
Good/Above Average Performance	< 0.73	< 44%	< 60.6%	< 0.0%	< 6.9%	= 0.0%		< 1.15			< 44.18	> 16.5
Fair/Average Performance	0.73 - 1.27	44% - 54%	60.6% - 78.1%	0.0% - 4.9%	6.9% - 12.4%			1.15 - 1.35			44.18-124.86	16.0 - 16.5
Poor/Below Average Performance	> 1.27	> 54%	> 78.1%	> 4.9%	> 12.4%	> 0.0%		> 1.35			> 124.86	< 16.0
Performance Level	**Rural 4 Lane Freeway with Daily Volume < 25,000**							**Interrupted**				
Good/Above Average Performance	< 0.84	< 51%	< 72.8%	< 1.0%	< 19.0%	= 0.0%		< 1.45	< 1.45	< 1.45		
Fair/Average Performance	0.84 - 1.16	51% - 58%	72.8% - 76.4%	1.0% - 3.3%	19.0% - 22.5%	0.0% - 0.9%		1.45-1.85	1.45-1.85	1.45-1.85		
Poor/Below Average Performance	> 1.16	> 58%	> 76.4%	> 3.3%	> 22.5%	> 0.9%		> 1.85	> 1.85	> 1.85		

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

Notes: "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), 2016-2040. Statewide performance goals that are relevant to I-40 East 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-40 East Corridor: Pavement, Bridge, and Safety.

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 12** shows the I-40 East 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 12: Corridor Performance Goals and Objectives

<table>
<tr><th rowspan="2">ADOT Statewide LRTP Goals</th><th rowspan="2">I-40 East Corridor Goals</th><th rowspan="2">I-40 East Corridor Objectives</th><th rowspan="2">Performance Area</th><th>Primary Measure</th><th colspan="2">Performance Objective</th></tr>
<tr><th>Secondary Measure Indicators</th><th>Corridor Average</th><th>Segment</th></tr>
<tr><td rowspan="6">Preserve & Maintain the State Transportation System</td><td rowspan="6">Maintain and preserve highway infrastructure</td><td rowspan="3">Maintain acceptable level of pavement ride quality</td><td rowspan="3">Pavement (Emphasis Area)</td><td>Pavement Index</td><td>Good</td><td rowspan="3">Fair or better</td></tr>
<tr><td>Directional Pavement Serviceability Rating</td><td rowspan="2"></td></tr>
<tr><td>% Area Failure</td></tr>
<tr><td rowspan="3">Reduce the number of structurally deficient bridges</td><td rowspan="3">Bridge (Emphasis Area)</td><td>Bridge Index</td><td>Good</td><td rowspan="3">Fair or better</td></tr>
<tr><td>Sufficiency Rating</td><td rowspan="2"></td></tr>
<tr><td>Lowest Bridge Rating</td></tr>
<tr><td rowspan="7">Improve Mobility & Accessibility

Support Economic Growth</td><td rowspan="7">Provide reliable route for recreation and tourist travel
Provide efficient commuting route within the Flagstaff metropolitan area
Provide efficient commuting route to/from APS power station at Joseph City</td><td rowspan="7">Reduce current and future congestion

Reduce delays from non-recurring events and incidents to enhance travel time reliability</td><td rowspan="7">Mobility</td><td>Mobility Index</td><td>Fair or better</td><td rowspan="7">Fair or better</td></tr>
<tr><td>Future Daily V/C</td><td rowspan="6"></td></tr>
<tr><td>Existing Peak Hour V/C (Directional)</td></tr>
<tr><td>Closure Extent (Directional)</td></tr>
<tr><td>Directional Level of Travel Time Reliability</td></tr>
<tr><td>% Bicycle Accommodation</td></tr>
<tr><td>% Non-SOV Trips</td></tr>
<tr><td rowspan="6">Enhance Safety & Security</td><td rowspan="6">Enhance Safety</td><td rowspan="6">Reduce fatal and incapacitating injury crashes for all roadway users</td><td rowspan="6">Safety (Emphasis Area)</td><td>Safety index</td><td>Above Average</td><td rowspan="6">Average or better</td></tr>
<tr><td>% of Fatal + Suspected Serious Injury Crashes at Intersections</td><td rowspan="5"></td></tr>
<tr><td>% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures</td></tr>
<tr><td>% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians</td></tr>
<tr><td>% of Fatal + Suspected Serious Injury Crashes Involving Trucks</td></tr>
<tr><td>% of Fatal + Suspected Serious Injury Crashes Involving Bicycles</td></tr>
<tr><td rowspan="4">Improve Mobility & Accessibility

Support Economic Growth</td><td rowspan="4">Provide reliable route for interstate and intrastate freight traffic</td><td rowspan="4">Reduce delays and restrictions to freight movements and improve travel time reliability</td><td rowspan="4">Freight</td><td>Freight Index</td><td>Fair or better</td><td rowspan="4">Fair or better</td></tr>
<tr><td>Truck Travel Time Reliability</td><td rowspan="3"></td></tr>
<tr><td>Closure Duration</td></tr>
<tr><td>Bridge Vertical Clearance</td></tr>
</table>

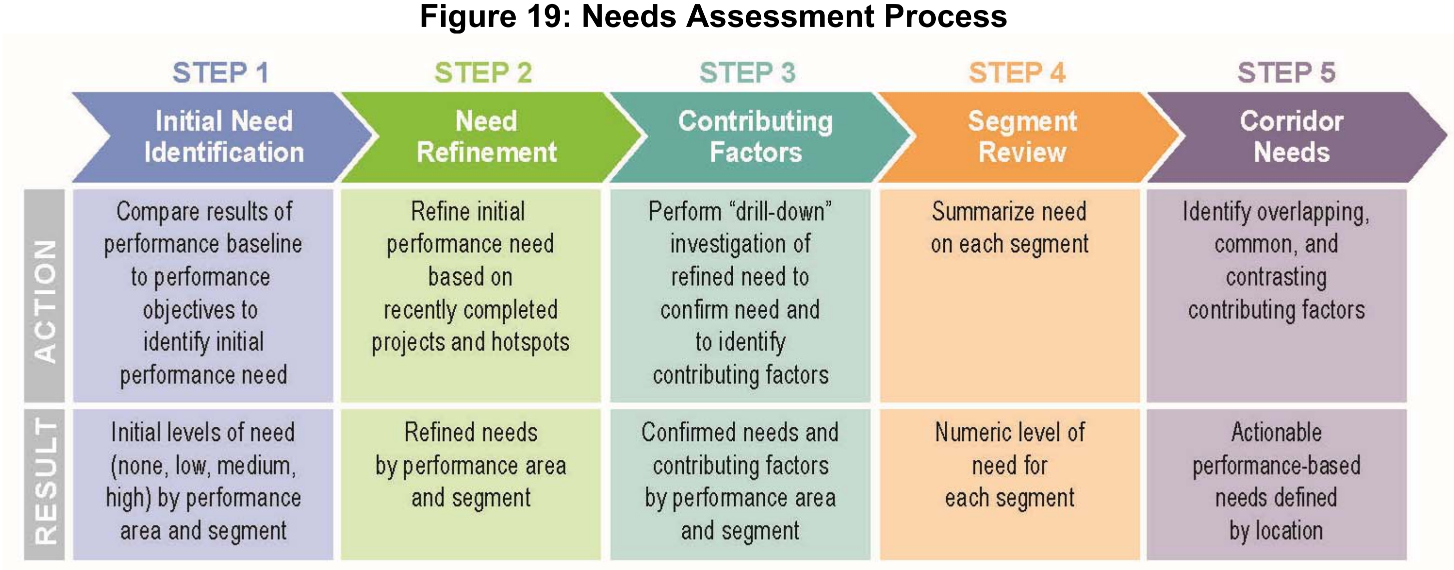
3.2 Needs Assessment Process

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
	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
6.5	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 levels of need for each primary and secondary performance measure are combined to produce a weighted 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 INRIX Database
- Highway Conditions Reporting System (HCRS) Database

Safety Performance Area

- Crash Database

Freight Performance Area

- INRIX 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 1 and refined in Step 2 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 13** through **Table 17**.

Pavement Needs Refinement and Contributing Factors

- No recently completed pavement projects have occurred along the corridor
- See **Appendix D** for detailed information on contributing factors.

Table 13: 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					
40-1	3.03	2.88	2.97	33%	3.20	MP 196-197 EBMP 198-199 EBMP 201-202	None	High
40-2	3.59	3.80	3.89	25%	0.60	MP 202-204 EBMP 204-205	None	Low
40-3	1.96	4.26	4.26	18%	3.40	MP 230-234	None	High
40-4	3.60	3.99	4.03	50%	0.60	MP 234-240	None	Low
40-5	1.77	4.15	4.25	13%	3.20	WBMP 246-249	None	High
40-6	2.95	3.83	3.77	58%	2.60	MP 259-261 WBMP 262-263 MP 263-264 WBMP 264-265 MP265-268	None	High
40-7	2.36	3.95	3.95	34%	3.60	WBMP 277-278 MP 278-283	None	High
40-8	2.79	3.90	3.96	25%	2.60	WBMP287-288 EBMP 288-289	None	High
40-9	2.25	4.26	4.30	0%	3.00	-	None	High
40-10	2.32	4.13	4.09	30%	3.60	WBMP 319-320 MP 320-326	None	High
40-11	3.56	4.03	3.94	47%	0.60	WBMP 326-327 MP 327-331 WBMP 331-332 EBMP 335-338 EBMP 340-342	None	Low
40-12	2.20	4.19	4.20	42%	3.60	EBMP 342-345 MP347-348 EBMP 348-349 MP 349-351 EBMP 351-352 MP 352-354	None	High

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

- Five of the segments (40-3, 40-5, 40-7, 40-8, and 40-10) had recent bridge projects.
- Segment 40-6 has an increase in the level of Needs from Low to Medium due to hot spots
- Twenty-two bridges have potential repetitive investment issues and are candidates for life-cycle cost analysis to evaluate alternative solutions.
- See **Appendix D** for detailed information on contributing factors.

Table 14: 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	Lowest Bridge Rating				
40-1	6.44	94.59	5.00	0.2	Lone Tree Road OP WB and EB	0	Low
40-2	5.90	93.47	5.00	1.2	-	0	Low
40-3	5.49	90.76	5.00	2.2	Canyon Padre Br EB, Twin Arrows TI UP, Babbits Tank Br WB, Buffalo Range TI OP EB and WB, Canyon Diablo Br WB	Project completed 2015 Canyon Padre Br EB Bridge Deck Replacement; Canyon Diablo Br EB deck replacement and WB rehabilitation	Medium
40-4	6.05	95.50	5.00	0.2	-	0	Low
40-5	5.63	89.98	5.00	1.2	Tucker Flat Br EB, Ruby Wash Br EB and WB, Maple St. OP WB and EB, E Winslow TI OP EB and WB, SR 87 TI UP	Project completed Dec. 2014, replaced bridge decks at Ruby Wash, Maple Street, and East Winslow TI bridges. Also sealed bridge decks at Little CO River Bridges, Bridge Deck rehabilitation at SR 87 UP	Low
40-6	5.50	89.91	5.00	1.2	Cottonwood Br WB and EB, Jackrabbit TI OP EB and WB	0	Medium
40-7	5.65	91.27	5.00	1.2	Manila Wash Br WB, Tanner Wash Br EB, Leroux Wash Br EB and WB	Replaced scour at Manila Wash bridges. Leroux Wash Br EB and WB replaced approach slabs and bridge deck rehab. Tanner Wash Br EB replaced bridge	Low
40-8	5.54	81.09	4.00	1.4	E Holbrook TI OP WB and EB	Girder repair and rocker replacement at E Holbrook TI bridges.	Low
40-9	6.80	96.37	5.00	0.2	-	0	Low
40-10	5.64	88.06	5.00	1.2	Painted Desert TI UP, Dead River Br EB, Crazy Creek Br WB	Superstructure replaced at the underpass bridge at Painted Desert TI.	Low
40-11	6.81	95.99	5.00	0.2	-	0	Low
40-12	5.78	89.65	5.00	1.2	Window Rock TI OP WB, Lupton TI OP WB and EB	0	Low

Level of Need (Score)	Performance Score Need Scale			Segment Level Need Scale
None (0)	≥ 6.0	≥ 70	> 5	0
Low (1)	5.5 - 6.0	60 - 70	5	< 1.5
Medium (2)	4.5 - 5.5	40 - 60	4	1.5 - 2.5
High (3)	≤ 4.5	≤ 40	< 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

- A majority of the Needs are related to closure extent.
- Recently completed projects in the corridor resulted in an adjustment to level of need from Low to None for Segments 40-1 and 40-11
- See **Appendix D** for detailed information on contributing factors.

Table 15: 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 LOTTR		% Bicycle Accommodation			
			NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB				
40-1	0.58	0.65	0.39	0.39	0.47	0.30	1.03	1.03	100%	Low	DMS installed at MP 197.61	None
40-2	0.36	0.4	0.25	0.25	0.22	0.22	1.02	1.03	100%	None	None	Low
40-3	0.44	0.49	0.27	0.27	1.11	0.92	1.02	1.02	100%	Low	None	Low
40-4	0.44	0.49	0.24	0.24	0.10	0.08	1.03	1.04	100%	None	None	Low
40-5	0.41	0.45	0.27	0.27	0.38	0.18	1.02	1.02	100%	Low	None	Low
40-6	0.33	0.36	0.17	0.17	0.13	0.10	1.03	1.03	100%	None	None	None
40-7	0.43	0.48	0.22	0.22	0.13	0.21	1.05	1.04	100%	None	None	Low
40-8	0.46	0.51	0.34	0.34	0.35	0.20	1.03	1.02	100%	None	None	None
40-9	0.42	0.47	0.21	0.21	0.56	0.37	1.02	1.02	98%	Low	None	Low
40-10	0.39	0.43	0.25	0.25	0.53	0.27	1.02	1.02	100%	Low	None	Low
40-11	0.4	0.44	0.23	0.23	0.43	0.32	1.03	1.04	96%	Low	DMS installed at MP 340.44	None
40-12	0.46	0.51	0.25	0.25	0.59	1.09	1.03	1.03	90%	Low	None	Low

Level of Need (Score)	Performance Score Need Scale				Segment Level Need Scale
None* (0)	≤ 0.77 (Urban) ≥ .63 (Rural)	< 0.35	<1.27[a] <1.27[b]	> 80%	0
Low (1)	0.77 - 0.83 (Urban) 0.63 - 0.69 (Rural)	0.35 - 0.49	1.27 - 1.38[a] 1.27 - 1.38[b]	70% - 80%	< 1.5
Medium (2)	0.83 - .095 (Urban) 0.69 - 0.83 (Rural)	0.49 - 0.75	1.38 - 1.62[a] 1.38 - 1.62[b]	50% - 70%	1.5 - 2.5
High (3)	≥ 0.95 (Urban) ≥ 0.83 (Rural)	>0.75	>1.62[a] >1.62[b]	< 50%	> 2.5

1: Urban or Fringe Urban
2: Rural

**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 Refinement and Contributing Factors

- Segment 40-4 includes a hot spot so the final segment need was raised from None to Low.
- Safety hot spots are also present in Segments 40-1, 40-3, 40-6, 40-8 and 40-9, which already have a High Safety segment need.
- At the overall corridor level, 39% of the fatal and incapacitating crashes involve either over-turning or colliding with a Motor Vehicle, 42% involve rear end crashes, and 28% involve failure to keep in proper lane.
- See **Appendix D** for detailed information on contributing factors.

Table 16: 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 + Suspected Serious Injury Crashes at Intersections	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures	% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians	% of Fatal + Suspected Serious Injury Crashes Involving Trucks	% of Fatal + Suspected Serious Injury Crashes Involving Bicycles				
		NB/EB	SB/WB									
40E - 1	1.73	2.29	1.17	Insufficient Data	0.63	Insufficient Data	0.38	Insufficient Data	4.1	MP 195-196	None	High
40E - 2	1.08	1.11	1.06	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	2.3	None	None	Medium
40E - 3	1.48	1.64	1.32	Insufficient Data	0.81	Insufficient Data	0.22	Insufficient Data	4.6	MP 218-220, MP 229	None	High
40E - 4	0.15	0.11	0.18	Insufficient Data	0.45	Insufficient Data	0.09	Insufficient Data	0.0	MP 240-242	None	Low
40E - 5	1.11	1.27	0.95	Insufficient Data	0.67	Insufficient Data	0.56	Insufficient Data	3.1	None	None	High
40E - 6	1.29	1.46	1.12	Insufficient Data	0.81	Insufficient Data	Insufficient Data	Insufficient Data	4.1	MP 262-265	None	High
40E - 7	0.70	1.05	0.34	Insufficient Data	Insufficient Data	Insufficient Data	0.20	Insufficient Data	0.1	None	None	Low
40E - 8	2.03	2.74	1.33	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	3.6	MP 288-290	None	High
40E - 9	1.24	0.83	1.65	Insufficient Data	Insufficient Data	Insufficient Data	0.22	Insufficient Data	2.7	MP 290-291	None	High
40E - 10	Insufficient Data	0.00	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.0	None	None	None
40E - 11	1.42	1.57	1.26	Insufficient Data	0.63	Insufficient Data	0.08	Insufficient Data	3.5	None	None	High
40E - 12	0.83	0.39	1.27	Insufficient Data	0.54	Insufficient Data	Insufficient Data	Insufficient Data	0.3	None	None	Low

Level of Need (Score)		Performance Score Needs Scale						Segment Level Need Scale
None* (0)	a	≤ 0.91	0%	≤ 66%	≤ 2%	≤ 7%	0%	0
	b	≤ 0.95	0%	≤ 74%	≤ 2%	≤ 2%	0%	
Low (1)	a	0.91 - 1.09	0%	66% - 72%	2% - 4%	7% - 9%	0%	≤ 1.5
	b	0.95 - 1.06	0%	74% - 75%	2% - 3%	2% - 2%	0%	
Medium (2)	a	1.09 – 1.45	0%	72% - 84%	4% - 7%	9% - 12%	0%	1.5 - 2.5
	b	1.06 - 1.27	0%	75% - 78%	3% - 4%	2% - 3%	0%	
High (3)	a	≥ 1.45	0%	≥ 84%	≥ 7%	≥ 12%	0%	≥ 2.5
	b	≥ 1.27	0%	≥ 78%	≥ 4%	≥ 3%	0%	

a: Urban 4 Lane Freeway
b: Rural 4 Lane Freeway < 25,000 vpd

**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 Refinement and Contributing Factors

- At the overall corridor level, 56% of closure durations in the eastbound direction and 24% in the westbound direction are higher than the statewide average.
- There are no bridges that provide less than 16.25' vertical clearance and cannot be by-passed by using ramps.
- Recently completed projects in the corridor did not result in an adjustment to level of need (Segments 40-1 and 40-11)
- See **Appendix D** for detailed information on contributing factors.

Table 17: Final Freight Needs

Segment #	Performance Score and Level of Need						Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Freight Index	Directional TTTR		Closure Duration		Bridge Vertical Clearance				
		NB/EB	SB/WB	NB/EB	SB/WB					
40-1	1.12	1.12	1.12	116.62	53.05	16.67	Low	None	DMS installed at MP 197.61 WB	Low
40-2	1.09	1.08	1.10	87.10	67.26	16.00	Low	None	None	Low
40-3	1.06	1.06	1.06	398.89	346.15	15.96	Low	None	None	Low
40-4	1.10	1.10	1.11	35.45	24.73	16.15	Low	None	None	Low
40-5	1.06	1.06	1.06	96.93	39.20	16.26	Low	None	None	Low
40-6	1.09	1.09	1.09	34.12	29.92	No UP	None	None	None	None
40-7	1.13	1.13	1.14	41.79	56.74	16.01	Low	None	None	Low
40-8	1.06	1.07	1.06	127.25	58.75	16.96	Low	None	None	Low
40-9	1.06	1.06	1.06	209.81	124.11	16.12	Low	None	None	Low
40-10	1.06	1.06	1.06	211.27	89.35	15.96	Low	None	None	Low
40-11	1.11	1.11	1.11	175.96	102.71	16.06	Low	None	DMS installed at MP 340.44 WB	Low
40-12	1.09	1.08	1.09	233.05	412.67	16.06	Low	None	None	Low

Level of Need (Score)		Performance Score Need Scale				Segment Level Need Scale
None* (0)	a	≤ 1.58	≤ 1.58	< 71.07	< 16.33	0
	b	≥ 1.22	≥ 1.22			
Low (1)	a	1.58 - 1.72	1.58 - 1.72	71.07 - 97.97	16.33 - 16.17	< 1.5
	b	1.22 - 1.28	1.22 - 1.28			
Medium (2)	a	1.72 - 1.98	1.72 - 1.98	97.97 - 151.75	16.17 - 15.83	1.5 - 2.5
	b	1.28 - 1.42	1.28 - 1.42			
High (3)	a	≥ 1.98	≥ 1.98	> 151.75	> 15.83	> 2.5
	b	≥ 1.42	≥ 1.42			

**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 18** provides a summary of needs for each segment across all performance areas, with the average need score for each segment presented in the last row of the table. A weighting factor of 1.5 is applied to the need scores of the performance areas identified as emphasis areas (Pavement, Bridge, and Safety for the I-40 East Corridor). There are no segments with a High average need, six segments with a Medium average need, and six segments with a Low average need.

Table 18: Summary of Needs by Segment

Performance Area	40-1	40-2	40-3	40-4	40-5	40-6	40-7	40-8	40-9	40-10	40-11	40-12
	MP 196-202	MP 202-212	MP 212-234	MP 234-246	MP 246-258	MP 258-270	MP 270-286	MP 286-290	MP 290-304	MP 304-326	MP 326-342	MP 342-360
Pavement*	High	Low	High	Low	High	High	High	High	High	High	Low	High
Bridge*	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	Low	Low
Mobility	None	Low	Low	Low	Low	None	Low	None	Low	Low	None	Low
Safety*	High	Medium	High	Low	High	High	Low	High	High	None	High	Low
Freight	Low	Low	Low	Low	Low	None	Low	Low	Low	Low	Low	Low
Average Need (0-3)	1.77	1.23	2.15	1.00	1.92	1.85	1.60	1.77	1.60	1.23	1.31	1.46

* Identified as Emphasis Areas for I-40 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

Summary Corridor Needs

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

Pavement Needs

- Pavement failure hot spots were identified on 22 miles of eastbound I-40 East and 21 miles of westbound I-40 East spread throughout the corridor.
- A high level of historical investment has occurred on approximately 62 miles (38% of centerline miles) of the corridor (MP 196-212, MP 246-270, MP 286-290, and MP 342-360) which may warrant further investigation or alternative solutions.

Bridge Needs

- Bridge needs were identified at 46 of the 112 bridges (38%).
- 16 bridges have current ratings of one 5.
- 16 bridges have current ratings of multiple 5's.
- 8 bridges have current ratings of 4 or less.
- 32 bridges have current deck ratings of 5 or less.
- 22 bridges have potential historical rating issues which may be candidates for life-cycle cost analysis to evaluate alternative solutions.

Mobility Needs

- A higher than average number of closures due to incidents/crashes occur from MP 196 to 234, MP 246 to 258 in the eastbound direction, MP 286 to 290 in the eastbound direction and MP 290 to 359.
- A higher than average extent of closures occurred from MP 212 to 234 and from MP 342 to 359 in the eastbound direction.

Safety Needs

- Safety needs were identified on 130 miles (79%) of the corridor.
- The highest levels of need have been identified from MP 196 to 202, MP 212 to 234, and from MP 258 to 270.
- Approximately 39% of the crashes along the corridor involved collision with motor vehicle, and 40% involved an overturning vehicle with 67% involves a first unit event of collision with pedestrian.
- Approximately 23% of the crashes involved under the influence of drugs or alcohol.
- MP 202-212 and MP 342-360 crashes involved a higher percentage of pedestrian and pedalcyclist crashes than similar operating environments.
- Crash hot spots near MP 195 to 196 and MP 288 to 290 may be weather related while crash hot spots near MP 218 to 220, MP 229, MP 240 to 242, and MP 262 to 265 may be lighting related.

Freight Needs

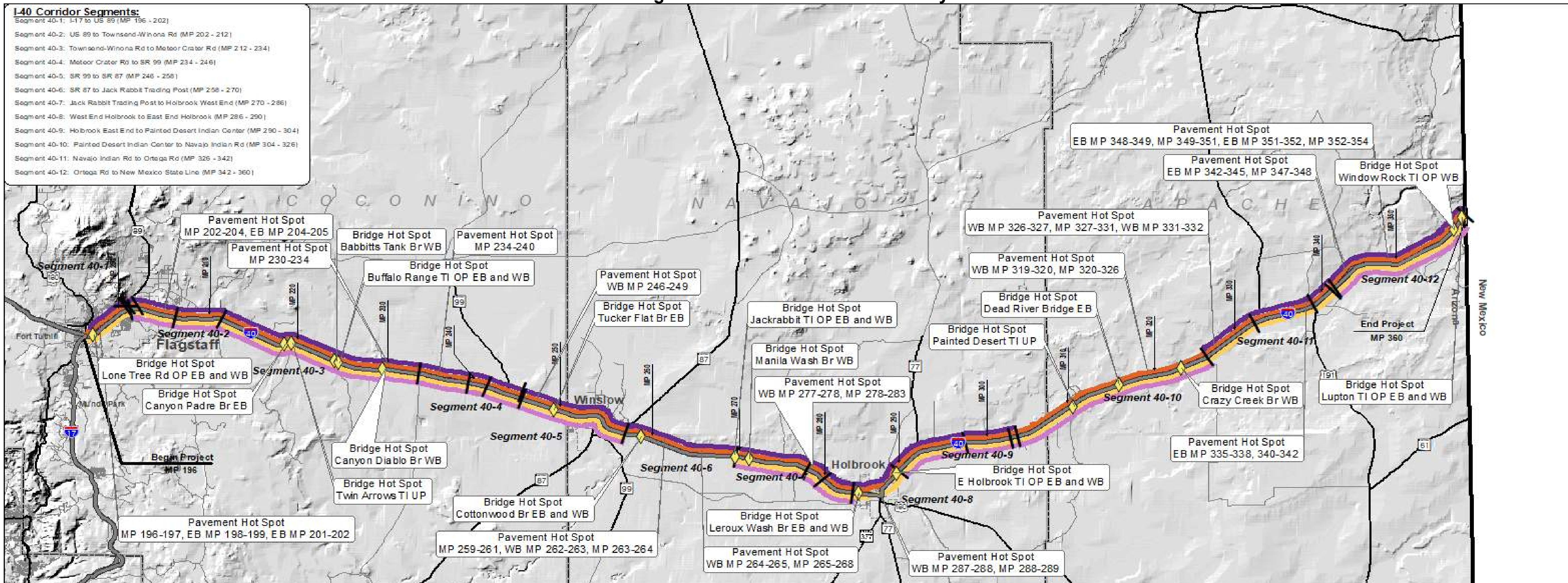
- Low freight needs exist on eleven of the twelve segments.
- Segments 40-3, 40-9, 40-10, 40-11, and 40-12 contain High closure duration needs primarily due to weather related accidents, incidents, obstructions, or hazards.
- Segments 40-3 and 4-10 contain a poor performance score for bridge clearance.

Overlapping Needs

This section identifies overlapping performance needs on I-40 East, 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 overlapping needs that relate to locations with elevated levels of need is provided below:

- Segment 40-1 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-2 has a Medium need in the Safety performance area
- Segment 40-3 has a High need in the Pavement performance area, Medium need in the Bridge performance area and a High need in the Safety performance area
- Segment 40-5 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-6 has a High need in the Pavement performance area, Medium need in the Bridge performance area and a High need in the Safety performance area
- Segment 40-7 has a High need in the Pavement performance area
- Segment 40-8 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-9 has a High need in the Pavement performance area and a High need in the Safety performance area
- Segment 40-10 has a High need in the Pavement performance area
- Segment 40-11 has a High need in the Safety performance area
- Segment 40-12 has a High need in the Pavement performance area

Figure 21: Corridor Needs Summary



Performance Area	40-1	40-2	40-3	40-4	40-5	40-6	40-7	40-8	40-9	40-10	40-11	40-12
	MP 196-202	MP 202-212	MP 212-234	MP 234-246	MP 246-258	MP 258-270	MP 270-286	MP 286-290	MP 290-304	MP 304-326	MP 326-342	MP 342-360
Pavement*	High	Low	High	Low	High	High	High	High	High	High	Low	High
Bridge*	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	Low	Low
Mobility	None	Low	Low	Low	Low	None	Low	None	Low	Low	None	Low
Safety*	High	Medium	High	Low	High	High	Low	High	High	None	High	Low
Freight	Low	Low	Low	Low	Low	None	Low	Low	Low	Low	Low	Low
Average Need (0-3)	1.77	1.23	2.15	1.00	1.92	1.85	1.60	1.77	1.60	1.23	1.31	1.46

I-40 Corridor Profile Study: I-17 to New Mexico State Line
Summary of Needs

Corridor Segments
US Hwy/State Route
County Boundary
City Boundary

Safety
Pavement
High
Freight
Mobility

Bridge

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

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-40 East strategic investment areas (resulting from the elevated needs) are shown in **Figure 22**.

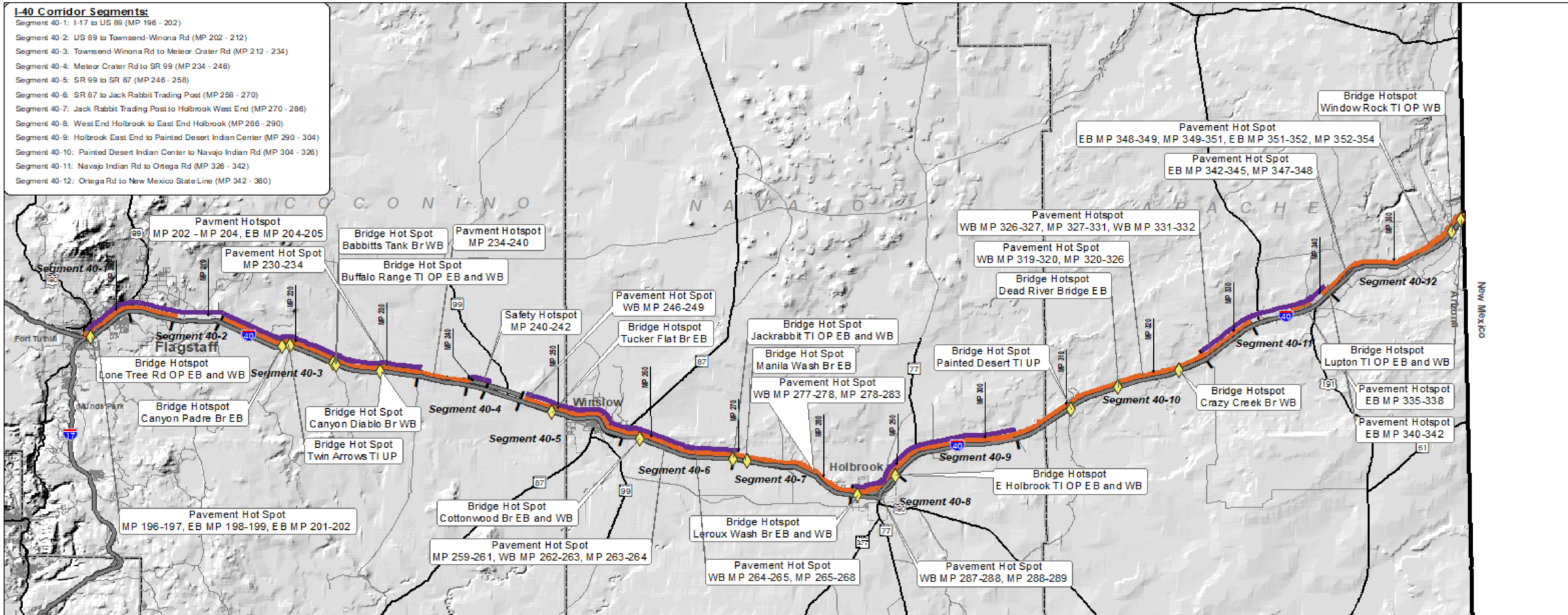
4.1 Screening Process

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 19 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	40-1	40-2	40-3	40-4	40-5	40-6	40-7	40-8	40-9	40-10	40-11	40-12
	MP 196-202	MP 202-212	MP 212-234	MP 234-246	MP 246-258	MP 258-270	MP 270-286	MP 286-290	MP 290-304	MP 304-326	MP 326-342	MP 342-360
Pavement*	High	Hot Spot	High	Hot Spot	High	High	High	High	High	High	Hot Spot	High
Bridge*	Hot Spot	-	Medium	-	Hot Spot	Medium	Hot Spot	Hot Spot	-	Hot Spot	-	Hot Spot
Mobility	-	-	-	-	-	-	-	-	-	-	-	-
Safety*	High	Medium	High	Hot Spot	High	High	-	High	High	-	High	-
Freight	-	-	-	-	-	-	-	-	-	-	-	-

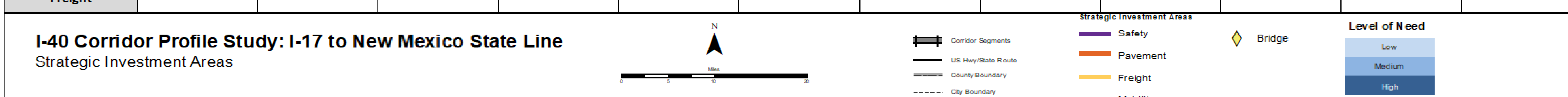


Table 19: Strategic Investment Area Screening

Segment and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
40-1 MP 196-202	High	Hot Spot		High		L1	Pavement	MP 196-202 has a High level of need based on Pavement Index, PSR in both directions, with 33% Pavement Failure and MP 196-197, EB MP 198-199 and EB MP 201-202 have Hot Spots due to excessive cracking	N	Pavement rehabilitation project is programmed in FY 2021 and started in April 2021
						L2	Bridge	Lone Tree RD OP EB has current deck and superstructure ratings of 5 with historical concerns	Y	No programmed project to address Bridge need
						L3	Bridge	Lone Tree RD OP WB has current deck and superstructure ratings of 5 with historical concerns	Y	No programmed project to address Bridge need
						L4	Safety	Crash trends show involvement with other non-collision (13%), single vehicle (50%), and head on (13%) crashes. Of these, dark-unlighted condition (50%), under the influence of drugs or alcohol (38%). Hot Spot MP 195-196	Y	No programmed project to address Safety need
40-2 MP 202-212	Hot Spot			Medium		L5	Pavement	EB/WB MP 202-204 and EB MP 204-205 have Hot Spots due to excessive cracking.	N	Pavement rehabilitation project is programmed in FY 2021 and started in April 2021
						L6	Safety	Crash trends show collision with pedestrian (17%), involved single vehicle (67%), and speeding too fast for conditions (17%). Dark-unlighted conditions (67%) Failure to Keep in Proper Lane (33%) under the influence of drugs or alcohol (17%)	Y	No programmed project to address Safety need
40-3 MP 212-234	High	Medium		High		L7	Pavement	MP 212-234 has a High level of need based on Pavement Index with 8% Pavement Failure and MP 203-204 has a Hot Spot due to excessive cracking	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L8	Bridge	Canyon Padre Br EB has no ratings of less than 6	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L9	Bridge	Twin Arrows TI UP has current deck rating of 4 with historical concerns	N	Bridge replacement programmed in FY 2016
						L10	Bridge	Babbitts Tank Br WB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L11	Bridge	Buffalo Range TI OP EB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L12	Bridge	Buffalo Range TI OP WB has current deck and superstructure ratings of 5 with historical concerns	N	No programmed project to address Bridge need
						L13	Bridge	Canyon Diablo BR WB has current deck and superstructure ratings of 5 with historical concerns	N	Bridge rehabilitation programmed in FY 2016
						L14	Bridge	Two Guns TI UP has current deck rating of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L15	Bridge	Meteor Crater TI UP has current deck rating of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L16	Safety	Crash trends show overturning (48%) and collision with a motor vehicle (44%), head on (15%), and Speed too fast for conditions (40%). Driver and road conditions: involved ice/frost conditions (4%), Fatigued/Fell Asleep (15%) and influence of alcohol/drugs (15%). Hot Spot MP 218-220, MP 229	Y	No programmed project to address Safety need.

Table 19: Strategic Investment Area Screening (continued)

40-4 MP 234-246	Hot Spot			Hot Spot		L17	Pavement	EB/WB MP 234-240 has a Hot Spot due to excessive cracking	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L18	Safety	Above average collision types include collisions with a motor vehicle (55%), rear end (55%), and involve single vehicle (45%); contributing factors include excessive speed (73%) following too closely (9%) and occurred in dark-unlighted conditions (64%). 27% of drivers were under the influence of drugs/alcohol. Hot Spot MP 240-242	Y	No programmed project to address Safety need
40-5 MP 246-258	High	Hot Spot		High		L19	Pavement	MP 246-258 has a High level of need based on Pavement Index and WB MP 246-249 has a Hot Spot due to excessive cracking	Y	No programmed project to address Pavement need; high historical investment
						L20	Bridge	Tucker Flat Br EB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L21	Safety	Crash trends include higher the normal crash rate with a fixed object (33%) and a single vehicle (67%). High percentages include excessive speed (44%) or lane departures (22%). Crashes occurred in Dark-Lighted conditions (22%) on Wet roads (22%)	Y	No programmed project to address Safety need
40-6 MP 258-270	High	Medium		High		L22	Pavement	MP 258-270 has a High level of need based on Pavement Index with 58% Pavement Failure and MP 259-261, WB MP 262-263, MP 263-264, WB MP 264-265 and MP 265-268 have Hot Spots due to excessive cracking	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L23	Bridge	Cottonwood Br WB has current deck and substructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic. Bridge replacement programmed in FY 2017
						L24	Bridge	Cottonwood Br EB has current deck and substructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic. Bridge replacement programmed in FY 2017
						L25	Bridge	Jackrabbit TI OP EB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic.
						L26	Bridge	Jackrabbit TI OP WB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic.
						L27	Safety	Crash trends show overturning (63%), involved collision with pedestrian (13%), run off the road (19%), and speed too fast for conditions (53%). A high number of crashes involved standing or moving water (6%), many with drivers that were fatigued/fell asleep (25%). Hot Spot MP 262-265	Y	No programmed project to address Safety need.
40-7 MP 270-286	High	Hot Spot				L28	Pavement	MP 270-286 has a High level of need based on Pavement Index with 34% Pavement Failure and WB MP 277-278 and MP 278-283 have Hot Spots due to excessive cracking	Y	Pavement rehabilitation project is programmed in FY 2023. Advance to evaluate preservation versus replacement.
						L29	Bridge	Manila Wash Br WB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic and previous project likely addressed issues
						L30	Bridge	W Joseph City TI UP has no ratings less than 6 with historical concerns	N	Bridge does not have a rating of 4 or multiple ratings of 5 so it is not a hot spot; will likely be addressed by current ADOT processes
						L31	Bridge	Hunt Rd TI UP has current superstructure rating of 5 with historical concerns	N	Bridge does not have a rating of 4 or multiple ratings of 5 so it is not a hot spot; will likely be addressed by current ADOT processes
						L32	Bridge	Leroux Wash BR EB has current superstructure rating of 5 and substructure rating of 4 with historical concerns	N	Recent project replaced deck to address low ratings. Bridge does have historical concerns but does not meet criteria for strategic investment since low ratings have been addressed
						L33	Bridge	Leroux Wash BR WB has current substructure rating of 4 with historical concerns	N	Recent project replaced deck to address low ratings. Bridge does have historical concerns but does not meet criteria for strategic investment since low ratings have been addressed

Legend: Strategic investment area screened out from further consideration.

Table 19: Strategic Investment Area Screening (continued)

40-8 MP 286-290	High	Hot Spot		High		L34	Pavement	MP 286-290 has a High level of need based on Pavement Index with 25% Pavement Failure and WB MP 287-288 and EB MP 288-289 have Hot Spots due to excessive cracking	Y	No programmed project to address Pavement need; high historical investment
						L35	Bridge	E Holbrook TI OP WB has current deck rating of 5, superstructure rating of 4 and substructure rating of 5 with historical concerns	N	Bridge rehabilitation programmed for FY 2021
						L36	Bridge	E Holbrook TI OP EB has current superstructure rating of 4 and substructure rating of 5 with historical concerns	N	Bridge rehabilitation programmed for FY 2021
						L37	Safety	Trends include crashes with other vehicles (50%) or overturning (50%), involving a single vehicle (50%) or were head on (50%). Crashes were in dark, unlit places (50%) or at dusk (25%), some in wet conditions (25%), and many drivers were under the influence of drugs/alcohol (75%). Hot Spot MP 288-290	N	Need considered non-actionable because all fatal and incapacitating crashes involved drug/alcohol or equipment failure
40-9 MP 290-304	High			High		L38	Pavement	MP 290-304 has a High level of need based on Pavement Index	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L39	Safety	A significant number of crashes involved another motor vehicle (56%) or pedestrians (11%), and a high percentage of sideswipe accidents (22% same, 11% opposite). Drivers exceeded safe speeds (33%), drove in opposing lanes (11%), and/or were under the influence of drugs/alcohol (44%). Conditions were Dark/unlit (44%) or at dusk (11%). Hot Spot MP 290-291	N	Need considered non-actionable because many fatal and incapacitating crashes involved drugs or alcohol or equipment failure
40-10 MP 304-326	High	Hot Spot				L40	Pavement	MP 304-326 has a High level of need based on Pavement Index with 30% Pavement Failure and WB MP 319-320 and MP 320-326 have Hot Spots due to excessive cracking	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L41	Bridge	Painted Desert TI UP does not have deck and substructure ratings of less than 6	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L42	Bridge	Dead River Br EB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L43	Bridge	Crazy Creek Br WB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
40-11 MP 326-342	Hot Spot			High		L44	Pavement	WB MP 326-327, EB/WB MP 327-331, WB MP 331-332, EB MP 335-338 and EB MP 340-342 have Hot Spots due to excessive cracking	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L45	Safety	Trending crashes involved other motor vehicles (40%), some by same direction sideswipe (16%); or single vehicles (48%), some with non-fixed objects (8%). 46% occurred during darkness (38% un-lit). Many vehicles ran off the road to the left (25%) or overturned (17%). 20% of drivers were under the influence of drugs/alcohol	Y	No programmed project to address Safety need.
40-12 MP 342-360	High	Hot Spot				L46	Pavement	MP 342-360 has a High level of need based on Pavement Index with 42% Pavement Failure and EB MP 342-345, EB/WB MP 347-348, EB MP 348-349, EB/WB MP 349-351, EB MP 351-352 and MP 352-354 have Hot Spots due to excessive cracking	Y	No programmed project to address Pavement need; high historical investment
						L47	Bridge	Window Rock TI OP WB has current deck and superstructure ratings of 4 with historical concerns	Y	Bridge rehabilitation programmed for FY 2025
						L48	Bridge	Lupton TI OP WB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic
						L49	Bridge	Lupton TI OP EB has current deck and superstructure ratings of 5 without historical concerns	N	Bridge does not meet criteria for historical review, therefore not considered strategic

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-40 East 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 27 candidate solutions are proposed to address the identified needs on the I-40 East Corridor.

Table 20 identifies each strategic location that has been assigned a candidate solution with a number (e.g., CS40.1, CS40.2, 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 20: Candidate Solutions

Candidate Solution #	Segment	Location #	Beginning Milepost	Ending Milepost	Candidate Solution Name	Option*	Scope	Investment Category (Preservation [P], Modernization [M], Expansion [E])
CS40.01	40-1	L2	196 EB	196 EB	Lone Tree Road OP EB Bridge	A	Rehabilitate/repair Lone Tree Rd OP EB bridge	P
						B	Replace Lone Tree Rd OP EB bridge	M
CS40.02	40-1	L3	196 WB	196 WB	Lone Tree Road OP WB Bridge	A	Rehabilitate/repair Lone Tree Rd OP WB bridge	P
						B	Replace Lone Tree Rd OP WB bridge	M
CS40.03	40-1	L4	196	200	Flagstaff Safety Improvements	-	Rehabilitate shoulder and widen inside shoulder Implement variable speed limits (wireless, ground-mount) Install in-lane route pavement markings for WB I-40 at I-17/I-40 Install Roadside Weather Information System (RWIS) Install rock-fall mitigation near MP 199	M
CS40.04	40-1	L4	196	202	Flagstaff Lighting	-	Install lighting	M
CS40.05	40-2	L4/L5	200	207	East Flagstaff Safety Improvements	-	Improve skid resistance (reconstruct pavement, increase super-elevation, or mill and replace) MP 200-202 Install chevrons and curve warning signs MP 200-202 Implement variable speed limits (wireless, ground-mount) Rehabilitate shoulder and widen inside shoulder	M
CS40.06	40-2	L6	207	212	Winona Safety Improvements	-	Improve skid resistance (reconstruct pavement, increase super-election, or mill and replace) MP 207-208 and MP 210-212 Install chevrons and curve warning signs MP 207-208 and MP 210-212 Install recessed high visibility striping, delineators, and rumble strips. Rehabilitate/widen inside shoulder Implement variable speed limits (wireless, ground-mount) Install Roadside Weather Information System (RWIS) at MP 212.1 Install new EB DMS near MP 212.1	M
CS40.07	40-3	L8	229.0	229.0	Canyon Diablo Bridge WB	A	Rehabilitate/repair Canyon Diablo WB bridge	P
						B	Replace Canyon Diablo WB bridge	M
CS40.08	40-3	L12	225 WB	225 WB	Buffalo Range TI OP WB Bridge	A	Rehabilitate/repair Buffalo Range TI OP WB bridge	P
						B	Replace Buffalo Range TI OP WB bridge	M
CS40.09	40-3	L16	212	218	East Winona Safety Improvements	-	Rehabilitate shoulder and widen inside shoulder Improve skid resistance (reconstruct pavement, increase super-elevation, or mill and replace) Install high visibility striping and delineators Implement variable speed limits (wireless, ground-mount)	M
CS40.10	40-3	L16	218	220	Canyon Diablo West Safety Improvements	-	Improve skid resistance (reconstruct pavement, increase super-elevation, or mill and replace) Install chevrons and curve warning signs Install dynamic speed feedback system near WB MP 220 and EB MP 218 Install high visibility striping and delineators	M
CS40.11	40-3	L16	220	229	Canyon Diablo Safety Improvements	-	Rehabilitate shoulder and widen inside shoulder	M

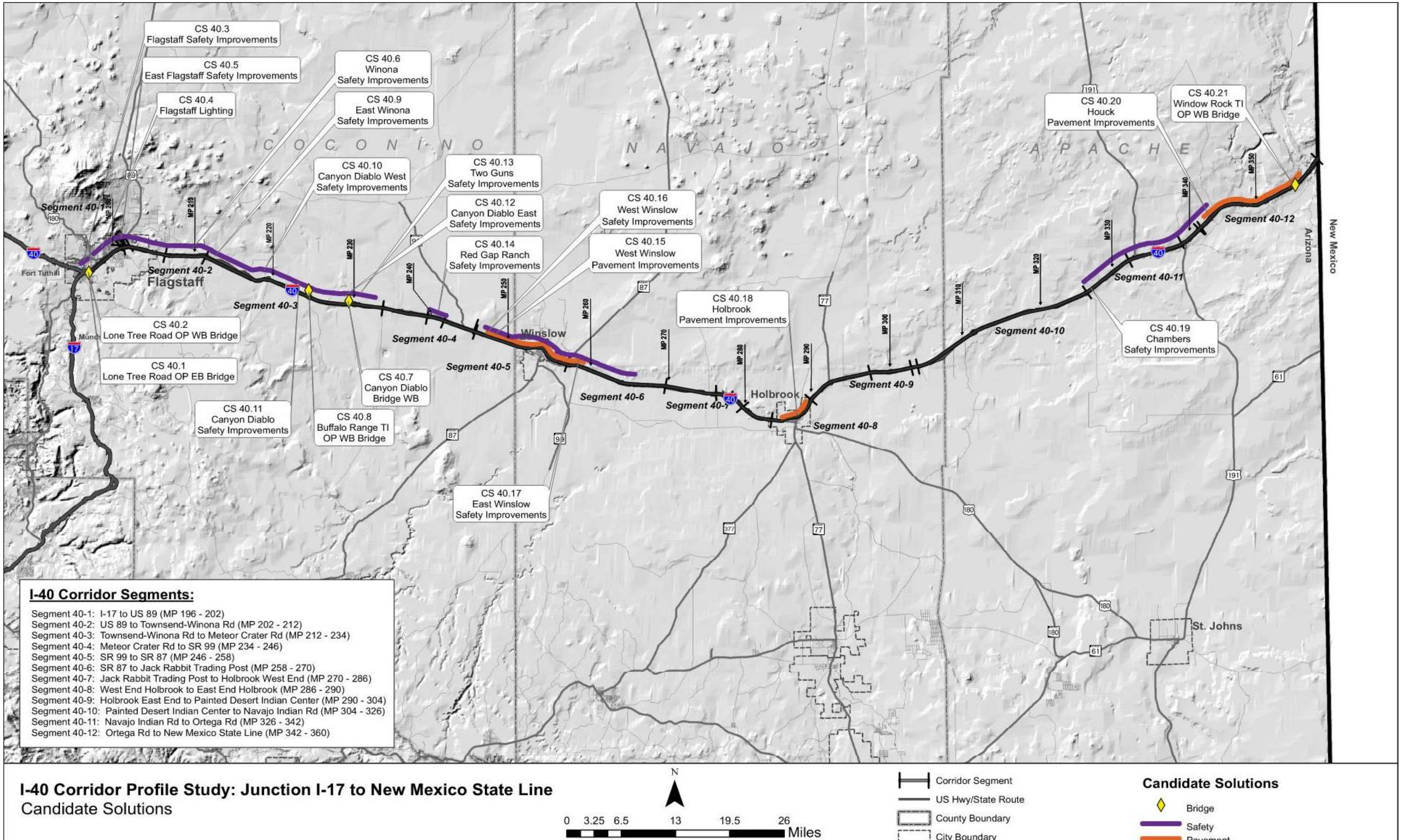
* '-': Indicates only one solution is being proposed and no options are being considered

Table 20: Candidate Solutions (continued)

Candidate Solution #	Segment	Location #	Beginning Milepost	Ending Milepost	Candidate Solution Name	Option*	Scope	Investment Category (Preservation [P], Modernization [M], Expansion [E])
CS40.12	40-3	L16	229	230	Canyon Diablo East Safety Improvements	-	Rehab shoulder and widen inside shoulder Install dynamic speed feedback system near WB MP 230 and EB MP 229 Install high visibility striping and delineators	M
CS40.13	40-3	L16	230	234	Two Guns Safety Improvements	-	Rehabilitate shoulder and widen inside shoulder Install recessed high visibility striping, delineators, and rumble strips	M
CS40.14	40-4	L18	240	242	Red Gap Ranch Safety Improvements	-	Rehab shoulder and widen inside shoulder Install recessed high visibility striping, delineators, and rumble strips Install dynamic speed feedback system	M
CS40.15	40-5	L19	246	258	West Winslow Pavement Improvements	A	Rehabilitate/repair pavement	P
						B	Replace pavement	M
CS40.16	40-5	L21	246	258	West Winslow Safety Improvements	-	Widen inside shoulder Improve skid resistance MP 248 to 251	M
CS40.17	40-6	L27	258	266	East Winslow Safety Improvements	-	Improve skid resistance (reconstruct pavement, increase super-elevation, or mill and replace) MP 258-260 Install dynamic speed feedback system near WB MP 260 and EB MP 258	M
CS40.18	40-8	L34	286	290	Holbrook Pavement Improvements	A	Rehabilitate/repair pavement	P
						B	Replace pavement	M
CS40.19	40-11	L45	326	342	Chambers Safety Improvements	-	Rehab shoulder, widen inside shoulder and include rumble strips Install high visibility striping and delineators	M
CS40.20	40-12	L46	342	360	Houck Pavement Improvements	A	Rehabilitate/repair pavement	P
						B	Replace pavement	M
CS40.21	40-12	L47	358 WB	358 WB	Window Rock TI OP WB Bridge	A	Rehabilitate/repair Window Rock TI OP WB bridge	P
						B	Replace Window Rock TI OP WB bridge	M

* '-': Indicates only one solution is being proposed and no options are being considered

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.

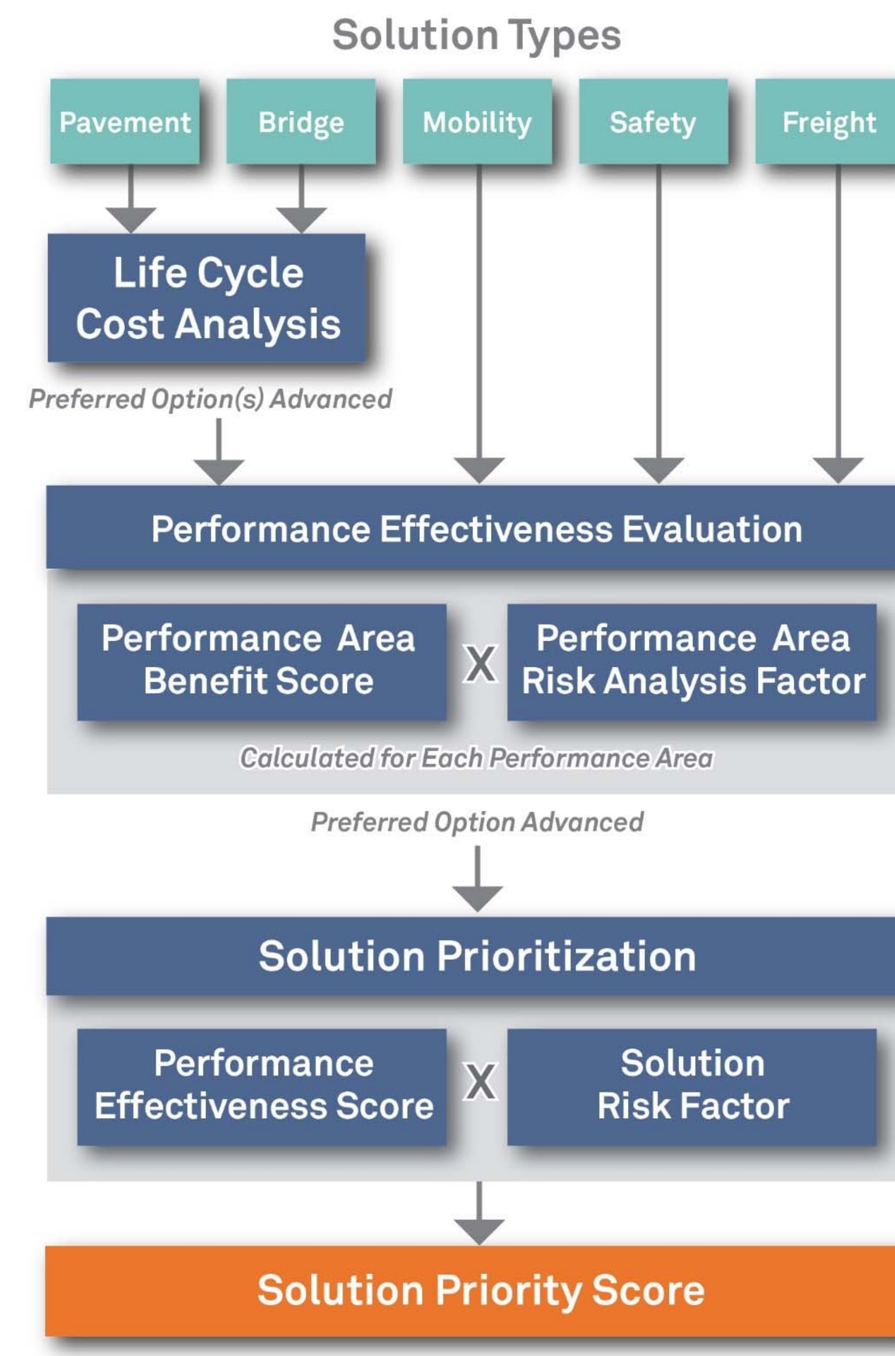
Solution Risk Analysis

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 of future costs is discounted at 3% and all dollar amounts are in 2022 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
- 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 20**, LCCA was conducted on three bridges on the I-40 East Corridor. A summary of this analysis is shown in **Table 21**. 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 2022 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 20**, LCCA was conducted for three pavement projects on the I-40 East Corridor. A summary of this analysis is shown in **Table 22.** Additional information regarding the pavement LCCA is included in **Appendix E.**

As shown in **Table 21** and **Table 22**, 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 that relate directly to the bridge or pavement. 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.

    - Window Rock TI OP WB Bridge (CS40.27) (MP WB 358)
    - ^ Lone Tree Road OP EB Bridge (CS40.01) (MP EB 196)
    - ^ Lone Tree Road OP WB Bridge (CS40.02) (MP WB 196)

    ^ For these bridges, the LCCA conclusions are the same, however the City of Flagstaff and ADOT are negotiating a project assessment to evaluate bridge replacement that will accommodate the future widening of Lone Tree Road under I-40. These negotiations should be concluded prior to normal programming.

- Replacement or reconstruction was determined to be the most effective approach for the candidate solutions below; the reconstruction option of these solutions was carried forward to the Performance Effectiveness Evaluation:

    - West Winslow Pavement Improvements (CS40.15) (MP 246-258)
    - Holbrook Pavement Improvements (CS40.18) (MP 286-290)
    - Houck Pavement Improvements (CS40.20) (MP342-360)

Table 21: 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		
Lone Tree Rd EB #1180 (CS40.01, MP 196.26)	$3,222,000	$3,181,000	$2,548,000	1.26	1.25	1.00	Y	Not strategic as a standalone solution and other needs are not related to bridge; no further evaluation
Lone Tree Rd WB #1181 (CS40.02, MP 196.26)	$3,306,000	$2,988,000	$2,376,000	1.39	1.26	1.00	Y	Not strategic as a standalone solution and other needs are not related to bridge; no further evaluation
Window Rock TI WB #678 (CS40.21, MP 357.53)	$1,037,000	$987,000	$791,000	1.31	1.25	1.00	Y	Not strategic as a standalone solution and other needs are not related to bridge; no further evaluation

Table 22: 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		
West Winslow Pavement Improvements (CS40.15, MP 246-258)	$217,791,000	$228,149,000	$268,302,000	$246,481,000	1.00	1.05	1.23	1.31	Y	Concrete reconstruction is lowest cost – replacement is recommended
Holbrook Pavement Improvements (CS40.18, MP 286-290)	$85,626,000	$83,934,000	$83,934,000	$83,934,000	1.02	1.00	1.00	1.00	N	Asphalt reconstruction is lowest cost – replacement is recommended
Houck Pavement Improvements (CS40.20, MP 342-360)	$323,704,000	$339,098,000	$315,354,000	$300,695,000	1.08	1.13	1.05	1.00	N	Concrete and Asphalt reconstruction are within 15% of the lowest cost – replacement is recommended

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 Performance Effectiveness Score (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) and Safety Index (due to crash reductions) would have a direct effect on the LOTTR 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 TTTR 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 net present value (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 = estimated 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 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 23**. 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-40 East Corridor, no candidate solutions have options to address Mobility, Safety, or Freight needs.

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 so these candidate solutions were dropped from further consideration. No PES values were calculated for these solutions and they do not appear in **Table 22**:

- West Winslow Pavement Improvements (CS40.15) (MP 246-258)
- Holbrook Pavement Improvements (CS40.18) (MP 286-290)
- Houck Pavement Improvements (CS40.20) (MP342-360)

Table 23: Performance Effectiveness Scores

Candidate Solution #	Segment	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	Mobility	Safety	Freight	Pavement	Bridge	Safety				
40.03	40-1	Flagstaff Safety Improvements	196 – 200	$22.93	0.00	0.00	0.321	5.750	0.866	0.00	0.00	0.339	7.276	4.39	15.3	21.3
40.04	40-1	Flagstaff Lighting	196 – 202	$8.06	0.00	0.00	0.137	4.164	0.512	0.00	0.00	0.233	5.046	4.79	15.3	45.8
40.05	40-2	East Flagstaff Safety Improvements	200-207	$53.54	0.00	0.00	0.386	7.194	2.405	0.00	0.00	0.562	5.309	4.63	15.3	7.0
40.06	40-2	Winona Safety Improvements	207 - 212	$40.84	0.00	0.00	0.203	3.069	1.475	0.00	0.00	0.237	4.983	3.94	15.3	7.4
40.09	40-3	East Winona Safety Improvements	212-218	$54.48	0.00	0.00	0.720	2.394	1.766	0.00	0.00	0.440	5.320	4.08	15.3	6.1
40.10	40-3	Canyon Diablo West Safety Improvements	218-220	$12.27	0.00	0.00	0.358	2.251	1.519	0.00	0.00	0.422	4.550	2.15	15.3	12.2
40.11	40-3	Canyon Diablo Safety Improvements	220-229	$8.81	0.00	0.00	0.301	1.338	0.956	0.00	0.00	0.259	2.854	4.60	15.3	22.8
40.12	40-3	Canyon Diablo East Safety Improvements	229-230	$3.46	0.00	0.00	0.012	0.082	0.304	0.00	0.00	0.015	0.414	1.23	15.3	2.2
40.13	40-3	Two Guns Safety Improvements	230-234	$3.91	0.00	0.00	0.017	0.117	0.101	0.00	0.00	0.023	0.257	3.38	15.3	3.4
40.14	40-4	Red Gap Ranch Safety Improvements	240-242	$6.78	0.00	0.00	0.000	0.035	0.995	0.00	0.00	0.025	1.056	2.14	15.3	5.1
40.15	40-5	West Winslow Pavement Improvements	246-258	$150.25	6.335	0.00	0.229	1.979	1.135	0.274	0.00	0.287	10.239	4.82	15.3	5.0
40.16	40-5	West Winslow Safety Improvements	246-258	$373.31	0.00	0.00	0.203	1.822	1.308	0.00	0.00	0.205	3.538	4.82	15.3	0.7
40.17	40-6	East Winslow Safety Improvements	258-266	$11.82	0.00	0.00	0.006	0.053	0.031	0.00	0.00	0.005	0.095	2.19	15.3	0.3
40.18	40-8	Holbrook Pavement Improvements	286-260	$50.08	15.417	0.00	0.027	6.618	0.630	0.111	0.00	0.231	23.034	3.61	15.3	25.4
40.19	40-11	Chambers Safety Improvements	326-342	$31.84	0.00	0.00	0.049	2.628	0.307	0.00	0.00	0.333	3.317	4.92	15.3	7.8
40.20	40-12	Houck Pavement Improvements	342-360	$225.37	18.503	0.00	0.505	0.883	1.612	0.473	0.00	0.546	22.521	4.98	15.3	7.6

*: See Table 24 for total construction costs

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
  - o 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
  - o 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
  - o 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
  - o 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 23***

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 24 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 24: **Prioritized Scores**

Candidate Solution #	Segment	Candidate Solution Name	Milepost Location	Estimated Cost (in millions)	Performance Effectiveness Score	Weighted Risk Factor	Segment Average Need Score	Prioritization Score	Percentage by which Solution Reduces Performance Area Segment Needs				
									Pavement	Bridge	Mobility	Safety	Freight
40.03	40-1	Flagstaff Safety Improvements	196 – 200	$22.93	21.3	1.711	1.77	**64.5**	0%	0%	14%	44%	25%
40.04	40-1	Flagstaff Lighting	196 – 202	$8.06	45.8	1.726	1.77	**140.0**	0%	0%	6%	32%	14%
40.05	40-2	East Flagstaff Safety Improvements	200-207	$53.54	7.0	1.669	1.38	**16.2**	0%	0%	9%	41%	19%
40.06	40-2	Winona Safety Improvements	207 - 212	$40.84	7.4	1.639	1.23	**14.8**	0%	0%	7%	74%	17%
40.09	40-3	East Winona Safety Improvements	212-218	$54.48	6.1	1.584	2.15	**20.7**	0%	0%	10%	26%	11%
40.10	40-3	Canyon Diablo West Safety Improvements	218-220	$12.27	12.2	1.607	2.15	**42.2**	0%	0%	6%	25%	10%
40.11	40-3	Canyon Diablo Safety Improvements	220-229	$8.81	22.8	1.595	2.15	**78.3**	0%	0%	4%	15%	6%
40.12	40-3	Canyon Diablo East Safety Improvements	229-230	$3.46	2.2	1.459	2.15	**7.0**	0%	0%	0%	1%	2%
40.13	40-3	Two Guns Safety Improvements	230-234	$3.91	3.4	1.587	2.15	**11.6**	0%	0%	0%	1%	1%
40.14	40-4	Red Gap Ranch Safety Improvements	240-242	$6.78	5.1	1.384	1.00	**7.1**	0%	0%	0%	25%	14%
40.15	40-5	West Winslow Pavement Improvements	246-258	$150.25	5.0	1.311	1.92	**12.6**	40%	0%	6%	57%	18%
40.16	40-5	West Winslow Safety Improvements	246-258	$373.31	0.7	1.601	1.92	**2.1**	0%	0%	5%	52%	21%
40.17	40-6	East Winslow Safety Improvements	258-266	$11.82	0.3	1.613	1.85	**0.8**	0%	0%	0%	1%	1%
40.18	40-8	Holbrook Pavement Improvements	286-260	$50.08	25.4	1.337	1.77	**60.1**	92%	0%	2%	61%	27%
40.19	40-11	Chambers Safety Improvements	326-342	$31.84	7.8	1.735	1.31	**17.8**	0%	0%	2%	29%	6%
40.20	40-12	Houck Pavement Improvements	342-360	$225.37	7.6	1.201	1.46	**13**	85%	0%	13%	57%	24%

6.0 SUMMARY OF CORRIDOR RECOMMENDATIONS

6.1 Prioritized Candidate Solution Recommendations

Table 25 and **Figure 27** show the prioritized candidate solutions recommended for the I-40 East 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-40 East Corridor. The following observations were noted about the prioritized solutions:

- One solution results in a Prioritization Score above 80 which shows that its performance benefits are much higher than its cost.
- The top solution includes the installation of lighting in locations where 50% of the fatal and serious injury crashes occur in dark unlit conditions.
- All five of the highest-ranking solutions are located where the Safety Index was the highest along the corridor.

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-40 East Corridor.

- When recommending future projects along the I-40 East Corridor, review historical ratings and levels of investment. According to data used for this study, the following pavement and bridge locations have exhibited high historical investment (pavement) or rating fluctuation (bridge) issues:
    - Pavement MP 196-202
    - Pavement MP 202-212
    - Pavement MP 246-258
    - Pavement MP 270-286
    - Pavement MP 286-290
    - Pavement MP 342-360
    - Canyon Padre Br EB (MP 218.73)
    - Twin Arrows TI UP MP219.53)
    - Canyon Diablo Br WB (MP 229.90)
    - Sunshine BNSF RR OP WB (MP 237.10)
    - Little Colo River Br EB/WB MP 256.95)
    - W Joseph City TI UP (#1893) (MP 274.76)
    - Hunt Rd TI UP (MP 280.64)
    - Navajo TI UP (MP 325.92)
    - McCarroll TI UP (MP 330.00)
    - Chambers TI UP (MP 333.41)
    - Ortega Rd TI UP (MP 341.81)
    - Black Creek Br EB (MP 347.90)

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-40 East, 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 initial four CPS rounds:

- 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
- At traffic interchanges with existing communication connectivity to the ADOT TOC, consideration should be given to adding thermal detection cameras for vehicle detection with the capability for wrong-way vehicle detection
- Improved vehicle detection systems, as recommended by ADOT Systems Technology group, should be deployed at traffic interchanges for improved traffic control

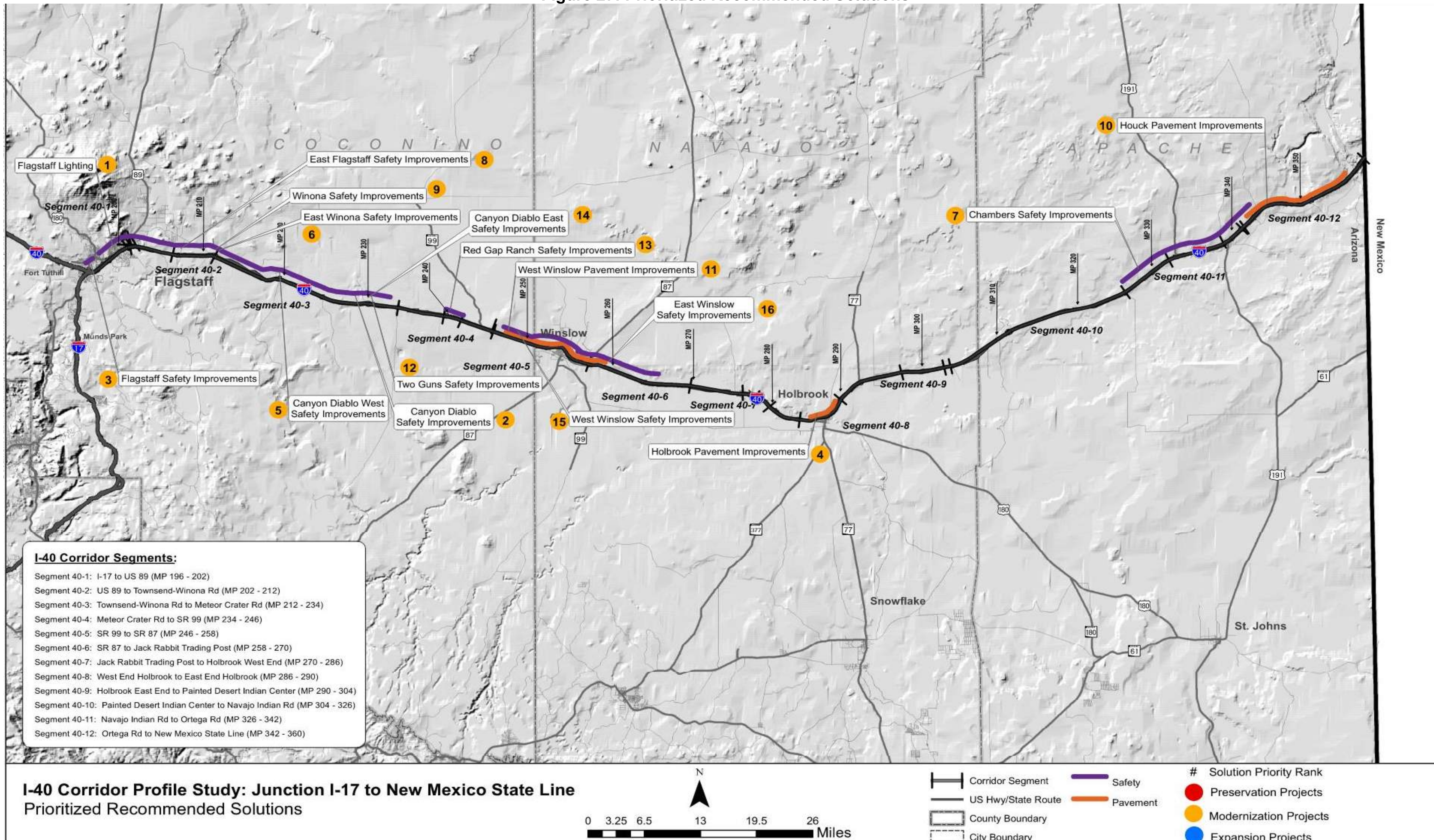
Table 25: Prioritized Recommended Solutions

Rank	Candidate Solution #	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P] Modernization [M] Expansion [E])	Prioritization Score
1	CS40.04	Flagstaff Lighting (MP 196 – 202)	Install offset lighting along I-40 between MP's 196 and 202 by connecting to existing power. This includes light poles, luminaires, pull boxes, conduit, and conductors.	$8.06	M	**140.0**
2	CS40.11	Canyon Diablo Safety Improvements (MP 220-229)	Rehabilitate shoulder and widen the inside shoulder.	$8.81	M	**78.3**
3	CS40.03	Flagstaff Safety Improvements (MP 196 – 200)	Rehabilitate shoulder and widen the inside shoulder. Implement variable speed limits using a wireless ground mount construction. Install in-lane route pavement markings for the westbound I-40/I-17 interchange. Install a Roadside Weather Information System (RWIS) and rock-fall mitigation (wire mesh) near MP 199.	$22.93	M	**64.5**
4	CS40.18	Holbrook Pavement Improvements (286-290)	Replace pavement in both directions between MP 286 and 290.	$50.08	M	**60.1**
5	CS40.10	Canyon Diablo West Safety Improvements (218-220)	For the entire length of the project (MP 218 – 220) improve skid resistance by reconstructing pavement, increasing super-elevation, or mill and replace. Install chevrons and curve warning signs. Install a dynamic speed feedback system near MP 218 eastbound and MP 220 westbound.	$12.27	M	**42.2**
6	CS40.09	East Winona Safety Improvements (MP 212-218)	Rehabilitate shoulder and widen the inside shoulder. Improve skid resistance from MP 212 to 218 by reconstructing pavement, increasing super-elevation, or mill and replace. Install high visibility striping and delineators. Implement variable speed limits using a wireless ground-mount construction.	$54.48	M	**20.7**
7	CS40.19	Chambers Safety Improvements (MP 326-342)	Rehabilitate shoulder, widen the inside shoulder, and include rumble strips. Install high visibility striping and delineators.	$31.84	M	**17.8**
8	CS40.05	East Flagstaff Safety Improvements (MP 200 – 207)	Improve skid resistance from MP 200 to 202 by reconstructing pavement, increasing super-elevation, or mill and replace. Install chevrons and curve warning signs from MP 200 to 202. Rehabilitate shoulder and widen the inside shoulder. Implement variable speed limits using a wireless ground-mount construction.	$53.54	M	**16.2**
9	CS40.06	Winona Safety Improvements (MP 207-212)	Improve skid resistance from MP 207 to 208 and from MP 210 to 212 by reconstructing pavement, increasing super-elevation, or mill and replace. Install chevrons and curve warning signs from MP 207 to 208 and from MP 210 to 212. Install high visibility striping, delineators, and rumble strips. Rehabilitate shoulder and widen the inside shoulder. Implement variable speed limits using a wireless ground-mount construction. Install RWIS and a new eastbound Dynamic Message Sign (DMS) near MP 212.1 with attached CCTV nearby.	$40.84	M	**14.8**
10	CS40.20	Houck Pavement Improvements (MP 342-360)	Replace pavement in both directions between MP 342 and 360.	$225.37	M	**13.0**

Table 25: Prioritized Recommended Solutions (continued)

Rank	Candidate Solution #	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P] Modernization [M] Expansion [E])	Prioritization Score
11	CS40.15	West Winslow Pavement Improvements (246-258)	Replace pavement in both directions between MP 246 and 258.	$150.25	M	**12.6**
12	CS40.13	Two Guns Safety Improvements (MP 230-234)	Rehabilitate shoulder and widen the inside shoulder. Install high visibility striping, delineators, and rumble strips.	$3.91	M	**11.6**
13	CS40.14	Red Gap Ranch (240-242)	Rehabilitate shoulder and widen the inside shoulder. Install high visibility striping, delineators, and rumble strips. Install dynamic speed feedback system.	$6.78	M	**7.1**
14	CS40.12	Canyon Diablo East Safety Improvements (MP 229 – 230)	Rehabilitate shoulder and widen the inside shoulder. Install a dynamic speed feedback system near MP 229 eastbound and MP 230 westbound. Retrofit RWIS at the Two Guns TI at MP 230. Install high visibility striping and delineators.	$3.46	M	**7.0**
15	CS40.16	West Winslow Safety Improvements (246-258)	Widen the inside shoulder and improve skid resistance from MP 248 to 251 by reconstructing pavement, increasing super-elevation, or mill and replace.	$373.31	M	**2.1**
16	CS40.17	East Winslow Safety Improvements (MP 258 – 266)	Improve skid resistance from MP 258 to 260 by reconstructing pavement, increasing super-elevation, or mill and replace. Install dynamic speed feedback systems near MP 258 eastbound and MP 260 westbound.	$11.82	M	**0.8**

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-40 East 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.

These 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.


EXIT
354
EXIT 285
40 180 EAST 77 SOUTH
Petrified Forest Natl Park
Show Low
1/2 MILE
ARIZONA
GRAND CANYON STATE
ELCOMES YOU

Appendices

Appendix A: Corridor Performance Maps

This appendix contains maps of each primary and secondary measure associated with the five performance areas for the I-40 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
- Lowest Bridge Rating

Mobility Performance Area:

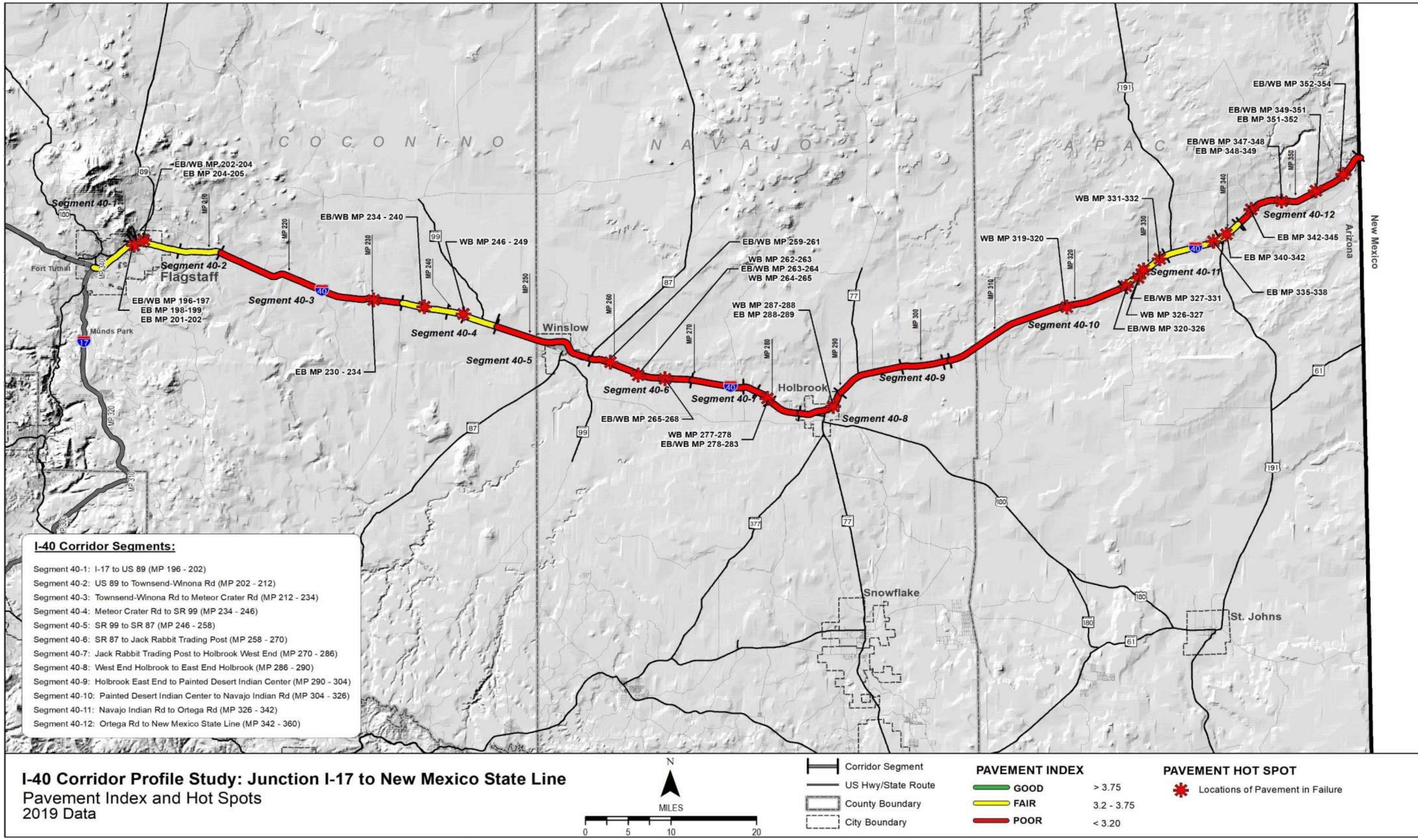
- Mobility Index
- Future Daily V/C Ratio
- Existing Peak Hour V/C Ratio (directional)
- Closure Frequency (directional)
- Level of Travel Time Reliability (directional)
- Multimodal Opportunities
- Percentage of Bicycle Accommodation

Safety Performance Area:

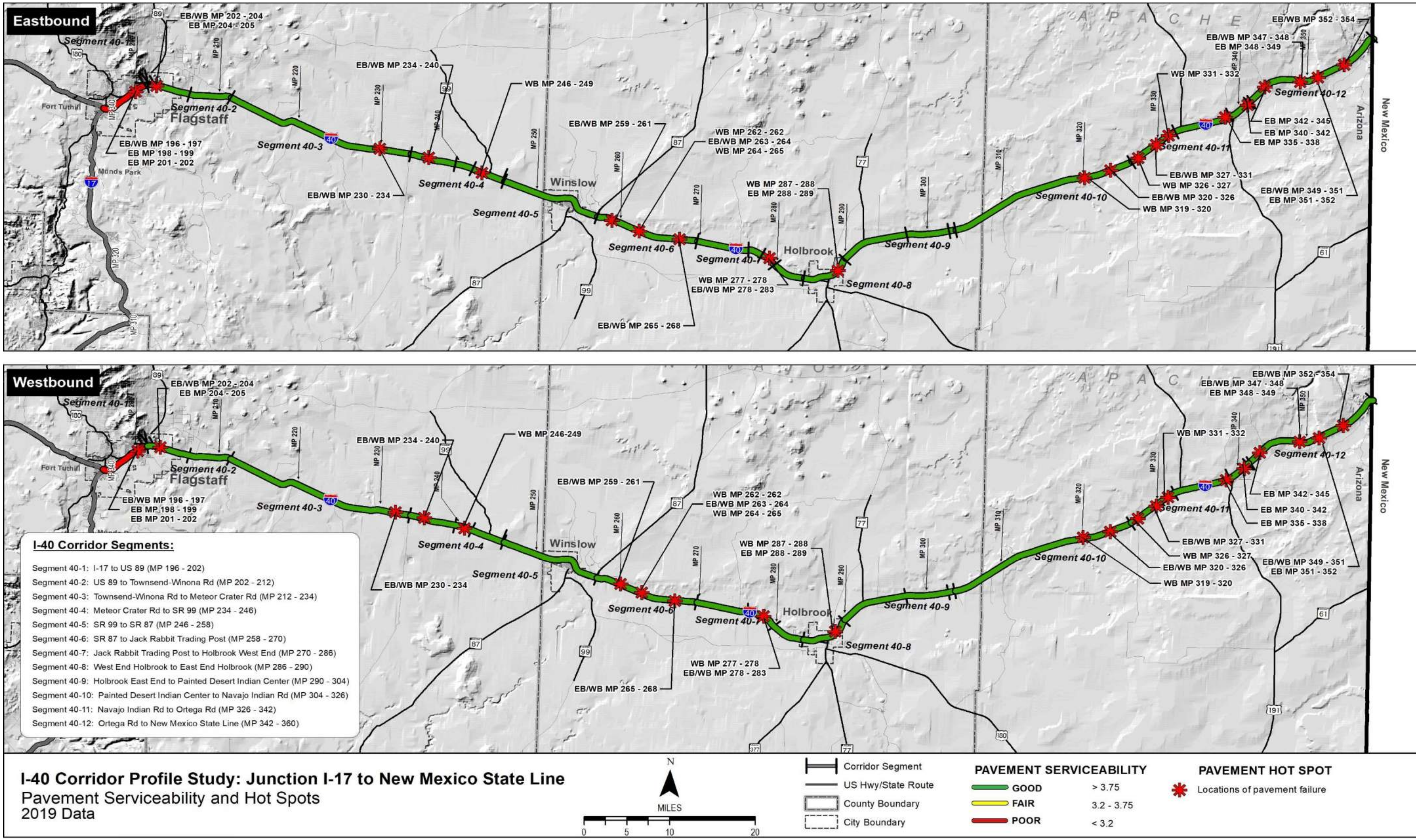
- Safety Index and Hot Spots
- Safety Index and Hot Spots (directional)
- Relative Frequency of Fatal + Suspected Serious Injury Crashes Involving Intersection Crashes Compared to the Statewide Average for Similar Segments (insufficient data – not included)
- Relative Frequency of Fatal + Suspected Serious Injury Crashes Involving Lane Departures Compared to the Statewide Average for Similar Segments
- Relative Frequency of Fatal + Suspected Serious Injury Crashes Involving Pedestrians Compared to the Statewide Average for Similar Segments (insufficient data – not included)
- Relative Frequency of Fatal + Suspected Serious Injury Crashes Involving Trucks Compared to the Statewide Average for Similar Segments (insufficient data – not included)
- Relative Frequency of Fatal + Suspected Serious Injury Crashes Involving Bicycles Compared to the Statewide Average for Similar Segments (insufficient data – not included)

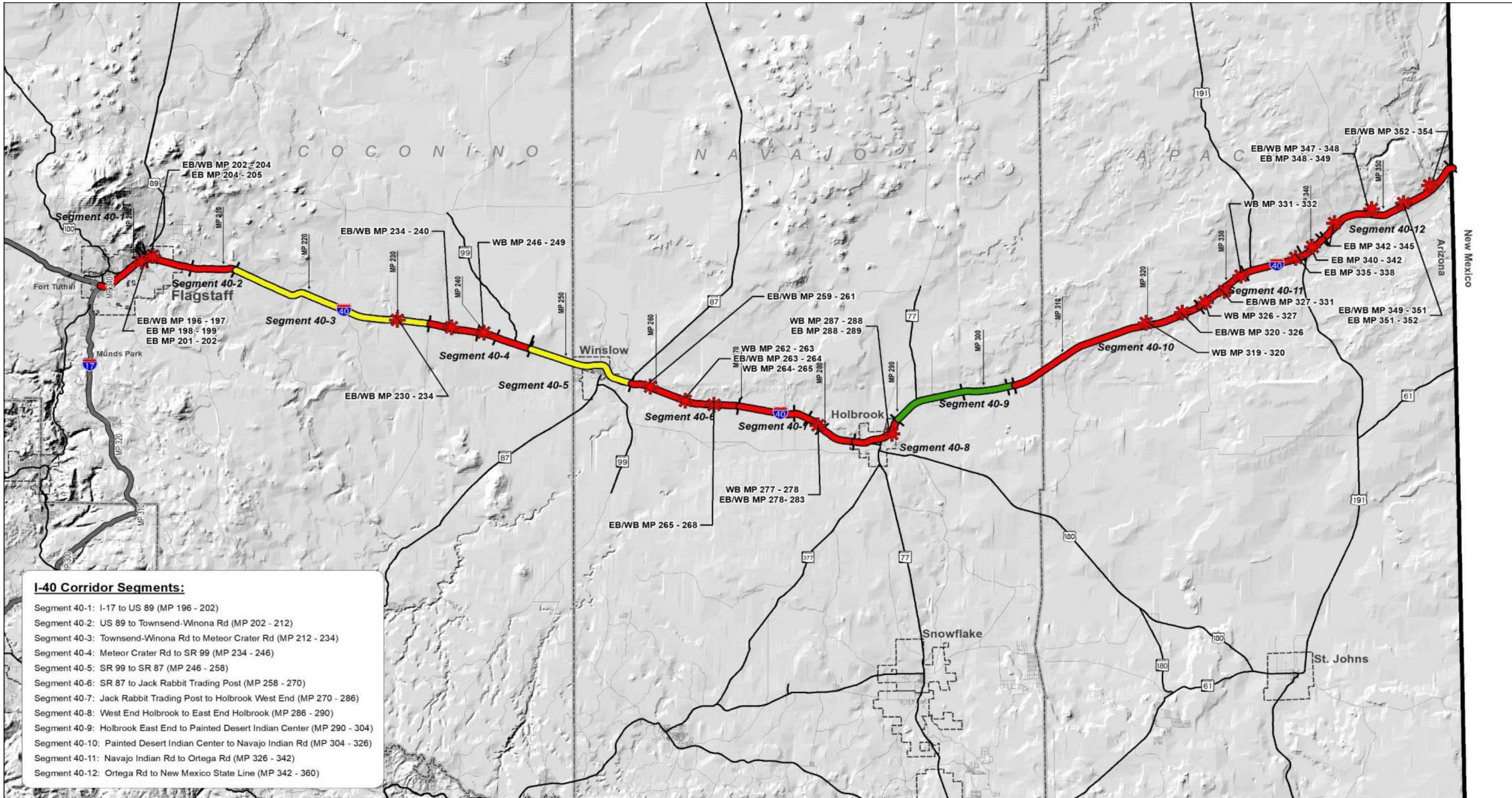
Freight Performance Area:

- Freight Index and Hot Spots
- Truck Travel Time Reliability (directional)
- Closure Duration (directional)
- Bridge Vertical Clearance



I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Pavement Index and Hot Spots
2019 Data


Eastbound
Westbound
EB/WB MP 202 - 204
EB MP 204 - 205
EB/WB MP 234 - 240
WB MP 246 - 249
EB/WB MP 259 - 261
WB MP 262 - 262
EB/WB MP 263 - 264
WB MP 264 - 265
EB/WB MP 196 - 197
EB MP 198 - 199
EB MP 201 - 202
EB/WB MP 230 - 234
WB MP 287 - 288
EB MP 288 - 289
WB MP 277 - 278
EB/WB MP 278 - 283
EB/WB MP 265 - 268
EB/WB MP 352 - 354
EB/WB MP 347 - 348
EB MP 348 - 349
WB MP 331 - 332
EB MP 342 - 345
EB MP 340 - 342
EB MP 335 - 338
EB/WB MP 327 - 331
WB MP 326 - 327
EB/WB MP 320 - 326
WB MP 319 - 320
EB/WB MP 349 - 351
EB MP 351 - 352
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Arizona
New Mexico
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
Segment 40-3: Townsend-Winona Rd to Meteor Crater Rd (MP 212 - 234)
Segment 40-4: Meteor Crater Rd to SR 99 (MP 234 - 246)
Segment 40-5: SR 99 to SR 87 (MP 246 - 258)
Segment 40-6: SR 87 to Jack Rabbit Trading Post (MP 258 - 270)
Segment 40-7: Jack Rabbit Trading Post to Holbrook West End (MP 270 - 286)
Segment 40-8: West End Holbrook to East End Holbrook (MP 286 - 290)
Segment 40-9: Holbrook East End to Painted Desert Indian Center (MP 290 - 304)
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Pavement Serviceability and Hot Spots
2019 Data
N
MILES
0 5 10 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 HOT SPOT
Locations of pavement failure



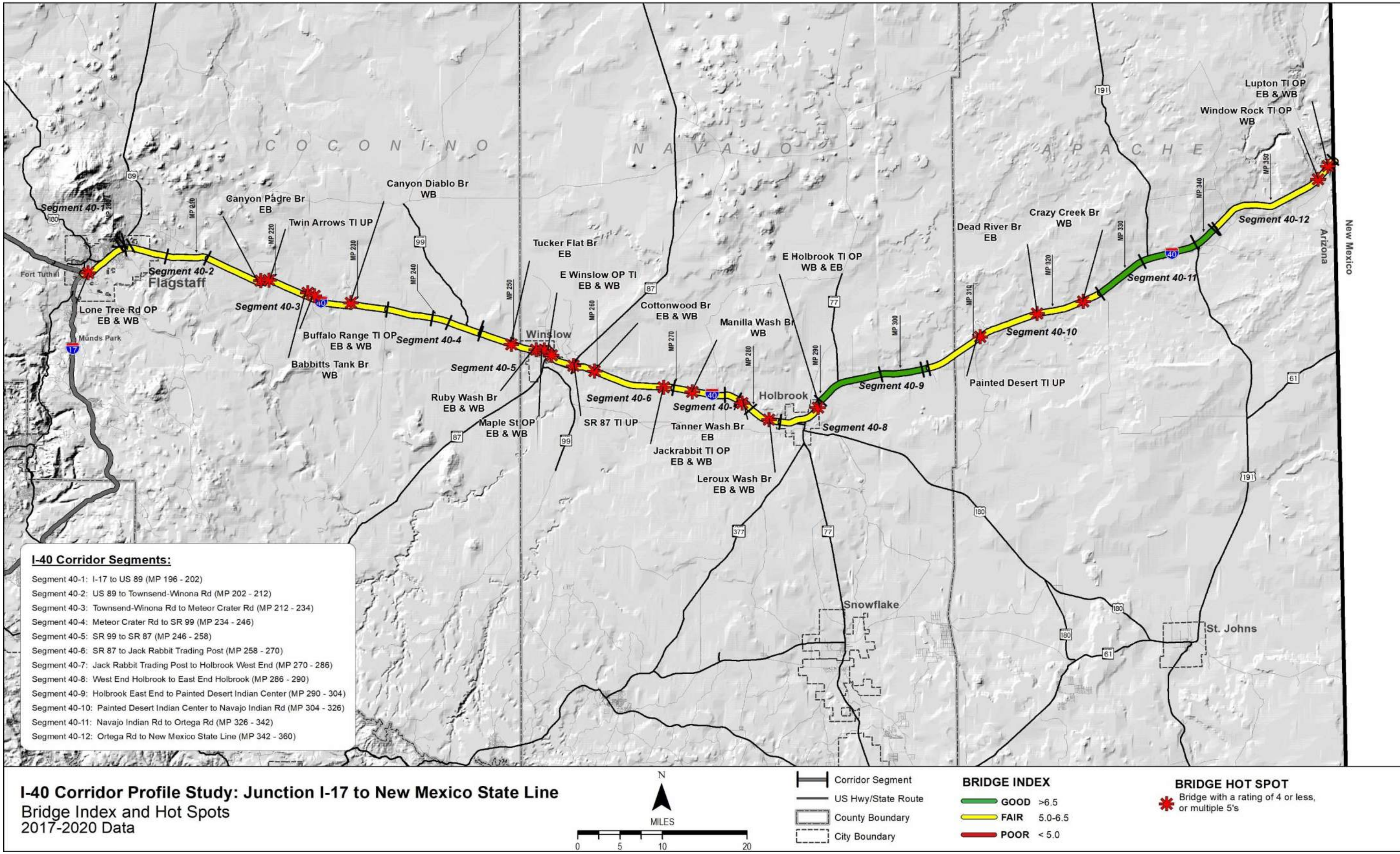
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Pavement Failure
2019 Data

N
MILES
0 5 10 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

PAVEMENT FAILURE

ABOVE AVERAGE PERFORMANCE	<5
AVERAGE PERFORMANCE	5-20
BELOW AVERAGE PERFORMANCE	>20



COCONINO
NAVAJO
APACHE
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
Lone Tree Rd OP EB & WB
Canyon Padre Br EB
Twin Arrows TI UP
Canyon Diablo Br WB
Buffalo Range TI OP EB & WB
Babbitts Tank Br WB
Tucker Flat Br EB
E Winslow OP TI EB & WB
Ruby Wash Br EB & WB
Maple St OP EB & WB
SR 87 TI UP
Cottonwood Br EB & WB
Manilla Wash Br WB
Tanner Wash Br EB
Jackrabbit TI OP EB & WB
Leroux Wash Br EB & WB
E Holbrook TI OP WB & EB
Dead River Br EB
Painted Desert TI UP
Crazy Creek Br WB
Window Rock TI OP WB
Lupton TI OP EB & WB
MP 210
MP 220
MP 230
MP 240
MP 250
MP 260
MP 270
MP 280
MP 290
MP 300
MP 310
MP 320
MP 330
MP 340
MP 350
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
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Segment 40-5: SR 99 to SR 87 (MP 246 - 258)
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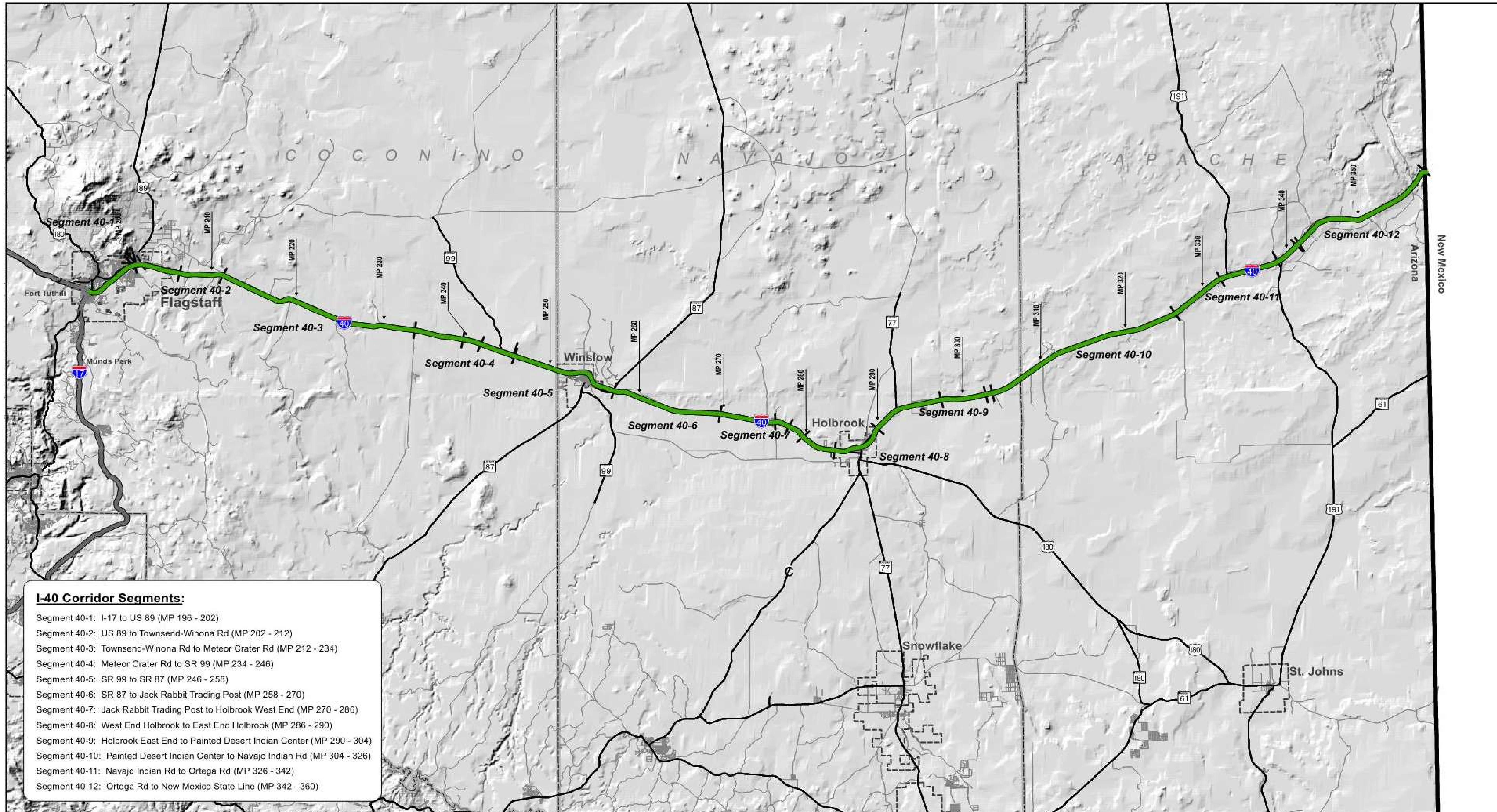
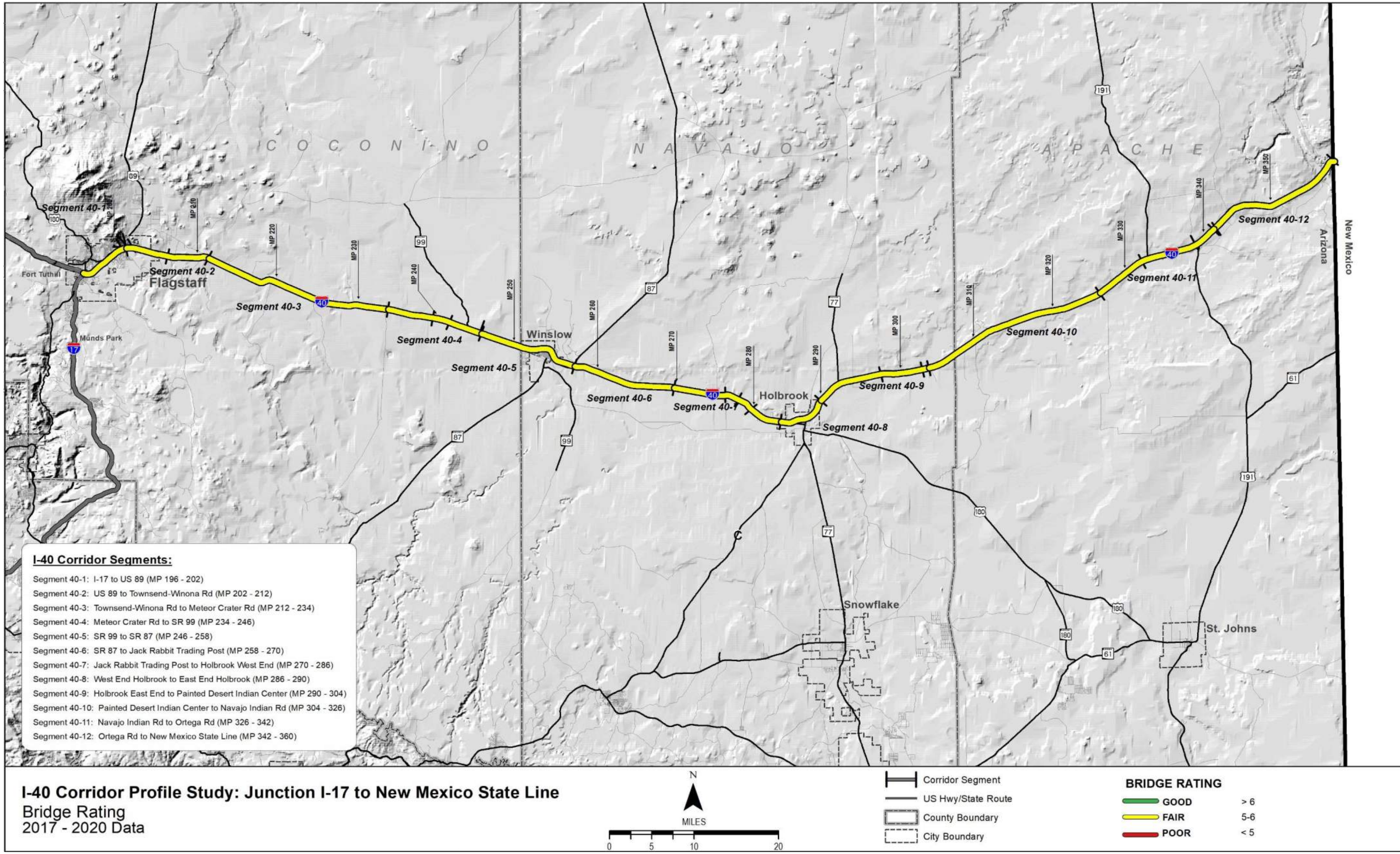
Segment 40-9: Holbrook East End to Painted Desert Indian Center (MP 290 - 304)
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Bridge Index and Hot Spots
2017-2020 Data
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
BRIDGE INDEX
GOOD >6.5
FAIR 5.0-6.5
POOR < 5.0
BRIDGE HOT SPOT
Bridge with a rating of 4 or less, or multiple 5's



I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line

Bridge Sufficiency

2017-2020 Data


C O C O N I N O
N A V A J O
A P A C H E
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
MP 210
MP 220
MP 230
MP 240
MP 250
MP 260
MP 270
MP 280
MP 290
MP 300
MP 310
MP 320
MP 330
MP 340
MP 350
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
Segment 40-3: Townsend-Winona Rd to Meteor Crater Rd (MP 212 - 234)
Segment 40-4: Meteor Crater Rd to SR 99 (MP 234 - 246)
Segment 40-5: SR 99 to SR 87 (MP 246 - 258)
Segment 40-6: SR 87 to Jack Rabbit Trading Post (MP 258 - 270)
Segment 40-7: Jack Rabbit Trading Post to Holbrook West End (MP 270 - 286)
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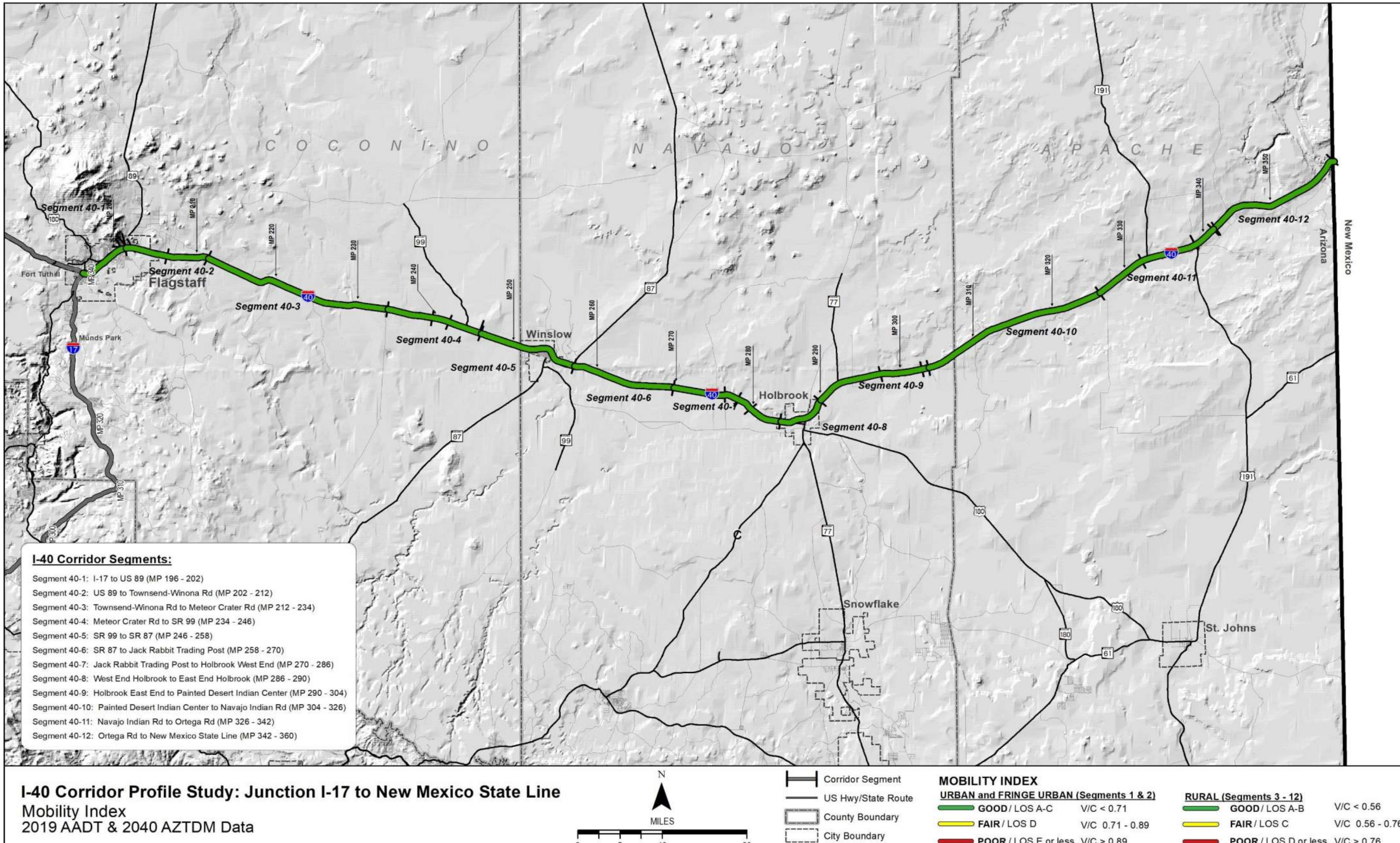
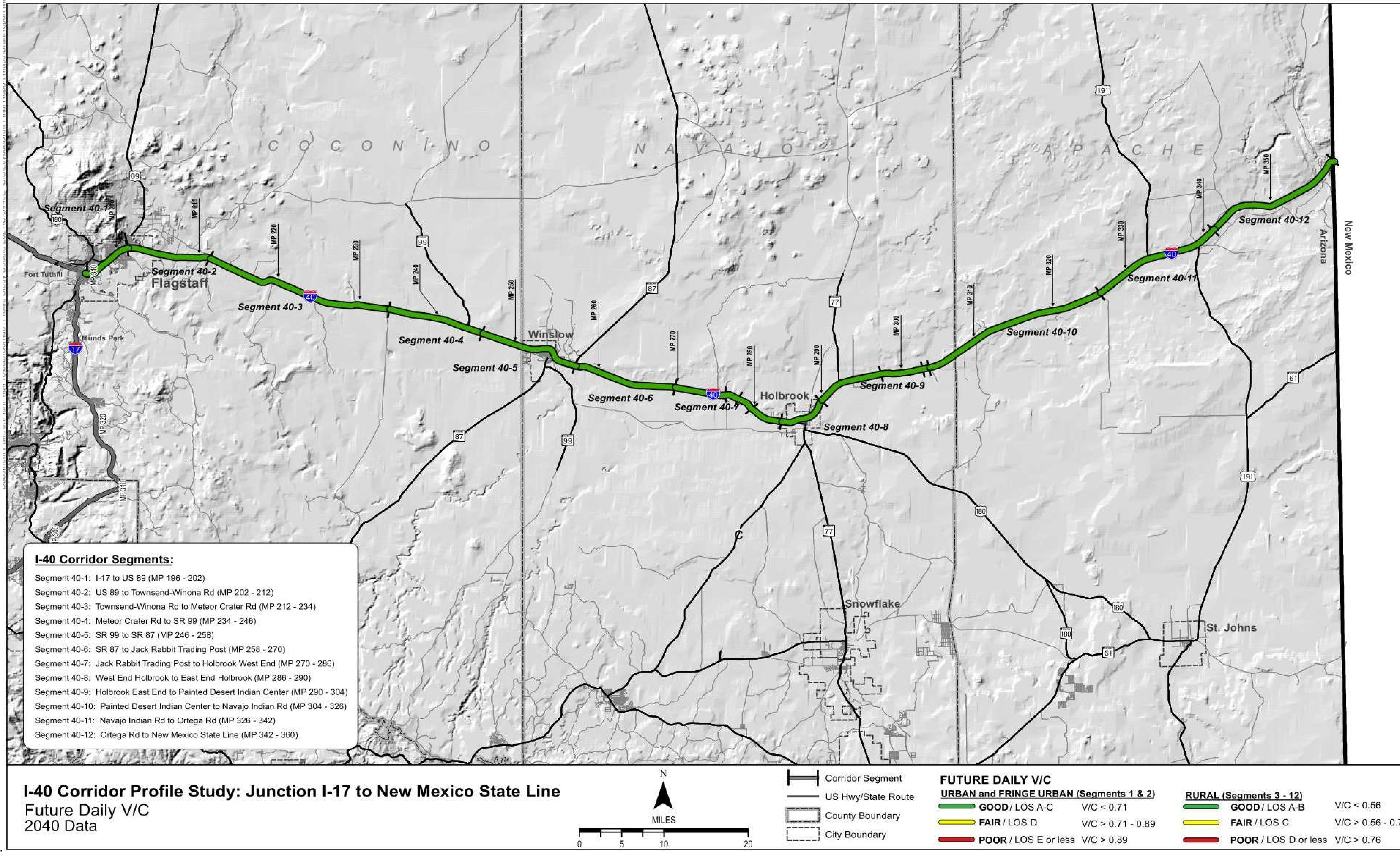
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Bridge Rating
2017 - 2020 Data
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
BRIDGE RATING
GOOD > 6
FAIR 5-6
POOR < 5


COCONINO
NAVAJO
APACHE
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
Segment 40-3: Townsend-Winona Rd to Meteor Crater Rd (MP 212 - 234)
Segment 40-4: Meteor Crater Rd to SR 99 (MP 234 - 246)
Segment 40-5: SR 99 to SR 87 (MP 246 - 258)
Segment 40-6: SR 87 to Jack Rabbit Trading Post (MP 258 - 270)
Segment 40-7: Jack Rabbit Trading Post to Holbrook West End (MP 270 - 286)
Segment 40-8: West End Holbrook to East End Holbrook (MP 286 - 290)
Segment 40-9: Holbrook East End to Painted Desert Indian Center (MP 290 - 304)
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Mobility Index
2019 AADT & 2040 AZTDM Data
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
MOBILITY INDEX
URBAN and FRINGE URBAN (Segments 1 & 2)
GOOD / LOS A-C V/C < 0.71
FAIR / LOS D V/C 0.71 - 0.89
POOR / LOS E or less V/C > 0.89
RURAL (Segments 3 - 12)
GOOD / LOS A-B V/C < 0.56
FAIR / LOS C V/C 0.56 - 0.76
POOR / LOS D or less V/C > 0.76



I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Future Daily V/C
2040 Data
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
Segment 40-3: Townsend-Winona Rd to Meteor Crater Rd (MP 212 - 234)
Segment 40-4: Meteor Crater Rd to SR 99 (MP 234 - 246)
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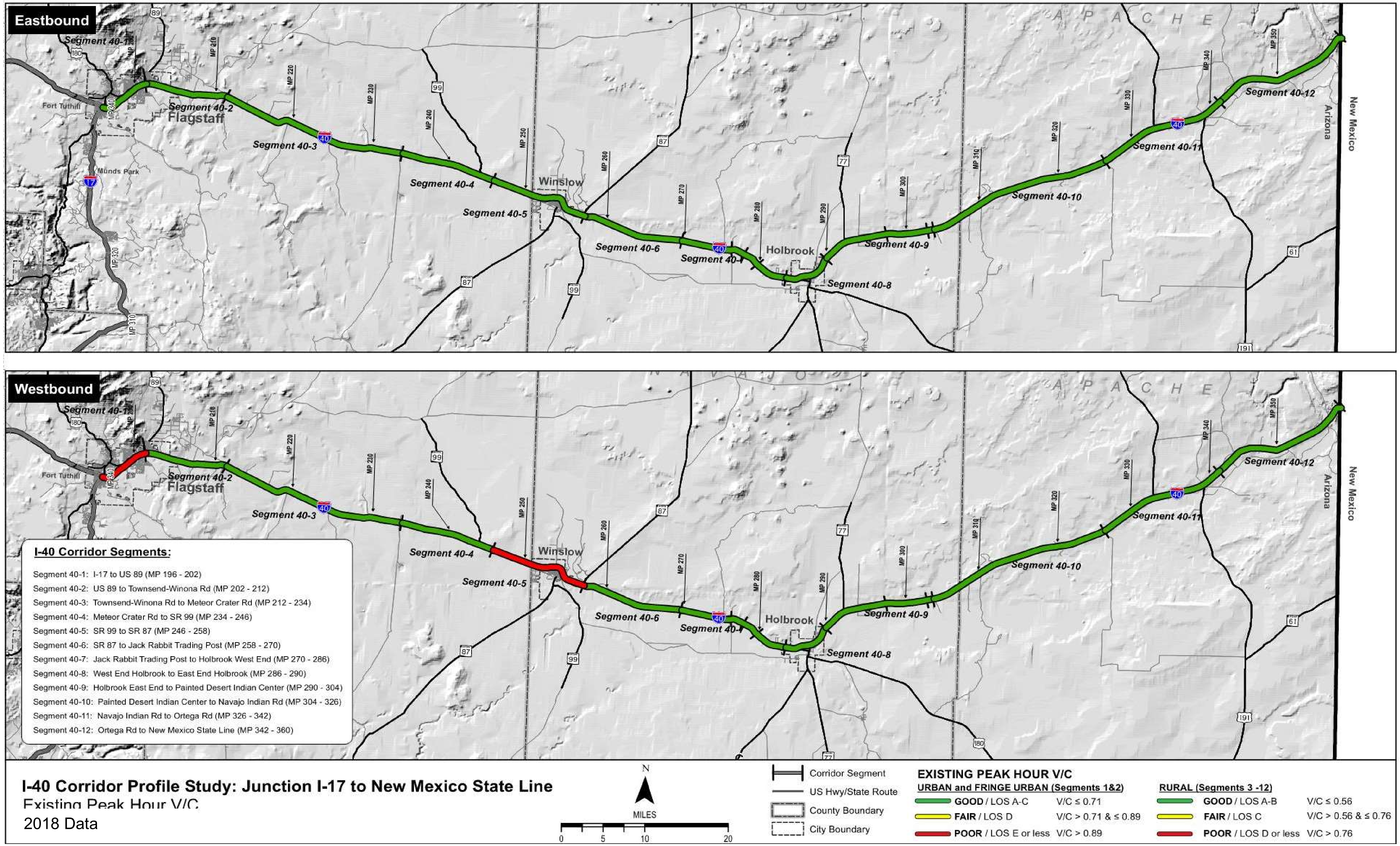
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
COCONINO
NAVAJO
APACHE
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
FUTURE DAILY V/C
URBAN and FRINGE URBAN (Segments 1 & 2)
GOOD / LOS A-C V/C < 0.71
FAIR / LOS D V/C > 0.71 - 0.89
POOR / LOS E or less V/C > 0.89
RURAL (Segments 3 - 12)
GOOD / LOS A-B V/C < 0.56
FAIR / LOS C V/C > 0.56 - 0.76
POOR / LOS D or less V/C > 0.76


Eastbound
Westbound
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
Fort Tuthill
Flagstaff
Munds Park
Winslow
Holbrook
Arizona
New Mexico
A P A C H E
MP 210
MP 220
MP 230
MP 240
MP 250
MP 260
MP 270
MP 280
MP 290
MP 300
MP 310
MP 320
MP 330
MP 340
MP 350
I-40 Corridor Segments:
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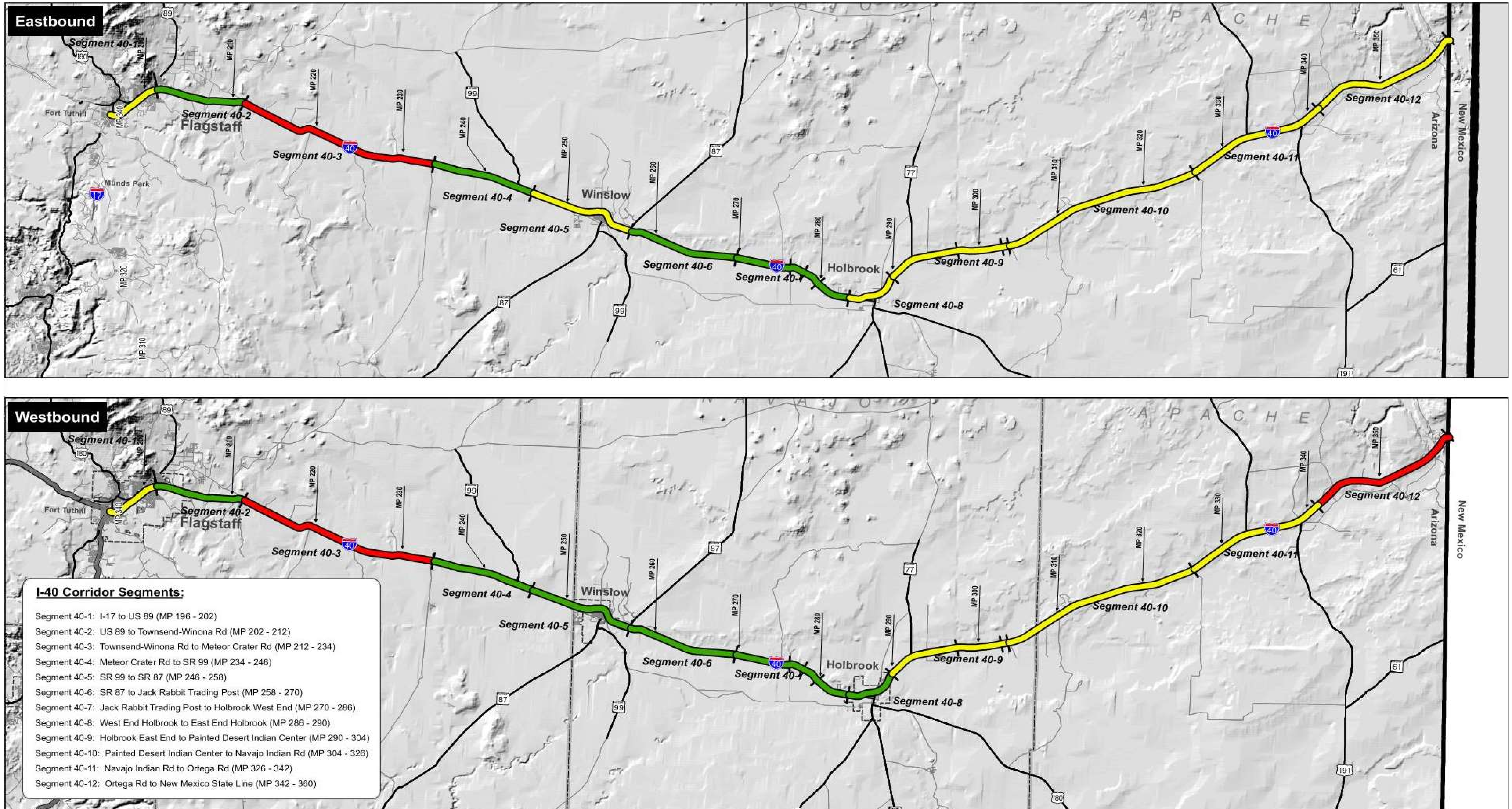
Segment 40-5: SR 99 to SR 87 (MP 246 - 258)
Segment 40-6: SR 87 to Jack Rabbit Trading Post (MP 258 - 270)
Segment 40-7: Jack Rabbit Trading Post to Holbrook West End (MP 270 - 286)
Segment 40-8: West End Holbrook to East End Holbrook (MP 286 - 290)
Segment 40-9: Holbrook East End to Painted Desert Indian Center (MP 290 - 304)
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Existing Peak Hour V/C
2018 Data
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
EXISTING PEAK HOUR V/C
URBAN and FRINGE URBAN (Segments 1&2)
GOOD / LOS A-C V/C ≤ 0.71
FAIR / LOS D V/C > 0.71 & ≤ 0.89
POOR / LOS E or less V/C > 0.89
RURAL (Segments 3 -12)
GOOD / LOS A-B V/C ≤ 0.56
FAIR / LOS C V/C > 0.56 & ≤ 0.76
POOR / LOS D or less V/C > 0.76



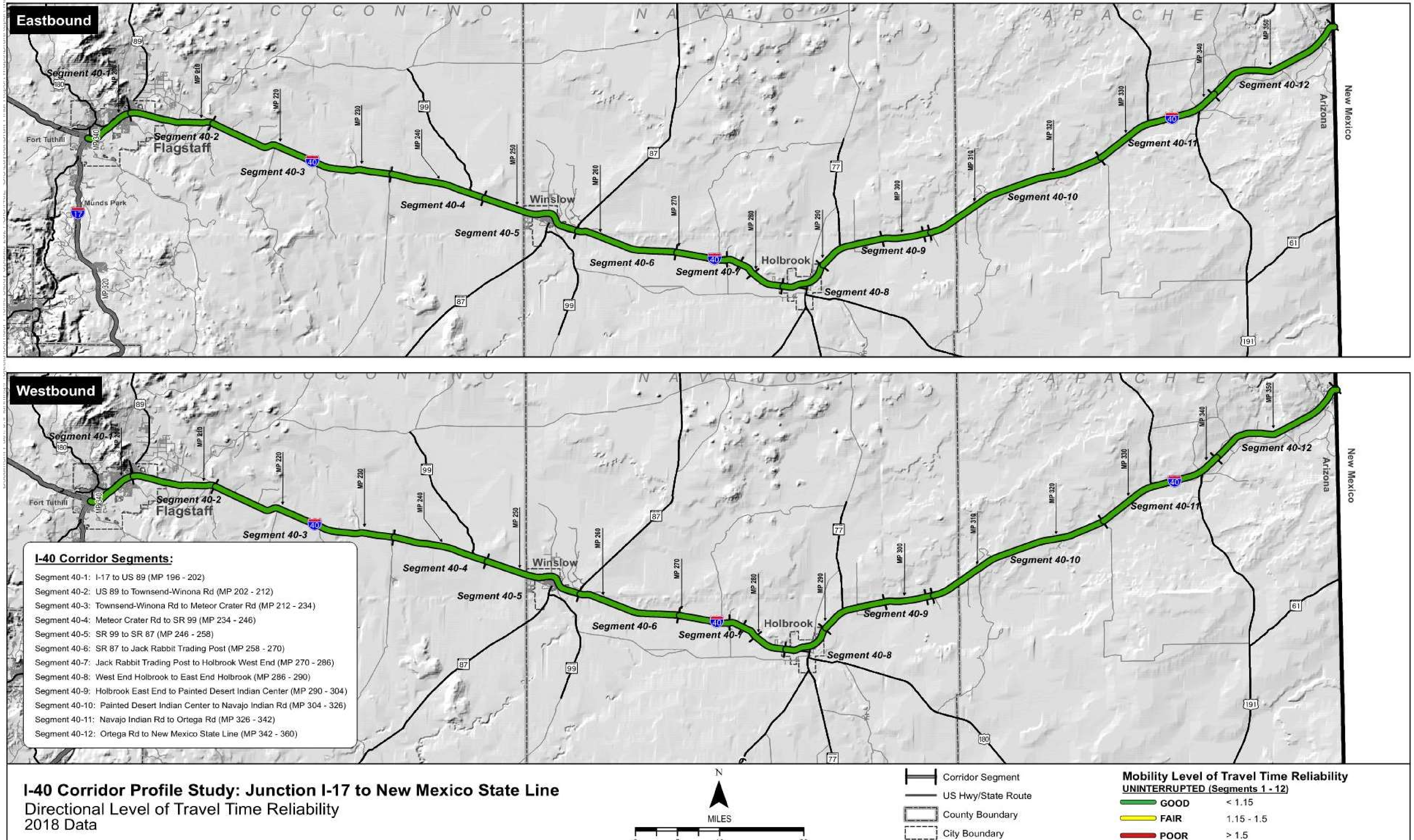
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Closure Frequency
2014 - 2019 Data

N
MILES
0 5 10 20

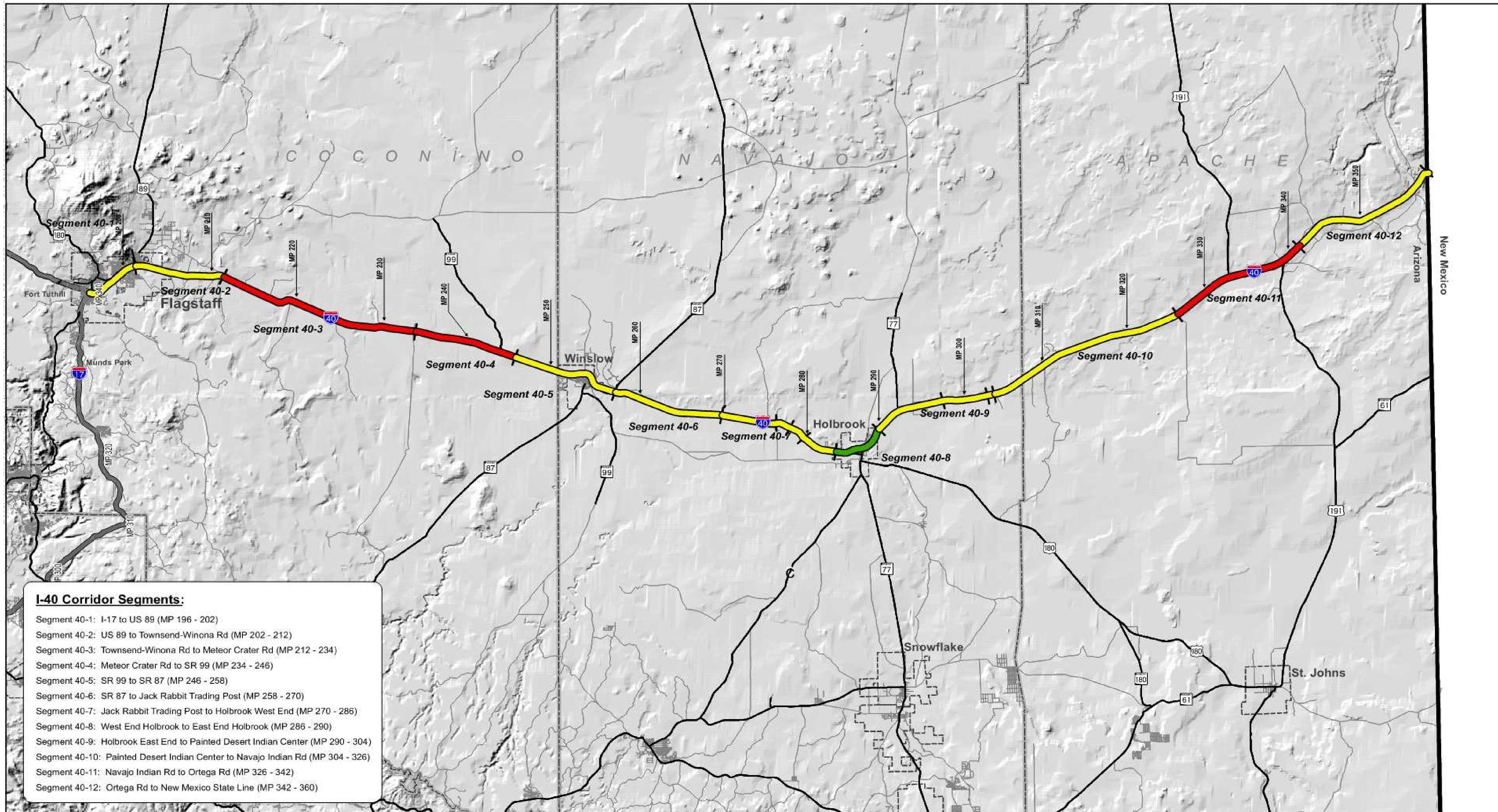
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

CLOSURE FREQUENCY
(#/miles/year)

ABOVE AVERAGE PERFORMANCE	< 0.22
AVERAGE PERFORMANCE	0.22 - 0.62
BELOW AVERAGE PERFORMANCE	> 0.62



I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Directional Level of Travel Time Reliability
2018 Data



I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line

Multimodal Opportunities

N

MILES

0 5 10 20

Corridor Segment

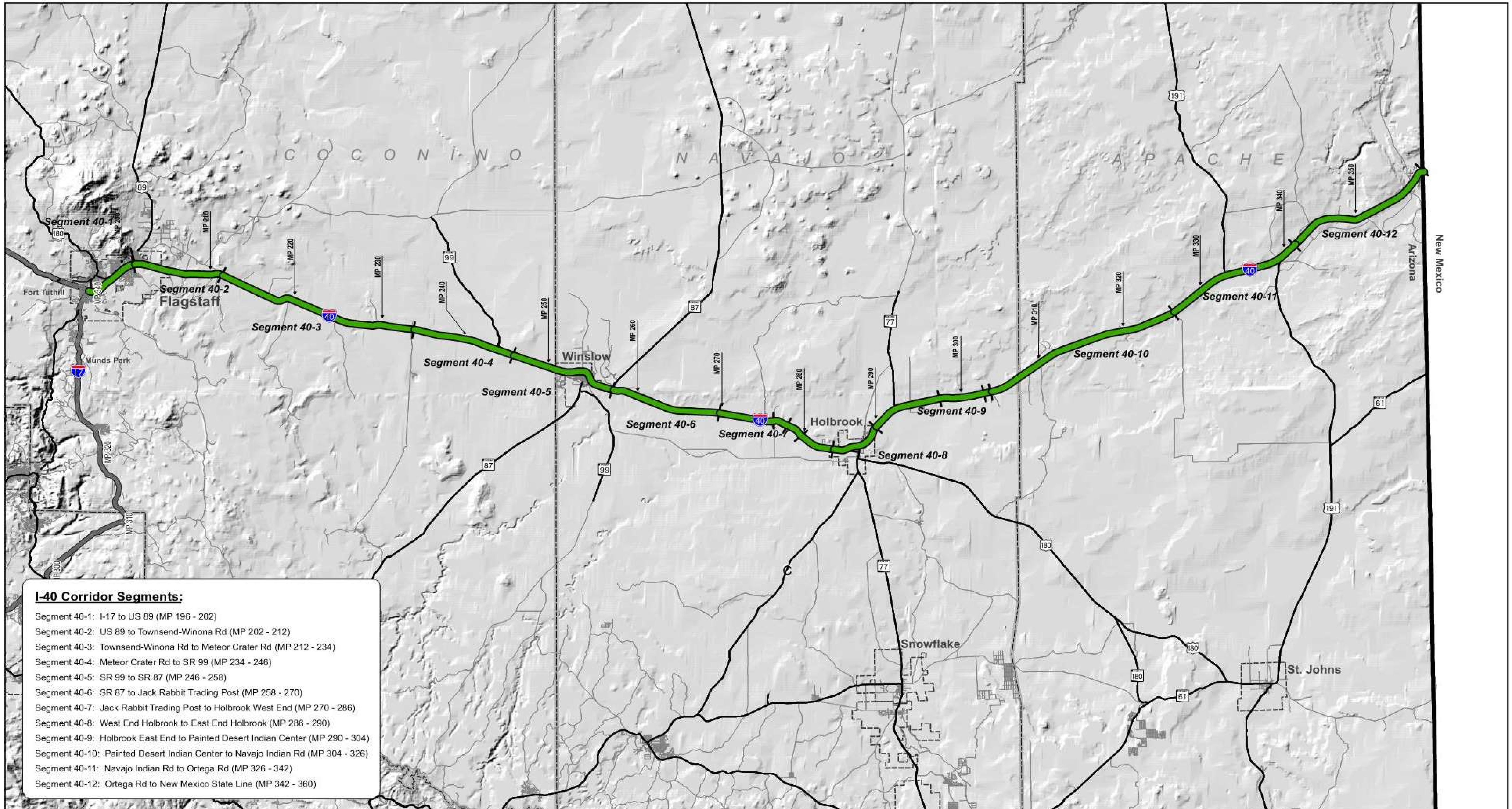
US Hwy/State Route

County Boundary

City Boundary

Average Non-Single Occupancy Vehicle Trips by Corridor Segment:

- **Segments ABOVE the Statewide average**
- **Segments WITHIN the Statewide average**
- **Segments BELOW the Statewide average**



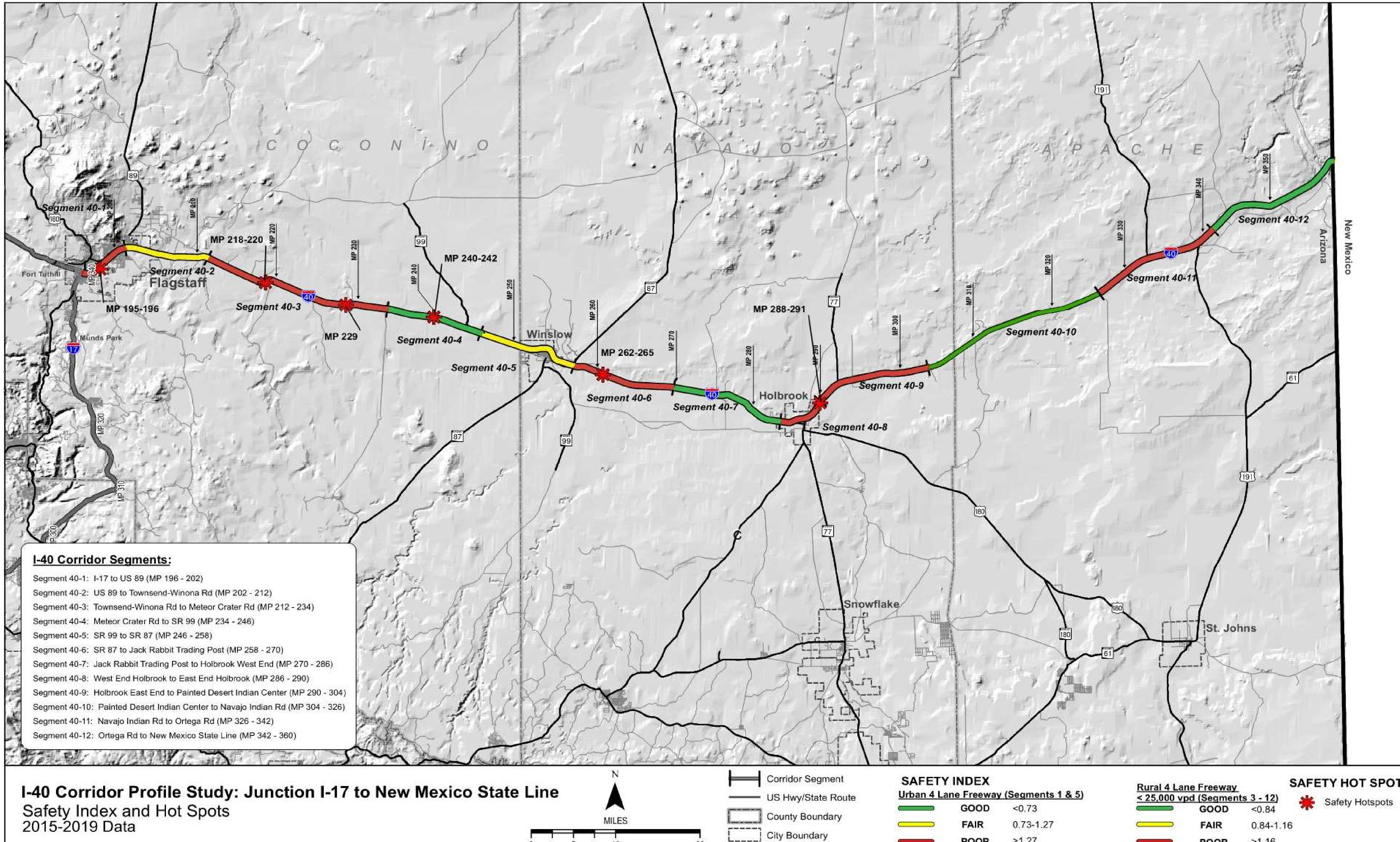
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Bicycle Accommodations

N
MILES
0 5 10 20

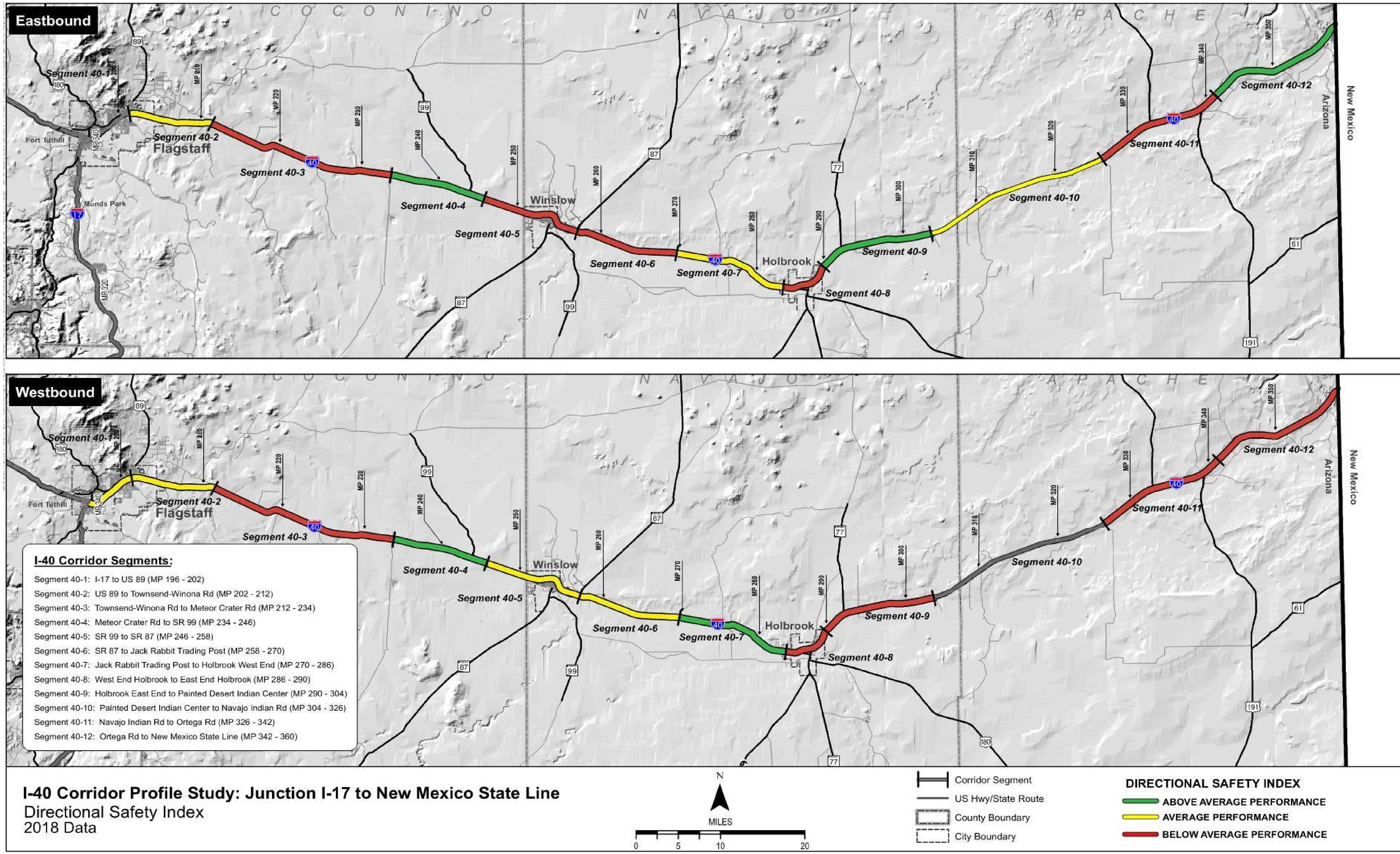
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

BICYCLE ACCOMMODATIONS

GOOD	≥ 90%
FAIR	60% - 90%
POOR	< 60%



I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
Segment 40-3: Townsend-Winona Rd to Meteor Crater Rd (MP 212 - 234)
Segment 40-4: Meteor Crater Rd to SR 99 (MP 234 - 246)
Segment 40-5: SR 99 to SR 87 (MP 246 - 258)
Segment 40-6: SR 87 to Jack Rabbit Trading Post (MP 258 - 270)
Segment 40-7: Jack Rabbit Trading Post to Holbrook West End (MP 270 - 286)
Segment 40-8: West End Holbrook to East End Holbrook (MP 286 - 290)
Segment 40-9: Holbrook East End to Painted Desert Indian Center (MP 290 - 304)
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
COCONINO
NAVAJO
APACHE
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
MP 195-196
MP 218-220
MP 229
MP 240-242
MP 262-265
MP 288-291
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Safety Index and Hot Spots
2015-2019 Data
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
SAFETY INDEX
Urban 4 Lane Freeway (Segments 1 & 5)
GOOD <0.73
FAIR 0.73-1.27
POOR >1.27
Rural 4 Lane Freeway
< 25,000 vpd (Segments 3 - 12)
GOOD <0.84
FAIR 0.84-1.16
POOR >1.16
SAFETY HOT SPOT
Safety Hotspots


Eastbound
Westbound
COCONINO
NAVAJO
APACHE
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Arizona
New Mexico
I-40 Corridor Segments:
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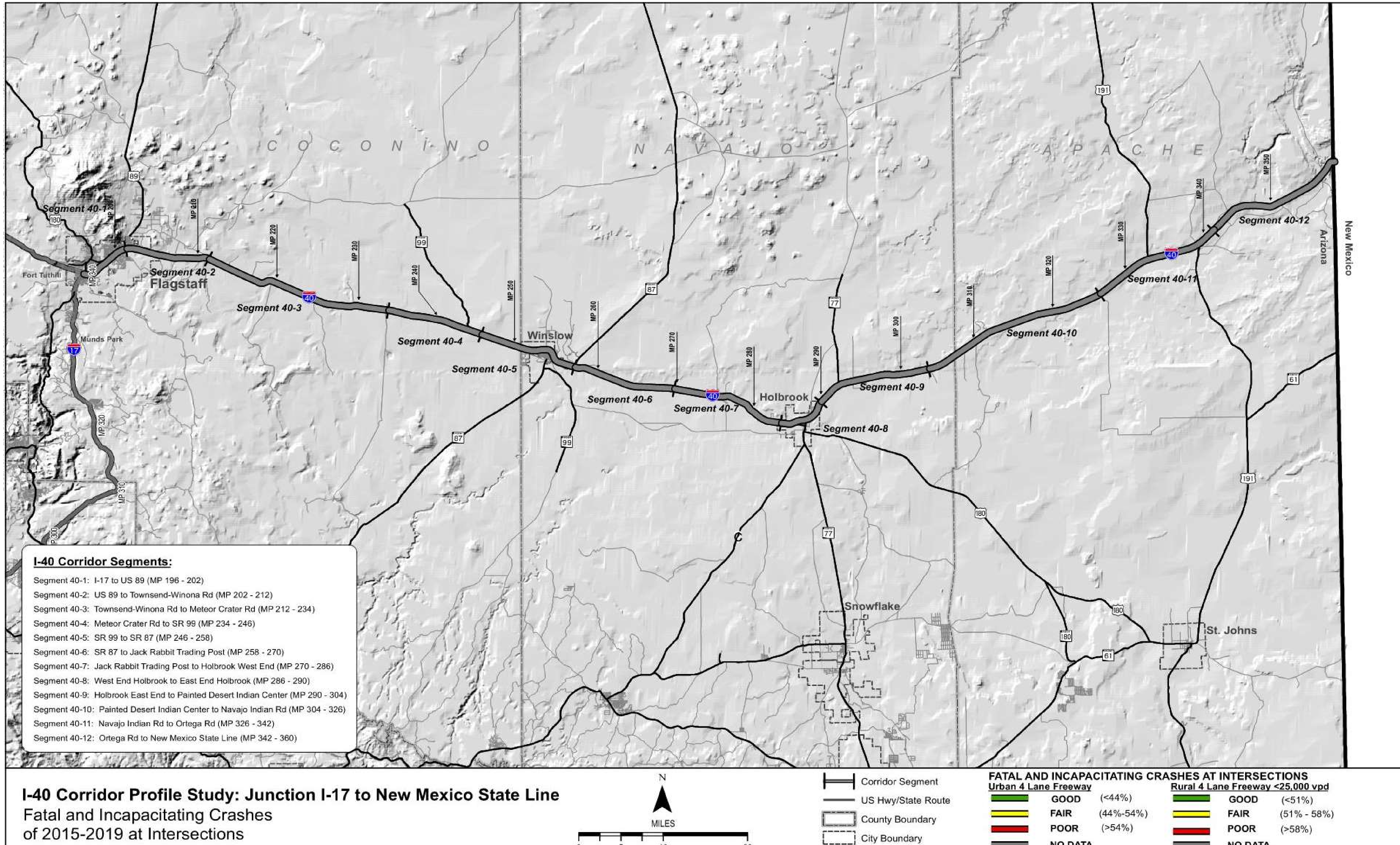
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Directional Safety Index
2018 Data
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
DIRECTIONAL SAFETY INDEX
ABOVE AVERAGE PERFORMANCE
AVERAGE PERFORMANCE
BELOW AVERAGE PERFORMANCE


I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Fatal and Incapacitating Crashes of 2015-2019 at Intersections
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
Segment 40-3: Townsend-Winona Rd to Meteor Crater Rd (MP 212 - 234)
Segment 40-4: Meteor Crater Rd to SR 99 (MP 234 - 246)
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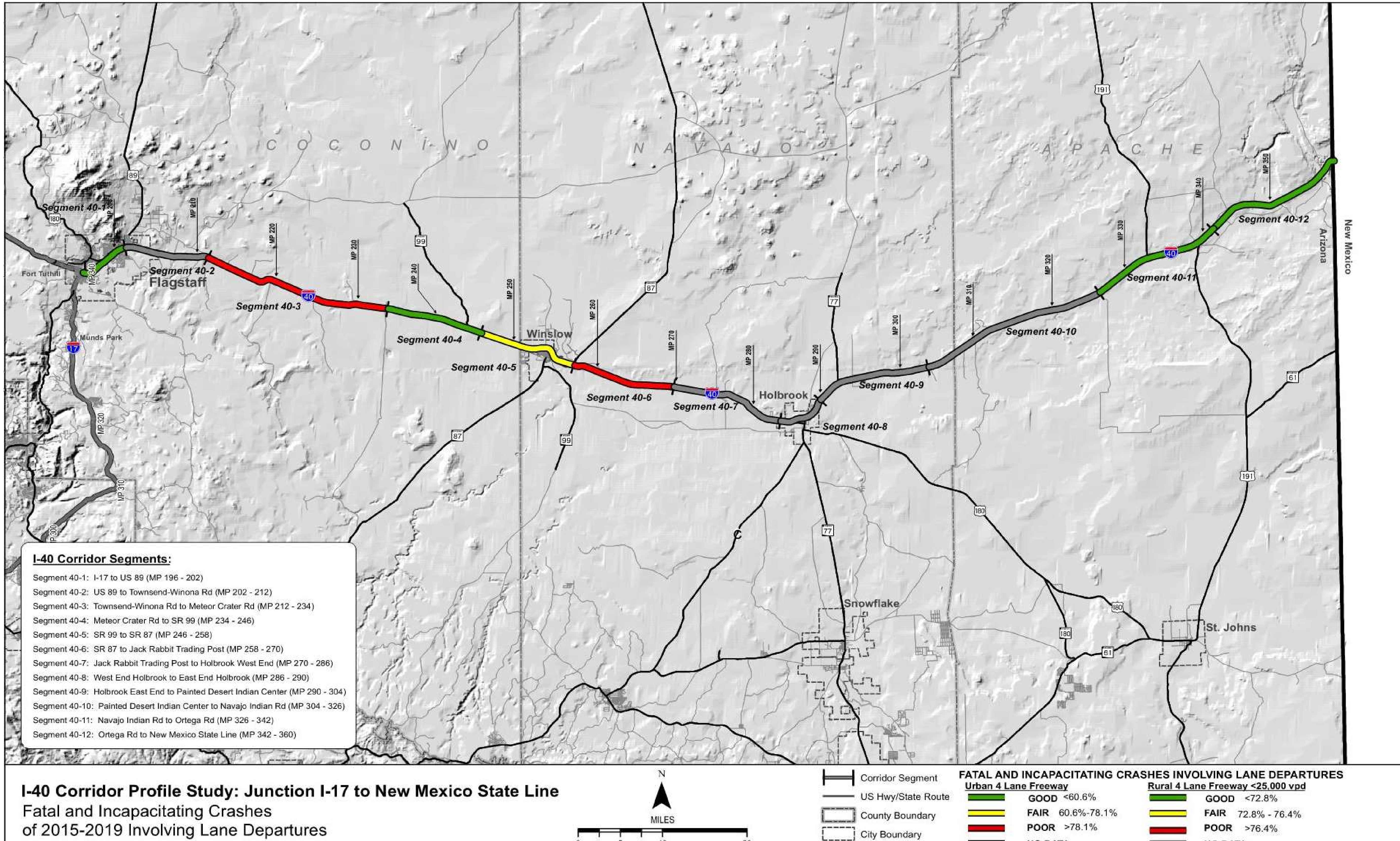
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
COCONINO
NAVAJO
APACHE
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
FATAL AND INCAPACITATING CRASHES AT INTERSECTIONS
Urban 4 Lane Freeway
GOOD (<44%)
FAIR (44%-54%)
POOR (>54%)
NO DATA
Rural 4 Lane Freeway <25,000 vpd
GOOD (<51%)
FAIR (51% - 58%)
POOR (>58%)
NO DATA


COCONINO
NAVAJO
APACHE
Segment 40-1
Segment 40-2
Flagstaff
Fort Tuthill
Segment 40-3
Munds Park
Segment 40-4
Winslow
Segment 40-5
Segment 40-6
Segment 40-7
Holbrook
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
Snowflake
St. Johns
Arizona
New Mexico
I-40 Corridor Segments:
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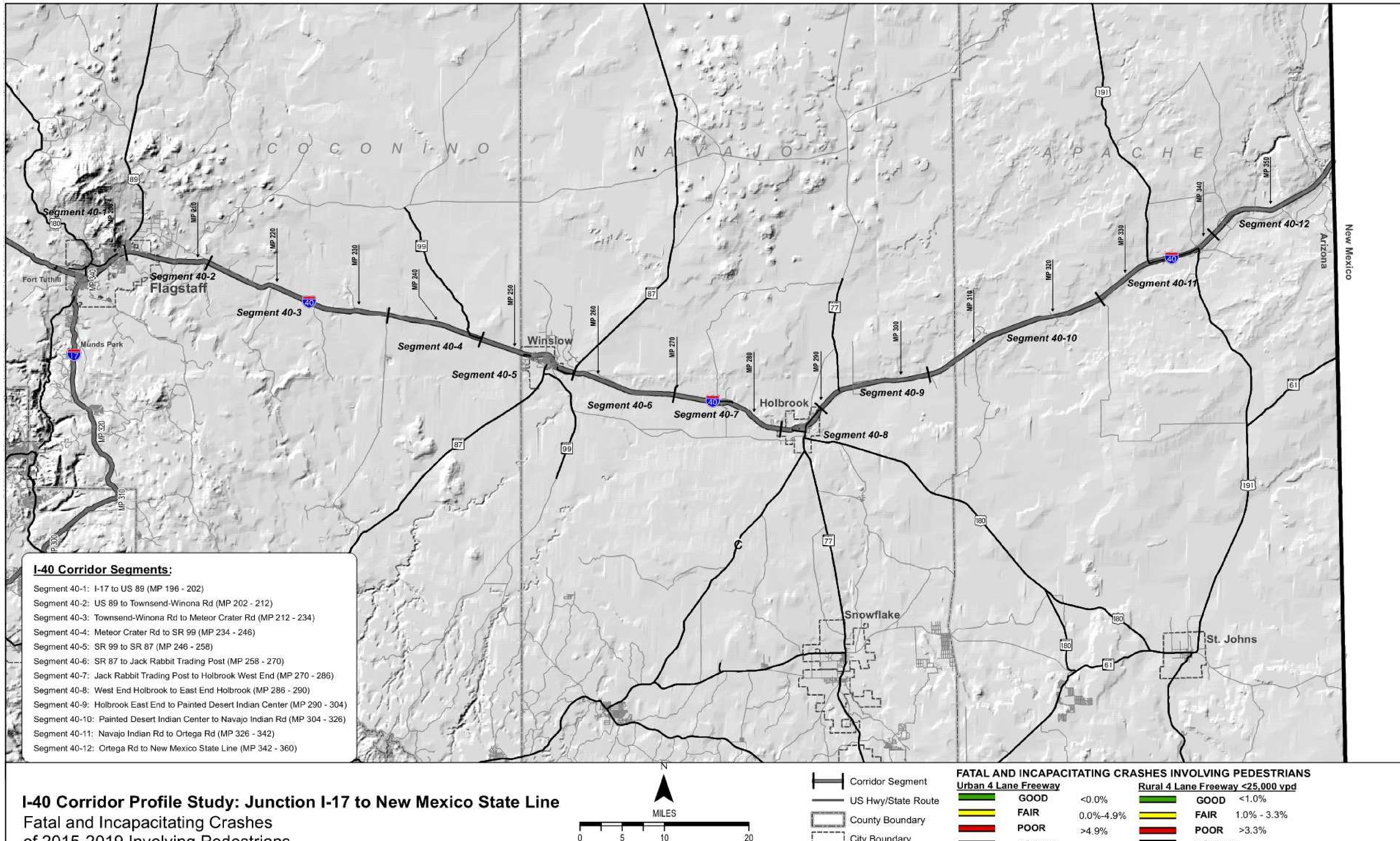
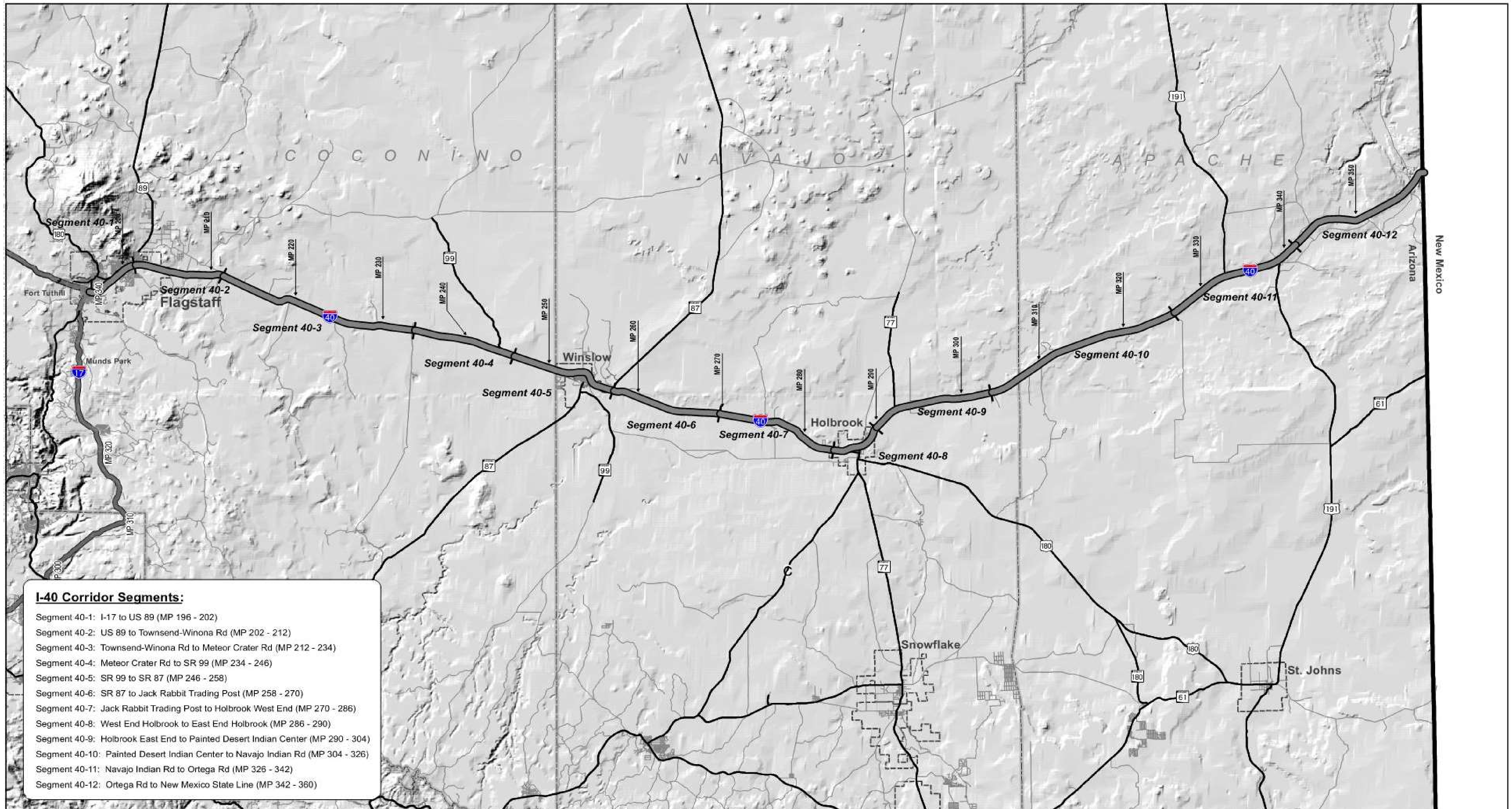
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Fatal and Incapacitating Crashes
of 2015-2019 Involving Lane Departures
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
FATAL AND INCAPACITATING CRASHES INVOLVING LANE DEPARTURES
Urban 4 Lane Freeway
GOOD <60.6%
FAIR 60.6%-78.1%
POOR >78.1%
NO DATA
Rural 4 Lane Freeway <25,000 vpd
GOOD <72.8%
FAIR 72.8% - 76.4%
POOR >76.4%
NO DATA



I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line

Fatal and Incapacitating Crashes of 2015-2019 Involving Pedestrians



I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line

Fatal and Incapacitating Crashes
of 2015-2019 Involving Bicycles

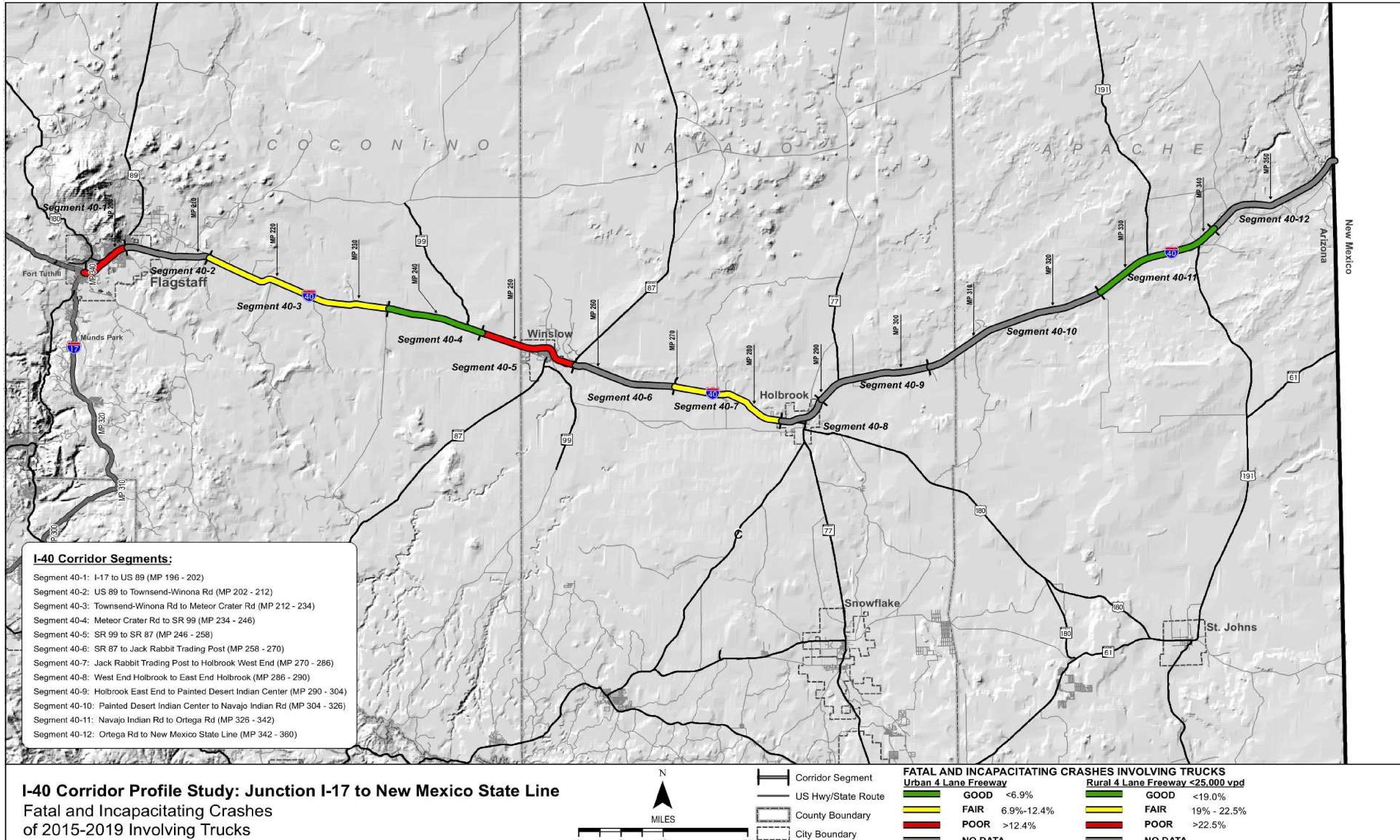
N

MILES
0 5 10 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

FATAL AND INCAPACITATING CRASHES INVOLVING BICYCLES

Urban 4 Lane Freeway		Rural 4 Lane Freeway <25,000 vpd	
GOOD	<0.0%	GOOD	<0%
FAIR	0.0%-0.0%	FAIR	0.0% -0.9%
POOR	>0.0%	POOR	>0.9%
NO DATA		NO DATA	



COCONINO
NAVAJO
APACHE
Fort Tuthill
Flagstaff
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
MP 210
MP 220
MP 230
MP 240
MP 250
MP 260
MP 270
MP 280
MP 290
MP 300
MP 310
MP 320
MP 330
MP 340
MP 350
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
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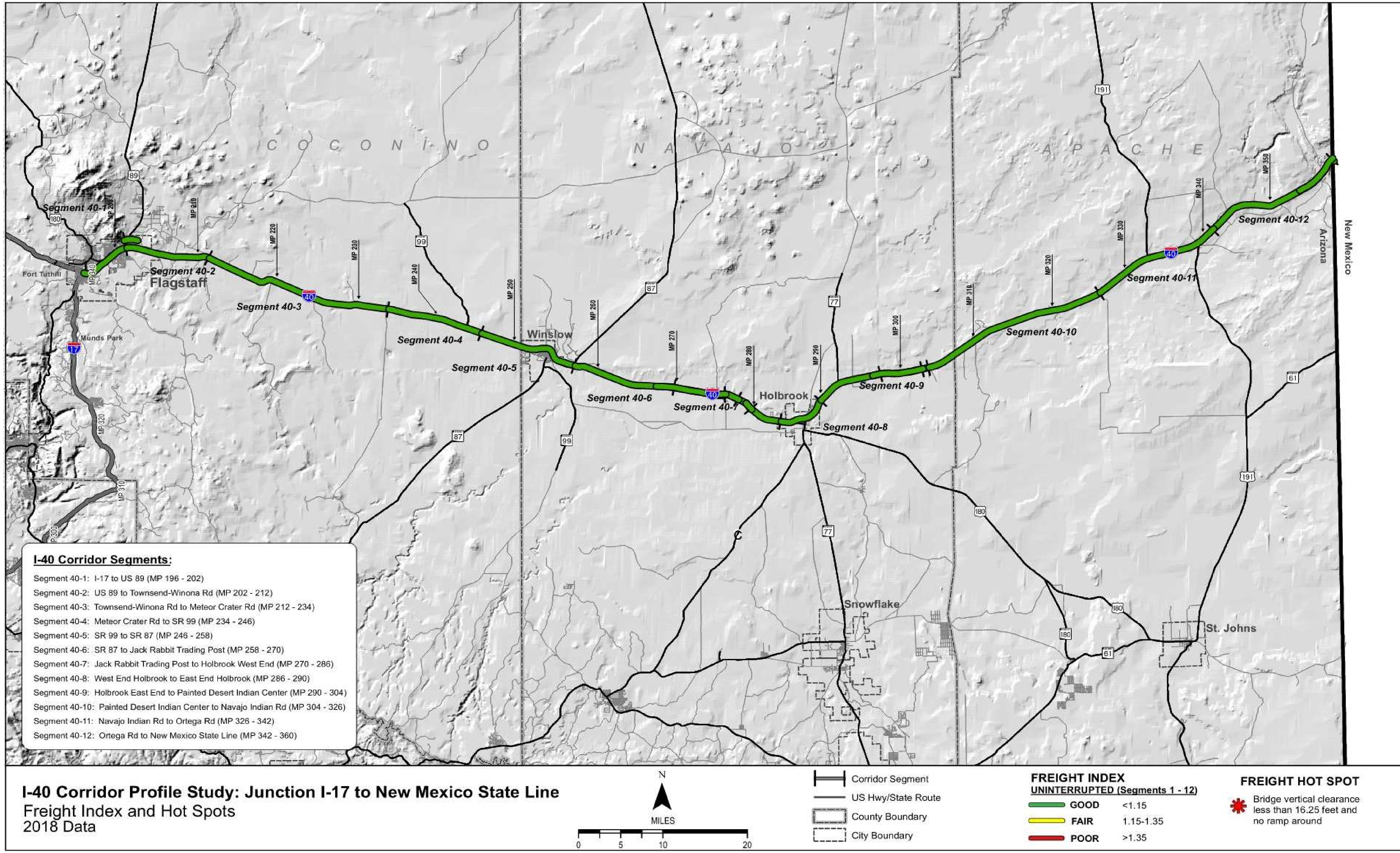
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Fatal and Incapacitating Crashes
of 2015-2019 Involving Trucks
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
FATAL AND INCAPACITATING CRASHES INVOLVING TRUCKS
Urban 4 Lane Freeway
GOOD <6.9%
FAIR 6.9%-12.4%
POOR >12.4%
NO DATA
Rural 4 Lane Freeway <25,000 vpd
GOOD <19.0%
FAIR 19% - 22.5%
POOR >22.5%
NO DATA


I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
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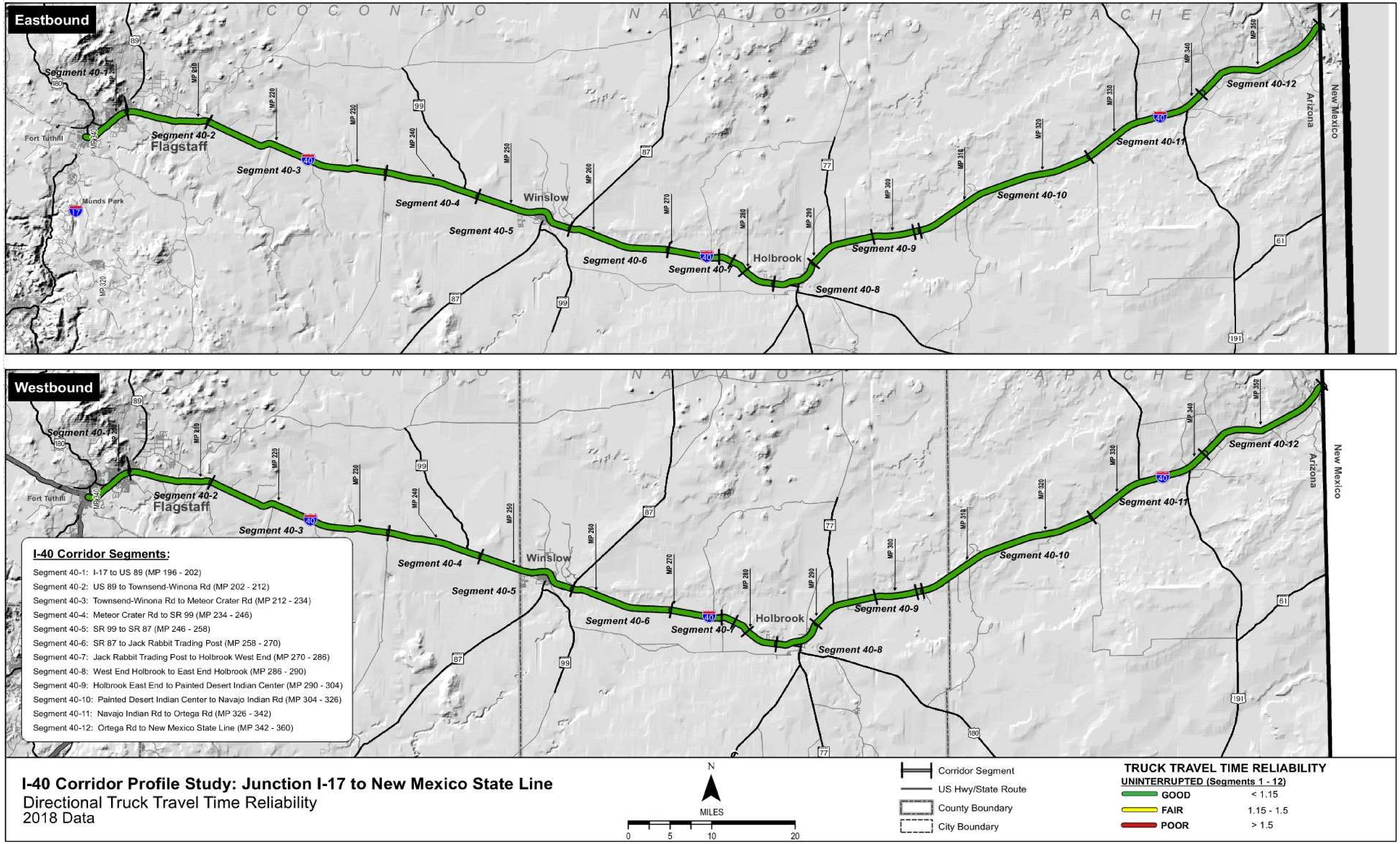
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
C O C O N I N O
N A V A J O
A P A C H E
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Freight Index and Hot Spots
2018 Data
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
FREIGHT INDEX
UNINTERRUPTED (Segments 1 - 12)
GOOD <1.15
FAIR 1.15-1.35
POOR >1.35
FREIGHT HOT SPOT
Bridge vertical clearance less than 16.25 feet and no ramp around


Eastbound
Westbound
COCONINO
NAVAJO
APACHE
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Arizona
New Mexico
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
MP 210
MP 220
MP 230
MP 240
MP 250
MP 260
MP 270
MP 280
MP 290
MP 300
MP 310
MP 320
MP 330
MP 340
MP 350
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
Segment 40-2: US 89 to Townsend-Winona Rd (MP 202 - 212)
Segment 40-3: Townsend-Winona Rd to Meteor Crater Rd (MP 212 - 234)
Segment 40-4: Meteor Crater Rd to SR 99 (MP 234 - 246)
Segment 40-5: SR 99 to SR 87 (MP 246 - 258)
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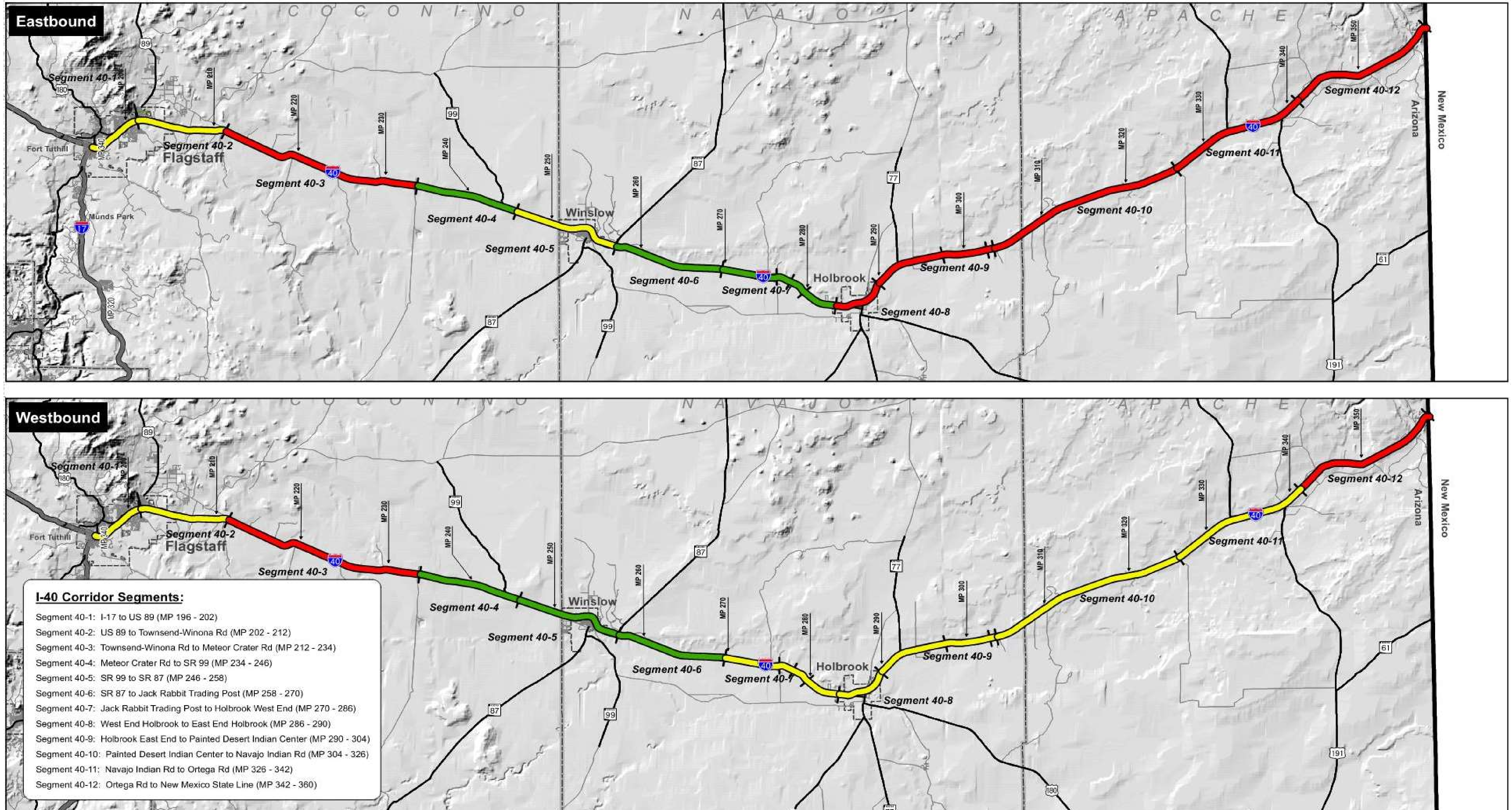
Segment 40-10: Painted Desert Indian Center to Navajo Indian Rd (MP 304 - 326)
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Directional Truck Travel Time Reliability
2018 Data
N
MILES
0 5 10 20
Corridor Segment
US Hwy/State Route
County Boundary
City Boundary
TRUCK TRAVEL TIME RELIABILITY
UNINTERRUPTED (Segments 1 - 12)
GOOD < 1.15
FAIR 1.15 - 1.5
POOR > 1.5



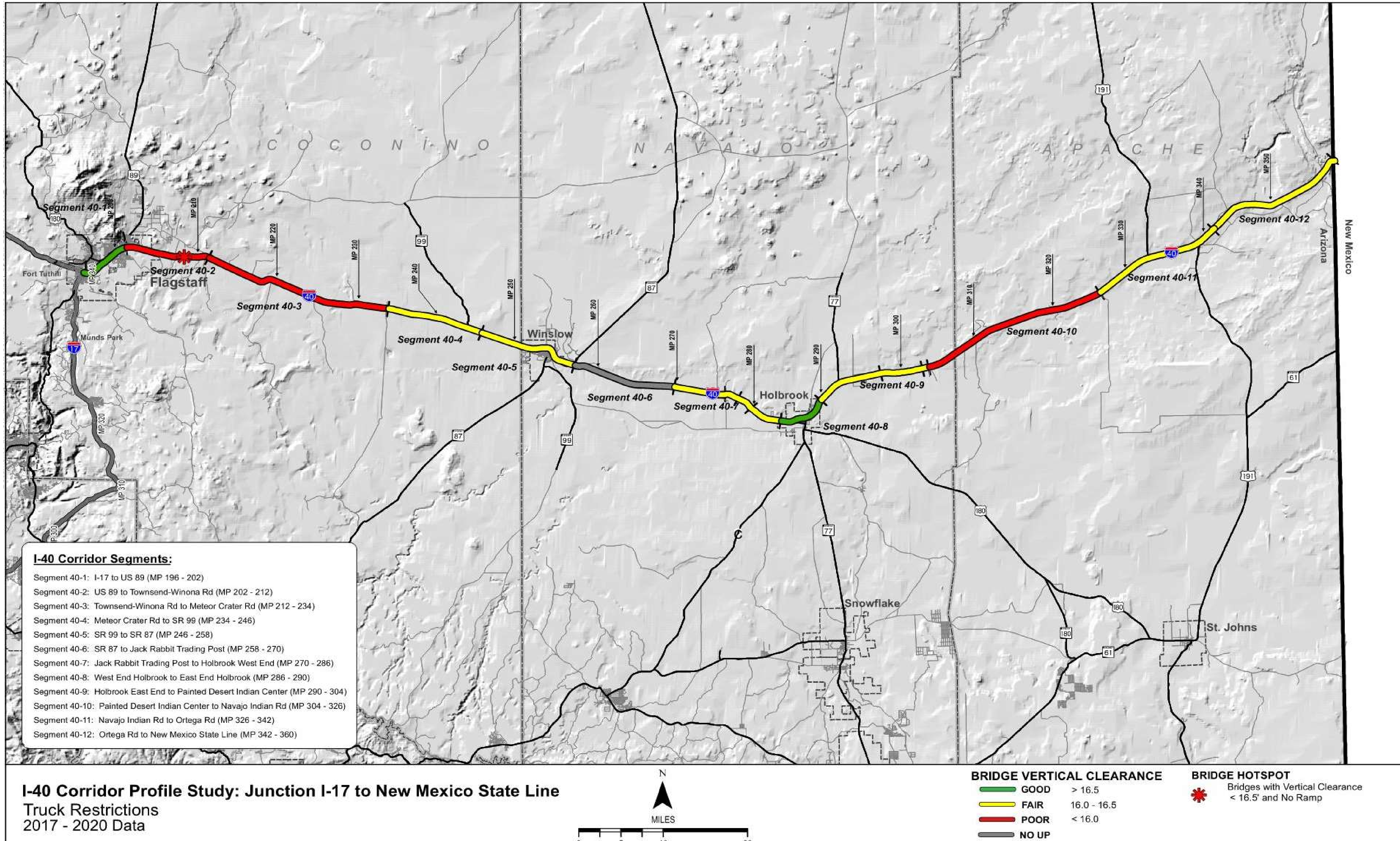
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Closure Duration
2018 Data

N
MILES
0 5 10 20

Corridor Segment
US Hwy/State Route
County Boundary
City Boundary

CLOSURE DURATION
(min/miles/year)

ABOVE AVERAGE PERFORMANCE	< 44.18
AVERAGE PERFORMANCE	44.18 - 124.86
BELOW AVERAGE PERFORMANCE	> 124.86



COCONINO
NAVAJO
APACHE
Flagstaff
Fort Tuthill
Munds Park
Winslow
Holbrook
Snowflake
St. Johns
Arizona
New Mexico
Segment 40-1
Segment 40-2
Segment 40-3
Segment 40-4
Segment 40-5
Segment 40-6
Segment 40-7
Segment 40-8
Segment 40-9
Segment 40-10
Segment 40-11
Segment 40-12
MP 210
MP 220
MP 230
MP 240
MP 250
MP 260
MP 270
MP 280
MP 290
MP 300
MP 310
MP 320
MP 330
MP 340
MP 350
I-40 Corridor Segments:
Segment 40-1: I-17 to US 89 (MP 196 - 202)
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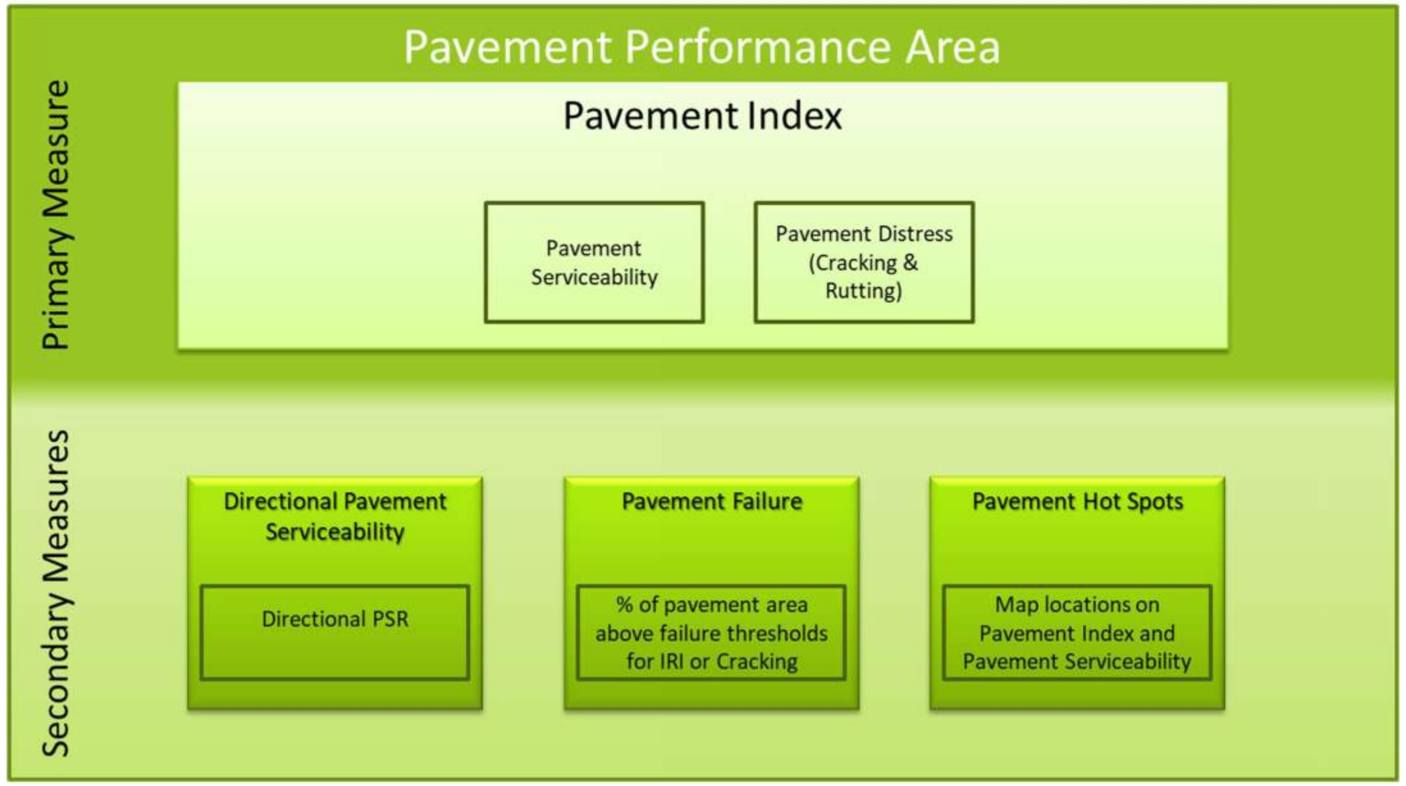
Segment 40-11: Navajo Indian Rd to Ortega Rd (MP 326 - 342)
Segment 40-12: Ortega Rd to New Mexico State Line (MP 342 - 360)
I-40 Corridor Profile Study: Junction I-17 to New Mexico State Line
Truck Restrictions
2017 - 2020 Data
N
MILES
0 5 10 20
BRIDGE VERTICAL CLEARANCE
GOOD > 16.5
FAIR 16.0 - 16.5
POOR < 16.0
NO UP
BRIDGE HOTSPOT
Bridges with Vertical Clearance < 16.5' and No Ramp

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.

<u>Primary Pavement Index</u>

The Pavement Index is calculated based on the use of three pavement condition ratings from the ADOT Pavement Database. The three ratings are the International Roughness Index (IRI), the Cracking rating, and the Rutting rating. The calculation of the Pavement Index uses a combination of these three 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. The Rutting rating is a measurement of the depth of pavement rutting based on field measurements. To facilitate the calculation of the index, the Cracking Rating and Rutting Rating were combined and converted to a Pavement Distress Index (PDI) using the following equation:

$$PDI = 5 - [\,(0.345 * C^{0.66}) + \left(0.01428 * \left(\frac{R}{2} * 100\right)^{1.32}\right) - \left(0.0823 * C^{0.18} * \left(\frac{R}{2} * 100\right)^{0.50}\right)\,]$$

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 & Rutting (PDI)
Good	<75 (>3.75)	Cracking <5.75 Rutting < 0.35
Fair	75 - 102 (3.40 - 3.75)	Cracking 5.75 - 12 Rutting 0.35 – 0.55
Poor	>102(<3.40)	Cracking >12 Rutting > 0.55

Performance Level for Non-Interstates	IRI (PSR)	Cracking & Rutting (PDI)
Good	<94 (>3.5)	Cracking < 5.75 Rutting < 0.35
Fair	94 - 142 (2.90 - 3.5)	Cracking 5.75 - 12 Rutting 0.35 – 0.55
Poor	>142 (<2.90)	Cracking >12 Rutting > 0.55

The PSR and PDI are calculated for each 1-mile section of roadway. If PSR or PDI falls into a poor rating (<3.4 for PSR 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.

<u>Secondary Pavement Measures</u>

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, Cracking, or Rutting 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, Cracking rating, or Rutting rating that fall above the failure threshold as identified by ADOT Pavement Group. For interstates, an IRI rating above 105, a Cracking rating above 10, or a Rutting rating above 0.4 will be used as the thresholds which are slightly different than the ratings shown previously. For non-interstates, an IRI rating above 142, a Cracking rating above 10, or a Rutting rating above 0.4 will be used as the thresholds.

<u>Scoring</u>

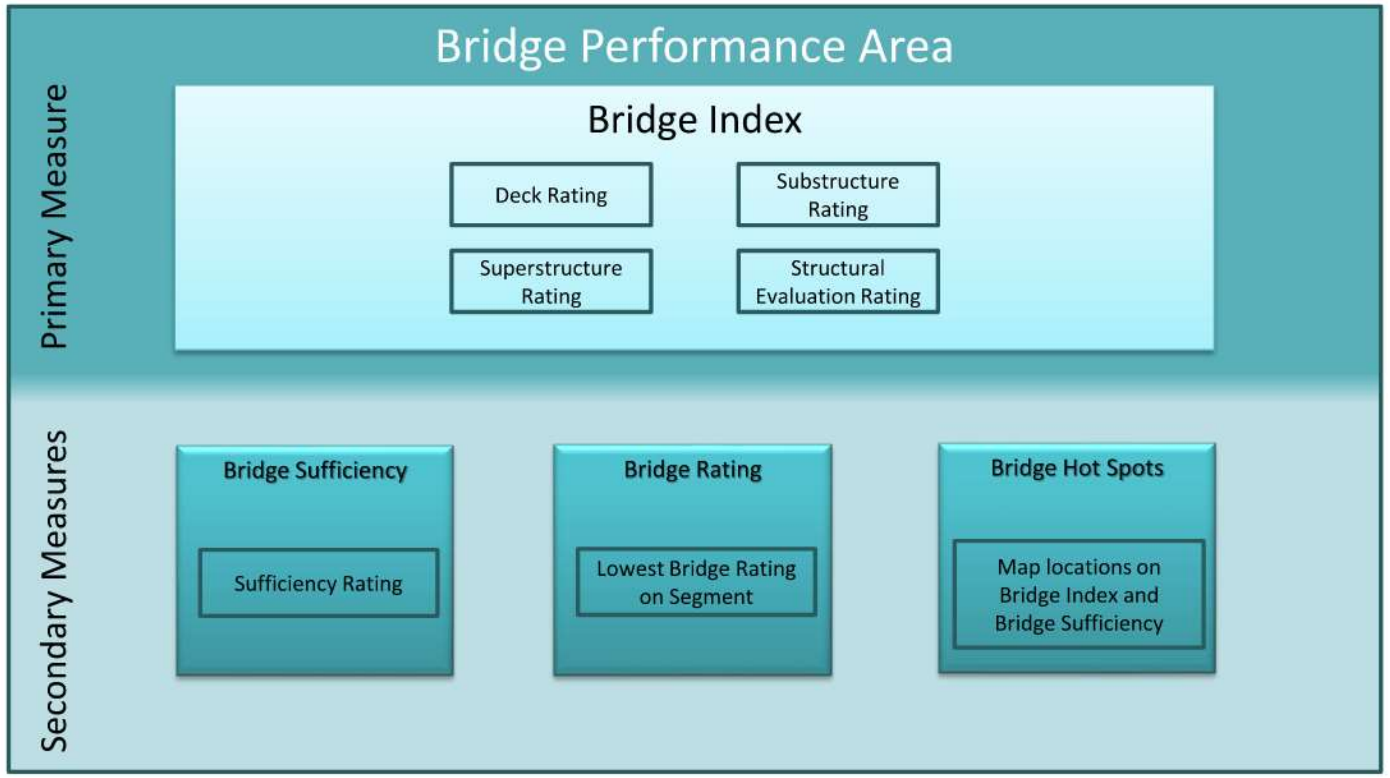
Performance Level	Pavement Index	
	Interstates	Non-Interstates
Good	>3.75	>3.6
Fair	3.0 - 3.75	2.8 - 3.6
Poor	<3.0	<2.8

Performance Level	Directional Pavement Serviceability	
	Interstates	Non-Interstates
Good	>3.75	>3.5
Fair	3.4 - 3.75	2.9 - 3.5
Poor	<3.4	<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.

<u>Primary Bridge Index</u>

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.

<u>Secondary Bridge Measures</u>

Three secondary measures will be evaluated:

- Bridge Sufficiency
- 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.

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:

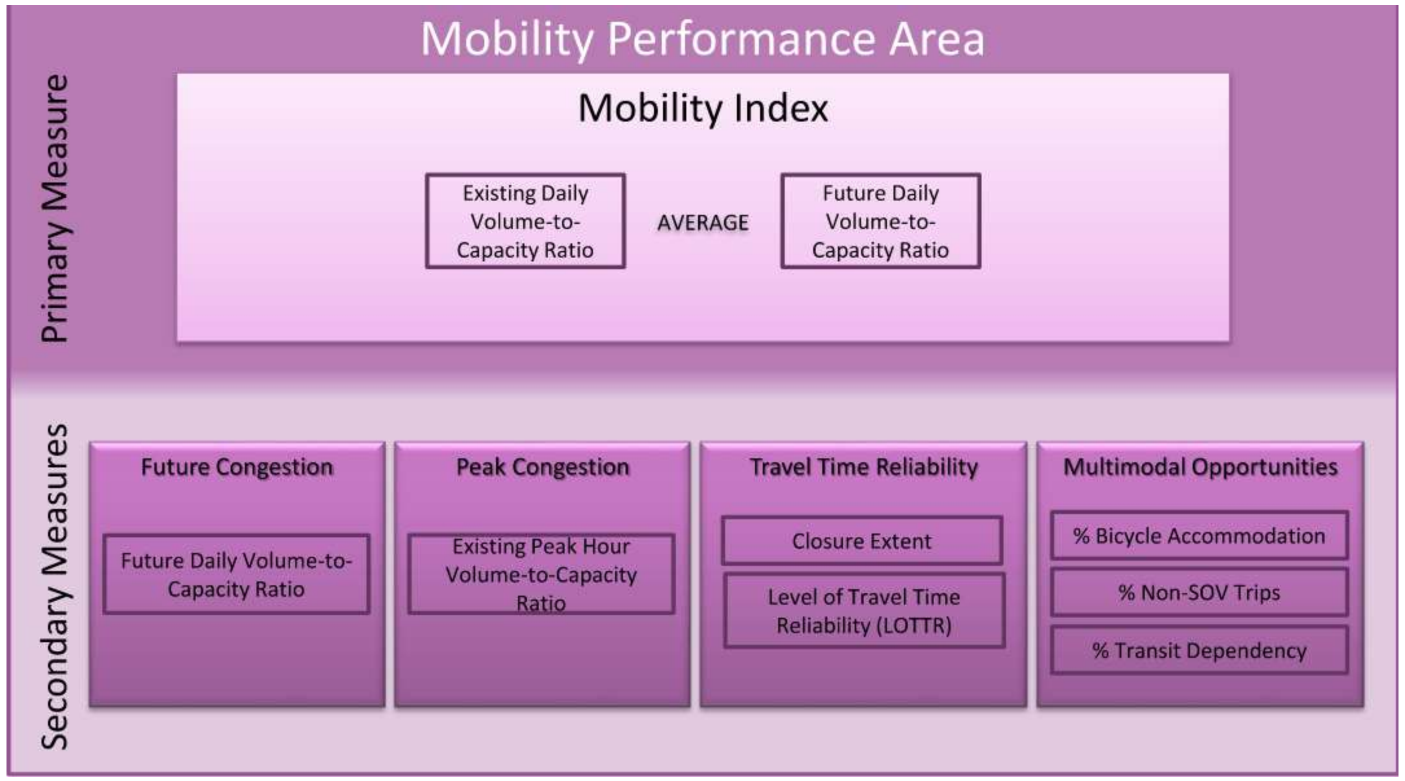
Performance Level	Bridge Index
Good	>6.5
Fair	5.0-6.5
Poor	<5.0

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

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

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:



<u>Primary Mobility Index</u>

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 existing 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 future AADT volume for each segment by the existing 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 existing AADT segment volume. The following equation is used to apply the average annual compound growth rate:

Future AADT = Existing AADT x ((1+ACGR)^(Future Year-Existing Year))

The ACGR for each segment is defined by comparing the total volumes in the existing Arizona Travel Demand Model (AZTDM2) to the future AZTDM2 traffic volumes at each existing HPMS count station location throughout the corridor. Each existing and future 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 = ((Future Volume/Existing Volume)^(1/(Future Year-Existing Year))))-1

<u>Secondary Mobility Measures</u>

Four secondary measures are evaluated:

- Future Congestion
- Peak Congestion
- Travel Time Reliability
    - Closure Extent
    - Directional Level of Travel Time Relatability

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

- 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 two indicators. The two indicators are the number of times a piece of a corridor is closed for any specific reason and the directional Level of Travel Time Reliability (LOTTR).

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 Level of Travel Time Reliability: In terms of overall mobility, the LOTTR is the relationship of 80^{th} percentile travel time to average (50^{th} percentile) travel time for a given corridor segment in

Using INRIX 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). The highest value of the four time periods calculation is defined as the LOTTR for that data point. The weighted average LOTTR is calculated within each segment based on the number of data points collected and the length associated with the TMC location. The value of the weighted average LOTTR across each entry is used as the LOTTR 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: 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	LOTTR on Uninterrupted Flow Facilities
Good	< 1.15
Fair	≥ 1.15 & < 1.50
Poor	≥ 1.50

Performance Level	LOTTR on Interrupted Flow Facilities
Good	< 1.15
Fair	≥ 1.15 & < 1.50
Poor	≥ 1.50

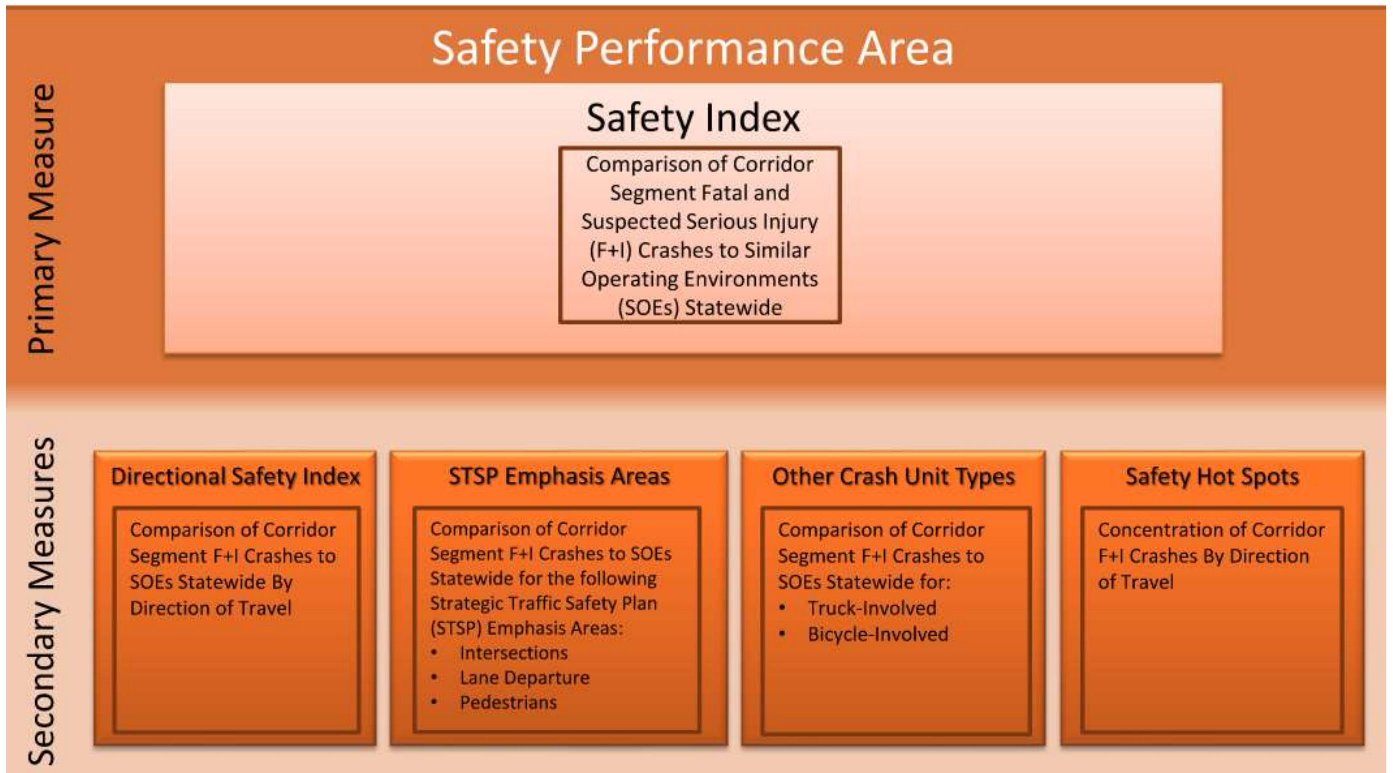
Performance Level	Percent Bicycle Accommodation
Good	≥ 90%
Fair	> 60% & ≤ 90%
Poor	< 60%

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 suspected serious injury crashes, the relative cost of those types of crashes, and crash occurrences on similar roadways in Arizona. According to ADOT's 2018 Highway Safety Improvement Program Manual, fatal crashes have an estimated cost that is 17.3 times the estimated cost of suspected serious injury crashes ($9.5 million compared to $550,000).

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

*CSS = 17.3 * (Normalized Fatal Crash Rate + Frequency) + (Normalized Suspected Serious 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	0.92	1.08
2 or 3 or 4 Lane Divided Highway	0.81	1.19
4 or 5 Lane Undivided Highway	0.78	1.22
6 Lane Highway	0.76	1.24
Rural 4 Lane Freeway with Daily Volume < 25,000	0.84	1.16
Rural 4 Lane Freeway with Daily Volume > 25,000	0.78	1.22
Urban 4 Lane Freeway	0.73	1.27
Urban or Rural 6 Lane Freeway	0.65	1.35
Urban > 6 Lane Freeway	0.89	1.11

** 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 suspected serious 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 suspected serious 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 suspected serious injury crashes:

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

Directional Safety Index: The Directional 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 suspected serious 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”

STSP Emphasis Areas: ADOT’s 2019 STSP identifies several emphasis areas for reducing fatal and suspected serious injury crashes. The three relevant STSP emphasis areas relate to crashes involving:

- Intersections
- Lane departures
- Pedestrians

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

The STSP emphasis areas performance is calculated using the following formula:

% Crashes Involving STSP Emphasis Area = Segment Crashes Involving STSP Emphasis Area / Total Segment Crashes

The percentage of total crashes involving STSP 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 STSP emphasis areas, the more the frequency of crashes involving STSP 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 STSP emphasis areas performance depends on the crash history on similar statewide operating environments, as shown in the tables below:

Similar Operating Environment	Crashes at Intersections	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	11.2%	15.6%
2 or 3 or 4 Lane Divided Highway	23.4%	29.3%
4 or 5 Lane Undivided Highway	43.8%	49.5%
6 Lane Highway	57.8%	73.2%
Rural 4 Lane Freeway with Daily Volume < 25,000	0.00%	0.00%
Rural 4 Lane Freeway with Daily Volume > 25,000	0.00%	0.00%
Urban 4 Lane Freeway	0.00%	0.00%
Urban or Rural 6 Lane Freeway	0.00%	0.00%
Urban > 6 Lane Freeway	0.00%	0.00%

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

Similar Operating Environment	Crashes Involving Lane Departures	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	66.9%	74.5%
2 or 3 or 4 Lane Divided Highway	56.4%	65.0%
4 or 5 Lane Undivided Highway	21.1%	32.1%
6 Lane Highway	11.7%	38.1%
Rural 4 Lane Freeway with Daily Volume < 25,000	72.8%	76.4%
Rural 4 Lane Freeway with Daily Volume > 25,000	69.0%	77.5%
Urban 4 Lane Freeway	60.6%	78.1%
Urban or Rural 6 Lane Freeway	55.7%	62.9%
Urban > 6 Lane Freeway	40.4%	43.2%

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

Similar Operating Environment	Crashes Involving Pedestrians	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	3.8%	7.2%
2 or 3 or 4 Lane Divided Highway	2.4%	3.6%
4 or 5 Lane Undivided Highway	8.8%	13.5%
6 Lane Highway	0.4%	11.9%
Rural 4 Lane Freeway with Daily Volume < 25,000	1.0%	3.3%
Rural 4 Lane Freeway with Daily Volume > 25,000	0.7%	4.7%
Urban 4 Lane Freeway	0.0%	4.9%
Urban or Rural 6 Lane Freeway	4.0%	7.9%
Urban > 6 Lane Freeway	1.6%	4.7%

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

The STSP emphasis area secondary safety performance measures for the Safety performance area include proportions of specific types of crashes within the total fatal and suspected serious injury crash frequencies. This more detailed categorization of fatal and suspected serious 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 STSP emphasis area secondary safety performance measures. If any of these criteria are met for a segment, that segment has "insufficient data" to reliably rate that STSP emphasis area performance:

- If the crash sample size (total fatal plus suspected serious 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 any of the STSP emphasis area performance measures is less than two crashes over the five-year analysis period, that entire STSP emphasis area performance measure has "insufficient data" and performance ratings are unreliable.

Other Crash Unit Types: Other crash unit types of interest are:

- Truck-involved crashes
- Bicycle-involved crashes

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

The crash unit type 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 each crash unit type 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.

<u>Scoring:</u>

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.

Similar Operating Environment	Crashes Involving Trucks	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	4.2%	8.0%
2 or 3 or 4 Lane Divided Highway	3.7%	9.9%
4 or 5 Lane Undivided Highway	0.8%	5.5%
6 Lane Highway	4.3%	7.5%
Rural 4 Lane Freeway with Daily Volume < 25,000	19.0%	22.5%
Rural 4 Lane Freeway with Daily Volume > 25,000	8.5%	18.0%
Urban 4 Lane Freeway	6.9%	12.4%
Urban or Rural 6 Lane Freeway	5.0%	12.9%
Urban > 6 Lane Freeway	1.9%	5.1%

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

Similar Operating Environment	Crashes Involving Bicycles	
	Lower Limit of Average*	Upper Limit of Average*
2 or 3 Lane Undivided Highway	0.0%	3.3%
2 or 3 or 4 Lane Divided Highway	0.0%	2.2%
4 or 5 Lane Undivided Highway	0.5%	3.8%
6 Lane Highway	0.0%	7.2%
Rural 4 Lane Freeway with Daily Volume < 25,000	0.0%	0.9%
Rural 4 Lane Freeway with Daily Volume > 25,000	0.0%	0.0%
Urban 4 Lane Freeway	0.0%	0.0%
Urban or Rural 6 Lane Freeway	0.0%	1.3%
Urban > 6 Lane Freeway	0.0%	0.0%

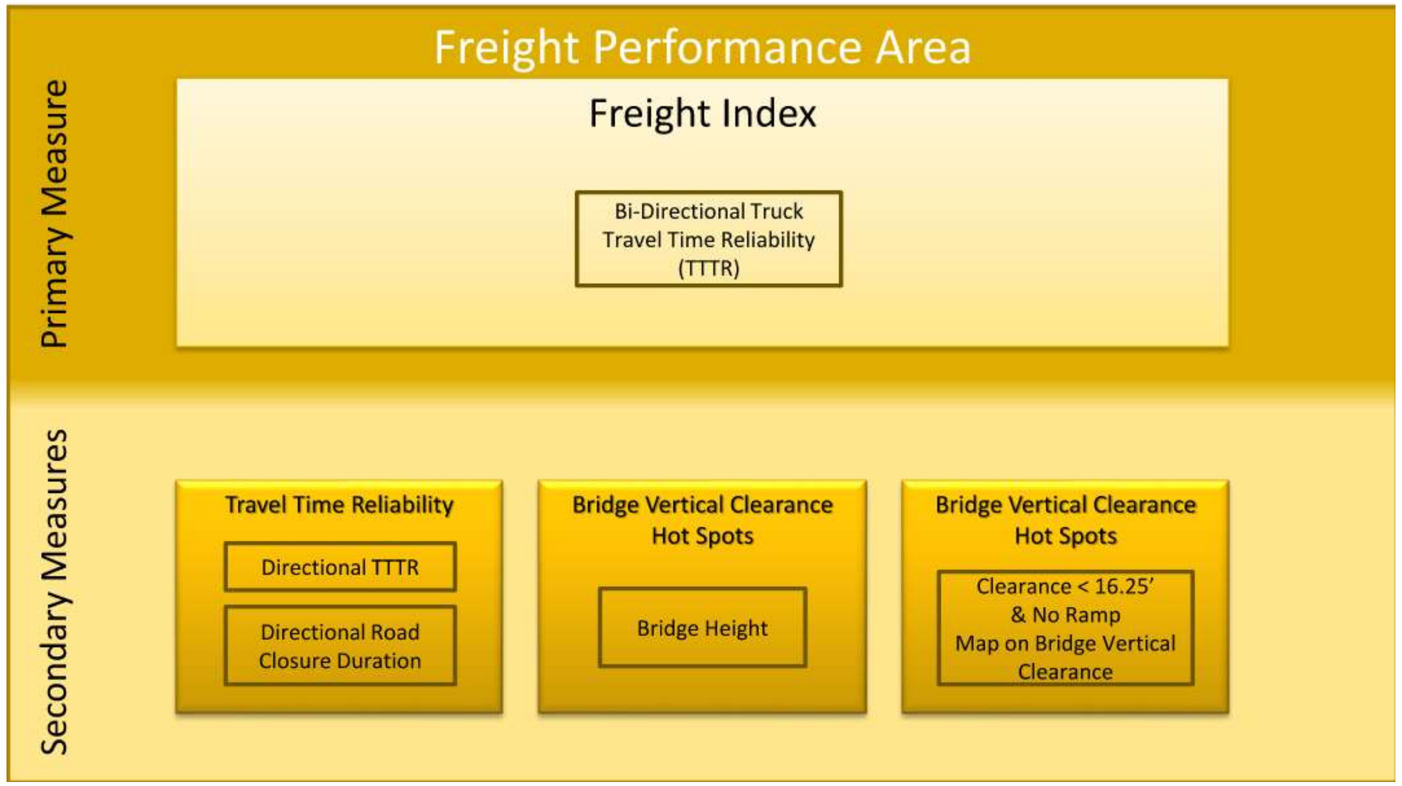
** Lower/upper limit of Average calculated as one standard deviation below/above the Mean*

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

Safety Hot Spots: A hot spot analysis was conducted that identified abnormally high concentrations of fatal and suspected serious 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 bi-directional truck travel time reliability (TTTR) for truck travel. The industry standard definition for the Truck Travel Time Reliability (TTTR) is the ratio of the 95th percentile travel time to average (50th percentile) travel time for trucks.

Using INRIX 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).

The highest calculated value of the four time periods is defined as the TTTR for that data point. The weighted average TTTR is calculated within each segment based on the number of data points collected and the length associated with the TMC location. The value of the weighted average TTTR across each entry is used as the TTTR for each respective segment within the corridor.

For each corridor segment, the TTTR is calculated for each direction of travel and then averaged to create a bi-directional TTTR. The Freight Index is equal to the average bi-directional TTTR for the segment.

The scale for rating the Freight Index differs between uninterrupted and interrupted flow facilities.

Secondary Freight Measures

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

- Travel Time Reliability
  - Directional Truck Travel Time Reliability
  - Closure Duration
- Bridge Vertical Clearance
- Bridge Vertical Clearance Hot Spots

Travel Time Reliability: Travel time reliability is a secondary measure that includes two indicators. The two indicators are the directional Truck Travel Time Reliability (TTTR) and the duration a piece of a corridor is closed for any specific reason.

Truck Travel Time Reliability: The performance measure for truck travel time reliability is directional TTTR. The industry standard definition for TTTR is the ratio of 95th percentile travel time to average (50th percentile) travel time for trucks for a given corridor segment in a specific direction.

Using INRIX 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). The highest value of the four time periods calculation is defined as the TTTR for that data point. The weighted average TTTR is calculated within each segment based on the number of data points collected and the length associated with the TMC location. The value of the weighted average TTTR across each entry is used as the TTTR for each respective segment within the corridor.

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 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.

<u>Scoring:</u>

Performance Level	Freight Index	
	Uninterrupted Flow Facilities	Interrupted Flow Facilities
Good	< 1.15	< 1.45
Fair	1.15 – 1.35	1.45 – 1.85
Poor	> 1.35	> 1.85

Performance Level	TTTR	
	Uninterrupted Flow Facilities	Interrupted Flow Facilities
Good	< 1.15	< 1.45
Fair	1.15 – 1.35	1.45 – 1.85
Poor	> 1.35	> 1.85

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

				Direction 1 (Eastbound)				Direction 2 (Westbound)				Direction 1		Direction 2		Composite		Pavement	% Pavement Failure	
				# of Lanes	IRI	Cracking	Rutting	# of Lanes	IRI	Cracking	Rutting	PSR	PDI	PSR	PDI	Dir 1 (EB)	Dir 2 (WB)	Index	Dir 1 (EB)	Dir 2 (WB)
Segment 1		***Interstate?***		**Yes**																
Milepost	196	to	197	2	-	4.70	0.23	2	-	6.50	0.29	-	4.05	-	3.76	-	-		2	2
Milepost	197	to	198	2	101.57	3.78	0.25	2	94.92	4.11	0.31	3.40	4.14	3.49	4.01	3.40	3.64		0	0
Milepost	198	to	199	2	105.86	3.70	0.18	2	71.74	1.18	0.24	3.34	4.24	3.81	4.53	3.34	4.02		2	0
Milepost	199	to	200	2	76.51	1.70	0.23	2	100.24	2.70	0.31	3.74	4.47	3.42	4.19	3.96	3.65		0	0
Milepost	200	to	201	2	75.03	6.70	0.20	2	78.52	2.10	0.23	3.76	3.85	3.71	4.40	3.79	3.92		0	0
Milepost	201	to	202	2	129.96	2.90	0.16	2	100.44	7.50	0.13	3.05	4.36	3.41	3.83	3.05	3.54		2	0
			Total	12				12												8
			Weighted Average									2.88	4.18	2.97	4.12	2.92	3.13			
			Factor									1.00		1.00						
			Indicator Score									2.88		2.97						33.3%
			Pavement Index															3.03		
Segment 2		***Interstate?***		**Yes**																
Milepost	202	to	203	2	150.46	6.00	0.14	2	131.61	5.50	0.13	2.82	3.99	3.03	4.05	2.82	3.03		2	2
Milepost	203	to	204	2	152.73	7.50	0.14	2	134.37	6.10	0.16	2.80	3.82	3.00	3.96	2.80	3.00		2	2
Milepost	204	to	205	2	117.10	8.80	0.17	2	96.12	5.10	0.17	3.20	3.67	3.47	4.07	3.20	3.65		2	0
Milepost	205	to	206	2	60.93	1.60	0.14	2	56.10	4.90	0.17	3.97	4.58	4.04	4.10	4.15	4.08		0	0
Milepost	206	to	207	2	40.15	0.10	0.17	2	35.89	0.33	0.18	4.29	-	4.36	4.77	-	4.65		0	0
Milepost	207	to	208	2	57.73	0.60	0.15	2	41.70	0.18	0.15	4.02	4.76	4.27	4.84	4.24	4.67		0	0
Milepost	208	to	209	2	44.14	0.30	0.18	2	41.02	0.90	0.19	4.23	4.79	4.28	4.65	4.62	4.54		0	0
Milepost	209	to	210	2	43.34	0.40	0.20	2	34.02	0.30	0.19	4.24	4.73	4.39	4.78	4.58	4.66		0	0
Milepost	210	to	211	2	43.98	0.50	0.20	2	67.50	5.80	0.13	4.23	4.71	3.87	4.02	4.57	3.97		0	0
Milepost	211	to	212	2	46.92	0.20	0.16	2	45.17	0.10	0.18	4.18	4.83	4.21	-	4.64	-		0	0
			Total	20				20												10
			Weighted Average									3.80	3.99	3.89	3.92	3.56	3.63			
			Factor									1.00		1.00						
			Indicator Score									3.80		3.89						25.0%
			Pavement Index															3.59		
Segment 3		***Interstate?***		**Yes**																
Milepost	212	to	213	2	32.52	0.10	0.14	2	36.05	0.10	0.18	4.42	-	4.36	-	-	-		0	0
Milepost	213	to	214	2	35.09	0.10	0.20	2	35.34	0.10	0.16	4.38	-	4.37	-	-	-		0	0
Milepost	214	to	215	2	33.72	0.10	0.15	2	39.01	0.10	0.16	4.40	-	4.31	-	-	-		0	0
Milepost	215	to	216	2	34.12	0.10	0.15	2	34.76	0.10	0.20	4.39	-	4.38	-	-	-		0	0
Milepost	216	to	217	2	31.56	0.10	0.16	2	35.48	0.10	0.18	4.43	-	4.37	-	-	-		0	0
Milepost	217	to	218	2	40.21	0.10	0.17	2	49.16	2.10	0.16	4.29	-	4.15	4.48	-	4.38		0	0
Milepost	218	to	219	2	45.42	1.30	0.15	2	82.25	3.40	0.13	4.21	4.62	3.66	4.32	4.49	3.86		0	0
Milepost	219	to	220	2	63.77	4.40	0.17	2	34.80	0.20	0.11	3.92	4.15	4.38	4.89	4.08	4.74		0	0
Milepost	220	to	221	2	41.97	1.10	0.17	2	28.79	0.10	0.09	4.26	4.63	4.48	-	4.52	-		0	0
Milepost	221	to	222	2	45.76	1.90	0.18	2	30.81	0.10	0.11	4.20	4.49	4.45	-	4.41	-		0	0
Milepost	222	to	223	2	29.26	0.20	0.14	2	30.82	0.10	0.14	4.47	4.86	4.45	-	4.74	-		0	0
Milepost	223	to	224	2	31.73	1.40	0.13	2	31.30	0.10	0.12	4.43	4.62	4.44	-	4.57	-		0	0
Milepost	224	to	225	2	37.81	0.30	0.12	2	45.74	0.30	0.10	4.33	4.86	4.20	4.87	4.70	4.67		0	0
Milepost	225	to	226	2	40.36	0.20	0.10	2	38.79	0.10	0.14	4.29	4.90	4.31	-	4.72	-		0	0
Milepost	226	to	227	2	32.97	0.10	0.11	2	37.59	0.10	0.16	4.41	-	4.33	-	-	-		0	0
Milepost	227	to	228	2	31.34	0.10	0.14	2	37.21	0.10	0.14	4.44	-	4.34	-	-	-		0	0
Milepost	228	to	229	2	29.38	0.10	0.12	2	36.33	0.10	0.14	4.47	-	4.36	-	-	-		0	0
Milepost	229	to	230	2	52.43	1.60	0.11	2	46.96	1.60	0.13	4.10	4.61	4.18	4.59	4.45	4.47		0	0
Milepost	230	to	231	2	58.03	17.90	0.18	2	51.56	19.00	0.17	4.01	2.84	4.11	2.76	3.19	3.17		2	2
Milepost	231	to	232	2	52.34	18.80	0.20	2	54.02	20.30	0.14	4.10	2.75	4.07	2.67	2.75	2.67		2	2
Milepost	232	to	233	2	65.89	20.00	0.24	2	70.04	17.50	0.17	3.89	2.62	3.83	2.88	2.62	3.16		2	2
Milepost	233	to	234	2	65.11	18.50	0.23	2	50.62	17.80	0.17	3.90	2.75	4.13	2.86	2.75	3.24		2	2
			Total	44				44												16
			Weighted Average									4.26	2.40	4.26	1.56	2.36	1.56			
			Factor									1.00		1.00						
			Indicator Score									4.26		4.26						18.2%
			Pavement Index															1.96		

				Direction 1 (Eastbound)				Direction 2 (Westbound)				Direction 1		Direction 2		Composite		Pavement	% Pavement Failure	
				# of Lanes	IRI	Cracking	Rutting	# of Lanes	IRI	Cracking	Rutting	PSR	PDI	PSR	PDI	Dir 1 (EB)	Dir 2 (WB)	Index	Dir 1 (EB)	Dir 2 (WB)
Segment 4		***Interstate?***		**Yes**																
Milepost	234	to	235	2	58.05	17.90	0.18	2	53.92	17.20	0.18	4.01	2.84	4.07	2.90	3.19	3.25		2	2
Milepost	235	to	236	2	68.66	16.50	0.17	2	51.47	18.90	0.16	3.85	2.96	4.11	2.77	3.23	3.18		2	2
Milepost	236	to	237	2	45.33	15.20	0.13	2	52.67	18.10	0.19	4.21	3.10	4.09	2.82	3.43	3.20		2	2
Milepost	237	to	238	2	73.20	11.00	0.14	2	34.98	19.80	0.18	3.79	3.47	4.38	2.69	3.56	2.69		2	2
Milepost	238	to	239	2	58.85	16.90	0.16	2	38.77	17.60	0.21	4.00	2.94	4.32	2.84	3.26	3.28		2	2
Milepost	239	to	240	2	77.71	18.40	0.10	2	53.31	17.33	0.17	3.72	2.83	4.08	2.89	3.10	3.25		2	2
Milepost	240	to	241	2	44.55	4.50	0.20	2	65.90	4.63	0.17	4.22	4.11	3.89	4.13	4.14	4.06		0	0
Milepost	241	to	242	2	77.64	8.20	0.22	2	73.23	8.00	0.23	3.72	3.68	3.79	3.69	3.71	3.72		0	0
Milepost	242	to	243	2	44.17	3.90	0.20	2	89.49	3.90	0.20	4.23	4.19	3.56	4.18	4.20	3.75		0	0
Milepost	243	to	244	2	46.13	8.00	0.19	2	87.58	2.40	0.21	4.20	3.73	3.58	4.38	3.87	3.82		0	0
Milepost	244	to	245	2	51.72	1.00	0.18	2	43.31	3.30	0.21	4.11	4.65	4.24	4.26	4.48	4.25		0	0
Milepost	245	to	246	2	67.29	3.90	0.19	2	41.11	7.30	0.23	3.87	4.19	4.28	3.76	3.97	3.92		0	0
			Total	24				24												24
			Weighted Average									3.99	3.56	4.03	3.44	3.68	3.53			
			Factor									1.00		1.00						
			Indicator Score									3.99		4.03						50.0%
			Pavement Index															3.60		
Segment 5		***Interstate?***		**Yes**																
Milepost	246	to	247	2	65.78	6.09	0.20	2	46.71	12.40	0.24	3.89	3.93	4.19	3.25	3.92	3.53		0	2
Milepost	247	to	248	2	64.56	5.78	0.21	2	41.79	10.60	0.20	3.91	3.94	4.27	3.46	3.93	3.70		0	2
Milepost	248	to	249	2	88.88	8.60	0.21	2	58.83	12.20	0.20	3.57	3.65	4.00	3.31	3.59	3.52		0	2
Milepost	249	to	250	2	62.17	9.60	0.21	2	74.51	9.80	0.22	3.95	3.55	3.77	3.52	3.67	3.59		0	0
Milepost	250	to	251	2	34.67	1.56	0.14	2	40.58	9.11	0.15	4.38	4.59	4.29	3.65	4.53	3.84		0	0
Milepost	251	to	252	2	32.95	0.10	0.13	2	33.68	0.10	0.12	4.41	-	4.40	-	-	-		0	0
Milepost	252	to	253	2	42.70	0.10	0.14	2	35.51	0.10	0.11	4.25	-	4.37	-	-	-		0	0
Milepost	253	to	254	2	39.92	0.10	0.08	2	43.52	0.10	0.09	4.30	-	4.24	-	-	-		0	0
Milepost	254	to	255	2	42.67	0.30	0.11	2	37.40	0.10	0.11	4.25	4.86	4.34	-	4.68	-		0	0
Milepost	255	to	256	2	45.62	0.10	0.10	2	34.97	0.10	0.11	4.20	-	4.38	-	-	-		0	0
Milepost	256	to	257	2	32.93	0.10	0.17	2	37.20	0.10	0.16	4.41	-	4.34	-	-	-		0	0
Milepost	257	to	258	2	38.88	0.10	0.17	2	30.82	0.10	0.15	4.31	-	4.45	-	-	-		0	0
			Total	24				24												6
			Weighted Average									4.15	2.04	4.25	1.43	2.03	1.52			
			Factor									1.00		1.00						
			Indicator Score									4.15		4.25						12.5%
			Pavement Index															1.77		
Segment 6		***Interstate?***		**Yes**																
Milepost	258	to	320	2	30.77	0.10	0.18	2	27.74	0.11	0.14	4.45	-	4.50	4.88	-	4.77		0	0
Milepost	259	to	321	2	108.56	9.75	0.25	2	123.46	21.00	0.16	3.31	3.49	3.13	2.61	3.31	3.13		2	2
Milepost	260	to	322	2	77.57	15.50	0.20	2	97.49	15.00	0.17	3.72	3.02	3.45	3.09	3.23	3.34		2	2
Milepost	261	to	323	2	78.77	8.40	0.25	2	67.36	5.10	0.15	3.71	3.62	3.87	4.08	3.64	4.02		0	0
Milepost	262	to	324	2	94.66	8.90	0.27	2	77.95	12.36	0.15	3.49	3.55	3.72	3.34	3.51	3.45		0	2
Milepost	263	to	325	2	64.26	10.10	0.21	2	78.59	14.10	0.16	3.92	3.50	3.71	3.18	3.62	3.34		2	2
Milepost	264	to	326	2	70.10	9.80	0.21	2	82.85	16.00	0.18	3.83	3.53	3.65	2.99	3.62	3.19		0	2
Milepost	265	to	327	2	58.70	11.00	0.16	2	76.07	18.10	0.14	4.00	3.45	3.74	2.85	3.62	3.12		2	2
Milepost	266	to	328	2	75.07	15.90	0.17	2	110.83	15.60	0.14	3.76	3.01	3.28	3.06	3.24	3.28		2	2
Milepost	267	to	329	2	97.10	11.10	0.20	2	82.42	15.17	0.14	3.46	3.41	3.66	3.09	3.44	3.26		2	2
Milepost	268	to	321	2	36.53	0.30	0.13	2	37.38	0.10	0.10	4.35	4.85	4.34	-	4.70	-		0	0
Milepost	269	to	322	2	59.18	0.10	0.13	2	43.84	0.10	0.14	3.99	-	4.23	-	-	-		0	0
			Total	24				24												28
			Weighted Average									3.83	2.95	3.77	2.76	2.99	2.91			
			Factor									1.00		1.00						
			Indicator Score									3.83		3.77						58.3%
			Pavement Index															2.95		

				Direction 1 (Eastbound)				Direction 2 (Westbound)				Direction 1		Direction 2		Composite		Pavement	% Pavement Failure	
				# of Lanes	IRI	Cracking	Rutting	# of Lanes	IRI	Cracking	Rutting	PSR	PDI	PSR	PDI	Dir 1 (EB)	Dir 2 (WB)	Index	Dir 1 (EB)	Dir 2 (WB)
Segment 7		***Interstate?***		**Yes**																
Milepost	270	to	331	2	60.25	9.00	0.23	2	40.67	0.10	0.13	3.98	3.59	4.28	-	3.70	-		0	0
Milepost	271	to	332	2	47.13	0.80	0.16	2	101.98	6.25	0.14	4.18	4.70	3.39	3.96	4.55	3.39		0	0
Milepost	272	to	333	2	42.94	0.10	0.18	2	57.80	7.50	0.14	4.25	-	4.01	3.82	-	3.88		0	0
Milepost	273	to	334	2	41.72	0.10	0.16	2	46.23	0.10	0.13	4.27	-	4.19	-	-	-		0	0
Milepost	274	to	335	2	46.44	0.10	0.16	2	46.10	0.10	0.14	4.19	-	4.20	-	-	-		0	0
Milepost	275	to	336	2	51.32	0.10	0.15	2	46.32	0.10	0.11	4.11	-	4.19	-	-	-		0	0
Milepost	276	to	337	2	45.89	0.10	0.13	2	35.67	0.10	0.12	4.20	-	4.37	-	-	-		0	0
Milepost	277	to	338	2	65.65	6.55	0.24	2	86.08	13.70	0.25	3.90	3.83	3.60	3.12	3.85	3.27		0	2
Milepost	278	to	339	2	144.50	22.11	0.31	2	84.33	17.40	0.25	2.89	2.38	3.63	2.81	2.89	3.06		2	2
Milepost	279	to	340	2	74.88	22.82	0.33	2	77.67	22.20	0.38	3.76	2.29	3.72	2.26	2.29	2.26		2	2
Milepost	280	to	341	2	63.14	16.11	0.30	2	97.83	18.70	0.26	3.93	2.85	3.45	2.70	3.18	2.70		2	2
Milepost	281	to	332	2	69.05	17.36	0.31	2	69.81	18.50	0.27	3.85	2.73	3.83	2.70	2.73	2.70		2	2
Milepost	282	to	333	2	74.99	19.78	0.32	2	56.58	14.50	0.26	3.76	2.54	4.03	3.05	2.54	3.34		2	2
Milepost	283	to	334	2	60.60	2.73	0.34	2	49.15	0.30	0.27	3.97	4.13	4.15	4.65	4.09	4.50		0	0
Milepost	284	to	335	2	65.86	0.40	0.39	2	59.57	1.70	0.32	3.89	4.40	3.99	4.31	4.05	4.22		0	0
Milepost	285	to	336	2	52.23	1.40	0.28	2	49.71	5.70	0.24	4.10	4.44	4.14	3.92	4.34	3.99		0	0
			Total	32				32												22
			Weighted Average									3.95	2.37	3.95	2.33	2.39	2.33			
			Factor									1.00		1.00						
			Indicator Score									3.95		3.95						**34.4%**
			Pavement Index															2.36		
Segment 8		***Interstate?***		**Yes**																
Milepost	286	to	287	2	49.08	0.10	0.20	2	47.25	6.80	0.19	4.15	-	4.18	3.86	-	3.95		0	0
Milepost	287	to	288	2	85.24	5.20	0.33	2	67.98	10.10	0.23	3.62	3.85	3.86	3.47	3.69	3.59		0	2
Milepost	288	to	289	2	65.49	14.00	0.38	2	62.26	6.80	0.24	3.90	2.92	3.95	3.80	3.21	3.85		2	0
Milepost	289	to	290	2	63.18	0.10	0.30	2	68.09	0.60	0.37	3.93	-	3.86	4.40	-	4.02		0	0
			Total	8				8												4
			Weighted Average									3.90	1.69	3.96	3.88	1.72	3.85			
			Factor									1.00		1.00						
			Indicator Score									3.90		3.96						**25.0%**
			Pavement Index															2.79		
Segment 9		***Interstate?***		**Yes**																
Milepost	290	to	291	2	52.17	0.10	0.14	2	46.45	0.10	0.18	4.10	-	4.19	-	-	-		0	0
Milepost	291	to	292	2	35.84	0.10	0.11	2	40.06	1.00	0.12	4.36	-	4.29	4.71	-	4.58		0	0
Milepost	292	to	293	2	41.00	0.10	0.10	2	45.40	0.30	0.11	4.28	-	4.21	4.86	-	4.67		0	0
Milepost	293	to	294	2	48.52	0.30	0.13	2	43.17	0.20	0.12	4.16	4.84	4.24	4.88	4.64	4.69		0	0
Milepost	294	to	295	2	55.41	3.40	0.21	2	52.03	3.20	0.15	4.05	4.24	4.10	4.33	4.18	4.26		0	0
Milepost	295	to	296	2	41.58	0.60	0.18	2	46.86	3.10	0.12	4.27	4.72	4.18	4.37	4.58	4.31		0	0
Milepost	296	to	297	2	42.82	0.10	0.14	2	42.85	3.30	0.12	4.25	-	4.25	4.34	-	4.31		0	0
Milepost	297	to	298	2	44.51	0.09	0.10	2	26.93	0.40	0.11	4.22	4.92	4.51	4.84	4.71	4.74		0	0
Milepost	298	to	299	2	54.82	0.20	0.15	2	37.86	0.10	0.16	4.06	4.84	4.33	-	4.29	-		0	0
Milepost	299	to	300	2	24.15	0.10	0.14	2	26.57	0.10	0.14	4.56	-	4.52	-	-	-		0	0
Milepost	300	to	301	2	30.91	0.10	0.11	2	38.16	0.10	0.14	4.45	-	4.33	-	-	-		0	0
Milepost	301	to	302	2	37.31	0.10	0.12	2	31.57	0.10	0.14	4.34	-	4.43	-	-	-		0	0
Milepost	302	to	303	2	34.99	0.10	0.14	2	38.45	0.10	0.13	4.38	-	4.32	-	-	-		0	0
Milepost	303	to	304	2	45.23	1.90	0.10	2	37.93	2.00	0.13	4.21	4.56	4.33	4.52	4.46	4.46		0	0
			Total	28				28												0
			Weighted Average									4.26	2.01	4.30	2.63	1.92	2.57			
			Factor									1.00		1.00						
			Indicator Score									4.26		4.30						**0.0%**
			Pavement Index															2.25		

				Direction 1 (Eastbound)				Direction 2 (Westbound)				Direction 1		Direction 2		Composite		Pavement	% Pavement Failure	
				# of Lanes	IRI	Cracking	Rutting	# of Lanes	IRI	Cracking	Rutting	PSR	PDI	PSR	PDI	Dir 1 (EB)	Dir 2 (WB)	Index	Dir 1 (EB)	Dir 2 (WB)
Segment 10		***Interstate?***		**Yes**																
Milepost	304	to	305	2	29.20	0.50		2	27.03	0.10		4.47	4.78	4.51	-	4.69	-		0	0
Milepost	305	to	306	2	32.12	0.10		2	29.53	0.60		4.43	-	4.47	4.75	-	4.67		0	0
Milepost	306	to	307	2	26.52	0.10		2	27.31	0.30		4.52	-	4.51	4.84	-	4.74		0	0
Milepost	307	to	308	2	29.40	0.10		2	29.73	0.10		4.47	-	4.47	-	-	-		0	0
Milepost	308	to	309	2	35.92	0.10		2	32.67	0.30		4.36	-	4.42	4.84	-	4.72		0	0
Milepost	309	to	310	2	27.82	0.10		2	30.00	0.10		4.50	-	4.46	-	-	-		0	0
Milepost	310	to	311	2	29.39	0.20		2	35.49	1.00		4.47	4.88	4.37	4.66	4.76	4.57		0	0
Milepost	311	to	312	2	48.32	1.70		2	46.79	1.20		4.16	4.51	4.19	4.61	4.41	4.48		0	0
Milepost	312	to	313	2	46.45	2.60		2	38.62	0.10		4.19	4.35	4.32	-	4.30	-		0	0
Milepost	313	to	314	2	44.83	0.20		2	48.08	0.40		4.22	4.88	4.17	4.81	4.68	4.62		0	0
Milepost	314	to	315	2	38.85	0.10		2	34.58	0.80		4.31	-	4.38	4.70	-	4.61		0	0
Milepost	315	to	316	2	42.61	0.10		2	38.16	0.60		4.25	-	4.33	4.75	-	4.63		0	0
Milepost	316	to	317	2	46.07	0.10		2	52.11	1.90		4.20	-	4.10	4.47	-	4.36		0	0
Milepost	317	to	318	2	39.00	0.10		2	35.28	0.10		4.31	-	4.37	-	-	-		0	0
Milepost	318	to	319	2	38.86	0.10		2	47.93	0.10		4.31	-	4.17	-	-	-		0	0
Milepost	319	to	320	2	37.01	0.40		2	67.80	13.50		4.34	4.81	3.86	3.08	4.67	3.31		0	2
Milepost	320	to	321	2	79.85	10.80		2	76.96	24.50		3.69	3.34	3.73	2.15	3.45	2.15		2	2
Milepost	321	to	322	2	103.40	19.50		2	90.72	31.60		3.38	2.55	3.54	1.63	2.55	1.63		2	2
Milepost	322	to	323	2	97.52	11.60		2	131.89	19.40		3.45	3.26	3.03	2.56	3.39	3.03		2	2
Milepost	323	to	324	2	102.39	25.50		2	106.16	25.10		3.39	2.07	3.34	2.11	2.07	2.11		2	2
Milepost	324	to	325	2	102.02	24.00		2	91.50	25.60		3.39	2.19	3.53	2.07	2.19	2.07		2	2
Milepost	325	to	326	2	62.48	17.40		2	70.83	20.90		3.94	2.73	3.82	2.43	2.73	2.43		2	2
			Total	44				44												26
			Weighted Average									4.13	2.02	4.09	2.66	2.00	2.64			
			Factor									1.00		1.00						
			Indicator Score									4.13		4.09						29.5%
			Pavement Index															2.32		
Segment 11		***Interstate?***		**Yes**																
Milepost	326	to	327	2	74.40	4.30		2	67.17	19.90		3.77	4.10	3.87	2.52	3.87	2.52		0	2
Milepost	327	to	328	2	73.83	19.20		2	65.09	18.10		3.78	2.57	3.90	2.67	2.57	2.67		2	2
Milepost	328	to	329	2	84.59	17.90		2	86.15	20.40		3.63	2.68	3.60	2.48	2.68	2.48		2	2
Milepost	329	to	330	2	67.87	17.30		2	141.26	18.40		3.86	2.74	2.92	2.64	2.74	2.92		2	2
Milepost	330	to	331	2	61.26	12.50		2	89.26	23.60		3.96	3.17	3.56	2.22	3.41	2.22		2	2
Milepost	331	to	332	2	38.88	2.10		2	57.13	12.10		4.31	4.44	4.02	3.21	4.40	3.46		0	2
Milepost	332	to	333	2	42.45	4.50		2	43.71	5.80		4.26	4.07	4.23	3.90	4.12	4.00		0	0
Milepost	333	to	334	2	43.45	1.80		2	44.62	3.70		4.24	4.49	4.22	4.18	4.42	4.19		0	0
Milepost	334	to	335	2	41.96	8.80		2	47.79	4.10		4.26	3.55	4.17	4.12	3.76	4.14		0	0
Milepost	335	to	336	2	52.64	15.50		2	50.96	8.70		4.09	2.89	4.12	3.56	3.25	3.73		2	0
Milepost	336	to	337	2	63.46	17.60		2	54.14	7.60		3.93	2.71	4.07	3.68	2.71	3.80		2	0
Milepost	337	to	338	2	50.22	16.70		2	47.71	0.50		4.13	2.79	4.17	4.78	3.19	4.60		2	0
Milepost	338	to	339	2	42.61	6.90		2	48.54	1.30		4.25	3.77	4.16	4.59	3.91	4.46		0	0
Milepost	339	to	340	2	54.19	3.60		2	45.63	1.10		4.07	4.20	4.20	4.63	4.16	4.50		0	0
Milepost	340	to	341	2	75.42	12.90		2	80.45	6.20		3.75	3.13	3.68	3.85	3.32	3.73		2	0
Milepost	341	to	342	2	50.50	13.10		2	46.63	0.90		4.13	3.12	4.19	4.68	3.42	4.53		2	0
			Total	32				32												30
			Weighted Average									4.03	3.40	3.94	3.61	3.50	3.62			
			Factor									1.00		1.00						
			Indicator Score									4.03		3.94						46.9%
			Pavement Index															3.56		

Bridge Performance Area Data

Structure Name (A209)	Structure # (N8)	Milepost (A232)	Area (A225)	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 1												
Lone Tree Rd OP WB	1181	196.26	4355	78.80	5.00	5.00	6.00	5.00	5.0	0		
Lone Tree Rd OP EB	1180	196.26	4355.0	78.70	5.00	5.00	6.00	5.00	5.0	0		
Rio De Flag Br WB	1483	197.43	20347.0	96.30	7.00	8.00	7.00	7.00	7.0	0		
Rio De Flag Br EB	1482	197.43	19594.0	96.40	7.00	8.00	7.00	7.00	7.0	0		
Butler Ave TI OP EB	2076	198.28	11140.0	94.40	6.00	7.00	7.00	7.00	6.0	0		
Butler Ave TI OP WB	2077	198.28	11365.0	94.40	6.00	7.00	7.00	7.00	6.0	0		
4th St UP EB	20197	199.30	13082.0	98.00	8.00	8.00	8.00	8.00	8.0	0		
4th St UP WB	20198	199.30	13082.0	98.00	8.00	8.00	8.00	8.00	8.0	0		
Country Club Rd TI UP	1926	201.10	28626.0	94.00	5.00	7.00	6.00	6.00	5.0	0		
Total			125,946									
Weighted Average				94.59					6.44	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**94.59**						**0.00%**	**5**	
Bridge Index									**6.44**			
Segment 2												
Walnut Can TI UP WB	1271	204.87	5069	91.90	6.00	6.00	7.00	6.00	6.0	0		
Walnut Can TI UP EB	1270	204.87	5069	90.90	5.00	6.00	6.00	6.00	5.0	0		
Cosnino Rd TI UP	1361	207.24	9703	83.40	5.00	6.00	7.00	6.00	5.0	0		
Walnut Canyon Bridge EB	2588	210.24	12678	96.90	6.00	7.00	6.00	6.00	6.0	0		
Walnut Canyon Bridge WB	2431	210.24	13831	97.20	6.00	7.00	7.00	7.00	6.0	0		
Winona TI UP	1084	211.16	9230	96.00	8.00	8.00	7.00	7.00	7.0	0		
Total			55,580									
Weighted Average				93.47					5.90	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**93.47**						**0.00%**	**5**	
Bridge Index									**5.90**			
Segment 3												
Canyon Padre Br EB	1670	218.73	14344	86.10	7.00	5.00	7.00	5.00	5.0	0		
Canyon Padre Br WB	2270	218.73	20837	96.30	6.00	7.00	6.00	6.00	6.0	0		
Twin Arrows TI UP	1363	219.53	7222	87.40	8.00	7.00	6.00	6.00	6.0	0		
Babbitts Tank Br WB	1385	224.70	4431	86.10	8.00	5.00	6.00	5.00	5.0	0		
Babbitts Tank Br EB	2514	224.70	3629	96.20	5.00	7.00	7.00	7.00	5.0	0		
Buffalo Range TI OP EB	1386	225.05	4301	84.00	7.00	5.00	6.00	5.00	5.0	0		
Buffalo Range TI OP WB	1387	225.05	4301	84.00	7.00	5.00	6.00	5.00	5.0	0		
Canyon Diablo Br WB	845	229.90	8140	73.90	7.00	5.00	6.00	5.00	5.0	0		
Canyon Diablo Br EB	1671	229.90	9990	97.10	7.00	6.00	6.00	6.00	6.0	0		
Two Guns TI UP	1388	230.45	7728	100.00	8.00	7.00	6.00	6.00	6.0	0		
Meteor Crater TI UP	1389	233.70	7820	95.50	5.00	7.00	7.00	7.00	5.0	0		
Total			92,743									
Weighted Average				90.76					5.49	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**90.76**						**0.00%**	**5**	
Bridge Index									**5.49**			

Segment 4													
Sunshine BNSF RR OP WB		1390	237.10	7503	96.30	7.00	7.00	7.00	7.00	7.0	0		
Sunshine BNSF RR OP EB		1783	237.10	11029	97.30	7.00	7.00	7.00	7.00	7.0	0		
Meteor City TI OP EB		1391	239.60	4151	89.10	5.00	7.00	7.00	6.00	5.0	0		
Meteor City TI OP WB		1392	239.60	4111	89.10	5.00	7.00	7.00	6.00	5.0	0		
Leupp TI UP SR 99		1317	245.39	8473	98.70	5.00	6.00	6.00	6.00	5.0	0		
	Total			35,267									
	Weighted Average				95.50					6.05	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**95.50**						**0.00%**	**5**	
	Bridge Index									**6.05**			
Segment 5													
Tucker Flat Br WB		1318	248.99	3256	96.40	7.00	7.00	7.00	7.00	7.0	0		
Tucker Flat Br EB		336	248.99	3600	76.90	5.00	5.00	7.00	5.00	5.0	0		
West Winslow TI UP		1650	252.12	14629	99.00	5.00	6.00	7.00	6.00	5.0	0		
Cemetery Wash Br EB		1809	253.07	1627	85.10	5.00	5.00	7.00	5.00	5.0	0		
Cemetery Wash Br WB		1810	253.07	1627	85.30	5.00	5.00	7.00	5.00	5.0	0		
North Park TI OP WB		2786	253.60	10442	98.00	7.00	7.00	7.00	7.00	7.0	0		
North Park TI OP EB		2785	253.60	10442	98.00	7.00	7.00	7.00	7.00	7.0	0		
Ruby Wash Bridge WB		1782	254.64	7716	97.30	7.00	6.00	6.00	6.00	6.0	0		
Ruby Wash Bridge EB		1781	254.64	7716	97.20	7.00	6.00	6.00	6.00	6.0	0		
Maple St OP EB		1777	255.10	5040	95.20	7.00	7.00	7.00	7.00	7.0	0		
Maple St OP WB		1778	255.10	5040	95.30	7.00	7.00	7.00	7.00	7.0	0		
E Winslow OP TI EB		1779	255.75	5397	94.00	7.00	6.00	7.00	6.00	6.0	0		
E Winslow OP TI WB		1780	255.75	5397	96.00	7.00	7.00	7.00	7.00	7.0	0		
Little Colo Rv Br WB		1597	256.95	40963	84.20	5.00	6.00	5.00	5.00	5.0	0		
Little Colo Rv Br EB		1596	256.95	40963	84.10	5.00	6.00	5.00	5.00	5.0	0		
SR 87 TI UP		1598	257.82	9187	90.10	7.00	6.00	6.00	6.00	6.0	0		
	Total			173,042									
	Weighted Average				89.98					5.63	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**89.98**						**0.00%**	**5**	
	Bridge Index									**5.63**			
Segment 6													
Cottonwood Br WB		520	259.60	18170	85.20	5.00	5.00	5.00	5.00	5.0	0		
Cottonwood Br EB		519	259.60	18010	97.30	8.00	6.00	6.00	6.00	6.0	0		
Hibbard Rd TI OP EB		672	264.72	3888	92.00	6.00	6.00	7.00	6.00	6.0	0		
Hibbard Rd TI OP WB		673	264.72	3888	92.00	6.00	6.00	7.00	6.00	6.0	0		
Jackrabbit TI OP EB		849	269.97	3578	81.00	5.00	5.00	8.00	5.00	5.0	0		
Jackrabbit TI OP WB		850	269.97	3578	81.00	5.00	5.00	7.00	5.00	5.0	0		
	Total			51,112									
	Weighted Average				89.91					5.50	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**89.91**						**0.00%**	**5**	
	Bridge Index									**5.50**			

Segment 7													
Manila Wash Br WB		852	271.48	4838	84.30	5.00	5.00	6.00	5.00	5.0	0		
Manila Wash Br EB		851	271.48	4838	96.20	6.00	6.00	6.00	6.00	6.0	0		
W Joseph City TI UP		1893	274.76	10588	98.90	6.00	6.00	7.00	6.00	6.0	0		
Joseph Cty Wsh Br EB		1894	275.34	5876	97.30	7.00	7.00	6.00	6.00	6.0	0		
Joseph Cty Wsh Br WB		1895	275.34	5876	97.30	6.00	6.00	6.00	6.00	6.0	0		
Westover Ave UP		1896	275.89	7987	91.30	7.00	6.00	7.00	6.00	6.0	0		
E Joseph City TI UP		1897	277.08	10588	99.80	6.00	6.00	7.00	6.00	6.0	0		
Tanner Wash Br EB		20102	278.03	6435	97.30	7.00	8.00	7.00	7.00	7.0	0		
Tanner Wash Bridge WB		2925	278.03	6435	97.30	6.00	6.00	7.00	6.00	6.0	0		
Hunt Rd TI UP		930	280.64	7800	72.20	6.00	5.00	6.00	5.00	5.0	0		
Perkins Valley TI UP		1776	283.64	7236	85.30	6.00	7.00	6.00	6.00	6.0	0		
Leroux Wash Br EB		1772	284.31	19492	86.10	6.00	6.00	5.00	5.00	5.0	0		
Leroux Wash Br WB		1773	284.31	19492	86.10	7.00	6.00	5.00	5.00	5.0	0		
West Holbrook TI OP WB		1775	285.17	6244	98.00	6.00	6.00	7.00	6.00	6.0	0		
West Holbrook TI OP EB		1774	285.17	6244	98.00	7.00	7.00	6.00	6.00	6.0	0		
	Total			129,969									
	Weighted Average				91.27					5.65	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**91.27**						**0.00%**	**5**	
	Bridge Index									**5.65**			
Segment 8													
8th Ave OP WB		1365	286.19	4060	76.40	5.00	5.00	8.00	5.00	5.0	0		
8th Ave OP EB		1364	286.19	4831	91.70	6.00	6.00	8.00	6.00	6.0	0		
Holbrook TI OP EB		2516	286.87	6701	98.00	7.00	8.00	7.00	7.00	7.0	0		
Holbrook TI OP WB		2517	286.87	9165	98.00	7.00	8.00	7.00	7.00	7.0	0		
Hermosa Dr UP		1368	288.27	10046	96.00	5.00	6.00	6.00	6.00	5.0	0		
Hermosa Dr Ped OP		2402	288.27	3420	-2.00	7.00	7.00	7.00	N	7.0	0		
E Holbrook TI OP WB		1370	289.80	10934	65.00	5.00	4.00	5.00	4.00	4.0	0		
E Holbrook TI OP EB		1369	289.80	10934	82.00	6.00	5.00	5.00	5.00	5.0	0		
	Total			60,091									
	Weighted Average				81.09					5.54	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**81.09**						**0.00%**	**4**	
	Bridge Index									**5.54**			
Segment 9													
Keams Can TI OP EB		903	292.82	4838	96.00	7.00	7.00	6.00	6.00	6.0	0		
Keams Can TI OP WB		904	292.82	4838	96.00	7.00	7.00	6.00	6.00	6.0	0		
Sun Valley Rd TI UP		931	294.55	8174	89.80	6.00	7.00	7.00	7.00	6.0	0		
Ltl Lithodendron WB		20003	300.75	13888	97.30	7.00	8.00	7.00	7.00	7.0	0		
Ltl Lithodendron EB		20002	300.75	13888	97.30	7.00	8.00	7.00	7.00	7.0	0		
Big Lithodendron EB		20004	303.12	21056	97.30	7.00	8.00	7.00	7.00	7.0	0		
Big Lithodendron WB		20005	303.12	21056	97.30	7.00	8.00	7.00	7.00	7.0	0		
Adamana TI OP WB		544	303.60	1160	93.00	7.00	7.00	7.00	7.00	7.0	0		
Adamana TI OP EB		543	303.60	1160	93.00	7.00	7.00	7.00	7.00	7.0	0		
	Total			90,058									
	Weighted Average				96.37					6.80	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**96.37**						**0.00%**	**6**	
	Bridge Index									**6.80**			

Segment 10													
Petrified Forest UP		589	310.10	8750	78.20	6.00	5.00	7.00	5.00	5.0	0		
Painted Desert TI UP		590	311.57	8750	81.80	8.00	8.00	6.00	6.00	6.0	0		
Dead River Bridge EB		565	316.17	6106	85.40	5.00	5.00	7.00	5.00	5.0	0		
Dead River Bridge WB		2374	316.17	6464	97.30	7.00	7.00	6.00	6.00	6.0	0		
Pinta TI UP		708	320.00	8250	94.30	6.00	6.00	6.00	6.00	6.0	0		
Crazy Creek Br EB		674	323.08	6134	96.10	6.00	6.00	7.00	6.00	6.0	0		
Crazy Creek Br WB		461	323.08	6333	78.10	5.00	5.00	7.00	5.00	5.0	0		
Navajo TI UP		709	325.92	7700	95.80	7.00	6.00	6.00	6.00	6.0	0		
	Total			58,487									
	Weighted Average				88.06					5.64	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**88.06**						**0.00%**	**5**	
	Bridge Index									**5.64**			
Segment 11													
McCarrell TI UP		710	330.00	8250	95.90	6.00	6.00	6.00	6.00	6.0	0		
Chambers TI UP		814	333.41	8134	90.10	7.00	8.00	7.00	7.00	7.0	0		
Sanders TI UP		2769	339.46	16907	99.40	8.00	8.00	8.00	8.00	8.0	0		
Ortega Rd TI UP		816	341.81	8300	94.90	5.00	6.00	6.00	6.00	5.0	0		
	Total			41,591									
	Weighted Average				95.99					6.81	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**95.99**						**0.00%**	**5**	
	Bridge Index									**6.81**			
Segment 12													
Querino TI UP EB		951	343.83	4482	96.00	8.00	7.00	7.00	7.00	7.0	0		
Querino TI OP WB		917	343.83	3931	95.30	6.00	6.00	7.00	6.00	6.0	0		
Querino Wash Bridge WB		2525	344.44	16020	97.40	7.00	8.00	7.00	7.00	7.0	0		
Pine Springs TI OP EB		918	346.55	3931	93.30	6.00	6.00	7.00	6.00	6.0	0		
Pine Springs TI OP WB		919	346.55	3931	93.30	6.00	6.00	6.00	6.00	6.0	0		
Black Creek Br WB		1642	347.90	8298	85.20	5.00	5.00	6.00	5.00	5.0	0		
Black Creek Br EB		1134	347.90	7214	95.30	5.00	6.00	7.00	6.00	5.0	0		
Houck TI UP		955	348.16	8101	76.90	5.00	6.00	5.00	5.00	5.0	0		
Allentown TI UP		956	351.35	8300	79.40	5.00	7.00	5.00	5.00	5.0	0		
Hawthorne TI OP WB		676	354.61	3870	94.10	6.00	6.00	7.00	6.00	6.0	0		
Hawthorne TI OP EB		675	354.61	3870	93.90	6.00	6.00	7.00	6.00	6.0	0		
Window Rock TI OP WB		678	357.53	1360	63.20	4.00	4.00	7.00	4.00	4.0	0		
Window Rock TI OP EB		677	357.53	1360	93.60	6.00	6.00	7.00	6.00	6.0	0		
Lupton TI OP WB		680	359.21	1360	81.60	5.00	5.00	6.00	5.00	5.0	0		
Lupton TI OP EB		679	359.21	1360	81.60	5.00	5.00	7.00	5.00	5.0	0		
	Total			77,388									
	Weighted Average				89.65					5.78	0.00%		
	Factor				1.00					1.00	1.00		
	Indicator Score				**89.65**						**0.00%**	**5**	
	Bridge Index									**5.78**			

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
40E-1	196	202	6	Urban	Uninterrupted	Rolling	4	Freeway Segment	12	65	Divided
40E-2	202	212	10	Fringe Urban	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-3	212	234	22	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-4	234	246	12	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-5	246	258	12	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-6	258	270	12	Rural	Uninterrupted	Level	4	Freeway Segment	12	75	Divided
40E-7	270	286	16	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-8	286	290	4	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-9	290	304	14	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-10	304	326	22	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-11	326	342	16	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided
40E-12	342	360	18	Rural	Uninterrupted	Rolling	4	Freeway Segment	12	75	Divided

LOTTR and TTTR – Direction 1

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-1	115P04979	1 AM Peak	I-40	E	37	37	38	41	65	1.03	1.10	1.03	1.10	12%	1.03	1.12
40E-1	115P04979	2 Mid Day	I-40	E	37	37	38	40	65	1.02	1.06					
40E-1	115P04979	3 PM Peak	I-40	E	37	38	38	41	65	1.03	1.09					
40E-1	115P04979	4 Weekend	I-40	E	37	37	38	40	65	1.02	1.07					
40E-1	115P04980	1 AM Peak	I-40	E	33	33	34	37	65	1.02	1.09	1.03	1.09	11%		
40E-1	115P04980	2 Mid Day	I-40	E	33	33	34	35	65	1.02	1.06					
40E-1	115P04980	3 PM Peak	I-40	E	33	33	34	36	65	1.03	1.09					
40E-1	115P04980	4 Weekend	I-40	E	33	33	34	35	65	1.02	1.06					
40E-1	115+04979	1 AM Peak	I-40	E	122	122	126	141	65	1.03	1.15	1.03	1.15	39%		
40E-1	115+04979	2 Mid Day	I-40	E	122	122	125	134	65	1.03	1.10					
40E-1	115+04979	3 PM Peak	I-40	E	123	123	126	139	65	1.03	1.12					
40E-1	115+04979	4 Weekend	I-40	E	121	122	124	133	65	1.03	1.09					
40E-1	115+04980	1 AM Peak	I-40	E	120	121	123	132	65	1.03	1.10	1.03	1.10	39%		
40E-1	115+04980	2 Mid Day	I-40	E	120	120	122	128	65	1.02	1.06					
40E-1	115+04980	3 PM Peak	I-40	E	120	121	124	132	65	1.03	1.09					
40E-1	115+04980	4 Weekend	I-40	E	120	120	122	128	65	1.02	1.06					
40E-2	115P04981	1 AM Peak	I-40	E	29	29	30	32	75	1.03	1.09	1.03	1.09	5%		
40E-2	115P04981	2 Mid Day	I-40	E	29	29	29	31	75	1.02	1.06					
40E-2	115P04981	3 PM Peak	I-40	E	29	29	30	32	75	1.02	1.08					
40E-2	115P04981	4 Weekend	I-40	E	29	29	30	31	75	1.03	1.07					
40E-2	115P04982	1 AM Peak	I-40	E	21	21	22	23	75	1.03	1.08	1.03	1.08	4%	1.02	1.08
40E-2	115P04982	2 Mid Day	I-40	E	21	21	22	23	75	1.02	1.06					
40E-2	115P04982	3 PM Peak	I-40	E	21	21	22	23	75	1.02	1.07					
40E-2	115P04982	4 Weekend	I-40	E	21	21	22	23	75	1.02	1.06					
40E-2	115P04983	1 AM Peak	I-40	E	32	32	33	35	75	1.02	1.07	1.02	1.07	6%		
40E-2	115P04983	2 Mid Day	I-40	E	32	32	33	34	75	1.02	1.06					
40E-2	115P04983	3 PM Peak	I-40	E	32	32	33	35	75	1.02	1.07					
40E-2	115P04983	4 Weekend	I-40	E	32	32	33	34	75	1.02	1.06					
40E-2	115+04981	1 AM Peak	I-40	E	163	165	167	178	75	1.02	1.08	1.02	1.08	31%		
40E-2	115+04981	2 Mid Day	I-40	E	163	164	166	174	75	1.02	1.06					
40E-2	115+04981	3 PM Peak	I-40	E	163	164	167	178	75	1.02	1.08					
40E-2	115+04981	4 Weekend	I-40	E	162	164	166	174	75	1.02	1.06					
40E-2	115+04982	1 AM Peak	I-40	E	100	101	103	110	75	1.02	1.09	1.02	1.09	19%		
40E-2	115+04982	2 Mid Day	I-40	E	100	101	102	107	75	1.02	1.06					
40E-2	115+04982	3 PM Peak	I-40	E	100	101	103	109	75	1.02	1.08					
40E-2	115+04982	4 Weekend	I-40	E	100	101	102	107	75	1.02	1.07					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-2	115+04983	1 AM Peak	I-40	E	181	183	185	197	75	1.02	1.07	1.02	1.07	34%		
40E-2	115+04983	2 Mid Day	I-40	E	180	182	184	193	75	1.02	1.06					
40E-2	115+04983	3 PM Peak	I-40	E	181	182	185	195	75	1.02	1.07					
40E-2	115+04983	4 Weekend	I-40	E	180	182	184	193	75	1.02	1.06					
40E-3	115P04984	1 AM Peak	I-40	E	59	60	61	65	75	1.03	1.08	1.03	1.08	5%	1.02	1.06
40E-3	115P04984	2 Mid Day	I-40	E	59	60	60	63	75	1.02	1.06					
40E-3	115P04984	3 PM Peak	I-40	E	59	60	61	64	75	1.02	1.08					
40E-3	115P04984	4 Weekend	I-40	E	59	60	61	64	75	1.03	1.08					
40E-3	115P04985	1 AM Peak	I-40	E	25	25	26	28	75	1.03	1.11	1.03	1.11	2%		
40E-3	115P04985	2 Mid Day	I-40	E	25	25	25	27	75	1.02	1.09					
40E-3	115P04985	3 PM Peak	I-40	E	25	25	26	28	75	1.03	1.11					
40E-3	115P04985	4 Weekend	I-40	E	25	25	25	27	75	1.03	1.09					
40E-3	115P04986	1 AM Peak	I-40	E	32	33	33	35	75	1.02	1.07	1.02	1.07	3%		
40E-3	115P04986	2 Mid Day	I-40	E	32	32	33	34	75	1.02	1.06					
40E-3	115P04986	3 PM Peak	I-40	E	32	32	33	35	75	1.02	1.07					
40E-3	115P04986	4 Weekend	I-40	E	32	32	33	34	75	1.02	1.06					
40E-3	115P04987	1 AM Peak	I-40	E	33	34	34	36	75	1.03	1.08	1.03	1.08	3%		
40E-3	115P04987	2 Mid Day	I-40	E	33	34	34	36	75	1.02	1.06					
40E-3	115P04987	3 PM Peak	I-40	E	33	34	34	36	75	1.02	1.06					
40E-3	115P04987	4 Weekend	I-40	E	33	34	34	36	75	1.02	1.06					
40E-3	115+04984	1 AM Peak	I-40	E	377	383	385	405	75	1.02	1.06	1.02	1.06	32%		
40E-3	115+04984	2 Mid Day	I-40	E	377	381	384	399	75	1.02	1.05					
40E-3	115+04984	3 PM Peak	I-40	E	379	383	386	400	75	1.02	1.05					
40E-3	115+04984	4 Weekend	I-40	E	377	381	385	400	75	1.02	1.05					
40E-3	115+04985	1 AM Peak	I-40	E	256	258	262	275	75	1.02	1.06	1.02	1.06	22%		
40E-3	115+04985	2 Mid Day	I-40	E	256	258	261	270	75	1.02	1.05					
40E-3	115+04985	3 PM Peak	I-40	E	256	258	261	271	75	1.02	1.05					
40E-3	115+04985	4 Weekend	I-40	E	256	258	261	272	75	1.02	1.05					
40E-3	115+04986	1 AM Peak	I-40	E	252	255	258	268	75	1.02	1.05	1.02	1.05	21%		
40E-3	115+04986	2 Mid Day	I-40	E	252	255	256	266	75	1.02	1.04					
40E-3	115+04986	3 PM Peak	I-40	E	253	255	257	268	75	1.02	1.05					
40E-3	115+04986	4 Weekend	I-40	E	252	255	257	267	75	1.02	1.05					
40E-3	115+04987	1 AM Peak	I-40	E	147	148	150	157	75	1.02	1.06	1.02	1.06	12%		
40E-3	115+04987	2 Mid Day	I-40	E	147	148	150	156	75	1.02	1.05					
40E-3	115+04987	3 PM Peak	I-40	E	147	148	150	156	75	1.02	1.05					
40E-3	115+04987	4 Weekend	I-40	E	147	148	150	156	75	1.02	1.05					
40E-4	115P04988	1 AM Peak	I-40	E	36	36	38	45	75	1.05	1.25	1.05	1.25	6%	1.03	1.10
40E-4	115P04988	2 Mid Day	I-40	E	36	36	38	43	75	1.05	1.20					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-4	115P04988	3 PM Peak	I-40	E	36	36	37	43	75	1.04	1.20					
40E-4	115P04988	4 Weekend	I-40	E	36	36	38	44	75	1.05	1.22					
40E-4	115P04989	1 AM Peak	I-40	E	30	30	33	42	75	1.10	1.39	1.10	1.41	5%		
40E-4	115P04989	2 Mid Day	I-40	E	30	30	32	42	75	1.08	1.41					
40E-4	115P04989	3 PM Peak	I-40	E	30	30	32	42	75	1.09	1.39					
40E-4	115P04989	4 Weekend	I-40	E	30	30	31	41	75	1.06	1.37					
40E-4	115P04990	1 AM Peak	I-40	E	31	31	31	33	75	1.03	1.06	1.03	1.06	5%		
40E-4	115P04990	2 Mid Day	I-40	E	31	31	31	32	75	1.02	1.05					
40E-4	115P04990	3 PM Peak	I-40	E	31	31	31	32	75	1.02	1.05					
40E-4	115P04990	4 Weekend	I-40	E	31	31	31	33	75	1.02	1.05					
40E-4	115+04988	1 AM Peak	I-40	E	48	48	49	55	75	1.03	1.13	1.03	1.13	8%		
40E-4	115+04988	2 Mid Day	I-40	E	47	48	49	53	75	1.03	1.11					
40E-4	115+04988	3 PM Peak	I-40	E	48	48	49	54	75	1.03	1.12					
40E-4	115+04988	4 Weekend	I-40	E	48	48	49	54	75	1.03	1.12					
40E-4	115+04989	1 AM Peak	I-40	E	189	191	196	207	75	1.04	1.08	1.04	1.08	31%		
40E-4	115+04989	2 Mid Day	I-40	E	188	190	194	206	75	1.03	1.08					
40E-4	115+04989	3 PM Peak	I-40	E	188	190	194	206	75	1.03	1.08					
40E-4	115+04989	4 Weekend	I-40	E	188	190	194	204	75	1.03	1.07					
40E-4	115+04990	1 AM Peak	I-40	E	272	274	278	290	75	1.03	1.06	1.03	1.06	45%		
40E-4	115+04990	2 Mid Day	I-40	E	272	274	277	287	75	1.02	1.05					
40E-4	115+04990	3 PM Peak	I-40	E	272	274	277	289	75	1.02	1.05					
40E-4	115+04990	4 Weekend	I-40	E	272	274	277	287	75	1.02	1.05					
40E-5	115P04991	1 AM Peak	I-40	E	34	34	35	37	75	1.02	1.06	1.02	1.06	5%	1.02	1.06
40E-5	115P04991	2 Mid Day	I-40	E	34	34	35	36	75	1.02	1.05					
40E-5	115P04991	3 PM Peak	I-40	E	34	34	35	36	75	1.02	1.05					
40E-5	115P04991	4 Weekend	I-40	E	34	34	35	36	75	1.02	1.05					
40E-5	115P04992	1 AM Peak	I-40	E	33	33	34	35	75	1.02	1.06	1.02	1.06	5%		
40E-5	115P04992	2 Mid Day	I-40	E	33	33	34	35	75	1.02	1.06					
40E-5	115P04992	3 PM Peak	I-40	E	33	33	34	35	75	1.02	1.05					
40E-5	115P04992	4 Weekend	I-40	E	33	33	34	35	75	1.02	1.05					
40E-5	115P04993	1 AM Peak	I-40	E	36	37	37	39	75	1.03	1.06	1.03	1.06	6%		
40E-5	115P04993	2 Mid Day	I-40	E	36	37	37	39	75	1.02	1.05					
40E-5	115P04993	3 PM Peak	I-40	E	37	37	37	39	75	1.02	1.05					
40E-5	115P04993	4 Weekend	I-40	E	37	37	37	39	75	1.02	1.06					
40E-5	115P04994	1 AM Peak	I-40	E	45	46	46	48	75	1.02	1.06	1.02	1.06	7%		
40E-5	115P04994	2 Mid Day	I-40	E	45	45	46	48	75	1.02	1.05					
40E-5	115P04994	3 PM Peak	I-40	E	45	45	46	47	75	1.02	1.05					
40E-5	115P04994	4 Weekend	I-40	E	45	45	46	48	75	1.02	1.05					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-5	115+04991	1 AM Peak	I-40	E	315	319	322	335	75	1.02	1.05	1.02	1.05	49%		
40E-5	115+04991	2 Mid Day	I-40	E	314	319	320	332	75	1.02	1.04					
40E-5	115+04991	3 PM Peak	I-40	E	316	319	322	332	75	1.02	1.04					
40E-5	115+04991	4 Weekend	I-40	E	315	319	320	332	75	1.02	1.04					
40E-5	115+04992	1 AM Peak	I-40	E	47	47	48	51	75	1.03	1.08	1.03	1.08	7%		
40E-5	115+04992	2 Mid Day	I-40	E	47	47	48	51	75	1.03	1.07					
40E-5	115+04992	3 PM Peak	I-40	E	47	47	48	50	75	1.03	1.06					
40E-5	115+04992	4 Weekend	I-40	E	47	47	48	50	75	1.02	1.06					
40E-5	115+04993	1 AM Peak	I-40	S	77	77	79	83	75	1.03	1.08	1.03	1.08	12%		
40E-5	115+04993	2 Mid Day	I-40	S	77	78	79	83	75	1.02	1.07					
40E-5	115+04993	3 PM Peak	I-40	S	77	78	79	83	75	1.03	1.07					
40E-5	115+04993	4 Weekend	I-40	S	77	78	79	83	75	1.03	1.07					
40E-5	115+04994	1 AM Peak	I-40	E	65	65	67	70	75	1.03	1.07	1.03	1.07	10%		
40E-5	115+04994	2 Mid Day	I-40	E	64	65	66	69	75	1.02	1.06					
40E-5	115+04994	3 PM Peak	I-40	E	65	65	66	69	75	1.02	1.06					
40E-5	115+04994	4 Weekend	I-40	E	65	65	66	69	75	1.02	1.06					
40E-6	115P04995	1 AM Peak	I-40	E	39	39	40	42	75	1.02	1.07	1.02	1.07	6%	1.03	1.09
40E-6	115P04995	2 Mid Day	I-40	E	39	39	39	41	75	1.02	1.06					
40E-6	115P04995	3 PM Peak	I-40	E	39	39	40	42	75	1.02	1.07					
40E-6	115P04995	4 Weekend	I-40	E	39	39	40	41	75	1.02	1.06					
40E-6	115P04996	1 AM Peak	I-40	E	37	37	39	45	75	1.07	1.22	1.07	1.26	6%		
40E-6	115P04996	2 Mid Day	I-40	E	37	37	39	46	75	1.07	1.26					
40E-6	115P04996	3 PM Peak	I-40	E	36	37	38	43	75	1.06	1.16					
40E-6	115P04996	4 Weekend	I-40	E	36	37	38	40	75	1.05	1.10					
40E-6	115+04995	1 AM Peak	I-40	E	339	341	348	364	75	1.03	1.07	1.03	1.07	51%		
40E-6	115+04995	2 Mid Day	I-40	E	339	341	348	361	75	1.03	1.06					
40E-6	115+04995	3 PM Peak	I-40	E	337	339	346	358	75	1.03	1.05					
40E-6	115+04995	4 Weekend	I-40	E	336	339	344	355	75	1.02	1.05					
40E-6	115+04996	1 AM Peak	I-40	E	239	242	246	266	75	1.03	1.10	1.03	1.10	37%		
40E-6	115+04996	2 Mid Day	I-40	E	239	242	244	265	75	1.02	1.10					
40E-6	115+04996	3 PM Peak	I-40	E	239	241	244	256	75	1.02	1.06					
40E-6	115+04996	4 Weekend	I-40	E	238	241	243	252	75	1.02	1.05					
40E-7	115P04997	1 AM Peak	I-40	E	42	42	46	50	75	1.09	1.18	1.12	1.24	5%	1.05	1.13
40E-7	115P04997	2 Mid Day	I-40	E	42	42	47	53	75	1.12	1.24					
40E-7	115P04997	3 PM Peak	I-40	E	42	42	45	49	75	1.07	1.17					
40E-7	115P04997	4 Weekend	I-40	E	42	42	44	48	75	1.06	1.14					
40E-7	115P04998	1 AM Peak	I-40	E	36	36	37	41	75	1.03	1.14	1.03	1.14	4%		
40E-7	115P04998	2 Mid Day	I-40	E	36	36	37	40	75	1.03	1.12					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-7	115P04998	3 PM Peak	I-40	E	36	36	37	39	75	1.03	1.07					
40E-7	115P04998	4 Weekend	I-40	E	36	36	36	38	75	1.02	1.06					
40E-7	115P04999	1 AM Peak	I-40	E	24	24	24	25	75	1.03	1.07	1.03	1.07	3%		
40E-7	115P04999	2 Mid Day	I-40	E	24	24	24	25	75	1.02	1.06					
40E-7	115P04999	3 PM Peak	I-40	E	24	24	24	25	75	1.02	1.06					
40E-7	115P04999	4 Weekend	I-40	E	24	24	24	25	75	1.02	1.06					
40E-7	115P05000	1 AM Peak	I-40	E	30	31	31	33	75	1.03	1.07	1.03	1.07	4%		
40E-7	115P05000	2 Mid Day	I-40	E	30	30	31	32	75	1.02	1.06					
40E-7	115P05000	3 PM Peak	I-40	E	30	31	31	32	75	1.02	1.06					
40E-7	115P05000	4 Weekend	I-40	E	30	31	31	32	75	1.02	1.06					
40E-7	115P05001	1 AM Peak	I-40	E	36	37	37	39	75	1.03	1.06	1.03	1.06	4%		
40E-7	115P05001	2 Mid Day	I-40	E	36	37	37	38	75	1.02	1.05					
40E-7	115P05001	3 PM Peak	I-40	E	36	37	37	38	75	1.02	1.05					
40E-7	115P05001	4 Weekend	I-40	E	36	37	37	39	75	1.02	1.06					
40E-7	115+04997	1 AM Peak	I-40	E	215	216	231	258	75	1.08	1.19	1.09	1.21	26%		
40E-7	115+04997	2 Mid Day	I-40	E	214	216	234	262	75	1.09	1.21					
40E-7	115+04997	3 PM Peak	I-40	E	213	215	229	246	75	1.08	1.15					
40E-7	115+04997	4 Weekend	I-40	E	213	214	226	238	75	1.06	1.11					
40E-7	115+04998	1 AM Peak	I-40	E	92	93	97	109	75	1.05	1.18	1.06	1.18	11%		
40E-7	115+04998	2 Mid Day	I-40	E	92	93	98	110	75	1.06	1.18					
40E-7	115+04998	3 PM Peak	I-40	E	92	93	96	103	75	1.04	1.11					
40E-7	115+04998	4 Weekend	I-40	E	92	93	95	100	75	1.04	1.08					
40E-7	115+04999	1 AM Peak	I-40	E	158	159	162	171	75	1.03	1.07	1.03	1.07	20%		
40E-7	115+04999	2 Mid Day	I-40	E	158	159	161	169	75	1.02	1.06					
40E-7	115+04999	3 PM Peak	I-40	E	158	159	161	168	75	1.02	1.05					
40E-7	115+04999	4 Weekend	I-40	E	158	159	161	167	75	1.02	1.05					
40E-7	115+05000	1 AM Peak	I-40	E	132	133	135	141	75	1.02	1.06	1.02	1.06	16%		
40E-7	115+05000	2 Mid Day	I-40	E	132	133	134	140	75	1.02	1.05					
40E-7	115+05000	3 PM Peak	I-40	E	132	133	135	140	75	1.02	1.05					
40E-7	115+05000	4 Weekend	I-40	E	132	133	135	140	75	1.02	1.05					
40E-7	115+05001	1 AM Peak	I-40	E	49	49	50	53	75	1.03	1.09	1.03	1.09	6%		
40E-7	115+05001	2 Mid Day	I-40	E	49	49	50	52	75	1.02	1.06					
40E-7	115+05001	3 PM Peak	I-40	E	49	49	50	52	75	1.02	1.07					
40E-7	115+05001	4 Weekend	I-40	E	49	49	50	53	75	1.03	1.07					
40E-8	115P05002	1 AM Peak	I-40	E	47	47	48	50	75	1.03	1.06	1.03	1.06	19%	1.03	1.07
40E-8	115P05002	2 Mid Day	I-40	E	46	47	47	49	75	1.02	1.05					
40E-8	115P05002	3 PM Peak	I-40	E	46	47	47	49	75	1.02	1.06					
40E-8	115P05002	4 Weekend	I-40	E	46	47	48	49	75	1.02	1.05					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-8	115P05003	1 AM Peak	I-40	N	47	48	49	51	75	1.03	1.06	1.03	1.06	20%		
40E-8	115P05003	2 Mid Day	I-40	N	47	48	48	50	75	1.02	1.06					
40E-8	115P05003	3 PM Peak	I-40	N	47	48	48	50	75	1.02	1.06					
40E-8	115P05003	4 Weekend	I-40	N	47	48	48	50	75	1.02	1.05					
40E-8	115+05002	1 AM Peak	I-40	E	47	48	49	51	75	1.03	1.07	1.03	1.07	20%		
40E-8	115+05002	2 Mid Day	I-40	E	47	48	48	50	75	1.02	1.06					
40E-8	115+05002	3 PM Peak	I-40	E	47	48	48	51	75	1.03	1.06					
40E-8	115+05002	4 Weekend	I-40	E	47	48	48	50	75	1.03	1.06					
40E-8	115+05003	1 AM Peak	I-40	N	98	98	100	105	75	1.03	1.07	1.03	1.07	41%		
40E-8	115+05003	2 Mid Day	I-40	N	97	98	99	103	75	1.02	1.05					
40E-8	115+05003	3 PM Peak	I-40	N	97	98	100	104	75	1.02	1.06					
40E-8	115+05003	4 Weekend	I-40	N	97	98	100	104	75	1.02	1.06					
40E-9	115P05004	1 AM Peak	I-40	E	37	37	38	40	75	1.02	1.06	1.02	1.06	5%	1.02	1.06
40E-9	115P05004	2 Mid Day	I-40	E	37	37	37	39	75	1.02	1.05					
40E-9	115P05004	3 PM Peak	I-40	E	37	37	38	39	75	1.02	1.05					
40E-9	115P05004	4 Weekend	I-40	E	37	37	38	39	75	1.02	1.05					
40E-9	115P05005	1 AM Peak	I-40	E	35	36	36	38	75	1.02	1.06	1.02	1.06	5%		
40E-9	115P05005	2 Mid Day	I-40	E	35	36	36	37	75	1.02	1.05					
40E-9	115P05005	3 PM Peak	I-40	E	35	36	36	38	75	1.02	1.05					
40E-9	115P05005	4 Weekend	I-40	E	35	36	36	38	75	1.02	1.05					
40E-9	115P05006	1 AM Peak	I-40	E	30	30	31	32	75	1.02	1.07	1.02	1.07	4%		
40E-9	115P05006	2 Mid Day	I-40	E	30	30	30	32	75	1.02	1.06					
40E-9	115P05006	3 PM Peak	I-40	E	30	30	30	32	75	1.02	1.06					
40E-9	115P05006	4 Weekend	I-40	E	30	30	30	32	75	1.02	1.06					
40E-9	115P05007	1 AM Peak	I-40	E	22	22	22	23	75	1.03	1.06	1.03	1.06	3%		
40E-9	115P05007	2 Mid Day	I-40	E	22	22	22	23	75	1.02	1.05					
40E-9	115P05007	3 PM Peak	I-40	E	22	22	22	23	75	1.02	1.05					
40E-9	115P05007	4 Weekend	I-40	E	22	22	22	23	75	1.02	1.05					
40E-9	115+05004	1 AM Peak	I-40	E	133	135	136	142	75	1.02	1.06	1.02	1.06	18%		
40E-9	115+05004	2 Mid Day	I-40	E	133	135	135	141	75	1.02	1.05					
40E-9	115+05004	3 PM Peak	I-40	E	133	135	136	142	75	1.02	1.05					
40E-9	115+05004	4 Weekend	I-40	E	133	135	136	141	75	1.02	1.05					
40E-9	115+05005	1 AM Peak	I-40	E	50	50	51	54	75	1.02	1.07	1.02	1.07	7%		
40E-9	115+05005	2 Mid Day	I-40	E	49	50	51	53	75	1.02	1.05					
40E-9	115+05005	3 PM Peak	I-40	E	50	50	51	53	75	1.02	1.06					
40E-9	115+05005	4 Weekend	I-40	E	50	50	51	53	75	1.02	1.05					
40E-9	115+05006	1 AM Peak	I-40	E	260	262	265	277	75	1.02	1.06	1.02	1.06	36%		
40E-9	115+05006	2 Mid Day	I-40	E	258	261	263	273	75	1.02	1.05					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-9	115+05006	3 PM Peak	I-40	E	259	261	265	274	75	1.02	1.05					
40E-9	115+05006	4 Weekend	I-40	E	258	261	264	273	75	1.02	1.05					
40E-9	115+05007	1 AM Peak	I-40	E	159	160	163	170	75	1.02	1.06	1.02	1.06	22%		
40E-9	115+05007	2 Mid Day	I-40	E	159	160	161	167	75	1.02	1.04					
40E-9	115+05007	3 PM Peak	I-40	E	159	160	162	167	75	1.02	1.04					
40E-9	115+05007	4 Weekend	I-40	E	159	160	162	167	75	1.02	1.04					
40E-10	115P05008	1 AM Peak	I-40	E	44	45	45	48	75	1.03	1.07	1.03	1.07	4%	1.02	1.06
40E-10	115P05008	2 Mid Day	I-40	E	44	44	45	47	75	1.02	1.05					
40E-10	115P05008	3 PM Peak	I-40	E	44	44	45	47	75	1.02	1.06					
40E-10	115P05008	4 Weekend	I-40	E	44	44	45	47	75	1.02	1.06					
40E-10	115P05009	1 AM Peak	I-40	E	22	22	22	24	75	1.03	1.11	1.03	1.11	2%		
40E-10	115P05009	2 Mid Day	I-40	E	22	22	22	24	75	1.02	1.09					
40E-10	115P05009	3 PM Peak	I-40	E	22	22	22	24	75	1.02	1.08					
40E-10	115P05009	4 Weekend	I-40	E	22	22	22	24	75	1.02	1.08					
40E-10	115P05010	1 AM Peak	I-40	E	30	31	31	34	75	1.03	1.09	1.03	1.09	3%		
40E-10	115P05010	2 Mid Day	I-40	E	30	31	31	33	75	1.02	1.07					
40E-10	115P05010	3 PM Peak	I-40	E	30	31	31	33	75	1.02	1.06					
40E-10	115P05010	4 Weekend	I-40	E	30	31	31	32	75	1.02	1.05					
40E-10	115+05008	1 AM Peak	I-40	E	393	396	401	418	75	1.02	1.05	1.02	1.05	33%		
40E-10	115+05008	2 Mid Day	I-40	E	391	396	398	411	75	1.02	1.04					
40E-10	115+05008	3 PM Peak	I-40	E	392	395	399	413	75	1.02	1.05					
40E-10	115+05008	4 Weekend	I-40	E	392	396	399	413	75	1.02	1.04					
40E-10	115+05009	1 AM Peak	I-40	E	410	412	418	436	75	1.02	1.06	1.02	1.06	35%		
40E-10	115+05009	2 Mid Day	I-40	E	406	411	414	428	75	1.02	1.04					
40E-10	115+05009	3 PM Peak	I-40	E	408	412	416	429	75	1.02	1.04					
40E-10	115+05009	4 Weekend	I-40	E	408	412	415	429	75	1.02	1.04					
40E-10	115+05010	1 AM Peak	I-40	E	286	289	293	311	75	1.02	1.08	1.02	1.08	24%		
40E-10	115+05010	2 Mid Day	I-40	E	285	288	290	305	75	1.02	1.06					
40E-10	115+05010	3 PM Peak	I-40	E	286	288	291	302	75	1.02	1.05					
40E-10	115+05010	4 Weekend	I-40	E	285	288	290	301	75	1.02	1.05					
40E-11	115P05011	1 AM Peak	I-40	E	17	18	18	19	75	1.03	1.10	1.03	1.10	3%	1.03	1.11
40E-11	115P05011	2 Mid Day	I-40	E	17	18	18	19	75	1.02	1.07					
40E-11	115P05011	3 PM Peak	I-40	E	17	18	18	19	75	1.02	1.06					
40E-11	115P05011	4 Weekend	I-40	E	17	18	18	19	75	1.02	1.06					
40E-11	115P05012	1 AM Peak	I-40	E	36	37	37	39	75	1.03	1.06	1.03	1.06	7%		
40E-11	115P05012	2 Mid Day	I-40	E	36	37	37	38	75	1.02	1.05					
40E-11	115P05012	3 PM Peak	I-40	E	36	37	37	39	75	1.02	1.05					
40E-11	115P05012	4 Weekend	I-40	E	36	37	37	39	75	1.02	1.05					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-11	115P05013	1 AM Peak	I-40	E	31	31	32	34	75	1.03	1.09	1.03	1.09	6%		
40E-11	115P05013	2 Mid Day	I-40	E	31	31	32	33	75	1.02	1.06					
40E-11	115P05013	3 PM Peak	I-40	E	31	31	32	33	75	1.03	1.07					
40E-11	115P05013	4 Weekend	I-40	E	31	31	32	33	75	1.02	1.07					
40E-11	115P05014	1 AM Peak	I-40	E	33	33	34	36	75	1.03	1.09	1.03	1.09	6%		
40E-11	115P05014	2 Mid Day	I-40	E	33	33	34	35	75	1.02	1.05					
40E-11	115P05014	3 PM Peak	I-40	E	33	33	34	35	75	1.02	1.06					
40E-11	115P05014	4 Weekend	I-40	E	33	33	34	36	75	1.02	1.06					
40E-11	115+05011	1 AM Peak	I-40	E	188	190	194	208	75	1.03	1.09	1.03	1.09	34%		
40E-11	115+05011	2 Mid Day	I-40	E	188	190	191	201	75	1.02	1.06					
40E-11	115+05011	3 PM Peak	I-40	E	188	189	192	200	75	1.02	1.06					
40E-11	115+05011	4 Weekend	I-40	E	188	190	192	198	75	1.02	1.04					
40E-11	115+05012	1 AM Peak	I-40	E	158	159	161	169	75	1.02	1.06	1.02	1.06	28%		
40E-11	115+05012	2 Mid Day	I-40	E	157	159	160	167	75	1.02	1.05					
40E-11	115+05012	3 PM Peak	I-40	E	157	159	161	167	75	1.02	1.05					
40E-11	115+05012	4 Weekend	I-40	E	157	159	160	167	75	1.02	1.05					
40E-11	115+05013	1 AM Peak	I-40	E	0	0	0	0	75	NO DATA	NO DATA	0.00	0.00	0%		
40E-11	115+05013	2 Mid Day	I-40	E	0	0	0	0	75	NO DATA	NO DATA					
40E-11	115+05013	3 PM Peak	I-40	E	0	0	0	0	75	NO DATA	NO DATA					
40E-11	115+05013	4 Weekend	I-40	E	0	0	0	0	75	NO DATA	NO DATA					
40E-11	115+05014	1 AM Peak	I-40	E	92	93	97	118	75	1.06	1.27	1.06	1.27	16%		
40E-11	115+05014	2 Mid Day	I-40	E	91	92	95	107	75	1.04	1.16					
40E-11	115+05014	3 PM Peak	I-40	E	92	92	95	109	75	1.04	1.18					
40E-11	115+05014	4 Weekend	I-40	E	92	92	96	113	75	1.05	1.22					
40E-12	115P05015	1 AM Peak	I-40	N	35	36	36	38	75	1.03	1.07	1.03	1.07	4%	1.03	1.08
40E-12	115P05015	2 Mid Day	I-40	N	35	36	36	37	75	1.02	1.05					
40E-12	115P05015	3 PM Peak	I-40	N	35	36	36	38	75	1.02	1.05					
40E-12	115P05015	4 Weekend	I-40	N	35	36	36	38	75	1.02	1.05					
40E-12	115P05016	1 AM Peak	I-40	E	26	26	27	28	75	1.03	1.07	1.03	1.07	3%		
40E-12	115P05016	2 Mid Day	I-40	E	26	26	26	27	75	1.02	1.05					
40E-12	115P05016	3 PM Peak	I-40	E	26	26	26	27	75	1.02	1.05					
40E-12	115P05016	4 Weekend	I-40	E	26	26	27	28	75	1.02	1.06					
40E-12	115P05017	1 AM Peak	I-40	E	28	29	29	31	75	1.03	1.07	1.03	1.07	3%		
40E-12	115P05017	2 Mid Day	I-40	E	28	29	29	30	75	1.02	1.05					
40E-12	115P05017	3 PM Peak	I-40	E	28	29	29	30	75	1.02	1.05					
40E-12	115P05017	4 Weekend	I-40	E	28	29	29	30	75	1.02	1.06					
40E-12	115P05018	1 AM Peak	I-40	E	32	32	32	35	75	1.03	1.09	1.03	1.09	3%		
40E-12	115P05018	2 Mid Day	I-40	E	31	32	32	34	75	1.02	1.06					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-12	115P05018	3 PM Peak	I-40	E	32	32	32	34	75	1.02	1.06					
40E-12	115P05018	4 Weekend	I-40	E	32	32	32	34	75	1.02	1.06					
40E-12	115P05019	1 AM Peak	I-40	E	20	20	21	22	75	1.03	1.08	1.03	1.08	2%		
40E-12	115P05019	2 Mid Day	I-40	E	20	20	21	22	75	1.02	1.06					
40E-12	115P05019	3 PM Peak	I-40	E	20	20	21	22	75	1.02	1.07					
40E-12	115P05019	4 Weekend	I-40	E	20	20	21	22	75	1.02	1.06					
40E-12	115P05020	1 AM Peak	I-40	N	23	23	24	25	75	1.03	1.08	1.03	1.08	3%		
40E-12	115P05020	2 Mid Day	I-40	N	23	23	23	24	75	1.02	1.05					
40E-12	115P05020	3 PM Peak	I-40	N	23	23	23	24	75	1.02	1.06					
40E-12	115P05020	4 Weekend	I-40	N	23	23	23	24	75	1.02	1.06					
40E-12	115P05021	1 AM Peak	I-40	N	30	31	32	41	75	1.05	1.34	1.05	1.37	3%		
40E-12	115P05021	2 Mid Day	I-40	N	30	31	32	40	75	1.05	1.32					
40E-12	115P05021	3 PM Peak	I-40	N	30	31	32	41	75	1.05	1.34					
40E-12	115P05021	4 Weekend	I-40	N	30	31	32	42	75	1.05	1.37					
40E-12	115+05015	1 AM Peak	I-40	E	68	69	70	74	75	1.03	1.07	1.03	1.07	7%		
40E-12	115+05015	2 Mid Day	I-40	E	68	69	69	72	75	1.02	1.05					
40E-12	115+05015	3 PM Peak	I-40	E	68	69	70	72	75	1.02	1.05					
40E-12	115+05015	4 Weekend	I-40	E	68	69	70	73	75	1.02	1.05					
40E-12	115+05016	1 AM Peak	I-40	E	117	118	120	127	75	1.03	1.08	1.03	1.08	13%		
40E-12	115+05016	2 Mid Day	I-40	E	116	118	119	124	75	1.02	1.05					
40E-12	115+05016	3 PM Peak	I-40	E	117	118	119	124	75	1.02	1.05					
40E-12	115+05016	4 Weekend	I-40	E	117	118	119	125	75	1.02	1.06					
40E-12	115+05017	1 AM Peak	I-40	E	61	61	62	65	75	1.02	1.06	1.02	1.06	7%		
40E-12	115+05017	2 Mid Day	I-40	E	60	61	62	64	75	1.02	1.05					
40E-12	115+05017	3 PM Peak	I-40	E	60	61	62	64	75	1.02	1.05					
40E-12	115+05017	4 Weekend	I-40	E	61	61	62	64	75	1.02	1.05					
40E-12	115+05018	1 AM Peak	I-40	E	136	137	140	146	75	1.02	1.07	1.02	1.07	15%		
40E-12	115+05018	2 Mid Day	I-40	E	135	137	138	143	75	1.02	1.05					
40E-12	115+05018	3 PM Peak	I-40	E	136	137	139	144	75	1.02	1.05					
40E-12	115+05018	4 Weekend	I-40	E	136	137	139	145	75	1.02	1.05					
40E-12	115+05019	1 AM Peak	I-40	E	144	145	147	155	75	1.02	1.07	1.02	1.07	16%		
40E-12	115+05019	2 Mid Day	I-40	E	143	145	146	151	75	1.02	1.05					
40E-12	115+05019	3 PM Peak	I-40	E	144	145	147	153	75	1.02	1.05					
40E-12	115+05019	4 Weekend	I-40	E	144	145	147	152	75	1.02	1.05					
40E-12	115+05020	1 AM Peak	I-40	E	134	135	137	144	75	1.02	1.07	1.02	1.07	15%		
40E-12	115+05020	2 Mid Day	I-40	E	133	135	136	141	75	1.02	1.05					
40E-12	115+05020	3 PM Peak	I-40	E	134	135	136	143	75	1.02	1.06					
40E-12	115+05020	4 Weekend	I-40	E	134	135	136	143	75	1.02	1.06					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
40E-12	115+05021	1 AM Peak	I-40	N	64	64	66	72	75	1.03	1.11	1.03	1.11	7%		
40E-12	115+05021	2 Mid Day	I-40	N	64	64	65	69	75	1.02	1.07					
40E-12	115+05021	3 PM Peak	I-40	N	64	64	66	70	75	1.03	1.09					
40E-12	115+05021	4 Weekend	I-40	N	64	64	66	70	75	1.03	1.09					

LOTTR and TTTR – Direction 2

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
1	115N04978	1 AM Peak	I-40	W	42	50	65	65	65	1	115N04978	1.05	1.22	13%	1.03	1.12
1	115N04978	2 Mid Day	I-40	W	42	47	65	65	65	1	115N04978					
1	115N04978	3 PM Peak	I-40	W	42	48	65	65	65	1	115N04978					
1	115N04978	4 Weekend	I-40	W	41	44	65	65	65	1	115N04978					
1	115N04979	1 AM Peak	I-40	W	34	36	65	65	65	1	115N04979	1.03	1.09	11%		
1	115N04979	2 Mid Day	I-40	W	34	35	65	65	65	1	115N04979					
1	115N04979	3 PM Peak	I-40	W	34	36	65	65	65	1	115N04979					
1	115N04979	4 Weekend	I-40	W	34	35	65	65	65	1	115N04979					
1	115-04978	1 AM Peak	I-40	W	114	124	65	65	65	1	115-04978	1.03	1.12	35%		
1	115-04978	2 Mid Day	I-40	W	113	119	65	65	65	1	115-04978					
1	115-04978	3 PM Peak	I-40	W	114	125	65	65	65	1	115-04978					
1	115-04978	4 Weekend	I-40	W	113	119	65	65	65	1	115-04978					
1	115-04979	1 AM Peak	I-40	W	124	134	65	65	65	1	115-04979	1.03	1.10	40%		
1	115-04979	2 Mid Day	I-40	W	124	129	65	65	65	1	115-04979					
1	115-04979	3 PM Peak	I-40	W	125	134	65	65	65	1	115-04979					
1	115-04979	4 Weekend	I-40	W	124	129	65	65	65	1	115-04979					
2	115N04980	1 AM Peak	I-40	W	35	38	75	75	65	2	115N04980	1.03	1.10	6%		
2	115N04980	2 Mid Day	I-40	W	35	37	75	75	65	2	115N04980					
2	115N04980	3 PM Peak	I-40	W	35	38	75	75	65	2	115N04980					
2	115N04980	4 Weekend	I-40	W	35	37	75	75	65	2	115N04980					
2	115N04981	1 AM Peak	I-40	W	47	50	75	75	65	2	115N04981	1.03	1.10	8%	1.02	1.08
2	115N04981	2 Mid Day	I-40	W	46	49	75	75	65	2	115N04981					
2	115N04981	3 PM Peak	I-40	W	46	50	75	75	65	2	115N04981					
2	115N04981	4 Weekend	I-40	W	46	49	75	75	65	2	115N04981					
2	115N04982	1 AM Peak	I-40	W	23	25	75	75	65	2	115N04982	1.03	1.09	4%		
2	115N04982	2 Mid Day	I-40	W	23	25	75	75	65	2	115N04982					
2	115N04982	3 PM Peak	I-40	W	23	25	75	75	65	2	115N04982					
2	115N04982	4 Weekend	I-40	W	23	24	75	75	65	2	115N04982					
2	115-04980	1 AM Peak	I-40	W	166	180	75	75	65	2	115-04980	1.03	1.11	29%		
2	115-04980	2 Mid Day	I-40	W	165	177	75	75	65	2	115-04980					
2	115-04980	3 PM Peak	I-40	W	166	178	75	75	65	2	115-04980					
2	115-04980	4 Weekend	I-40	W	165	172	75	75	65	2	115-04980					
2	115-04981	1 AM Peak	I-40	W	100	106	75	75	65	2	115-04981	1.03	1.08	18%		
2	115-04981	2 Mid Day	I-40	W	100	105	75	75	65	2	115-04981					
2	115-04981	3 PM Peak	I-40	W	100	105	75	75	65	2	115-04981					
2	115-04981	4 Weekend	I-40	W	100	104	75	75	65	2	115-04981					

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2	115-04982	1 AM Peak	I-40	W	195	210	75	75	65	2	115-04982	1.03	1.10	34%		
2	115-04982	2 Mid Day	I-40	W	195	207	75	75	65	2	115-04982					
2	115-04982	3 PM Peak	I-40	W	195	209	75	75	65	2	115-04982					
2	115-04982	4 Weekend	I-40	W	195	207	75	75	65	2	115-04982					
3	115N04983	1 AM Peak	I-40	W	39	41	75	75	65	3	115N04983	1.03	1.07	3%	1.02	1.06
3	115N04983	2 Mid Day	I-40	W	39	41	75	75	65	3	115N04983					
3	115N04983	3 PM Peak	I-40	W	39	41	75	75	65	3	115N04983					
3	115N04983	4 Weekend	I-40	W	39	40	75	75	65	3	115N04983					
3	115N04984	1 AM Peak	I-40	W	35	37	75	75	65	3	115N04984	1.03	1.08	3%		
3	115N04984	2 Mid Day	I-40	W	35	38	75	75	65	3	115N04984					
3	115N04984	3 PM Peak	I-40	W	35	38	75	75	65	3	115N04984					
3	115N04984	4 Weekend	I-40	W	35	37	75	75	65	3	115N04984					
3	115N04985	1 AM Peak	I-40	W	35	37	75	75	65	3	115N04985	1.03	1.07	3%		
3	115N04985	2 Mid Day	I-40	W	35	37	75	75	65	3	115N04985					
3	115N04985	3 PM Peak	I-40	W	35	37	75	75	65	3	115N04985					
3	115N04985	4 Weekend	I-40	W	35	37	75	75	65	3	115N04985					
3	115N04986	1 AM Peak	I-40	W	35	37	75	75	65	3	115N04986	1.02	1.06	3%		
3	115N04986	2 Mid Day	I-40	W	35	37	75	75	65	3	115N04986					
3	115N04986	3 PM Peak	I-40	W	35	37	75	75	65	3	115N04986					
3	115N04986	4 Weekend	I-40	W	35	36	75	75	65	3	115N04986					
3	115-04983	1 AM Peak	I-40	W	421	439	75	75	65	3	115-04983	1.02	1.06	34%		
3	115-04983	2 Mid Day	I-40	W	421	438	75	75	65	3	115-04983					
3	115-04983	3 PM Peak	I-40	W	421	438	75	75	65	3	115-04983					
3	115-04983	4 Weekend	I-40	W	421	435	75	75	65	3	115-04983					
3	115-04984	1 AM Peak	I-40	W	261	272	75	75	65	3	115-04984	1.02	1.05	21%		
3	115-04984	2 Mid Day	I-40	W	261	272	75	75	65	3	115-04984					
3	115-04984	3 PM Peak	I-40	W	262	273	75	75	65	3	115-04984					
3	115-04984	4 Weekend	I-40	W	261	271	75	75	65	3	115-04984					
3	115-04985	1 AM Peak	I-40	W	263	274	75	75	65	3	115-04985	1.03	1.06	21%		
3	115-04985	2 Mid Day	I-40	W	264	276	75	75	65	3	115-04985					
3	115-04985	3 PM Peak	I-40	W	264	277	75	75	65	3	115-04985					
3	115-04985	4 Weekend	I-40	W	264	275	75	75	65	3	115-04985					
3	115-04986	1 AM Peak	I-40	W	149	155	75	75	65	3	115-04986	1.02	1.05	12%		
3	115-04986	2 Mid Day	I-40	W	149	155	75	75	65	3	115-04986					
3	115-04986	3 PM Peak	I-40	W	149	155	75	75	65	3	115-04986					
3	115-04986	4 Weekend	I-40	W	149	154	75	75	65	3	115-04986					
4	115N04987	1 AM Peak	I-40	W	36	38	75	75	65	4	115N04987	1.03	1.07	6%	1.03	1.10
4	115N04987	2 Mid Day	I-40	W	36	38	75	75	65	4	115N04987					

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4	115N04987	3 PM Peak	I-40	W	36	38	75	75	65	4	115N04987					
4	115N04987	4 Weekend	I-40	W	36	38	75	75	65	4	115N04987					
4	115N04988	1 AM Peak	I-40	W	34	40	75	75	65	4	115N04988	1.06	1.25	5%		
4	115N04988	2 Mid Day	I-40	W	34	39	75	75	65	4	115N04988					
4	115N04988	3 PM Peak	I-40	W	34	39	75	75	65	4	115N04988					
4	115N04988	4 Weekend	I-40	W	34	39	75	75	65	4	115N04988					
4	115N04989	1 AM Peak	I-40	W	32	40	75	75	65	4	115N04989	1.13	1.46	5%		
4	115N04989	2 Mid Day	I-40	W	32	42	75	75	65	4	115N04989					
4	115N04989	3 PM Peak	I-40	W	31	41	75	75	65	4	115N04989					
4	115N04989	4 Weekend	I-40	W	30	41	75	75	65	4	115N04989					
4	115-04987	1 AM Peak	I-40	W	90	96	75	75	65	4	115-04987	1.04	1.10	14%		
4	115-04987	2 Mid Day	I-40	W	90	96	75	75	65	4	115-04987					
4	115-04987	3 PM Peak	I-40	W	90	95	75	75	65	4	115-04987					
4	115-04987	4 Weekend	I-40	W	90	95	75	75	65	4	115-04987					
4	115-04988	1 AM Peak	I-40	W	172	183	75	75	65	4	115-04988	1.04	1.10	26%		
4	115-04988	2 Mid Day	I-40	W	172	184	75	75	65	4	115-04988					
4	115-04988	3 PM Peak	I-40	W	173	183	75	75	65	4	115-04988					
4	115-04988	4 Weekend	I-40	W	171	183	75	75	65	4	115-04988					
4	115-04989	1 AM Peak	I-40	W	279	293	75	75	65	4	115-04989	1.03	1.07	45%		
4	115-04989	2 Mid Day	I-40	W	280	294	75	75	65	4	115-04989					
4	115-04989	3 PM Peak	I-40	W	280	293	75	75	65	4	115-04989					
4	115-04989	4 Weekend	I-40	W	278	291	75	75	65	4	115-04989					
5	115N04990	1 AM Peak	I-40	W	35	36	75	75	65	5	115N04990	1.03	1.06	5%	1.02	1.06
5	115N04990	2 Mid Day	I-40	W	35	37	75	75	65	5	115N04990					
5	115N04990	3 PM Peak	I-40	W	35	37	75	75	65	5	115N04990					
5	115N04990	4 Weekend	I-40	W	35	36	75	75	65	5	115N04990					
5	115N04991	1 AM Peak	I-40	W	32	34	75	75	65	5	115N04991	1.02	1.06	5%		
5	115N04991	2 Mid Day	I-40	W	32	34	75	75	65	5	115N04991					
5	115N04991	3 PM Peak	I-40	W	32	34	75	75	65	5	115N04991					
5	115N04991	4 Weekend	I-40	W	32	33	75	75	65	5	115N04991					
5	115N04992	1 AM Peak	I-40	W	37	39	75	75	65	5	115N04992	1.02	1.06	6%		
5	115N04992	2 Mid Day	I-40	W	37	39	75	75	65	5	115N04992					
5	115N04992	3 PM Peak	I-40	W	37	39	75	75	65	5	115N04992					
5	115N04992	4 Weekend	I-40	W	37	38	75	75	65	5	115N04992					
5	115N04993	1 AM Peak	I-40	W	37	39	75	75	65	5	115N04993	1.02	1.06	6%		
5	115N04993	2 Mid Day	I-40	W	37	38	75	75	65	5	115N04993					
5	115N04993	3 PM Peak	I-40	W	37	39	75	75	65	5	115N04993					
5	115N04993	4 Weekend	I-40	W	37	38	75	75	65	5	115N04993					

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5	115-04990	1 AM Peak	I-40	W	323	334	75	75	65	5	115-04990	1.02	1.05	49%		
5	115-04990	2 Mid Day	I-40	W	324	336	75	75	65	5	115-04990					
5	115-04990	3 PM Peak	I-40	W	324	336	75	75	65	5	115-04990					
5	115-04990	4 Weekend	I-40	W	322	332	75	75	65	5	115-04990					
5	115-04991	1 AM Peak	I-40	W	47	49	75	75	65	5	115-04991	1.03	1.07	7%		
5	115-04991	2 Mid Day	I-40	W	46	49	75	75	65	5	115-04991					
5	115-04991	3 PM Peak	I-40	W	47	49	75	75	65	5	115-04991					
5	115-04991	4 Weekend	I-40	W	46	48	75	75	65	5	115-04991					
5	115-04992	1 AM Peak	I-40	N	78	83	75	75	65	5	115-04992	1.02	1.06	12%		
5	115-04992	2 Mid Day	I-40	N	78	81	75	75	65	5	115-04992					
5	115-04992	3 PM Peak	I-40	N	78	82	75	75	65	5	115-04992					
5	115-04992	4 Weekend	I-40	N	78	81	75	75	65	5	115-04992					
5	115-04993	1 AM Peak	I-40	W	66	69	75	75	65	5	115-04993	1.02	1.07	10%		
5	115-04993	2 Mid Day	I-40	W	66	69	75	75	65	5	115-04993					
5	115-04993	3 PM Peak	I-40	W	66	70	75	75	65	5	115-04993					
5	115-04993	4 Weekend	I-40	W	66	69	75	75	65	5	115-04993					
6	115N04994	1 AM Peak	I-40	W	41	42	75	75	65	6	115N04994	1.02	1.06	6%	1.03	1.09
6	115N04994	2 Mid Day	I-40	W	41	42	75	75	65	6	115N04994					
6	115N04994	3 PM Peak	I-40	W	41	42	75	75	65	6	115N04994					
6	115N04994	4 Weekend	I-40	W	40	42	75	75	65	6	115N04994					
6	115N04995	1 AM Peak	I-40	W	38	40	75	75	65	6	115N04995	1.02	1.07	6%		
6	115N04995	2 Mid Day	I-40	W	38	40	75	75	65	6	115N04995					
6	115N04995	3 PM Peak	I-40	W	38	40	75	75	65	6	115N04995					
6	115N04995	4 Weekend	I-40	W	38	40	75	75	65	6	115N04995					
6	115-04994	1 AM Peak	I-40	W	354	369	75	75	65	6	115-04994	1.03	1.07	51%		
6	115-04994	2 Mid Day	I-40	W	356	373	75	75	65	6	115-04994					
6	115-04994	3 PM Peak	I-40	W	354	366	75	75	65	6	115-04994					
6	115-04994	4 Weekend	I-40	W	352	361	75	75	65	6	115-04994					
6	115-04995	1 AM Peak	I-40	W	253	276	75	75	65	6	115-04995	1.03	1.12	37%		
6	115-04995	2 Mid Day	I-40	W	253	275	75	75	65	6	115-04995					
6	115-04995	3 PM Peak	I-40	W	253	269	75	75	65	6	115-04995					
6	115-04995	4 Weekend	I-40	W	250	262	75	75	65	6	115-04995					
7	115N04996	1 AM Peak	I-40	W	33	38	75	75	65	7	115N04996	1.05	1.24	4%	1.05	1.13
7	115N04996	2 Mid Day	I-40	W	33	39	75	75	65	7	115N04996					
7	115N04996	3 PM Peak	I-40	W	32	36	75	75	65	7	115N04996					
7	115N04996	4 Weekend	I-40	W	32	34	75	75	65	7	115N04996					
7	115N04997	1 AM Peak	I-40	W	48	56	75	75	65	7	115N04997	1.03	1.19	6%		
7	115N04997	2 Mid Day	I-40	W	48	57	75	75	65	7	115N04997					

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7	115N04997	3 PM Peak	I-40	W	48	51	75	75	65	7	115N04997					
7	115N04997	4 Weekend	I-40	W	48	49	75	75	65	7	115N04997					
7	115N04998	1 AM Peak	I-40	W	37	42	75	75	65	7	115N04998	1.03	1.17	4%		
7	115N04998	2 Mid Day	I-40	W	37	42	75	75	65	7	115N04998					
7	115N04998	3 PM Peak	I-40	W	36	38	75	75	65	7	115N04998					
7	115N04998	4 Weekend	I-40	W	36	37	75	75	65	7	115N04998					
7	115N04999	1 AM Peak	I-40	W	43	45	75	75	65	7	115N04999	1.02	1.06	5%		
7	115N04999	2 Mid Day	I-40	W	42	44	75	75	65	7	115N04999					
7	115N04999	3 PM Peak	I-40	W	43	44	75	75	65	7	115N04999					
7	115N04999	4 Weekend	I-40	W	42	44	75	75	65	7	115N04999					
7	115N05000	1 AM Peak	I-40	W	35	37	75	75	65	7	115N05000	1.03	1.07	4%		
7	115N05000	2 Mid Day	I-40	W	35	36	75	75	65	7	115N05000					
7	115N05000	3 PM Peak	I-40	W	35	37	75	75	65	7	115N05000					
7	115N05000	4 Weekend	I-40	W	35	36	75	75	65	7	115N05000					
7	115-04996	1 AM Peak	I-40	W	230	256	75	75	65	7	115-04996	1.07	1.21	27%		
7	115-04996	2 Mid Day	I-40	W	232	263	75	75	65	7	115-04996					
7	115-04996	3 PM Peak	I-40	W	227	243	75	75	65	7	115-04996					
7	115-04996	4 Weekend	I-40	W	225	234	75	75	65	7	115-04996					
7	115-04997	1 AM Peak	I-40	W	83	94	75	75	65	7	115-04997	1.03	1.17	10%		
7	115-04997	2 Mid Day	I-40	W	83	94	75	75	65	7	115-04997					
7	115-04997	3 PM Peak	I-40	W	82	87	75	75	65	7	115-04997					
7	115-04997	4 Weekend	I-40	W	81	85	75	75	65	7	115-04997					
7	115-04998	1 AM Peak	I-40	W	164	176	75	75	65	7	115-04998	1.02	1.09	20%		
7	115-04998	2 Mid Day	I-40	W	164	174	75	75	65	7	115-04998					
7	115-04998	3 PM Peak	I-40	W	164	171	75	75	65	7	115-04998					
7	115-04998	4 Weekend	I-40	W	163	169	75	75	65	7	115-04998					
7	115-04999	1 AM Peak	I-40	W	119	124	75	75	65	7	115-04999	1.02	1.06	15%		
7	115-04999	2 Mid Day	I-40	W	119	123	75	75	65	7	115-04999					
7	115-04999	3 PM Peak	I-40	W	119	124	75	75	65	7	115-04999					
7	115-04999	4 Weekend	I-40	W	118	122	75	75	65	7	115-04999					
7	115-05000	1 AM Peak	I-40	W	37	39	75	75	65	7	115-05000	1.03	1.08	5%		
7	115-05000	2 Mid Day	I-40	W	37	39	75	75	65	7	115-05000					
7	115-05000	3 PM Peak	I-40	W	37	40	75	75	65	7	115-05000					
7	115-05000	4 Weekend	I-40	W	37	39	75	75	65	7	115-05000					
8	115N05001	1 AM Peak	I-40	W	43	44	75	75	65	8	115N05001	1.02	1.06	19%	1.03	1.07
8	115N05001	2 Mid Day	I-40	W	43	44	75	75	65	8	115N05001					
8	115N05001	3 PM Peak	I-40	W	43	44	75	75	65	8	115N05001					
8	115N05001	4 Weekend	I-40	W	42	44	75	75	65	8	115N05001					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
8	115N05002	1 AM Peak	I-40	W	29	31	75	75	65	8	115N05002	1.02	1.07	13%		
8	115N05002	2 Mid Day	I-40	W	29	31	75	75	65	8	115N05002					
8	115N05002	3 PM Peak	I-40	W	30	31	75	75	65	8	115N05002					
8	115N05002	4 Weekend	I-40	W	29	30	75	75	65	8	115N05002					
8	115-05001	1 AM Peak	I-40	W	73	76	75	75	65	8	115-05001	1.02	1.06	32%		
8	115-05001	2 Mid Day	I-40	W	73	75	75	75	65	8	115-05001					
8	115-05001	3 PM Peak	I-40	W	73	76	75	75	65	8	115-05001					
8	115-05001	4 Weekend	I-40	W	72	75	75	75	65	8	115-05001					
8	115-05002	1 AM Peak	I-40	S	84	88	75	75	65	8	115-05002	1.02	1.06	37%		
8	115-05002	2 Mid Day	I-40	S	84	87	75	75	65	8	115-05002					
8	115-05002	3 PM Peak	I-40	S	84	88	75	75	65	8	115-05002					
8	115-05002	4 Weekend	I-40	S	84	86	75	75	65	8	115-05002					
9	115N05003	1 AM Peak	I-40	S	42	44	75	75	65	9	115N05003	1.02	1.05	5%	1.02	1.06
9	115N05003	2 Mid Day	I-40	S	42	44	75	75	65	9	115N05003					
9	115N05003	3 PM Peak	I-40	S	42	44	75	75	65	9	115N05003					
9	115N05003	4 Weekend	I-40	S	42	43	75	75	65	9	115N05003					
9	115N05004	1 AM Peak	I-40	W	39	41	75	75	65	9	115N05004	1.03	1.07	5%		
9	115N05004	2 Mid Day	I-40	W	39	41	75	75	65	9	115N05004					
9	115N05004	3 PM Peak	I-40	W	39	41	75	75	65	9	115N05004					
9	115N05004	4 Weekend	I-40	W	39	41	75	75	65	9	115N05004					
9	115N05005	1 AM Peak	I-40	W	31	32	75	75	65	9	115N05005	1.03	1.07	4%		
9	115N05005	2 Mid Day	I-40	W	30	32	75	75	65	9	115N05005					
9	115N05005	3 PM Peak	I-40	W	31	32	75	75	65	9	115N05005					
9	115N05005	4 Weekend	I-40	W	30	32	75	75	65	9	115N05005					
9	115N05006	1 AM Peak	I-40	W	33	36	75	75	65	9	115N05006	1.02	1.10	4%		
9	115N05006	2 Mid Day	I-40	W	33	35	75	75	65	9	115N05006					
9	115N05006	3 PM Peak	I-40	W	33	35	75	75	65	9	115N05006					
9	115N05006	4 Weekend	I-40	W	33	35	75	75	65	9	115N05006					
9	115-05003	1 AM Peak	I-40	S	143	149	75	75	65	9	115-05003	1.02	1.05	18%		
9	115-05003	2 Mid Day	I-40	S	142	148	75	75	65	9	115-05003					
9	115-05003	3 PM Peak	I-40	S	143	148	75	75	65	9	115-05003					
9	115-05003	4 Weekend	I-40	S	142	147	75	75	65	9	115-05003					
9	115-05004	1 AM Peak	I-40	W	60	64	75	75	65	9	115-05004	1.03	1.07	8%		
9	115-05004	2 Mid Day	I-40	W	60	63	75	75	65	9	115-05004					
9	115-05004	3 PM Peak	I-40	W	61	64	75	75	65	9	115-05004					
9	115-05004	4 Weekend	I-40	W	60	63	75	75	65	9	115-05004					
9	115-05005	1 AM Peak	I-40	W	271	283	75	75	65	9	115-05005	1.02	1.06	35%		
9	115-05005	2 Mid Day	I-40	W	269	280	75	75	65	9	115-05005					

Segment	TMC	Time Period	Road No.	Road Dir	Cars 50th % Travel Time (secs)	Trucks 50th % Travel Time (secs)	Cars 80th % Travel Time (secs)	Trucks 95th % Travel Time (secs)	Posted Speed Limit	LOTTR	TTTR	Peak LOTTR	Peak TTTR	TMC Weighting	Weighted LOTTR	Weighted TTTR
9	115-05005	3 PM Peak	I-40	W	271	282	75	75	65	9	115-05005					
9	115-05005	4 Weekend	I-40	W	269	279	75	75	65	9	115-05005					
9	115-05006	1 AM Peak	I-40	W	158	165	75	75	65	9	115-05006	1.02	1.06	20%		
9	115-05006	2 Mid Day	I-40	W	157	163	75	75	65	9	115-05006					
9	115-05006	3 PM Peak	I-40	W	158	164	75	75	65	9	115-05006					
9	115-05006	4 Weekend	I-40	W	157	162	75	75	65	9	115-05006					
10	115N05007	1 AM Peak	I-40	W	23	25	75	75	65	10	115N05007	1.02	1.08	2%	1.02	1.06
10	115N05007	2 Mid Day	I-40	W	23	25	75	75	65	10	115N05007					
10	115N05007	3 PM Peak	I-40	W	23	25	75	75	65	10	115N05007					
10	115N05007	4 Weekend	I-40	W	23	24	75	75	65	10	115N05007					
10	115N05008	1 AM Peak	I-40	W	44	47	75	75	65	10	115N05008	1.02	1.07	4%		
10	115N05008	2 Mid Day	I-40	W	44	46	75	75	65	10	115N05008					
10	115N05008	3 PM Peak	I-40	W	44	46	75	75	65	10	115N05008					
10	115N05008	4 Weekend	I-40	W	44	46	75	75	65	10	115N05008					
10	115N05009	1 AM Peak	I-40	W	21	24	75	75	65	10	115N05009	1.03	1.15	2%		
10	115N05009	2 Mid Day	I-40	W	21	23	75	75	65	10	115N05009					
10	115N05009	3 PM Peak	I-40	W	21	23	75	75	65	10	115N05009					
10	115N05009	4 Weekend	I-40	W	21	23	75	75	65	10	115N05009					
10	115-05007	1 AM Peak	I-40	W	388	405	75	75	65	10	115-05007	1.02	1.06	33%		
10	115-05007	2 Mid Day	I-40	W	387	399	75	75	65	10	115-05007					
10	115-05007	3 PM Peak	I-40	W	387	401	75	75	65	10	115-05007					
10	115-05007	4 Weekend	I-40	W	385	397	75	75	65	10	115-05007					
10	115-05008	1 AM Peak	I-40	W	428	446	75	75	65	10	115-05008	1.02	1.05	35%		
10	115-05008	2 Mid Day	I-40	W	428	442	75	75	65	10	115-05008					
10	115-05008	3 PM Peak	I-40	W	428	444	75	75	65	10	115-05008					
10	115-05008	4 Weekend	I-40	W	428	440	75	75	65	10	115-05008					
10	115-05009	1 AM Peak	I-40	W	298	315	75	75	65	10	115-05009	1.02	1.07	25%		
10	115-05009	2 Mid Day	I-40	W	297	308	75	75	65	10	115-05009					
10	115-05009	3 PM Peak	I-40	W	298	309	75	75	65	10	115-05009					
10	115-05009	4 Weekend	I-40	W	297	306	75	75	65	10	115-05009					
11	115N05010	1 AM Peak	I-40	W	19	20	75	75	65	11	115N05010	1.03	1.09	2%	1.03	1.11
11	115N05010	2 Mid Day	I-40	W	19	20	75	75	65	11	115N05010					
11	115N05010	3 PM Peak	I-40	W	19	20	75	75	65	11	115N05010					
11	115N05010	4 Weekend	I-40	W	19	19	75	75	65	11	115N05010					
11	115N05011	1 AM Peak	I-40	W	20	21	75	75	65	11	115N05011	1.03	1.09	2%		
11	115N05011	2 Mid Day	I-40	W	20	21	75	75	65	11	115N05011					
11	115N05011	3 PM Peak	I-40	W	20	21	75	75	65	11	115N05011					
11	115N05011	4 Weekend	I-40	W	20	21	75	75	65	11	115N05011					

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11	115N05012	1 AM Peak	I-40	W	25	27	75	75	65	11	115N05012	1.02	1.06	3%		
11	115N05012	2 Mid Day	I-40	W	25	26	75	75	65	11	115N05012					
11	115N05012	3 PM Peak	I-40	W	25	26	75	75	65	11	115N05012					
11	115N05012	4 Weekend	I-40	W	25	26	75	75	65	11	115N05012					
11	115N05013	1 AM Peak	I-40	W	36	41	75	75	65	11	115N05013	1.09	1.23	4%		
11	115N05013	2 Mid Day	I-40	W	36	41	75	75	65	11	115N05013					
11	115N05013	3 PM Peak	I-40	W	35	39	75	75	65	11	115N05013					
11	115N05013	4 Weekend	I-40	W	35	39	75	75	65	11	115N05013					
11	115-05010	1 AM Peak	I-40	W	201	213	75	75	65	11	115-05010	1.02	1.07	24%		
11	115-05010	2 Mid Day	I-40	W	200	209	75	75	65	11	115-05010					
11	115-05010	3 PM Peak	I-40	W	201	210	75	75	65	11	115-05010					
11	115-05010	4 Weekend	I-40	W	200	206	75	75	65	11	115-05010					
11	115-05011	1 AM Peak	I-40	W	161	169	75	75	65	11	115-05011	1.02	1.06	19%		
11	115-05011	2 Mid Day	I-40	W	160	166	75	75	65	11	115-05011					
11	115-05011	3 PM Peak	I-40	W	161	167	75	75	65	11	115-05011					
11	115-05011	4 Weekend	I-40	W	160	165	75	75	65	11	115-05011					
11	115-05012	1 AM Peak	I-40	W	297	309	75	75	65	11	115-05012	1.02	1.05	35%		
11	115-05012	2 Mid Day	I-40	W	297	306	75	75	65	11	115-05012					
11	115-05012	3 PM Peak	I-40	W	297	308	75	75	65	11	115-05012					
11	115-05012	4 Weekend	I-40	W	297	305	75	75	65	11	115-05012					
11	115-05013	1 AM Peak	I-40	W	129	162	75	75	65	11	115-05013	1.16	1.44	11%		
11	115-05013	2 Mid Day	I-40	W	128	159	75	75	65	11	115-05013					
11	115-05013	3 PM Peak	I-40	W	117	145	75	75	65	11	115-05013					
11	115-05013	4 Weekend	I-40	W	119	145	75	75	65	11	115-05013					
12	115N05014	1 AM Peak	I-40	W	29	33	75	75	65	12	115N05014	1.04	1.18	3%	1.03	1.08
12	115N05014	2 Mid Day	I-40	W	29	32	75	75	65	12	115N05014					
12	115N05014	3 PM Peak	I-40	W	28	30	75	75	65	12	115N05014					
12	115N05014	4 Weekend	I-40	W	28	29	75	75	65	12	115N05014					
12	115-05014	1 AM Peak	I-40	S	85	90	75	75	65	12	115-05014	1.03	1.08	9%		
12	115-05014	2 Mid Day	I-40	S	85	88	75	75	65	12	115-05014					
12	115-05014	3 PM Peak	I-40	S	85	88	75	75	65	12	115-05014					
12	115-05014	4 Weekend	I-40	S	84	87	75	75	65	12	115-05014					
12	115N05016	1 AM Peak	-	-	#N/A	#N/A	75	75	65	12	115N05016	0.00	0.00	0%		
12	115N05016	2 Mid Day	-	-	#N/A	#N/A	75	75	65	12	115N05016					
12	115N05016	3 PM Peak	-	-	#N/A	#N/A	75	75	65	12	115N05016					
12	115N05016	4 Weekend	-	-	#N/A	#N/A	75	75	65	12	115N05016					
12	115N05017	1 AM Peak	I-40	W	19	20	75	75	65	12	115N05017	1.03	1.07	2%		
12	115N05017	2 Mid Day	I-40	W	19	20	75	75	65	12	115N05017					

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12	115N05017	3 PM Peak	I-40	W	19	20	75	75	65	12	115N05017					
12	115N05017	4 Weekend	I-40	W	19	20	75	75	65	12	115N05017					
12	115N05018	1 AM Peak	I-40	W	33	35	75	75	65	12	115N05018	1.02	1.08	4%		
12	115N05018	2 Mid Day	I-40	W	33	35	75	75	65	12	115N05018					
12	115N05018	3 PM Peak	I-40	W	33	35	75	75	65	12	115N05018					
12	115N05018	4 Weekend	I-40	W	33	35	75	75	65	12	115N05018					
12	115N05019	1 AM Peak	I-40	W	21	22	75	75	65	12	115N05019	1.02	1.10	2%		
12	115N05019	2 Mid Day	I-40	W	21	22	75	75	65	12	115N05019					
12	115N05019	3 PM Peak	I-40	W	21	22	75	75	65	12	115N05019					
12	115N05019	4 Weekend	I-40	W	21	22	75	75	65	12	115N05019					
12	115N05020	1 AM Peak	I-40	S	22	23	75	75	65	12	115N05020	1.03	1.08	2%		
12	115N05020	2 Mid Day	I-40	S	22	23	75	75	65	12	115N05020					
12	115N05020	3 PM Peak	I-40	S	22	23	75	75	65	12	115N05020					
12	115N05020	4 Weekend	I-40	S	22	23	75	75	65	12	115N05020					
12	115N05020	1 AM Peak	I-40	S	22	23	75	75	65	12	115N05020	1.03	1.08	2%		
12	115N05020	2 Mid Day	I-40	S	22	23	75	75	65	12	115N05020					
12	115N05020	3 PM Peak	I-40	S	22	23	75	75	65	12	115N05020					
12	115N05020	4 Weekend	I-40	S	22	23	75	75	65	12	115N05020					
12	115N05021	1 AM Peak	I-40	S	26	29	75	75	65	12	115N05021	1.07	1.17	3%		
12	115N05021	2 Mid Day	I-40	S	26	28	75	75	65	12	115N05021					
12	115N05021	3 PM Peak	I-40	S	26	29	75	75	65	12	115N05021					
12	115N05021	4 Weekend	I-40	S	26	28	75	75	65	12	115N05021					
12	115N05021	1 AM Peak	I-40	S	26	29	75	75	65	12	115N05021	1.07	1.17	3%		
12	115N05021	2 Mid Day	I-40	S	26	28	75	75	65	12	115N05021					
12	115N05021	3 PM Peak	I-40	S	26	29	75	75	65	12	115N05021					
12	115N05021	4 Weekend	I-40	S	26	28	75	75	65	12	115N05021					
12	115-05016	1 AM Peak	I-40	W	65	68	75	75	65	12	115-05016	1.02	1.07	7%		
12	115-05016	2 Mid Day	I-40	W	65	67	75	75	65	12	115-05016					
12	115-05016	3 PM Peak	I-40	W	65	68	75	75	65	12	115-05016					
12	115-05016	4 Weekend	I-40	W	65	67	75	75	65	12	115-05016					
12	115-05017	1 AM Peak	I-40	W	145	153	75	75	65	12	115-05017	1.02	1.06	16%		
12	115-05017	2 Mid Day	I-40	W	145	150	75	75	65	12	115-05017					
12	115-05017	3 PM Peak	I-40	W	146	153	75	75	65	12	115-05017					
12	115-05017	4 Weekend	I-40	W	145	150	75	75	65	12	115-05017					
12	115-05018	1 AM Peak	I-40	W	148	156	75	75	65	12	115-05018	1.02	1.06	16%		
12	115-05018	2 Mid Day	I-40	W	148	153	75	75	65	12	115-05018					
12	115-05018	3 PM Peak	I-40	W	148	154	75	75	65	12	115-05018					
12	115-05018	4 Weekend	I-40	W	148	153	75	75	65	12	115-05018					

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12	115-05019	1 AM Peak	I-40	W	135	142	75	75	65	12	115-05019	1.02	1.07	15%		
12	115-05019	2 Mid Day	I-40	W	135	140	75	75	65	12	115-05019					
12	115-05019	3 PM Peak	I-40	W	135	140	75	75	65	12	115-05019					
12	115-05019	4 Weekend	I-40	W	135	140	75	75	65	12	115-05019					

Closure Data

	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
40E - 1	1	3	0	0	13	6	0	0	0	0	0	0
40E - 2	0	1	3	4	8	6	0	0	0	0	0	0
40E - 3	3	3	7	2	16	9	3	1	0	0	1	1
40E - 4	0	0	0	0	6	5	0	0	0	0	0	0
40E - 5	1	1	5	3	17	7	0	0	0	0	0	0
40E - 6	0	0	0	0	8	6	0	0	0	0	0	0
40E - 7	1	0	2	0	6	10	1	2	0	0	0	0
40E - 8	0	0	0	0	5	3	0	0	0	0	2	1
40E - 9	3	4	1	1	7	7	0	0	0	0	2	1
40E - 10	0	0	2	2	12	6	0	0	0	0	2	1
40E - 11	0	1	1	2	5	4	1	1	0	0	2	1
40E - 12	1	1	3	2	12	8	0	0	0	0	2	2

			Total miles of closures		Average Occurrences/Mile/Year	
Segment	Length (miles)	# of closures	NB (or EB)	SB (or WB)	NB (or EB)	SB (or WB)
87-1	5	22	14.0	9.0	0.47	0.30
87-2	9	22	11.0	11.0	0.22	0.22
87-3	22	42	121.9	100.9	1.11	0.92
87-4	22	11	6.0	5.0	0.10	0.08
87-5	6	33	23.0	11.0	0.38	0.18
87-6	9	14	8.0	6.0	0.13	0.10
87-7	3	19	10.0	17.0	0.13	0.21
260-8	4	9	7.0	4.0	0.35	0.20
260-9	4	23	39.3	26.0	0.56	0.37
260-10	17	22	58.4	30.0	0.53	0.27
260-11	5	16	39.0	29.0	0.43	0.32
260-12	22	28	52.7	98.0	0.59	1.09

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	2019 AADT	K Factor	D-Factor	T-Factor
40E-1	196	202	18387	18217	36604	18885	18885	37769	8	50	36
40E-2	202	212	10305	10160	20464	11189	11189	22377	8	50	48
40E-3	212	234	9476	9324	18799	10139	10139	20278	7	50	45
40E-4	234	246	9202	9399	18601	10038	10038	20075	6	50	46
40E-5	246	258	9308	9157	18465	9953	9953	19907	8	50	38
40E-6	258	270	9610	9007	18616	10379	10379	20757	6	50	41
40E-7	270	286	9297	9506	18802	10226	10226	20451	6	50	41
40E-8	286	290	9981	9968	19950	11520	11520	23040	9	50	35
40E-9	290	304	8845	8934	17779	10103	10103	20206	6	50	40
40E-10	304	326	8410	8388	16799	9122	9122	18244	8	50	43
40E-11	326	342	8542	8756	17298	9313	9313	18627	7	50	41
40E-12	342	360	9434	9338	18772	11111	11111	22222	6	50	38

SEGMENT	Loc ID	BMP	EMP	Length	Pos Dir AADT	Neg Dir AADT	Corrected Pos Dir AADT	Corrected Neg Dir AADT	2019 AADT	K Factor	D-Factor	D-Factor Adjusted	T-Factor
40E - 1	100541	195.44	198.35	2.91	0	0	24021	24021	48042	9	51	50	30
	100542	198.35	201.1	2.75	0	0	20542	20542	41083	8	52	50	29
	100543	201.1	204.86	3.76	0	0	13698	13698	27395	7	51	50	46
40E - 2	100544	204.86	207.29	2.43	0	0	10961	10961	21921	9	52	50	47
	100545	207.29	211.16	3.87	0	0	11960	11960	23920	6	52	50	46
	100546	211.16	219.58	8.42	0	0	10900	10900	21800	9	53	50	50
40E - 3	100547	219.58	225.07	5.49	0	0	10479	10479	20958	7	55	50	42
	100548	225.07	230.45	5.38	0	0	10000	10000	20000	8	55	50	49
	100549	230.45	233.88	3.43	0	0	10200	10200	20400	6	60	50	43
	100550	233.88	239.67	5.79	0	0	9910	9910	19820	7	50	50	44
40E - 4	100551	239.67	245.41	5.74	0	0	9750	9750	19500	7	51	50	48
	100552	245.41	252.13	6.72	0	0	10284	10284	20567	6	58	50	45
40E - 5	100553	252.13	253.63	1.5	0	0	10752	10752	21504	7	53	50	42
	100554	253.63	255.75	2.12	0	0	10828	10828	21655	6	55	50	43
	100555	255.75	257.7	1.95	0	0	10946	10946	21891	6	58	50	43
	100556	257.7	264.77	7.07	0	0	9248	9248	18496	9	54	50	34
40E - 6	100557	264.77	269.99	5.22	0	0	10254	10254	20507	6	58	50	40
	100558	269.99	274.74	4.75	0	0	10516	10516	21032	6	56	50	41

40E - 7	100559	274.74	277.08	2.34	0	0	10383	10383	20765	6	54	50	43
	100560	277.08	280.65	3.57	0	0	10774	10774	21547	6	51	50	42
	100561	280.65	283.66	3.01	0	0	10657	10657	21313	6	51	50	40
	100562	283.66	285.18	1.52	0	0	10053	10053	20106	6	54	50	40
	100563	285.18	286.89	1.71	0	0	8262	8262	16523	6	55	50	42
40E - 8	100564	286.89	289.51	2.62	0	0	9314	9314	18628	6	54	50	43
	100565	289.51	292.81	3.3	0	0	13271	13271	26542	11	50	50	29
40E - 9	100566	292.81	294.53	1.72	0	0	9516	9516	19032	6	51	50	42
	100567	294.53	300.54	6.01	0	0	9948	9948	19895	6	52	50	42
	100568	300.54	303.62	3.08	0	0	10103	10103	20206	6	51	50	42
	100569	303.62	311.56	7.94	0	0	10348	10348	20695	6	51	50	37
40E - 10	100570	311.56	320.01	8.45	0	0	9150	9150	18300	6	52	50	43
	100571	320.01	325.9	5.89	0	0	9167	9167	18334	11	52	50	43
	100572	325.9	330.01	4.11	0	0	9000	9000	18000	6	52	50	42
40E - 11	100573	330.01	333.41	3.4	0	0	8834	8834	17668	6	61	50	39
	100574	333.41	339.52	6.11	0	0	8582	8582	17164	8	60	50	43
	100575	339.52	341.82	2.3	0	0	10650	10650	21300	6	56	50	40
	100576	341.82	343.84	2.02	0	0	10810	10810	21620	6	56	50	40
40E - 12	100577	343.84	346.56	2.72	0	0	11457	11457	22914	6	52	50	41
	100578	346.56	348.21	1.65	0	0	11263	11263	22525	6	53	50	41
	100579	348.21	351.35	3.14	0	0	10979	10979	21957	6	52	50	38
	100580	351.35	354.62	3.27	0	0	10888	10888	21776	6	55	50	37
	100581	354.62	357.53	2.91	0	0	10897	10897	21794	8	53	50	36

Bicycle Accommodation Data

Segment	BMP	EMP	Divided or Non	NB/EB Right Shoulder Width	SB/WB Right Shoulder Width	NB/EB Left Shoulder Width	SB/WB Left Shoulder Width	NB/EB Effective Length of Shoulder	SB/WB Effective Length of Shoulder	% Bicycle Accommodation
87-1	177	182	Divided	5.5	8.4	1.6	3.2	2.5	2.0	45%
87-2	182	191	Divided	9.5	9.9	3.4	3.6	7.9	8.9	93%
87-3	191	213	Divided	9.9	9.0	3.8	3.7	21.8	22.0	99%
87-4	213	235	Divided	9.5	9.1	3.5	5.3	16.1	21.8	86%
87-5	235	241	Divided	10.0	9.7	4.0	4.8	5.0	6.0	92%
87-6	241	250	Divided	10.0	5.1	4.0	3.0	9.0	5.2	79%
87-7	250	253	Undivided	6.2	5.4	N/A	N/A	3.3	0.0	56%
260-8	252	256	Undivided	4.6	4.6	N/A	N/A	1.3	0.0	16%
260-9	256	260	Undivided	1.3	1.2	N/A	N/A	0.2	0.0	2%
260-10	260	277	Divided	9.5	9.5	3.9	4.4	16.0	15.5	93%
260-11	277	282	Undivided	7.8	2.6	N/A	N/A	4.9	0.0	49%
260-12	282	304	Undivided	2.1	2.4	N/A	N/A	0.7	0.0	2%
260-13	304	306	Undivided	3.50	4.0	N/A	N/A	0.6	0.0	15%
277-14	306	313	Undivided	1.18	1.2	N/A	N/A	0.0	0.0	0%
377-15	0	34	Undivided	0.17	0.2	N/A	N/A	0.0	0.0	0%
77-16	386	389	Undivided	1.58	1.4	N/A	N/A	0.1	0.0	1%
40B-17	287	288	Undivided	3.47	2.2	N/A	N/A	0.5	0.0	27%

AZTDM Data

SEGMENT	Growth Rate	% Non-SOV
87-1	3.20%	13.6%
87-2	3.88%	14.4%
87-3	3.51%	16.7%
87-4	1.46%	5.2%
87-5	-0.82%	12.9%
87-6	-0.24%	12.4%
87-7	2.44%	18.4%
260-8	2.46%	18.5%
260-9	2.22%	15.1%
260-10	-0.40%	16.2%
260-11	1.14%	12.5%
260-12	0.89%	10.8%
260-13	0.88%	6.7%
277-14	1.61%	17.5%
377-15	1.23%	18.2%
77-16	2.74%	18.7%
40B-17	2.54%	20.7%

HERS Capacity Calculation Data

Segment	Capacity Environment Type	Facility Type	Terrain	Lane Width	NB/EB Rt. Shoulder	SB/WB Rt. Shoulder	F_{lw} or f_w or f_{LS}	NB/EB F_{lc}	SB/WB F_{lc}	Total Ramp Density	PHF	E_T	f_{HV}	f_M	f_A	g/C	f_G	f_{NP}	Nm	f_p	NB/EB FFS	SB/WB FFS	NB/EB Peak-Hour Capacity	SB/WB Peak-Hour Capacity	Major Direction Peak-Hour Capacity	Daily Capacity
87-1	3	Urban	Level	12.00	5.51	8.42	1.0	N/A	N/A	N/A	0.9	2	0.956	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1798.51	34,257
87-2	3	Fringe Urban	Level	12.00	9.48	9.87	1.0	N/A	N/A	N/A	0.9	2	0.951	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1788.81	34,073
87-3	2	Rural	Level	12.00	9.88	8.96	0.0	0	0.4	N/A	0.88	1.5	0.952	0	0.19	N/A	N/A	N/A	N/A	N/A	64.81	64.41	3688	3688	N/A	70,240
87-4	2	Rural	Mountainous	12.00	9.51	9.06	0.0	0	0.4	N/A	0.88	4.5	0.742	0	0.14	N/A	N/A	N/A	N/A	N/A	62.86	62.46	2872	2872	N/A	54,713
87-5	2	Rural	Level	12.00	10.00	9.73	0.0	0	0.4	N/A	0.88	1.5	0.951	0	0.43	N/A	N/A	N/A	N/A	N/A	64.57	64.17	3683	3683	N/A	70,160
87-6	2	Rural	Mountainous	12.00	9.96	5.08	0.0	0	0.4	N/A	0.88	4.5	0.736	0	0.16	N/A	N/A	N/A	N/A	N/A	64.84	64.44	2850	2850	N/A	54,292
87-7	3	Urban	Level	12.00	6.24	5.40	1.0	N/A	N/A	N/A	0.92	2	0.923	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1774.05	33,791
260-8	3	Urban	Level	12.00	4.63	4.61	1.0	N/A	N/A	N/A	0.9	2	0.980	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1843.63	35,117
260-9	4	Rural	Level	12.00	1.25	1.16	4.2	N/A	N/A	N/A	0.88	1	1.000	N/A	0.65	N/A	1	0.50	N/A	N/A	58.15	58.15	N/A	N/A	1000.97	19,066
260-10	2	Rural	Level	12.00	9.54	9.52	0.0	0	0.4	N/A	0.88	1.5	0.981	0	0.24	N/A	N/A	N/A	N/A	N/A	59.76	59.36	3791	3777	N/A	72,202
260-11	2	Rural	Mountainous	12.00	7.81	2.58	0.0	0.9	0.9	N/A	0.88	4.5	0.817	1.6	0.1	N/A	N/A	N/A	N/A	N/A	52.40	52.40	2945	2945	N/A	56,089
260-12	4	Rural	Level	12.00	2.15	2.38	2.6	N/A	N/A	N/A	0.88	1.4	0.965	N/A	0.47	N/A	1	3.23	N/A	N/A	60.93	60.93	N/A	N/A	969.08	18,459
260-13	5	Fringe Urban	Level	12.00	3.50	3.98	1.0	N/A	N/A	N/A	0.92	2	0.897	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	3135.25	59,719
277-14	4	Rural	Level	12.00	1.18	1.18	4.2	N/A	N/A	N/A	0.88	1.9	0.919	N/A	1.5	N/A	1	1.70	N/A	N/A	56.30	56.30	N/A	N/A	760.72	14,490
377-15	4	Rural	Level	12.00	0.17	0.17	4.2	N/A	N/A	N/A	0.88	1.5	0.953	N/A	0.18	N/A	1	2.75	N/A	N/A	69.62	69.62	N/A	N/A	1452.17	27,660
77-16	4	Fringe Urban	Level	12.00	1.58	1.41	4.2	N/A	N/A	N/A	0.88	1.3	0.962	N/A	1.17	N/A	1	1.60	N/A	N/A	53.63	53.63	N/A	N/A	656.28	12,501
40B-17	3	Urban	Level	11.00	3.47	2.18	1.0	N/A	N/A	N/A	0.9	2	0.915	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1721.27	32,786

Safety Performance Area Data

Segment	Operating Environment	Segment Length (miles)	NB/EB Fatal Crashes 2010-2014	SB/WB Fatal Crashes 2010-2014	NB/EB Incapacitating Injury Crashes	SB/WB Incapacitating Injury Crashes
40E - 1	Urban 4 Lane Freeway	6	4	2	1	1
40E - 2	Rural 4 Lane Freeway < 25,000	10	2	2	2	0
40E - 3	Rural 4 Lane Freeway < 25,000	22	6	5	11	5
40E - 4	Rural 4 Lane Freeway < 25,000	12	0	0	4	7
40E - 5	Urban 4 Lane Freeway	12	3	2	0	4
40E - 6	Rural 4 Lane Freeway < 25,000	12	3	2	4	7
40E - 7	Rural 4 Lane Freeway < 25,000	16	3	1	1	0
40E - 8	Rural 4 Lane Freeway < 25,000	4	2	1	1	0
40E - 9	Rural 4 Lane Freeway < 25,000	14	2	4	1	2
40E - 10	Rural 4 Lane Freeway < 25,000	22	0	0	0	0
40E - 11	Rural 4 Lane Freeway < 25,000	16	4	3	7	10
40E - 12	Rural 4 Lane Freeway < 25,000	18	1	4	5	3

Segment	Operating Environment	Fatal + Incapacitating Injury Crashes at Intersections	Fatal + Incapacitating Injury Crashes Involving Lane Departures	Fatal + Incapacitating Injury Crashes Involving Pedestrians	Fatal + Incapacitating Injury Crashes Involving Trucks	Fatal + Incapacitating Injury Crashes Involving Bicycles	Weighted 5-Year (2010-2014) Average NB/EB AADT	Weighted 5-Year (2010-2014) Average SB/WB AADT	Weighted 5-Year (2010-2014) Average Total AADT
40E - 1	Urban 4 Lane Freeway	0	5	1	3	0	18387	18217	36604
40E - 2	Rural 4 Lane Freeway < 25,000	0	4	1	1	0	10305	10160	20464
40E - 3	Rural 4 Lane Freeway < 25,000	0	22	0	6	0	9476	9324	18799
40E - 4	Rural 4 Lane Freeway < 25,000	0	5	0	1	0	9202	9399	18601
40E - 5	Urban 4 Lane Freeway	0	6	1	5	0	9308	9157	18465
40E - 6	Rural 4 Lane Freeway < 25,000	0	13	2	3	0	9610	9007	18616
40E - 7	Rural 4 Lane Freeway < 25,000	0	3	0	1	0	9297	9506	18802
40E - 8	Rural 4 Lane Freeway < 25,000	0	4	0	1	0	9981	9968	19950
40E - 9	Rural 4 Lane Freeway < 25,000	0	7	1	2	0	8845	8934	17779
40E - 10	Rural 4 Lane Freeway < 25,000	0	0	0	0	0	8410	8388	16799
40E - 11	Rural 4 Lane Freeway < 25,000	0	15	0	2	1	8542	8756	17298
40E - 12	Rural 4 Lane Freeway < 25,000	0	7	3	2	0	9434	9338	18772

HPMS Data

SEGMENT	MP_FROM	MP_TO	2015-2019 Weighted Average			2019			2018			2017			2016			2015		
			WEIGHTED AVERAGE NB/EB AADT	WEIGHTED AVERAGE SB/WB AADT	WEIGHTED AVERAGE AADT	NB/EB AADT	SB/WB AADT	2019 AADT	NB/EB AADT	SB/WB AADT	2019 AADT	NB/EB AADT	SB/WB AADT	2019 AADT	NB/EB AADT	SB/WB AADT	2019 AADT	NB/EB AADT	SB/WB AADT	2019 AADT
40E - 1	196	202	18387	18217	36604	18885	18885	37769	19628	18652	38281	18205	18205	36411	18378	18572	36950	16836	16771	33607
40E - 2	202	212	10305	10160	20464	11189	11189	22377	9832	9942	19774	9769	9636	19405	10899	10525	21424	9834	9506	19339
40E - 3	212	234	9476	9324	18799	10139	10139	20278	9397	9555	18952	9306	9022	18328	9457	9263	18721	9078	8640	17718
40E - 4	234	246	9202	9399	18601	10038	10038	20075	8288	9823	18111	9358	8939	18297	9282	9282	18565	9043	8912	17955
40E - 5	246	258	9308	9157	18465	9953	9953	19907	9283	9789	19072	9298	8926	18223	9179	8707	17886	8827	8411	17238
40E - 6	258	270	9610	9007	18616	10379	10379	20757	9656	9961	19617	9794	8668	18462	9262	8147	17409	8958	7879	16837
40E - 7	270	286	9297	9506	18802	10226	10226	20451	8436	10249	18685	9665	9251	18915	9231	9051	18281	8927	8753	17680
40E - 8	286	290	9981	9968	19950	11520	11520	23040	10937	10588	21525	10500	10500	21000	8404	8608	17012	8545	8627	17172
40E - 9	290	304	8845	8934	17779	10103	10103	20206	8519	9717	18237	9146	8445	17591	8367	8338	16705	8092	8064	16156
40E - 10	304	326	8410	8388	16799	9122	9122	18244	8284	8615	16899	8361	8211	16573	8278	8130	16409	8006	7863	15869
40E - 11	326	342	8542	8756	17298	9313	9313	18627	8465	9061	17526	8803	8629	17431	8200	8528	16729	7931	8248	16178
40E - 12	342	360	9434	9338	18772	11111	11111	22222	9466	9782	19248	9410	8614	18023	8735	8735	17471	8448	8448	16896

Freight Performance Area Data

Segment	Length (miles)	# of closures	Total minutes of closures		Avg Mins/Mile/Year	
			NB (or EB)	SB (or WB)	NB (or EB)	SB (or WB)
40E - 1	6	22	3498.6	1591.6	116.62	53.05
40E - 2	10	22	4355.0	3363.0	87.10	67.26
40E - 3	22	42	43877.8	38076.8	398.89	346.15
40E - 4	12	11	2127.0	1484.0	35.45	24.73
40E - 5	12	33	5816.0	2352.0	96.93	39.20
40E - 6	12	14	2047.0	1795.0	34.12	29.92
40E - 7	16	19	3343.0	4539.0	41.79	56.74
40E - 8	4	9	2545.0	1175.0	127.25	58.75
40E - 9	14	23	14686.5	8688.0	209.81	124.11
40E - 10	22	22	23239.4	9829.0	211.27	89.35
40E - 11	18	16	15836.0	9244.0	175.96	102.71
40E - 12	18	28	20974.6	37140.0	233.05	412.67

	ITIS Category Description											
	Closures		Incidents/Accidents		Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
Segment	NB (or EB)	SB (or WB)	NB (or EB)	SB (or WB)	NB (or EB)	SB (or WB)	NB (or EB)	SB (or WB)	NB (or EB)	SB (or WB)	NB (or EB)	SB (or WB)
40E - 1	1	3	0	0	13	6	0	0	0	0	0	0
40E - 2	0	1	3	4	8	6	0	0	0	0	0	0
40E - 3	3	3	7	2	16	9	3	1	0	0	1	1
40E - 4	0	0	0	0	6	5	0	0	0	0	0	0
40E - 5	1	1	5	3	17	7	0	0	0	0	0	0
40E - 6	0	0	0	0	8	6	0	0	0	0	0	0
40E - 7	1	0	2	0	6	10	1	2	0	0	0	0
40E - 8	0	0	0	0	5	3	0	0	0	0	2	1
40E - 9	3	4	1	1	7	7	0	0	0	0	2	1
40E - 10	0	0	2	2	12	6	0	0	0	0	2	1
40E - 11	0	1	1	2	5	4	1	1	0	0	2	1
40E - 12	1	1	3	2	12	8	0	0	0	0	2	2

See the **Mobility Performance Area Data** section for other Freight Performance Area related data.

Appendix D: Needs Analysis Contributing Factors and Scores

Pavement Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Pavement Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score for each segment to the appropriate "Performance Score" columns. This includes the primary and secondary measures for Pavement. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Assessment Scales" within the Step 1 template.

To develop an aggregate Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scored, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Enter the appropriate segment information into the columns titled "Segment", "Segment Length", "Segment Mileposts" and "Facility Type".

Step 1.2

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis into the appropriate "Performance Score" columns. Copy the performance score for each segment to the appropriate "Performance Score" column. Paste only the "values" and do not overwrite the formatting.

Step 1.3

Indicate if Pavement is an Emphasis Area by selecting "Yes" or "No" in the row immediately below the segment information.

Step 1.4

Confirm that that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the segment information and the initial needs from the Step 1 template to the "Initial Need" column of the Step 2 template.

Step 2.2

Note in the "Hot Spots" column any pavement failure hot spots identified as part of the baseline corridor performance. For each entry, include the milepost limits of the hot spot. Hot spots are identified in the Pavement Index spreadsheet by the red cells in the columns titled "% Pavement Failure". These locations are based on the following criteria:

Interstates: IRI > 105 or Cracking > 10 or Rutting > 0.4

Non-Interstates: IRI > 142 or Cracking > 10 or Rutting > 0.4

Every segment that has a % Pavement Failure greater than 0% will have at least one hot spot. Hot spot locations should be described as extending over consecutive miles. For example, if there is a pavement failure location that extends 5 consecutive miles, it should be identified as one hot spot, not 5 separate hot spots.

Step 2.3

Identify recently completed or under construction paving projects in the "Previous Projects" column. Include only projects that were completed after the pavement condition data period (check dates in pavement condition data provided by ADOT) that would supersede the results of the performance system.

Step 2.5

Update the “Final Need” column using the following criteria:

- If "None" but have a hot spot (or hot spots), the Final Need = Low, and note the reason for the change in the “Comments” column (column H).
- If a recent project has superseded the performance rating data, change the Final Need to “None” and note the reason for the change in the “Comments” column.

Example Scales for Level of Need

Pavement Index (Interstates) Performance Thresholds		Initial Need	Description (Non-Emphasis Area)
3.75	Good	None	All of Good Performance and upper third of Fair Performance (>3.50)
	Good		
	Good		
	Fair		
	Fair	Low	Middle third of Fair Perf. (3.25 - 3.5)
3	Fair	Medium	Lower third of Fair and top third of Poor Performance (2.75-3.25)
	Poor		
	Poor	High	Lower two-thirds of Poor Performance (<2.75)
	Poor		

Need Scale for Interstates

Measure	None >=	Low >=	> Medium <		High <=
Pavement Index (corridor non-emphasis area)	3.5	3.25	3.25	2.75	2.75
Pavement Index (corridor emphasis area)	4.0	3.5	3.5	3.00	3.00
Pavement Index (segments)	3.5	3.25	3.25	2.75	2.75
Directional PSR	3.63	3.52	3.52	3.28	3.28
%Pavement Failure	10%	15%	15%	25%	25%

Need Scale for Highways (Non-Interstates)

Measure	None >=	Low >=	> Medium <		High <=
Pavement Index (corridor non-emphasis area)	3.33	3.07	3.07	2.53	2.53
Pavement Index (corridor emphasis area)	3.87	3.33	3.33	2.80	2.80
Pavement Index (segments)	3.33	3.07	3.07	2.53	2.53
Directional PSR	3.30	3.10	3.10	2.70	2.70
%Pavement Failure	10%	15%	15%	25%	25%

Step 2.6

Note any programmed projects that could have the potential to mitigate pavement needs in in the “Comments” column. Programmed projects are provided as information and do not impact the need rating. The program information can be found in ADOT’s 5-year construction program. If there are other comments relevant to the needs analysis (such as information from previous reports), they can be entered in the “Comments” column. However, only include information related to needs that have been identified through this process. Do not add or create needs from other sources.

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab. The steps to complete Step 3 include:

Step 3.1

Input the level of historical investment for each segment. This will be determined from the numeric score from the Pavement History Table based on the following thresholds:

- Low = < 4.60
- Medium = 4.60 – 6.60
- High = > 6.60

If the PeCoS data shows a high level of maintenance investment, increase the historical investment rating by one level.

Step 3.2

Note the milepost ranges of pavement failure hot spots into the column titled “Contributing Factors and Comments.”

Step 3.3

Note any other information that may be contributing to the deficiency, or supplemental information, in the “Contributing Factors and Comments” column. This could come from discussions with ADOT District staff, ADOT Materials/Pavement Group, previous reports, or the historical investment data.

Step 3.4

Include any programmed projects from ADOT’s 5-year construction program in the “Contributing Factors and Comments” column.

Bridge Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Bridge Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score for each segment to the appropriate “Performance Score” columns. This includes the primary and secondary measures for Bridge. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of “None” (score = 0), “Low” (score = 1), “Medium” (score = 2), and “High” (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled “Needs Assessment Scales” within the Step 1 template.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scored, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial level of need for each segment (combining the primary and secondary measures) has levels of “None” (score < 0.01), “Low” (score $\geq$ 0.01 and < 1.5), “Medium” (score $\geq$ 1.5 and < 2.5), and “High” (score $\geq$ 2.5).

The steps include:

Step 1.1

Enter the appropriate segment information into the columns titled “Segment”, “Segment Length”, “Segment Mileposts” and “Number of Bridges.”

Step 1.2

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis into the appropriate “Performance Score” columns. Copy the performance score for each segment to the appropriate “Performance Score” column. Paste only the “values” and do not overwrite the formatting.

Step 1.3

Indicate if Bridge is an Emphasis Area by selecting “Yes” or “No” in the row immediately below the segment information.

Step 1.4

Confirm that that the Step 1 template is generating the appropriate “Level of Need” for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial needs from the Step 1 template to the “Initial Need” column of the Step 2 template.

Step 2.2

Note in the column titled “Hot Spots” any bridge hot spots identified as part of the baseline corridor performance. For each entry, note the specific location. Hot spots are identified as having any bridge rating of 4 or less, or multiple ratings of 5 in the deck, substructure, or superstructure ratings.

Step 2.3

Identify recently completed or under construction bridge projects in the “Previous Projects” column. Include only projects that were completed after the bridge condition data period (check dates in bridge condition data provided by ADOT) that would supersede the results of the performance system.

Step 2.4

Update the Final Need on each segment based on the following criteria:

- If the Initial Need is “None” and there is at least one hot spot located on the segment, change the Final Need to “Low”.
- If a recent project has superseded the performance rating data, the performance data should be adjusted to increase the specific ratings and the resulting need should be reduced to account for the project.
- Note the reason for any change in the “Comments” column.

Step 2.5

Historical bridge rating data was tabulated and graphed to find any bridges that had fluctuations in the ratings. Note in the “Historical Review” column any bridge that was identified as having a potential historical rating concern based on the following criteria:

- Ratings increase or decrease (bar chart) more than 2 times
- Sufficiency rating drops more than 20 points

This is for information only and does not affect the level of need.

Step 2.6

Note the number of functionally obsolete bridges in each segment in the column titled “# Functionally Obsolete Bridges”. This is for information only and does not affect the level of need.

Step 2.7

Identify each bridge “of concern” in the “Comments” column. Note any programmed projects that could have the potential to mitigate bridge needs. Programmed projects are provided as information and do not impact the need rating. The program information can be found in ADOT’s 5-year construction program. If there are other comments relevant to the needs analysis (such as information from previous reports), they can be entered in the “Comments” column. However, only include information related to needs that have been identified through this process. Do not add or create needs from other sources.

Example Scales for Level of Need

Bridge Index Performance Thresholds	Level of Need		Description (Non-Emphasis Area)
6.5	Good	None	All of Good Performance and upper third of Fair Performance (>6.0)
	Good		
	Good		
	Fair		
	Fair	Low	Middle third of Fair Performance (5.5-6.0)
5.0	Fair	Medium	Lower third of Fair and top third of Poor Performance (4.5-5.5)
	Poor		
	Poor	High	Lower two-thirds of Poor Performance (<4.5)
	Poor		

Need Scale

Measure	None >=	Low >=	> Medium <		High <=
Bridge Index (corridor non-emphasis area)	6.0	5.5	5.5	4.5	4.5
Bridge Index (corridor emphasis area)	7.0	6.0	6.0	5.0	5.0
Bridge Index (segments)	6.0	5.5	5.5	4.5	4.5
Bridge Sufficiency	70	60	60	40	40
Bridge Rating	6.0	5.0	4.0	4.0	3.0

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab. The steps to compete Step 3 include:

Step 3.1

Input the bridge name, structure number, and milepost information for each bridge “of concern” resulting from Step 2.

Step 3.2

For bridges that have a current rating of 5 or less, enter the specific rating, or state “No current ratings less than 6”.

Step 3.3

For bridges that were identified for a historical review (step 2.5), state “Could have a repetitive investment issue”. If a bridge was not identified for a historical review, state “This structure was not identified in historical review”.

Step 3.4

Input any programmed projects from ADOT’s 5-year construction program. Note any other information that may be contributing to the deficiency, or supplemental information. This could come from discussions with ADOT District staff, ADOT Bridge Group, or previous reports.

Mobility Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Mobility Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Refined Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score for each segment to the appropriate "Performance Score" columns from Existing Performance Analysis. This includes the primary and secondary measures for Mobility. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Assessment Scales" in the Step 1 tab.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scores, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Input the accurate number of segments for your corridor in the column titled 'Segment' and the appropriate segment milepost limits and segment lengths in adjacent columns.

Step 1.2

Select the appropriate 'Environment Type' and 'Facility Operation Type' from the drop-down menus as defined in Existing Performance Analysis.

Step 1.3

Select 'Yes' or 'No' form the drop-down list to not if the Mobility Performance Area is an Emphasis Area for your corridor.

Step 1.4

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis. Copy the performance score for each segment to the appropriate "Performance Score" column.

Step 1.5

Confirm that that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2 The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial deficiencies from the Step 1 template to the Step 2 template.

Step 2.2

Identify recently completed or under construction projects that would be considered relevant to mobility performance. Include only projects that were constructed after the date for which the HPMS data used for traffic volumes would not include. Any completed or under construction roadway project after the HPMS data date that has the potential to mitigate a mobility issue on a corridor segment should be listed in the template. Such projects should include the construction of new travel lanes or speed limit changes on the main corridor only. Do not include projects involving frontage roads or crossings as they would not impact the corridor level performance.

Step 2.3

Update the Final Need using the following criteria:

- If a recent project has superseded the performance rating data and it is certain the project addressed the deficiency, change the need rating to "None".
- If a recent project has superseded the performance rating data but it is uncertain that a project addressed the need, maintain the current deficiency rating and note the uncertainty as a comment.

Step 2.4

Note any programmed or planned projects that have the potential to mitigate any mobility needy on the segment. Programmed and Planned projects are provided as information and do not impact the deficiency rating. Future projects will be reviewed in the development of solution sets for identified needs and deficiencies. The source of future projects can be found in ADOT's 5-year construction program or other planning documents. Other comments relevant to the needs analysis can be entered.

Example Scales for Level of Need

Mobility Index (Urban and Fringe Urban) Performance Thresholds	Initial Need		Description (Non-Emphasis Area)
0.71	Good	None	All of Good Performance and upper third of Fair Performance (<0.77)
	Good		
	Good		
	Fair		
	Fair	Low	Middle third of Fair Performance (0.77 - 0.83)
0.89	Fair	Medium	Lower third of Fair and top third of Poor Performance (0.83-0.95)
	Poor		
	Poor	High	Lower two-thirds of Poor Performance (>0.95)
	Poor		

Needs Scale

Measure		None <=	Low >=	> Medium <		High <=
Mobility Index (Corridor Emphasis Area)		Weighted calculation for the segment totals in corridor (urban vs. rural)				
Mobility Index (Corridor Non-Emphasis Area)		Weighted calculation for the segment totals in corridor (urban vs. rural)				
Mobility Index (Segment)	Urban	0.77	0.83	0.83	0.95	0.95
	Rural	0.63	0.69	0.69	0.83	0.83
Future Daily V/C	Urban	0.77	0.83	0.83	0.95	0.95
	Rural	0.63	0.69	0.69	0.83	0.83
Existing Peak Hour V/C	Urban	0.77	0.83	0.83	0.95	0.95
	Rural	0.63	0.69	0.69	0.83	0.83
Closure Extent		0.35	0.49	0.49	0.75	0.75
Directional LOTTR	Uninterrupted	1.27	1.38	1.38	1.62	1.62
	Interrupted	1.27	1.38	1.38	1.62	1.62
Bicycle Accommodation		80%	70%	70%	50%	50%

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab. The steps to compete Step 3 include:

Step 3.1

Input data from Mobility Index worksheet and corridor observations in appropriate columns for Roadway Variables.

Step 3.2

Input traffic variable data in appropriate columns as indicated, Buffer Index scores will auto populate.

Step 3.3

Input relevant mobility related infrastructure located within each segment as appropriate

Step 3.4

Input the Closure Extents that have occurred along the study corridor. Road closure information can be detailed out by the reason for the closure as documented in Highway Condition Reporting System (HCRS) data analyzed as part of the baseline corridor performance. Closure reasons include incident/accidents, winter storms, obstruction hazards, and undefined closures. Statewide average percentages for the various closure reasons have been calculated for most recent five-year period on ADOT's designated strategic corridors. Compare these statewide average percentages to the corridor percentages for the various closure reasons to identify higher than average percentages of one or more closure reasons on any given segment. Input the closures as follows and use red text to indicate that the segment percentage exceeds statewide averages:

- Total Number of Closures
- % Incidents/Accidents
- % Obstructions/Hazards
- % Weather Related

Step 3.5

List the non-actionable conditions that are present within each segment by milepost if possible. Non-Actionable conditions are conditions that exist within the environment of each segment that cannot be improved through an engineered solution. For example, the border patrol check point in Segment 3 of I-19 is a non-actionable condition.

Step 3.6

Considering all information input, identify and list the contributing factors to the Final Need score.

Safety Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Safety Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the corridor characteristics and existing performance score for each segment to the appropriate "Performance Score" columns. This includes the primary and secondary measures for safety. As each performance score is input into the template, the Level of Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Scale" within the Step 1 template.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted scored, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Populate the Step 1 template with the corridor characteristics information. This includes segment operating environments and segment length. Also, specify if the safety performance area is an emphasis area as determined in Goals and Objectives. The "Level of Need" is dependent on the input of the operating environment and "Emphasis Area" as the thresholds dynamically update accordingly.

Input the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis. Copy the performance score (paste values only) for each segment to the appropriate "Performance Score" column and conditional formatting should color each cell green, yellow, or red based on the corresponding performance thresholds.

Step 1.2

The thresholds for the corridor safety index are based on the segments' operating environments. To ensure that the correct corridor safety index threshold is applied, input the unique segment operating environments that exist with the corridor. Once the input is complete, the average of the Good/Fair and Fair/Poor thresholds for each of the operating environments is calculated and the "Level of Need" thresholds will be derived and applied to the main Step 1 Table.

Step 1.3

Confirm that the following criteria for "Insufficient Data" have been applied and that the resulting Level of Need has been shown as "N/A" where applicable.

- Crash frequency for a segment is less than 5 crashes over the 5-year crash analysis period.
- The change in +/- 1 crash results in the change of need level of 2 levels (i.e., changes from Above Average to Below Average or changes from Below Average to Above Average).
- The average segment crash frequency for the overall corridor (total fatal plus suspected serious injury crash frequency divided by the number of corridor segments) is less than 2 per segment over the 5-year crash analysis period.

Step 1.4

Confirm that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial needs from the Step 1 template to the Step 2 template.

Step 2.2

Using the crash concentration (hot spot) map developed as part of the baseline corridor performance, note the direction of travel and approximate milepost limits of each hot spot.

Step 2.3

Identify recently completed or under construction projects that would be considered relevant to safety performance. Include only projects that were not taken into account during the five-year crash data analysis period. Any completed or under construction roadway project after the crash analysis period that has the potential to mitigate a safety issue on a corridor segment should be listed in the template. Sources of recent or current project activity can include ADOT MPD staff, ADOT public notices, and ADOT District staff.

Step 2.4

Update the Final Need based on the following criteria:

- If there is a crash hot spot concentration on a “None” segment, upgrade the need rating to “Low.”

Step 2.5

Note any programmed projects that could have the potential to mitigate any safety need on the segment. Programmed projects are provided as information and do not impact the need rating. Programmed projects will be reviewed in the development of solution sets for identified needs. The source of the programming information can be found in ADOT’s 5-year construction program. Any other relevant issues identified in previous reports should also be reported.

Example Scales for Level of Need

<table>
<tr><th>Safety Index (6 Lane Highway) Performance Thresholds</th><th colspan="2">Initial Need</th><th>Description (Non-Emphasis Area)</th></tr>
<tr><td rowspan="5">0.76</td><td>Good</td><td rowspan="4">None</td><td rowspan="4">All of Above Average Performance and upper third of Average Performance (<0.92)</td></tr>
<tr><td>Good</td></tr>
<tr><td>Good</td></tr>
<tr><td>Fair</td></tr>
<tr><td>Fair</td><td>Low</td><td>Middle third of Average Performance (0.92 - 1.08)</td></tr>
<tr><td rowspan="3">1.24</td><td>Fair</td><td rowspan="2">Medium</td><td rowspan="2">Lower third of Average and top third of Below Average Performance (1.08-1.40)</td></tr>
<tr><td>Poor</td></tr>
<tr><td>Poor</td><td>High</td><td>Lower two-thirds of Below Average Performance (>1.40)</td></tr>
</table>

Measure		None <=	Low <=	< Medium >		High >=	Good/Fair Threshold	Fair/Poor Threshold
Corridor Safety Index (Emphasis Area)		Weighted average based on operating environment type						
Corridor Safety Index (Non-Emphasis Area)		# Weighted average based on operating environment type					0.92	1.08
Safety Index and Directional Safety Index (Segment)	2 or 3 Lane Undivided Highway	0.97	1.02	1.02	1.13	1.13	0.92	1.08
	2 or 3 or 4 Lane Divided Highway	0.94	1.07	1.07	1.32	1.32	0.81	1.19
	4 or 5 Lane Undivided Highway	0.93	1.08	1.08	1.37	1.37	0.78	1.22
	6 Lane Highway	0.92	1.08	1.08	1.4	1.4	0.76	1.24
	Rural 4 Lane Freeway with Daily Volume < 25,000	0.95	1.06	1.06	1.27	1.27	0.84	1.16
	Rural 4 Lane Freeway with Daily Volume > 25,000	0.93	1.08	1.08	1.37	1.37	0.78	1.22
	Urban 4 Lane Freeway	0.91	1.09	1.09	1.45	1.45	0.73	1.27
	Urban or Rural 6 Lane Freeway	0.88	1.11	1.11	1.58	1.58	0.65	1.35
	Urban > 6 Lane Freeway	0.96	1.03	1.03	1.18	1.18	0.89	1.11
% of Fatal + Susp. Serious Injury Crashes at Intersections	2 or 3 Lane Undivided Highway	13%	14%	14%	17%	17%	11%	16%
	2 or 3 or 4 Lane Divided Highway	25%	27%	27%	31%	31%	23%	29%
	4 or 5 Lane Undivided Highway	46%	48%	48%	52%	52%	44%	50%
	6 Lane Highway	63%	68%	68%	78%	78%	58%	73%
	Rural 4 Lane Freeway with Daily Volume < 25,000	0%	0%	0%	0%	0%	0%	0%
	Rural 4 Lane Freeway with Daily Volume > 25,000	0%	0%	0%	0%	0%	0%	0%
	Urban 4 Lane Freeway	0%	0%	0%	0%	0%	0%	0%
	Urban or Rural 6 Lane Freeway	0%	0%	0%	0%	0%	0%	0%
	Urban > 6 Lane Freeway	0%	0%	0%	0%	0%	0%	0%
% of Fatal + Susp. Serious Injury Crashes Involving Lane Departures	2 or 3 Lane Undivided Highway	69%	72%	72%	77%	77%	67%	75%
	2 or 3 or 4 Lane Divided Highway	59%	62%	62%	68%	68%	56%	65%
	4 or 5 Lane Undivided Highway	25%	29%	29%	36%	36%	21%	32%
	6 Lane Highway	21%	30%	30%	47%	47%	12%	38%
	Rural 4 Lane Freeway with Daily Volume < 25,000	74%	75%	75%	78%	78%	73%	76%
	Rural 4 Lane Freeway with Daily Volume > 25,000	72%	75%	75%	81%	81%	69%	78%
	Urban 4 Lane Freeway	66%	72%	72%	84%	84%	61%	78%
	Urban or Rural 6 Lane Freeway	58%	60%	60%	65%	65%	56%	63%
	Urban > 6 Lane Freeway	41%	42%	42%	44%	44%	40%	43%
% of Fatal + Susp. Serious Injury Crashes Involving Pedestrians	2 or 3 Lane Undivided Highway	5%	6%	6%	8%	8%	4%	7%
	2 or 3 or 4 Lane Divided Highway	3%	3%	3%	4%	4%	2%	4%
	4 or 5 Lane Undivided Highway	10%	12%	12%	15%	15%	9%	14%
	6 Lane Highway	4%	8%	8%	16%	16%	0%	12%
	Rural 4 Lane Freeway with Daily Volume < 25,000	2%	3%	3%	4%	4%	1%	3%
	Rural 4 Lane Freeway with Daily Volume > 25,000	2%	3%	3%	6%	6%	1%	5%
	Urban 4 Lane Freeway	2%	4%	4%	7%	7%	0%	5%
	Urban or Rural 6 Lane Freeway	5%	6%	6%	9%	9%	4%	8%
	Urban > 6 Lane Freeway	3%	4%	4%	6%	6%	2%	5%

Measure		None <=	Low <=	< Medium >		High >=	Good/Fair Threshold	Fair/Poor Threshold
Corridor Safety Index (Emphasis Area)		Weighted average based on operating environment type						
Corridor Safety Index (Non-Emphasis Area)		# Weighted average based on operating environment type					0.92	1.08
% of Fatal + Susp. Serious Injury Crashes Involving Trucks	2 or 3 Lane Undivided Highway	5%	6%	6%	9%	9%	4%	8%
	2 or 3 or 4 Lane Divided Highway	6%	8%	8%	12%	12%	4%	10%
	4 or 5 Lane Undivided Highway	2%	4%	4%	7%	7%	1%	6%
	6 Lane Highway	5%	6%	6%	8%	8%	4%	8%
	Rural 4 Lane Freeway with Daily Volume < 25,000	20%	21%	21%	24%	24%	19%	23%
	Rural 4 Lane Freeway with Daily Volume > 25,000	12%	15%	15%	22%	22%	9%	18%
	Urban 4 Lane Freeway	9%	11%	11%	15%	15%	7%	12%
	Urban or Rural 6 Lane Freeway	8%	11%	11%	16%	16%	5%	13%
	Urban > 6 Lane Freeway	3%	4%	4%	6%	6%	2%	5%
% of Fatal + Susp. Serious Injury Crashes Involving Bicycles	2 or 3 Lane Undivided Highway	1%	2%	2%	4%	4%	0%	3%
	2 or 3 or 4 Lane Divided Highway	1%	2%	2%	3%	3%	0%	2%
	4 or 5 Lane Undivided Highway	2%	3%	3%	5%	5%	1%	4%
	6 Lane Highway	2%	4%	4%	9%	9%	0%	7%
	Rural 4 Lane Freeway with Daily Volume < 25,000	0%	0%	0%	1%	1%	0%	1%
	Rural 4 Lane Freeway with Daily Volume > 25,000	0%	0%	0%	0%	0%	0%	0%
	Urban 4 Lane Freeway	0%	0%	0%	0%	0%	0%	0%
	Urban or Rural 6 Lane Freeway	0%	0%	0%	1%	1%	0%	1%
	Urban > 6 Lane Freeway	0%	0%	0%	0%	0%	0%	0%

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab.

Table 3 - Step 3 Template

A separate *Crash Summary Sheet* file contains summaries for 8 crash attributes for the entire corridor, for each corridor segment, and for statewide roadways with similar operating environments (the database of crashes on roadways with similar operating environments was developed in Existing Performance Analysis (the baseline corridor performance)). The crash attribute summaries are consistent with the annual ADOT Publication, *Crash Facts*. The 8 crash attribute summaries consist of the following:

- First Harmful Event (FHET)
- Crash Type (CT)
- Violation or Behavior (VB)
- Lighting Condition (LC)
- Roadway Surface Type (RST)
- First Unit Event (FUE)
- Driver Physical Condition (Impairment)
- Safety Device Usage (Safety Device)

Non-colored tabs in this spreadsheet auto-populate with filtered crash attributes. Each tab is described below:

- **Step_3_Summary** – This tab contains the filtered summary of crashes that exceed statewide thresholds for crashes on roadways with similar operating environments. Data in this tab are copied into the Step 3 template.
- **Statewide** – This tab contains a summary of statewide crashes from roadways with similar operating environments filtered by the 8 crash type summaries listed above. The crash type summaries calculate statewide crash thresholds (% total for fatal plus suspected serious crashes). The crash thresholds were developed to provide a statewide expected proportion of crash attributes against which the corridor segments' crash attributes can be compared. The crash thresholds were developed using the *Probability of Specific Crash Types Exceeding a Threshold Proportion* as shown in the Highway Safety Manual, Volume 1 (2010). The thresholds are automatically calculated within the spreadsheet. The threshold proportion was calculated as follows:

$$p*_i = \frac{\sum N_{Observed,i}}{\sum N_{Observed,i(total)}}$$

Where:

$p*_i$ = Threshold proportion

$\sum N_{Observed,i}$ = Sum of observed target crash frequency within the population

$\sum N_{Observed,i(total)}$ = Sum of total observed crash frequency within the population

A minimum crash sample size of 5 crashes over the 5-year crash analysis period is required for a threshold exceedance to be displayed in the Step 3 template. The probability of exceeding the crash threshold was not calculated to simplify the process.

- **Corridor** – A summary of corridor-wide crashes filtered by the 8 crash attribute summaries listed above.
- **Segment FHET** – A segment-by-segment summary of crashes filtered by first harmful event attributes.
- **Segment CT** – A segment-by-segment summary of crashes filtered by crash type attributes.
- **Segment VB** - A segment-by-segment summary of crashes filtered by violation or behavior attributes.
- **Segment LC** – A segment-by-segment summary of crashes filtered by lighting condition attributes.
- **Segment RST** – A segment-by-segment summary of crashes filtered by roadway surface attributes.
- **Segment FUE** – A segment-by-segment summary of crashes filtered by first unit event attributes.
- **Segment Impairment** – A segment-by-segment summary of crashes filtered by driver physical condition attributes related to impairment.
- **Segment Safety Device** – A segment-by-segment summary of crashes filtered by safety device usage attributes.

The steps to compete Step 3 include:

Step 3.1

Using the Crash_Summary_Sheet.xlsx, go to the "Step_3_Summary" tab. Input the operating environments for each segment in the table.

Step 3.2

Filter data from the ADOT database for the "CORRIDOR_DATA" tab by inserting the following data in the appropriate columns that are highlighted in gray for the "INPUT_CORRIDOR_DATA" tab:

- Incident ID
- Incident Crossing Feature (MP)
- Segment Number (Non-native ADOT data – must be manually assigned based on the location of the crash)
- Operating Environment (Non-native ADOT data – should already be assigned but if for some reason it isn't, it will need to be manually assigned)
- Incident Injury Severity
- Incident First Harmful Description
- Incident Collision Manner

- Incident Lighting Condition Description
- Unit Body Style
- Surface Condition
- First Unit Event Sequence
- Person Safety Equipment
- Personal Violation or Behavior
- Impairment

Note that columns highlighted in yellow perform a calculated input to aggregate specific crash descriptions. For example, crashes can contain various attributes for animal-involved crashes. The crash attributes that involve an animal were combined into a common attribute, such as "ANIMAL". This will allow the summaries to be consistent with the ADOT *Crash Facts*.

The data in the Impairment category contains blank descriptions if it was found that there was "No Apparent Influence" or if it was "Unknown". Using the crash data fields "PersonPhysicalDescription" 0 - 99, fill in the blank columns to reflect if the physical description is described as "No Apparent Influence" or "Unknown". Note that the native physical description data from the ADOT database may need to be combined to a single column.

Step 3.3

Confirm that the crash database is being properly filtered by comparing crash frequencies from the summary tables with the frequencies developed in Existing Performance Analysis. For example, the lookup function will fail if the filter is for "NO IMPROPER ACTION" if the database has the attribute of "NO_IMPROPER_ACTION".

Step 3.4

Copy and paste the Step_3_Summary into the Safety Needs Assessment spreadsheet in the Step 3 tab. Paste values only and remove the summaries with "0%s" for a clean display. Where duplicate values exist, go to the "Calcs" tab in the Crash_Summary_Sheet file to determine which categories have the same %. If there are more crash types with the same % than there is space in the table, select the crash type with the highest difference between the segment % and the statewide average %

Step 3.5

The Step 3 table in the Safety Needs Assessment spreadsheet should be similar to the Step 3 template. In the Segment Crash Summaries row, the top three crash attributes are displayed. Change the font color of the crash attributes that exceed the statewide crash threshold to red for emphasis. The attributes with a red font in the "Calcs" tab have exceeded statewide crash thresholds. Note that corridor-wide values are not compared to statewide values as corridor-wide values are typically a blend of multiple similar operating environments while the statewide values apply to one specific similar operating environment.

Step 3.6

Provide a summary of any observable patterns found within the crash Hot Spots, if any exist in the segments.

Step 3.7

Input any historic projects (going no further back than 15 years) that can be related to improving safety. Projects more than five years old may have exceeded their respective design life and could be contributing factors to safety performance needs.

Step 3.8

Input key points from District interviews or any important information from past discussions with District staff that is consistent with needs and crash patterns identified as part of the performance and needs assessment as this may be useful in identifying contributing causes. This information may be obtained from District Maintenance personnel by requesting the mile post locations that may be considered safety issues.

Step 3.9

For segments with one or more of the following characteristics, review crashes of all severity levels (not just fatal and suspected serious injury crashes). Identify likely contributing factors and compare that to the above statewide average comparison findings already calculated for fatal and suspected serious injury crashes. Refine the contributing factors list accordingly.

- Segments with Medium or High need
- Segments with a crash hot spot concentration (but only review crashes at the concentration areas)
- Segments with no apparent predominant contributing factors based on the comparison of fatal and suspected serious injury crashes to statewide averages if the segment has a Medium or High need.

Step 3.10

Considering all information in Steps 1-3, list the contributing factors using engineering judgment and the information on contributing factors available in Section 6.2 of the 2010 Highway Safety Manual. Additional sources for determining contributing factors may include aerial, "streetview", and/or ADOT photologs. Other documents such as Design Concept Reports (DCR) or Road Safety Assessments can provide insight into the study corridor's contributing factors.

Add comments as needed on additional information related to contributing factors that may have been provided by input from ADOT staff.

Add comments as needed on additional information related to contributing factors that may have been provided by input from ADOT staff.

Freight Needs Assessment Methodology (Steps 1-3)

This section documents the approach for conducting the first three steps of a 5-step needs assessment process for the Freight Performance Area. After completion of Step 3 for all performance areas (Pavement, Bridge, Mobility, Safety, and Freight), Step 4 will review each corridor segment to quantify a total level of need that combines all performance areas. Corridor needs are then identified in Step 5 of the process. The 5-step process is listed below:

- Step 1: Initial Needs
- Step 2: Final Needs
- Step 3: Contributing Factors
- Step 4: Segment Review
- Step 5: Corridor Needs

Step 1: Initial Needs

The input required to populate the Step 1 template includes transferring the existing performance score and color for each segment to the appropriate "Performance Score" columns. This includes the primary and secondary measures for Freight. As each performance score is input into the template, the Initial Need will populate based on the weighted scoring system for each measure.

The Level of Need for each performance measure has levels of "None" (score = 0), "Low" (score = 1), "Medium" (score = 2), and "High" (score = 3). The assignment of these levels to individual performance measures for segments is determined by the table entitled "Needs Assessment Scale" within the Step 1 template.

To develop an aggregated Initial Need for each segment, the primary and secondary measures are combined by summing the weighted score, with the primary measure having a weight of 1.0 while each secondary measure has a weight of 0.2 (0.1 each direction if directional). The Initial Need for each segment (combining the primary and secondary measures) has levels of "None" (score < 0.01), "Low" (score $\geq$ 0.01 and < 1.5), "Medium" (score $\geq$ 1.5 and < 2.5), and "High" (score $\geq$ 2.5).

The steps include:

Step 1.1

Populate the Step 1 template with the existing (baseline) performance scores for all primary and secondary performance measures from Existing Performance Analysis. Copy the performance score for each segment to the appropriate "Performance Score" column. Select the *Facility Operations* for each segment from the drop-down list and input whether or not the performance area is an emphasis area. The corridor needs assessment scales will be updated automatically.

Step 1.2

Confirm that that the Step 1 template is generating the appropriate "Level of Need" for each primary and secondary measure by reviewing the relationship of baseline performance score to level of need.

Step 2: Final Needs

The Initial Need will be carried over to Step 2. The steps required to complete Step 2 are as follows:

Step 2.1

Confirm that the template has properly populated the initial need from the Step 1 template to the Step 2 template.

Step 2.2

Note any truck height restriction hot spots (clearance < 16.25') identified as part of the baseline corridor performance. For each entry, note the milepost of the height restriction and if the height restriction can be detoured by ramping around the obstruction. If it is not possible for a truck to ramp around the height restriction, note the existing height as well.

Step 2.3

Identify recently completed or under construction projects that would be considered relevant to freight performance. Include only projects that were not taken into account during the freight data analysis period. Any completed or under construction roadway project after the date of the data that has the potential to mitigate a freight issue on a corridor segment should be listed in the template. Such projects can include the construction of climbing lanes or Dynamic Message Signs (DMS) installation. Sources of recent or current project activity can be ADOT MPD staff, ADOT public notices, and ADOT District staff.

Step 2.4

Update the Final Need using the following criteria:

- If there is at least one truck height restriction hot spot where a truck cannot ramp around on a 'None' segment, increase (i.e., worsen) the need rating to 'Low'.
- If a recent project has superseded the performance rating data and it is certain the project addressed the need, change the need rating to "None".
- If a recent project has superseded the performance rating data but it is uncertain that a project addressed the need, maintain the current need rating and note the uncertainty as a comment.

Step 2.5

Note any programmed projects that could have the potential to mitigate any freight need on the segment. Programmed projects are provided as information and do not impact the need rating. Programmed projects will be reviewed in the development of solution sets for identified needs. The source of the programming information can be found in ADOT's 5-year construction program. If there are other comments relevant to the needs analysis, they can be entered in the right-most column.

Example Scales for Level of Need

Freight Index (Interrupted) Performance Score Thresholds	Performance Level	Initial Performance Level of Need	Description (Non-emphasis Area)
1.45	Good	None	All levels of Good and the top third of Fair (<1.58)
	Good		
	Good		
	Fair		
	Fair	Low	Middle third of Fair (1.58-1.72)
1.85	Fair	Medium	Lower third of Fair and top third of Poor (1.72-1.98)
	Poor		
	Poor	High	Lower two-thirds of Poor (>1.98)
	Poor		

Needs Scale

Measure	None <=	Low <=	> Medium <		High >=
Corridor Freight Index (Emphasis Area)	Dependent on weighted average of interrupted vs. uninterrupted segments				
Corridor Freight Index (Non-Emphasis Area)	Dependent on weighted average of interrupted vs. uninterrupted segments				
Freight Index (Segment)					
Interrupted	1.58	1.72	1.72	1.98	1.98
Uninterrupted	1.22	1.28	1.28	1.42	1.42
Directional TTTR					
Interrupted	1.58	1.72	1.72	1.98	1.98
Uninterrupted	1.22	1.28	1.28	1.42	1.42
Closure Duration					
All Facility Operations	71.07	97.97	97.97	151.75	151.75
Measure	**None >=**	**Low >=**	**< Medium >**		**High <=**
Bridge Clearance (feet)					
All Bridges	16.33	16.17	16.17	15.83	15.83

Step 3: Contributing Factors

The Final Need ratings from Step 2 will populate into the Step 3 tab.

The steps to compete Step 3 include:

Step 3.1

Input all roadway variable data that describe each segment into the appropriate columns. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment.

Step 3.2

Input all traffic variables for each segment into the appropriate columns. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment.

Step 3.3

Input any freight-related infrastructure that currently exists on the corridor for each segment. The relevant infrastructure can include DMS locations, weigh stations, Ports of Entry (POE), rest areas, parking areas, and climbing lanes. Include the mileposts of the listed infrastructure. This data can be extracted from the most recent Highway Log and the 2015 Climbing and Passing Lane Prioritization Study.

Step 3.4

Input the Closure Extents that have occurred along the study corridor. Road closure information can be detailed out by the reason for the closure as documented in Highway Condition Reporting System (HCRS) data analyzed as part of the baseline corridor performance. Closure reasons include incident/accidents, winter storms, obstruction hazards, and undefined closures. Statewide average percentages for the various closure reasons have been calculated for the analysis period on ADOT's designated strategic corridors. Compare these statewide average percentages to the corridor percentages for the various closure reasons to identify higher than average percentages of one or more closure reasons on any given segment. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment. Input the closures as follows and use red text to indicate that the segment percentage exceeds statewide averages:

- Total Number of Closures
- % Closures (No Reason)
- % Incidents/Accidents
- % Obstructions/Hazards
- % Weather Related

Step 3.5

List the non-actionable conditions that are present within each segment by milepost if possible. Non-Actionable conditions are conditions that exist within the environment of each segment that cannot be improved through an engineered solution. Examples of Non-Actionable conditions can include border patrol check points and other closures/restrictions not controlled by ADOT. Note that this data can be copied from the Mobility Needs Assessment spreadsheet for Needs Assessment.

Step 3.6

Input any programmed and planned projects or issues that have been identified from previous documents or studies that are relevant to the Final Need. Sources for this data include the current Highway Log, the 2015 Climbing and Passing Lane Prioritization Study, and ADOT's 5-year construction program.

Step 3.7

Considering all information in Steps 1-3, identify the contributing factors to the Final Need column. Potential contributing factors to freight performance needs include roadway vertical grade, number of lanes, traffic volume-to-capacity ratios, presence/lack of a climbing lanes, and road closures. Also, identify higher than average percentages of one or more closure reasons on any given segment.

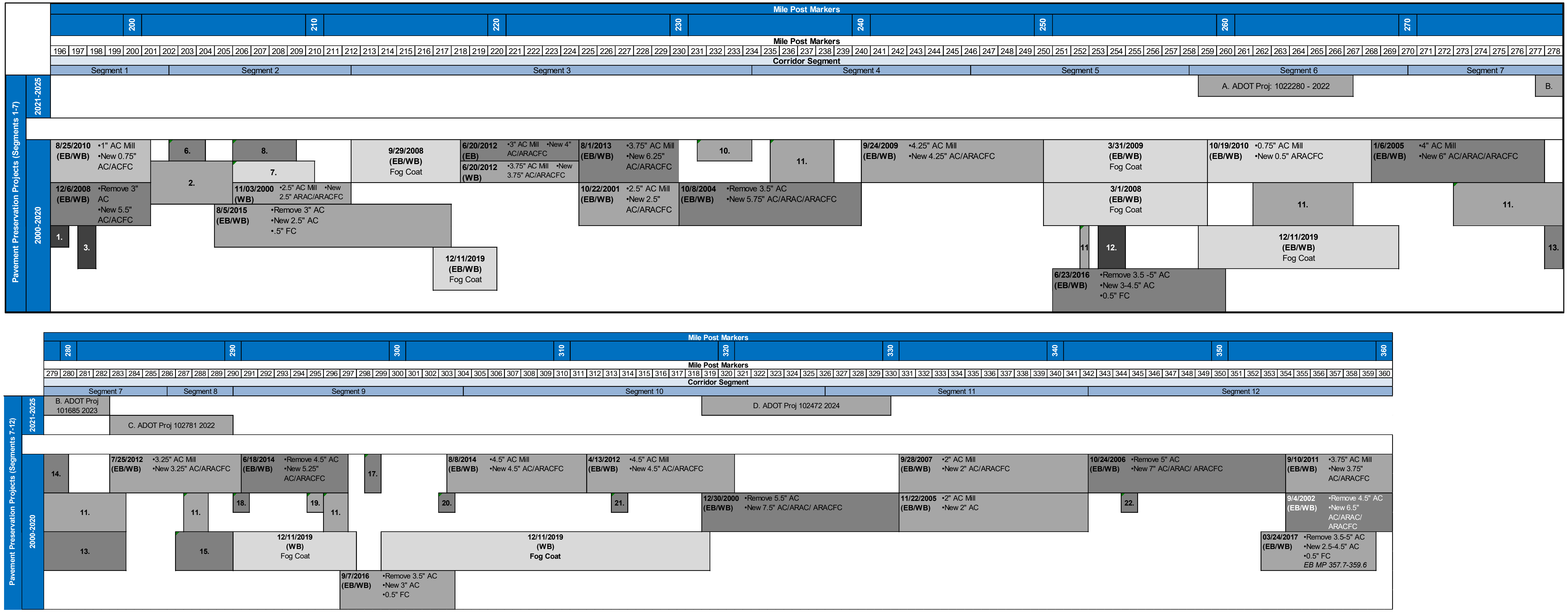
Pavement Performance Area - Needs Analysis Step 1

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Facility Type	Pavement Index			Directional PSR					% Area Failure			Initial Need
				Performance Score	Performance Objective	Level of Need	Performance Score		Performance Objective	Level of Need		Performance Score	Performance Objective	Level of Need	
							NB	SB		NB	SB				
40-1	6	196-202	Interstate	3.03	Fair or Better	Medium	2.88	2.97	Fair or Better	High	High	33.30%	Fair or Better	High	High
40-2	10	202-212	Interstate	3.59	Fair or Better	None	3.80	3.89	Fair or Better	None	None	25.00%	Fair or Better	High	Low
40-3	22	212-234	Interstate	1.96	Fair or Better	High	4.26	4.26	Fair or Better	None	None	18.20%	Fair or Better	Medium	High
40-4	12	234-246	Interstate	3.60	Fair or Better	None	3.99	4.03	Fair or Better	None	None	50.00%	Fair or Better	High	Low
40-5	12	246-258	Interstate	1.77	Fair or Better	High	4.15	4.25	Fair or Better	None	None	12.50%	Fair or Better	Low	High
40-6	12	258-270	Interstate	2.95	Fair or Better	Medium	3.83	3.77	Fair or Better	None	None	58.30%	Fair or Better	High	High
40-7	16	270-286	Interstate	2.36	Fair or Better	High	3.95	3.95	Fair or Better	None	None	34.40%	Fair or Better	High	High
40-8	4	286-290	Interstate	2.79	Fair or Better	Medium	3.90	3.96	Fair or Better	None	None	25.00%	Fair or Better	High	High
40-9	14	290-304	Interstate	2.25	Fair or Better	High	4.26	4.30	Fair or Better	None	None	0.00%	Fair or Better	None	High
40-10	22	304-326	Interstate	2.32	Fair or Better	High	4.13	4.09	Fair or Better	None	None	29.50%	Fair or Better	High	High
40-11	16	326-342	Interstate	3.56	Fair or Better	None	4.03	3.94	Fair or Better	None	None	46.90%	Fair or Better	High	Low
40-12	17.63	342-359.63	Interstate	2.20	Fair or Better	High	4.19	4.20	Fair or Better	None	None	41.70%	Fair or Better	High	High
Emphasis Area?	No	Weighted Average		2.59	Fair or Better	High									

Pavement Performance Area - Needs Analysis Step 2

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Initial Need	Need Adjustments: Hot Spots	Need Adjustments: Previous Projects (which supersede condition data)	Final Need	Comments (may include programmed projects or issues from previous reports)
40-1	6	196-202	High	MP 196-197 EB MP 198-199 EB MP 201-202	None	High	
40-2	10	202-212	Low	MP 202-204 EB MP 204-205	None	Low	
40-3	22	212-234	High	MP 230-234	None	High	
40-4	12	234-246	Low	MP 234-240	None	Low	
40-5	12	246-258	High	WB MP 246-249	None	High	
40-6	12	258-270	High	MP 259-261 WB MP 262-263 MP 263-264 WB MP 264-265 MP265-268	None	High	
40-7	16	270-286	High	WB MP 277-278 MP 278-283	None	High	
40-8	4	286-290	High	WB MP287-288 EB MP 288-289	None	High	
40-9	14	290-304	High	-	None	High	
40-10	22	304-326	High	WB MP 319-320 MP 320-326	None	High	
40-11	16	326-342	Low	WB MP 326-327 MP 327-331 WB MP 331-332 EB MP 335-338 EB MP 340-342	None	Low	
40-12	17.63	342-359.63	High	EBMP 342-345 MP347-348 EBMP 348-349 MP 349-351 EBMP 351-352 MP 352-354	None	High	

Pavement History



Legend

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

Pavement Bid History Investment

		Segment Number																							
Value	Level	1		2		3		4		5		6		7		8		9		10		11		12	
		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	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir
1	L1		83%		45%		27%				67%		8%					55%		66%					
1							20%				67%		8%					37%							
1													79%												
1													91%												
1																									
3	L2			65%	75%	36%	30%		29%		39%		46%		70%		100%	7%	52%		34%		72%		35%
3					45%		30%		50%		65%				67%		38%		11%		41%		72%		37%
3											4%				53%				7%						
3																									
3																									
4	L3		83%	20%		36%	30%		50%				16%		82%		88%	7%	48%	5%	34%		28%	6%	65%
4			17%	35%		16%	25%								11%			7%	7%						35%
4															20%										
4															67%										
4																									
6	L4	17%	17%								13%														
6																									
6																									
6																									
6																									
Sub-Total		1.0002	5.8335	4.15	4.05	3.16	4.47	0	4.3748	0	5.3234	0	3.886	0	12.9	0	7.625	1.7012	4.2952	0.8416	3.61	0	5.44	0.24	6.16
Total		**6.3336**		**6.125**		**6.05**		**4.3748**		**5.3234**		**3.886**		**12.9**		**7.625**		**5.1458**		**4.0308**		**5.44**		**6.28**	

Pavement Historical Investment

Segment	Pavement History Value (bid projects)	Pavement History (bid projects)	PeCos ($/mile/yr)	PeCos	Resulting Historical Investment
40-1	6.3	Medium	$10,315.55	High	High
40-2	6.1	Medium	$6,648.62	High	High
40-3	6.1	Medium	$2,509.75	Medium	Medium
40-4	4.4	Low	$584.15	Low	Low
40-5	5.3	Medium	$5,527.83	High	High
40-6	3.9	Low	$7,598.06	High	Medium
40-7	12.9	High	$3,379.82	Medium	High
40-8	7.6	High	$4,698.47	High	High
40-9	5.1	Medium	$2,525.77	Medium	Medium
40-10	4.0	Low	$831.68	Low	Low
40-11	5.4	Medium	$3,047.86	Medium	Medium
40-12	6.3	Medium	$9,501.07	High	High

Pavement Area Performance – Needs Analysis step 3

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Final Need	Bid History Investment	PeCos History Investment*	Resulting Historical Investment	Contributing Factors and Comments
40-1	6	196-202	High	6.33	High	6.61	
40-2	10	202-212	Low	6.13	High	6.61	
40-3	22	212-234	High	6.05	Medium	6.05	
40-4	12	234-246	Low	4.37	Low	4.37	
40-5	12	246-258	High	5.32	High	6.61	
40-6	12	258-270	High	3.88	High	4.61	
40-7	16	270-286	High	12.90	Medium	12.90	
40-8	4	286-290	High	7.63	High	7.63	
40-9	14	290-304	High	5.15	Medium	5.15	
40-10	22	304-326	High	4.04	Low	4.04	
40-11	16	326-342	Low	5.44	Medium	5.44	
40-12	17.63	342-359.63	High	6.28	High	6.61	

Bridge Performance Area – Needs Analysis Step 1

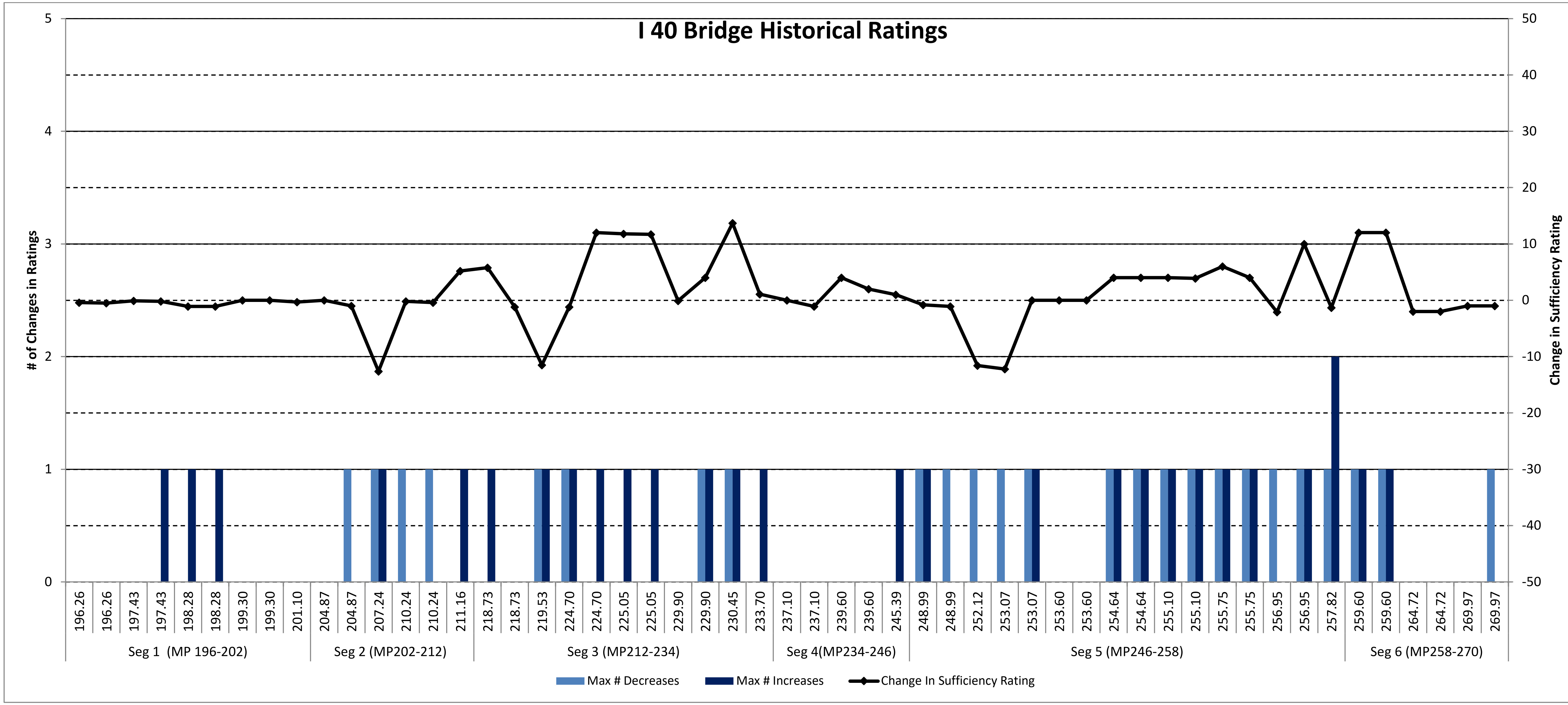
Segment #	Segment Length (miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Bridge Index			Lowest Bridge Rating			Sufficiency Rating			Initial Need
				Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	
40-1	6	196-202	9	6.44	Fair or Better	None	5	Fair or Better	Low	94.6	Fair or Better	None	Low
40-2	10	202-212	6	5.90	Fair or Better	Low	5	Fair or Better	Low	93.5	Fair or Better	None	Low
40-3	22	212-234	11	5.49	Fair or Better	Medium	5	Fair or Better	Low	90.8	Fair or Better	None	Medium
40-4	12	234-246	5	6.05	Fair or Better	None	5	Fair or Better	Low	95.5	Fair or Better	None	Low
40-5	12	246-258	16	5.63	Fair or Better	Low	5	Fair or Better	Low	90.0	Fair or Better	None	Low
40-6	12	258-270	6	5.50	Fair or Better	Low	5	Fair or Better	Low	89.9	Fair or Better	None	Low
40-7	16	270-286	15	5.65	Fair or Better	Low	5	Fair or Better	Low	91.3	Fair or Better	None	Low
40-8	4	286-290	8	5.54	Fair or Better	Low	4	Fair or Better	Medium	81.1	Fair or Better	None	Low
40-9	14	290-304	9	6.80	Fair or Better	None	5	Fair or Better	Low	96.4	Fair or Better	None	Low
40-10	22	304-326	8	5.64	Fair or Better	Low	5	Fair or Better	Low	88.1	Fair or Better	None	Low
40-11	16	326-342	4	6.81	Fair or Better	None	5	Fair or Better	Low	96.0	Fair or Better	None	Low
40-12	17.63	342-359.63	15	5.78	Fair or Better	Low	5	Fair or Better	Low	89.7	Fair or Better	None	Low

Bridge Performance Area – Needs Analysis Step 2

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Initial Need	Need Adjustments: Hot Spots (Rating of 4 or multiple 5's)	Need Adjustments: Previous Projects (which supersede condition data)	Final Need	Historical Review	Comments
40-1	6	196-202	9	Low	Lone Tree Road OP WB and EB		Low	Lone Tree Rd OP EB and WB, 4th St UP WB	Lone Tree Road OP EB and WB, and 4th St. UP EB and WB; Design Bridge Rehab on 4th St UP and Butler Ave programmed for FY 2016
40-2	10	202-212	6	Low	-		Low	-	Winona TI UP
40-3	22	212-234	11	Medium	Canyon Padre Br EB, Twin Arrows TI UP, Babbits Tank Br WB, Buffalo Range TI OP EB and WB, Canyon Diablo Br WB	Project completed 2015 Canyon Padre Br EB Bridge Deck Replacement; Canyon Diablo Br EB deck replacement and WB rehabilitation	Medium	Canyon Padre Br EB, Twin Arrows TI UP, Buffalo Range TI OP WB, Canyon Diablo Br WB	Canyon Padre Br EB, Twin Arrows TI UP, Babbits Tank Br WB, Buffalo Range TI OP EB and WB, Canyon Diablo Br WB, Two Guns TI UP, and Meteor Crater TI UP; Bridge deck Rehab on Twin Arrows TI programmed for FY 2016; Canyon Padre Br EB improvements will possibly make the bridge no longer a hot spot, but it still has one 5 rating. Recent project replaced deck on Canyon Diablo WB resulting in all rating of 6 or higher
40-4	12	234-246	5	Low	-		Low	Sunshine BNSF RR OP WB	Sunshine BNSF RR OP WB, Meteor City TI OP EB and WB, and Leupp TI UP SR 99; Bridge deck rehab on Meteor City TI OP's programmed for FY 2019
40-5	12	246-258	16	Low	Tucker Flat Br EB, Ruby Wash Br EB and WB, Maple St. OP WB and EB, E Winslow TI OP EB and WB, SR 87 TI UP	Project completed Dec. 2014, replaced bridge decks at Ruby Wash, Maple Street, and East Winslow TI bridges. Also sealed bridge decks at Little CO River Bridges, Bridge Deck rehabilitation at SR 87 UP	Low	Little Colo Rv Br EB and WB	Tucker Flat Br EB, Little Colorado River Br EB & WB; Changed from Medium to Low due to recent project (which superseded conditions data) on 7 of the 8 hot spot bridges
40-6	12	258-270	6	Low	Cottonwood Br WB and EB, Jackrabbit TI OP EB and WB		Medium	-	Jackrabbit TI EB & WB, Cottonwood Br WB and EB; Bridge deck rehab on Cottonwood Bridges programmed for 2017
40-7	16	270-286	15	Low	Manila Wash Br WB, Tanner Wash Br EB, Leroux Wash Br EB and WB	Replaced scour at Manila Wash bridges. Leroux Wash Br EB and WB replaced approach slabs and bridge deck rehab. Tanner Wash Br EB replaced bridge	Low	W Joseph City TI UP, Tanner Wash Br EB, Hunt Rd TI UP, Leroux Wash Br EB and WB	W Joseph City TI UP, Manila Wash Br WB, Hunt Rd TI UP, and Leroux Wash Br EB and WB. Manila Wash WB improvements likely didn't address all low ratings. Tanner Wash Br EB was replaced and will no longer be a hotspot or historical issue. Leroux Br EB and WB likely did not fix all the needs therefore it's still a hot spot.
40-8	4	286-290	8	Low	E Holbrook TI OP WB and EB	Girder repair and rocker replacement at E Holbrook TI bridges.	Low	E Holbrook TI OP EB and WB	Hermosa Dr UP and E Holbrook TI OP EB and WB. E Holbrook TI OP had girder repair and rocker replacement but likely still has ratings of 5.
40-9	14	290-304	9	Low	-		Low	-	No hot spot bridges and no historical issues; MP 298 Utility OP CBC extension programmed for 2016
40-10	22	304-326	8	Low	Painted Desert TI UP, Dead River Br EB, Crazy Creek Br WB	Superstructure replaced at the underpass bridge at Painted Desert TI.	Low	Painted Desert TI UP, Navajo TI UP	Painted Desert TI UP, Petrified Forest UP, Dead River Br EB, Crazy Creek Br WB, and Navajo TI UP. Painted Desert TI UP improvements replaced the superstructure and deck.
40-11	16	326-342	4	Low	-		Low	McCarroll TI UP, Chambers TI UP, Ortega Rd TI UP	McCarroll TI UP, Chambers TI UP, and Ortega Rd TI UP

Segment #	Segment Length (miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Initial Need	Need Adjustments: Hot Spots (Rating of 4 or multiple 5's)	Need Adjustments: Previous Projects (which supersede condition data)	Final Need	Historical Review	Comments
40-12	17.63	342-359.63	15	Low	Window Rock TI OP WB, Lupton TI OP WB and EB		Low	Black Creek Br EB, Window Rock TI OP WB	Black Creek Br EB, Houck TI UP, Allentown TI UP, Window Rock TI OP WB, and Lupton TI OP WB and EB

Bridge Ratings History

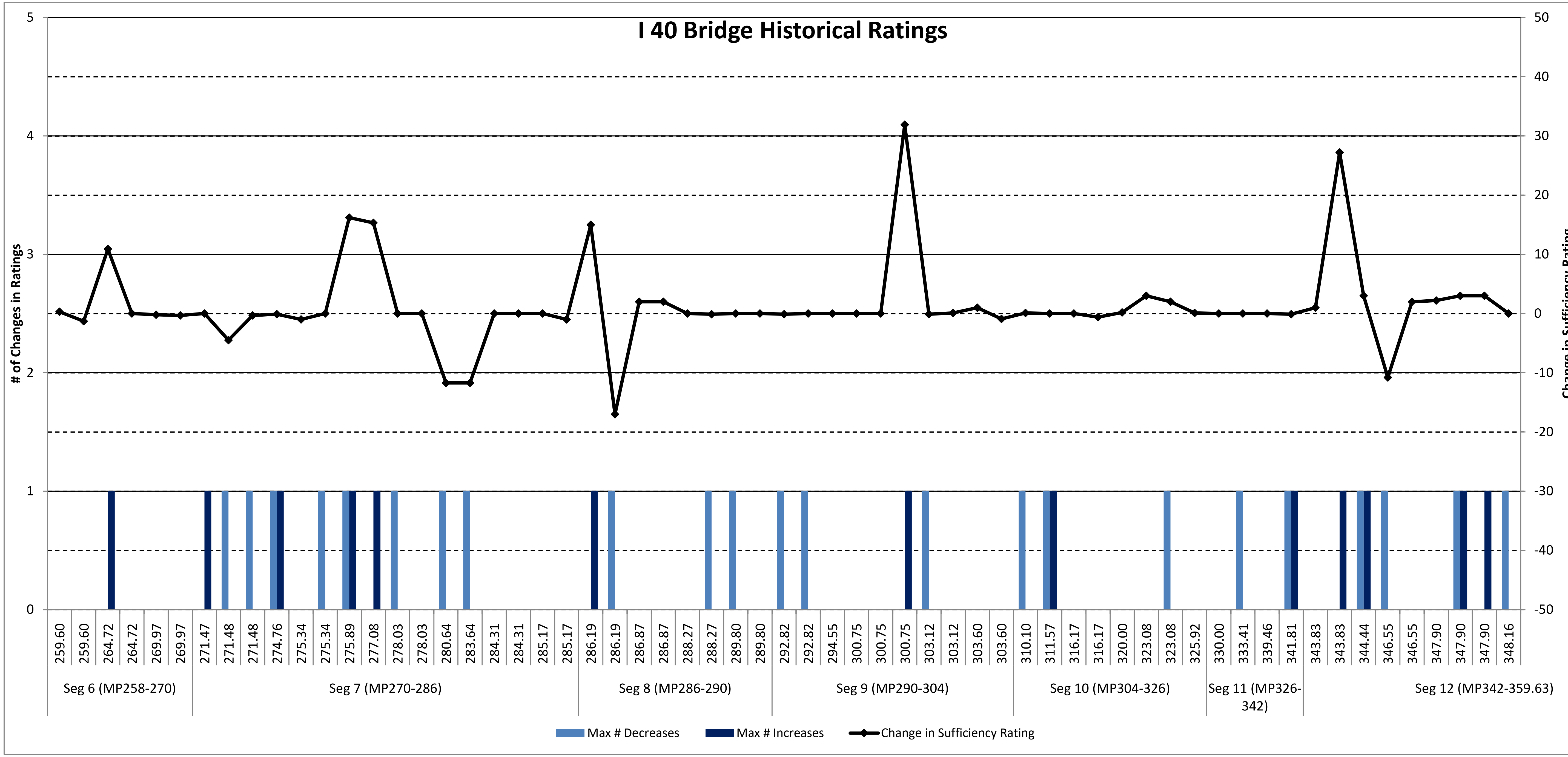


_identifies the bridge indicated is of concern from a historical ratings perspective

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)



_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 in the last 20 years of available data. (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 in the last 20 years of available data. (Higher number could indicate a higher level of investment)

Change in Sufficiency Rating: Cumulative change in Sufficiency Rating in the last 20 years of available data. (Bigger negative number could indicate a more dramatic decline in the performance of the bridge)

Bridge Performance Area – Needs Analysis Step 3

Segment #	Segment Length (Miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Final Need	Contributing Factors			Comments
					Bridge	Current Ratings	Historical Review	
40-1	6	196-202	9	Low	**Lone Tree Rd OP EB (#1180) (MP 196.26)** **Lone Tree Rd OP WB (#1181) (MP 196.26)** **4th St UP EB (#1182) (MP 199.30)** **4th St UP WB (#1183) (MP 199.30)**	Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5, Current Super Rating 5 Current Sub Rating 5 Current Sub Rating 5	Could have a repetitive investment issue Could have a repetitive investment issue This structure was not identified in historical review Could have a repetitive investment issue	DCR recommended replacement DCR recommended replacement Project is programmed in FY 16; DCR recommended replacement Project is programmed in FY 16; DCR recommended replacement
40-2	10	202-212	6	Low	**Winona TI UP WB (#1084) (MP 211.16)**	Current Deck Rating 5	This structure was not identified in historical review	DCR recommended replacement
40-3	22	212-234	11	Medium	**Canyon Padre Br EB (#1670) (MP 218.73)** **Twin Arrows TI UP (#1363) (MP219.53)** **Babbitts Tank Br WB (#1385) (MP 224.7)** **Buffalo Range TI OP EB (#1386) (MP 225.05)** **Buffalo Range TI OP WB (#1387) (MP 225.05)** **Canyon Diablo Br WB (#845) (MP 229.90)** **Two Guns TI UP (#1388) (MP 230.45)** **Meteor Crater TI UP (#1389) (MP 233.7)**	Current Deck Rating 4, Current Super Rating 5 Current Deck Rating 4 Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5 Current Deck Rating 5	Could have a repetitive investment issue Could have a repetitive investment issue This structure was not identified in historical review This structure was not identified in historical review Could have a repetitive investment issue Could have a repetitive investment issue This structure was not identified in historical review This structure was not identified in historical review	Previous Project replaced deck Project is programmed in FY 16 Recent project likely addressed low ratings
40-4	12	234-246	5	Low	**Sunshine BNSF RR OP WB (#1390) (MP 237.10)** **Meteor City TI OP EB (#1391) (MP 239.60)** **Meteor City TI OP WB (#1392) (MP 239.60)** **Leupp TI UP SR 99 (#1317) (MP 245.39)**	No Current Ratings less than 6 Current Deck Rating 5 Current Deck Rating 5 Current Deck Rating 5	Could have a repetitive investment issue This structure was not identified in historical review This structure was not identified in historical review This structure was not identified in historical review	Project is programmed in FY 19 Project is programmed in FY 19
40-5	12	246-258	16	Low	**Tucker Flat Br EB (#336) (MP 248.99)** **Little Colo River Br EB (#1596) (MP 256.95)** **Little Colo River Br WB (#1597) (MP 256.95)**	Current Deck Rating 5, Current Super Rating 3 Current Sub Rating 5 Current Sub Rating 5	This structure was not identified in historical review Could have a repetitive investment issue Could have a repetitive investment issue	
40-6	12	258-270	6	Medium	**Cottonwood Br WB (#520) (MP 259.60)** **Cottonwood Br EB (#519) (MP 259.60)** **Jackrabbit TI OP EB (#849)(MP 269.97)** **Jackrabbit TI OP WB (#850)(MP 269.97)**	Current Deck Rating 5, Current Sub Rating 5 Current Deck Rating 5, Current Sub Rating 5 Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5, Current Super Rating 5	This structure was not identified in historical review This structure was not identified in historical review This structure was not identified in historical review This structure was not identified in historical review	Project is programmed in FY 17 (FY 18 in Tentative Program) Project is programmed in FY 17 (FY 18 in Tentative Program)
40-7	16	270-286	15	Low	**Manila Wash Br WB (#852) (MP 271.48)** **W Joseph City TI UP (#1893) (MP 274.76)** **Hunt Rd TI UP (#930) (MP 280.64)** **Leroux Wash Br EB (#1772) (MP 284.31)** **Leroux Wash Br WB (#1773) (MP 284.31)**	Current Deck Rating 5, Current Super Rating 5 No Current Ratings less than 6 Current Super Rating 5 Current Super Rating 5, Current Sub Rating 4 Current Sub Rating 4	This structure was not identified in historical review Could have a repetitive investment issue Could have a repetitive investment issue Could have a repetitive investment issue Could have a repetitive investment issue	Previous project likely addressed some issues
40-8	4	286-290	8	Low	**Hermosa Dr UP (#1368) (MP 288.27)** **E Holbrook TI OP WB (#1370) (MP 289.80)** **E Holbrook TI OP EB (#1369) (MP 289.80)**	Current Deck Rating 5Current Deck Rating 5, Current Super Rating 4, Current Sub Rating 5Current Super Rating 4, Current Sub Rating 5	This structure was not identified in historical reviewCould have a repetitive investment issue Could have a repetitive investment issue	Previous Project May Have Fixed Super IssuePrevious Project May Have Fixed Super Issue
40-9	14	290-304	9	Low	**No bridges with current rating less than 6**			

Segment #	Segment Length (Miles)	Segment Mileposts (MP)	Number of Bridges in Segment	Final Need	Contributing Factors: Bridge	Contributing Factors: Current Ratings	Contributing Factors: Historical Review	Comments
40-10	22	304-326	8	Low	**Petrified Forest UP (#589) (MP 310.10)** **Painted Desert TI UP (#590) (MP 311.57)** **Dead River Bridge EB (#565) (MP 316.17)** **Crazy Creek Br WB (#461) (MP 323.08)** **Navajo TI UP (#709) (MP 325.92)**	Current Super Rating 5 Current Deck Rating 4, Current Super Rating 4 Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5, Current Super Rating 5 No Current Ratings less than 6	This structure was not identified in historical review This structure was not identified in historical review This structure was not identified in historical review This structure was not identified in historical review Could have a repetitive investment issue	Previous project likely addressed Super and Deck
40-11	16	326-342	4	Low	**McCarroll TI UP (#710) (MP 330.00)** **Chambers TI UP (#814) (MP 333.41)** **Ortega Rd TI UP (#816) (MP 341.81)**	No Current Ratings less than 6 No Current Ratings less than 6 Current Deck Rating 5	Could have a repetitive investment issue Could have a repetitive investment issue Could have a repetitive investment issue	
40-12	17.63	342-359.63	15	Low	**Black Creek Br EB (#1134) (MP 347.90)** **Houck TI UP (#955) (MP 348.16)** **Allentown TI UP (#956) (MP 351.35)** **Window Rock TI OP WB (#678) (MP 357.53)** **Lupton TI OP WB (#680) (MP 359.21)** **Lupton TI OP EB (#679) (MP 359.21)**	Current Deck Rating 5 Current Deck Rating 5 Current Deck Rating 5 Current Deck Rating 4, Current Super Rating 4 Current Deck Rating 5, Current Super Rating 5 Current Deck Rating 5, Current Super Rating 5	Could have a repetitive investment issue This structure was not identified in historical review This structure was not identified in historical review Could have a repetitive investment issue This structure was not identified in historical review This structure was not identified in historical review	

Mobility Performance Area – Needs Analysis Step 1

Segment	Segment Mileposts	Segment Length (miles)	Environ-ment Type	Facility Operation	Mobility Index			Future Daily V/C			Existing Peak Hour V/C					Closure Extent (occurrences/year/mile)				
					Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	Performance Score NB/EB	Performance Score SB/WB	Performance Objective	Level of Need NB/EB	Level of Need SB/WB	Performance Score NB/EB	Performance Score SB/WB	Performance Objective	Level of Need NB/EB	Level of Need SB/WB
40E-1	196-202	6	Urban	Uninterrupted	0.58	Fair or Better	None	0.65	Fair or Better	None	0.39	0.39	Fair or Better	None	None	0.47	0.30	Fair or Better	Low	None
40E-2	202-212	10	Urban	Uninterrupted	0.36	Fair or Better	None	0.40	Fair or Better	None	0.25	0.25	Fair or Better	None	None	0.22	0.22	Fair or Better	None	None
40E-3	212-234	22	Rural	Uninterrupted	0.44	Fair or Better	None	0.49	Fair or Better	None	0.27	0.27	Fair or Better	None	None	1.11	0.92	Fair or Better	High	High
40E-4	234-246	12	Rural	Uninterrupted	0.44	Fair or Better	None	0.49	Fair or Better	None	0.24	0.24	Fair or Better	None	None	0.10	0.08	Fair or Better	None	None
40E-5	246-258	12	Rural	Uninterrupted	0.41	Fair or Better	None	0.45	Fair or Better	None	0.27	0.27	Fair or Better	None	None	0.38	0.18	Fair or Better	Low	None
40E-6	258-270	12	Rural	Uninterrupted	0.33	Fair or Better	None	0.36	Fair or Better	None	0.17	0.17	Fair or Better	None	None	0.13	0.10	Fair or Better	None	None
40E-7	270-286	16	Rural	Uninterrupted	0.43	Fair or Better	None	0.48	Fair or Better	None	0.22	0.22	Fair or Better	None	None	0.13	0.21	Fair or Better	None	None
40E-8	286-290	4	Rural	Uninterrupted	0.46	Fair or Better	None	0.51	Fair or Better	None	0.34	0.34	Fair or Better	None	None	0.35	0.20	Fair or Better	None	None
40E-9	290-304	14	Rural	Uninterrupted	0.42	Fair or Better	None	0.47	Fair or Better	None	0.21	0.21	Fair or Better	None	None	0.56	0.37	Fair or Better	Medium	Low
40E-10	304-326	22	Rural	Uninterrupted	0.39	Fair or Better	None	0.43	Fair or Better	None	0.25	0.25	Fair or Better	None	None	0.53	0.27	Fair or Better	Medium	None
40E-11	326-342	16	Rural	Uninterrupted	0.40	Fair or Better	None	0.44	Fair or Better	None	0.23	0.23	Fair or Better	None	None	0.43	0.32	Fair or Better	Low	None
40E-12	342-360	18	Rural	Uninterrupted	0.46	Fair or Better	None	0.51	Fair or Better	None	0.25	0.25	Fair or Better	None	None	0.59	1.09	Fair or Better	Medium	High

Segment	Segment Mileposts	Segment Length (miles)	Environment Type	Facility Operation	Directional LOTTR (all vehicles)					Bicycle Accommodation			Initial Need
					Performance Score NB/EB	Performance Score SB/WB	Performance Objective	Level of Need NB/EB	Level of Need SB/WB	Performance Score	Performance Objective	Level of Need	
40-1	196-202	6	Urban	Uninterrupted	1.03	1.03	Fair or Better	None	None	100%	Fair or Better	None	Low
40-2	202-212	10	Urban	Uninterrupted	1.02	1.03	Fair or Better	None	None	100%	Fair or Better	None	None
40-3	212-234	22	Rural	Uninterrupted	1.02	1.02	Fair or Better	None	None	100%	Fair or Better	None	Low
40-4	234-246	12	Rural	Uninterrupted	1.03	1.04	Fair or Better	None	None	100%	Fair or Better	None	None
40-5	246-258	12	Rural	Uninterrupted	1.02	1.02	Fair or Better	None	None	100%	Fair or Better	None	Low
40-6	258-270	12	Rural	Uninterrupted	1.03	1.03	Fair or Better	None	None	100%	Fair or Better	None	None
40-7	270-286	16	Rural	Uninterrupted	1.05	1.04	Fair or Better	None	None	100%	Fair or Better	None	None
40-8	286-290	4	Rural	Uninterrupted	1.03	1.02	Fair or Better	None	None	100%	Fair or Better	None	None
40-9	290-304	14	Rural	Uninterrupted	1.02	1.02	Fair or Better	None	None	98%	Fair or Better	None	Low
40-10	304-326	22	Rural	Uninterrupted	1.02	1.02	Fair or Better	None	None	100%	Fair or Better	None	Low
40-11	326-342	16	Rural	Uninterrupted	1.03	1.04	Fair or Better	None	None	96%	Fair or Better	None	Low
40-12	342-359.63	17.63	Rural	Uninterrupted	1.03	1.03	Fair or Better	None	None	90%	Fair or Better	None	Low

Mobility Performance Area – Needs Analysis Step 2

Segment	Segment Mileposts (MP)	Segment Length (miles)	Initial Need	Need Adjustments	Final Need	Planned and Programmed Future Projects
				Recent Projects Since 2019		
40-1	196-202	6	Low	DMS installed at MP 197.61	None	Planned: Widen the mainline to six lanes (DCR), construct a new TI at Lone Tree (MP 196.7) (DCR), Reconstruct Butler TI (MP 198.28) (DCR) Install new DMS on I-40 WB, between 4th St and Country Cl (Statewide DMS Master Plan) Minor improvements to the exisitng Country Club TI (DCR) Minor improvements to the existing Country Cl TI (DCR)
40-2	202-212	10	None	None	Low	Planned: Widen the mainline to six lanes (DCR), Reconstruct the TI at Walnut Canyon (MP 204.8) (DCR) Reconstruct the existing TI at Winona (MP 211.16) (DCR) Minor improvements to the exisitng Cosnino TI (DCR)
40-3	212-234	22	Low	None	Low	Planned: Widen the mainline to six lanes (DCR)
40-4	234-246	12	None	None	Low	Planned: Widen the mainline to six lanes (BQAZ)
40-5	246-258	12	Low	None	Low	Planned: Widen the mainline to six lanes (BQAZ)
40-6	258-270	12	None	None	None	Planned: Widen the mainline to six lanes (BQAZ)
40-7	270-286	16	None	None	Low	Planned: Widen the mainline to six lanes (BQAZ)
40-8	286-290	4	None	None	None	Planned: Widen the mainline to six lanes (BQAZ)
40-9	290-304	14	Low	None	Low	Planned: Widen the mainline to six lanes (BQAZ) Sign rehabilitation at Goodwater - Yellowhorse (MP297) (DCR)
40-10	304-326	22	Low	None	Low	Programmed: Port of Entry improvements at Crazy Horse POE (MP 322) FY 17 Planned: Widen the mainline to six lanes (BQAZ)
40-11	326-342	16	Low	DMS installed at MP 340.44	None	Planned: Widen the mainline to six lanes (BQAZ)
40-12	342-359.63	17.63	Low	None	Low	Planned: Widen the mainline to six lanes (BQAZ), Lupton Traffic Interchange (MP 359.21) - construct a new TI (DCR)

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	Weighted Average Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2040 LOS	% Trucks	
40-1	196-202	6	None	Interstate	Urban	Rolling	2	65	No	Divided	0%	A-C	A-C	36	I-17 System Interchange MP 196, Transit Rail Station MP 196, Permanent Traffic Counter MP 196, DMS Sign MP 199
40-2	202-212	10	Low	Interstate	Fringe Urban	Rolling	2	75	No	Divided	0%	A-C	A-C	48	DMS Sign MP 212
40-3	212-234	22	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	45	Road Weather Information MP 229
40-4	234-246	12	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	46	Open Rest Area MP 240
40-5	246-258	12	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	38	DMS Sign MP 250, Transit Rail Station MP 254, Road Weather Information MP 256
40-6	258-270	12	None	Interstate	Rural	Level	2	75	No	Divided	0%	A/B	A/B	41	Traffic Counter MP 260, DMS Sign MP 260, Road Weather Information MP 269
40-7	270-286	16	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	41	Traffic Counter MP 275, DMS Sign MP 281
40-8	286-290	4	None	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	35	None
40-9	290-304	14	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	40	Weigh Station MP 291, DMS Sign MP 295
40-10	304-326	22	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	43	DMS Sign MP 310, Road Weather Information MP 312
40-11	326-342	16	None	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	41	DMS Sign MP 330, Weigh Station MP 341
40-12	342-359.63	17.63	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	38	Open Rest Area MP 357, DMS Sign MP 357, Road Weather Information MP 358

Mobility Performance Area – Needs Analysis Step 3

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent: Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related	Non-Actionable Conditions	Programmed and Planned Projects or Issues from Previous Documents Relevant to Final Need	Contributing Factors
40E-1	196-202	6	None	22	0	0%	0	0%	0	0%	None	Planned: Widen the mainline to six lanes (DCR), construct a new TI at Lone Tree (MP 196.7) (DCR), Reconstruct Butler TI (MP 198.28) (DCR) Install new DMS on I-40 WB, between 4th St and Country Cl (Statewide DMS Master Plan) Minor improvements to the exisitng Country Club TI (DCR) Minor improvements to the existing Country Cl TI (DCR)	The majority of closures were due to incidents/crashes. The duration of two closures exceeded 1000 minutes and were both due to incidents/crashes.
40E-2	202-212	10	Low	22	7	32%	0	0%	0	0%	None	Planned: Widen the mainline to six lanes (DCR), Reconstruct the TI at Walnut Canyon (MP 204.8) (DCR) Reconstruct the existing TI at Winona (MP 211.16) (DCR) Minor improvements to the exisitng Cosnino TI (DCR)	The majority of closures were due to incidents/crashes.
40E-3	212-234	22	Low	42	9	21%	4	10%	2	5%	None	Planned: Widen the mainline to six lanes (DCR)	The majority of closures were due to incidents/crashes, with most traveling in the EB direction. The duration of one closure exceeded 1000 minutes.
40E-4	234-246	12	Low	11	0	0%	0	0%	0	0%	None	Planned: Widen the mainline to six lanes (BQAZ)	All closures were die to incidents/crashes. The duration of one closure exceeded 1000 minutes due to incidents/crashes.
40E-5	246-258	12	Low	33	8	24%	0	0%	0	0%	None	Planned: Widen the mainline to six lanes (BQAZ)	The majority of closures were due to incidents/crashes, with most traveling in the EB direction.
40E-6	258-270	12	None	14	0	0%	0	0%	0	0%	None	Planned: Widen the mainline to six lanes (BQAZ)	The majority of closures were due to incidents/crashes.

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	Contributing Factors
				Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related			
40E-7	270-286	16	Low	19	2	11%	3	16%	0	0%	None	Planned: Widen the mainline to six lanes (BQAZ)	The majority of closures were due to incidents/crashes.
40E-8	286-290	4	None	9	0	0%	0	0%	3	33%	None	Planned: Widen the mainline to six lanes (BQAZ)	The majority of closures were due to incidents/crashes.
40E-9	290-304	14	Low	23	2	9%	0	0%	3	13%	None	Planned: Widen the mainline to six lanes (BQAZ) Sign rehabilitation at Goodwater - Yellowhorse (MP297) (DCR)	The majority of closures were due to incidents/crashes.
40E-10	304-326	22	Low	22	4	18%	0	0%	3	14%	None	Programmed: Port of Entry improvements at Crazy Horse POE (MP 322) FY 17 Planned: Widen the mainline to six lanes (BQAZ)	The majority of closures were due to incidents/crashes, with most traveling in the EB direction.
40E-11	326-342	16	None	16	3	19%	2	13%	3	19%	None	Planned: Widen the mainline to six lanes (BQAZ)	The majority of closures were due to incidents/crashes.
40E-12	342-359.63	17.63	Low	28	5	18%	0	0%	4	14%	None	Planned: Widen the mainline to six lanes (BQAZ), Lupton Traffic Interchange (MP 359.21) - construct a new TI (DCR)	The majority of closures were due to incidents/crashes.

Safety Performance Area - Needs Analysis Step 1

Segment	Operating Environment	Segment Length (miles)	Segment Mileposts (MP)	Safety Index			Directional Safety Index					% of Fatal + Suspected Serious Injury Crashes at Intersections		
				Performance Score	Performance Objective	Level of Need	NB Performance Score	SB Performance Score	Performance Objective	NB Level of Need	SB Level of Need	Performance Score	Performance Objective	Level of Need
40E - 1	2 or 3 Lane Undivided Highway	5	342 - 347	0.99	Average or Better	Low	1.97	0.00	Average or Better	High	None	*Insufficient Data*	Average or Better	N/A
40E - 2	4 or 5 Lane Undivided Highway	4	347 – 351	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	*Insufficient Data*	Average or Better	N/A	N/A	*Insufficient Data*	Average or Better	N/A
40E - 3	4 or 5 Lane Undivided Highway	14	351 - 365	0.23	Average or Better	None	0.08	0.38	Average or Better	None	None	*Insufficient Data*	Average or Better	N/A
40E - 4	2 or 3 Lane Undivided Highway	21	365 - 386	0.54	Average or Better	None	1.05	0.03	Average or Better	Medium	None	*Insufficient Data*	Average or Better	N/A
40E - 5	Urban 4 Lane Freeway	12	246 - 258	1.11	Average or Better	Medium	1.27	0.95	Average or Better	Medium	Low	*Insufficient Data*	Average or Better	N/A
40E - 6	Rural 4 Lane Freeway with Daily Volume < 25,000	12	258 - 270	1.29	Average or Better	High	1.46	1.12	Average or Better	High	Medium	*Insufficient Data*	Average or Better	N/A
40E - 7	Rural 4 Lane Freeway with Daily Volume < 25,000	16	270 - 286	0.70	Average or Better	None	1.05	0.34	Average or Better	Low	None	*Insufficient Data*	Average or Better	N/A
40E - 8	Rural 4 Lane Freeway with Daily Volume < 25,000	4	286 - 290	2.03	Average or Better	High	2.74	1.33	Average or Better	High	High	*Insufficient Data*	Average or Better	N/A
40E - 9	Rural 4 Lane Freeway with Daily Volume < 25,000	14	290 - 304	1.24	Average or Better	Medium	0.83	1.65	Average or Better	None	High	*Insufficient Data*	Average or Better	N/A
40E - 10	Rural 4 Lane Freeway with Daily Volume < 25,000	22	304 - 326	*Insufficient Data*	Average or Better	N/A	0.00	0.00	Average or Better	None	None	*Insufficient Data*	Average or Better	N/A
40E - 11	Rural 4 Lane Freeway with Daily Volume < 25,000	16	326 - 342	1.42	Average or Better	High	1.57	1.26	Average or Better	High	Medium	*Insufficient Data*	Average or Better	N/A
40E - 12	Rural 4 Lane Freeway with Daily Volume < 25,000	18	342 - 360	0.83	Average or Better	None	0.39	1.27	Average or Better	None	High	*Insufficient Data*	Average or Better	N/A
Safety Emphasis Area?		**No**	**Weighted Average**	0.97	Average or Better	Low								

Segment	Operating Environment	Segment Length (miles)	Segment Mileposts (MP)	% of Fatal + Suspected Serious Injury Crashes Involving Lane Departures			% of Fatal + Suspected Serious Injury Crashes Involving Pedestrians			% of Fatal + Suspected Serious Injury Crashes Involving Trucks			Initial Need
				Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	Performance Score	Performance Objective	Level of Need	
40E - 1	Urban 4 Lane Freeway	6	196 - 202	63%	Average or Better	None	*Insufficient Data*	Average or Better	N/A	38%	Average or Better	High	High
40E - 2	Rural 4 Lane Freeway with Daily Volume < 25,000	10	202 - 212	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	Medium
40E - 3	Rural 4 Lane Freeway with Daily Volume < 25,000	22	212 - 234	81%	Average or Better	High	*Insufficient Data*	Average or Better	N/A	22%	Average or Better	Medium	High
40E - 4	Rural 4 Lane Freeway with Daily Volume < 25,000	12	234 - 246	45%	Average or Better	None	*Insufficient Data*	Average or Better	N/A	9%	Average or Better	None	None
40E - 5	Urban 4 Lane Freeway	12	246 - 258	67%	Average or Better	Low	*Insufficient Data*	Average or Better	N/A	56%	Average or Better	High	High
40E - 6	Rural 4 Lane Freeway with Daily Volume < 25,000	12	258 - 270	81%	Average or Better	High	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	High
40E - 7	Rural 4 Lane Freeway with Daily Volume < 25,000	16	270 - 286	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	20%	Average or Better	None	Low
40E - 8	Rural 4 Lane Freeway with Daily Volume < 25,000	4	286 - 290	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	High
40E - 9	Rural 4 Lane Freeway with Daily Volume < 25,000	14	290 - 304	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	22%	Average or Better	Medium	High
40E - 10	Rural 4 Lane Freeway with Daily Volume < 25,000	22	304 - 326	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	None
40E - 11	Rural 4 Lane Freeway with Daily Volume < 25,000	16	326 - 342	63%	Average or Better	None	*Insufficient Data*	Average or Better	N/A	8%	Average or Better	None	High
40E - 12	Rural 4 Lane Freeway with Daily Volume < 25,000	18	342 - 360	54%	Average or Better	None	*Insufficient Data*	Average or Better	N/A	*Insufficient Data*	Average or Better	N/A	Low

Safety Performance Area - Needs Analysis Step 2

Segment	Segment Length (miles)	Segment Mileposts (MP)	Initial Need	Hot Spots	Relevant Recently Completed or Under Construction Projects (which supersede performance data)*	Final Need	Comments (may include tentatively programmed projects with potential to address need or other relevant issues identified in previous reports)
40E - 1	6	196 - 202	High	MP 195-196	None	High	**Planned**: Pavement Rehabilitation [MP 195-205.2] Maineline expansion, Flagstaff to Winona [MP 196-214] -Widen the mainline to three lanes in each direction (inside widening) -Widen and Replace bridges -Address vertical sight distance, superelevation, and grade issues Install new DMS on I-40 WB, west of Butler Avenue [MP 197.6] Reconstruct the existing Butler TI [MP 198.28] Install New DMS on I-40 WB, between 4th Street and Country Club TI [MP 199.8] Minor Improvements to the existing Country Club TI [MP 201.1]
40E - 2	10	202 - 212	Medium		None	Medium	**Planned**: Maineline expansion, Flagstaff to Winona [MP 196-214] -Widen the mainline to three lanes in each direction (inside widening) -Widen and Replace bridges -Address vertical sight distance, superelevation, and grade issues Reconstruct the existing Walnut Canyon TI [MP 204.8] Minor Improvements to the existing Cosnino TI [MP 201.1] Reconstruct the existing Winona TI[MP 211.16]
40E - 3	22	212 - 234	High	MP 218-220, MP 229	None	High	**Planned**: Maineline expansion, Flagstaff to Winona [MP 196-214] -Widen the mainline to three lanes in each direction (inside widening) -Widen and Replace bridges -Address vertical sight distance, superelevation, and grade issues Widen to six lanes [214-359]
40E - 4	12	234 - 246	None	MP 240-242	None	Low	
40E - 5	12	246 - 258	High		None	High	
40E - 6	12	258 - 270	High	MP 262-265	None	High	**Planned**: Pavement Preservation from Jackrabbit Road)MP 268) to Joseph City (MP 278)
40E - 7	16	270 - 286	Low		None	Low	**Planned**: Pavement Rehabilitation [MP 277.58-282.8] Rockfall mitigation along I-40 [MP 279.2-279.7]
40E - 8	4	286 - 290	High	MP 288-290	None	High	
40E - 9	14	290 - 304	High	MP 290-291	None	High	**Planned**: Pavement preservation from Sun Valley Road to Washboard Road [MP297-303]
40E - 10	22	304 - 326	None		None	None	
40E - 11	16	326 - 342	High		None	High	Technology and physical infrastructure improvements at the Sanders/Chambers Port of Entry [MP 340] Install new DMS on I-40 WB, east of US 191 [MP 340.4]

Segment	Segment Length (miles)	Segment Mileposts (MP)	Initial Need	Hot Spots	Relevant Recently Completed or Under Construction Projects (which supersede performance data)*	Final Need	Comments (may include tentatively programmed projects with potential to address need or other relevant issues identified in previous reports)
40E - 12	18	342 - 360	Low		None	Low	**Planned**: Pavement preservation from Allentown Road to State Line [MP 354-360] Reconstruct the Lupton TI [MP 359.21] -Construct new diamond TI approximately 800 ft west of the existing TI -Construct two new overpass bridge structures -Modify the alignment of the frontage road -Build a new drainage system

Safety Performance Area - Needs Analysis Step 3

	Segment Number	40E - 1	40E - 2	40E - 3	40E - 4	40E - 5	40E - 6
	Segment Length (miles)	6	10	22	12	12	12
	Segment Milepost (MP)	196 - 202	202 - 212	212 - 234	234 - 246	246 - 258	258 - 270
	Final Need	High	Medium	High	Low	High	High
	Segment Crash Overview	6 Crashes were fatal 2 Crashes had suspected serious injuries 0 Crashes at intersections 5 Crashes involve lane departures 1 Crashes involve pedestrians 3 Crashes involve trucks 0 Crashes involve bicycles	5 Crashes were fatal 5 Crashes had suspected serious injuries 0 Crashes at intersections 6 Crashes involve lane departures 1 Crashes involve pedestrians 3 Crashes involve trucks 0 Crashes involve bicycles	11 Crashes were fatal 16 Crashes had suspected serious injuries 0 Crashes at intersections 22 Crashes involve lane departures 0 Crashes involve pedestrians 6 Crashes involve trucks 0 Crashes involve bicycles	0 Crashes were fatal 11 Crashes had suspected serious injuries 0 Crashes at intersections 5 Crashes involve lane departures 0 Crashes involve pedestrians 1 Crashes involve trucks 0 Crashes involve bicycles	5 Crashes were fatal 12 Crashes had suspected serious injuries 0 Crashes at intersections 12 Crashes involve lane departures 1 Crashes involve pedestrians 7 Crashes involve trucks 0 Crashes involve bicycles	5 Crashes were fatal 11 Crashes had suspected serious injuries 0 Crashes at intersections 13 Crashes involve lane departures 2 Crashes involve pedestrians 3 Crashes involve trucks 0 Crashes involve bicycles
Segment Crash Summaries (Fatal and Suspected Serious Injury Crashes)	First Harmful Event Type	38% Involve Collision with Motor Vehicle 25% Involve Overturning 13% Involve Other Non-Collision	50% Involve Overturning 17% Involve Collision with Pedestrian 17% Involve Collision with Fixed Object	48% Involve Overturning 44% Involve Collision with Motor Vehicle 4% Involve Other Non-Collision	55% Involve Collision with Motor Vehicle 36% Involve Overturning 9% Involve Other Non-Collision	33% Collision with Fixed Object 33% Involve Overturning 22% Involve Collision with Motor Vehicle	63% Involve Overturning 19% Involve Collision with Motor Vehicle 13% Involve Collision with Pedestrian
	Collision Type	50% Involve Single Vehicle 25% Involve Rear End 13% Involve Head On	67% Involve Single Vehicle 17% Involve Rear End 17% Involve Other	52% Involve Single Vehicle 15% Involve Head On 15% Involve Rear End	55% Involve Rear End 45% Involve Single Vehicle	67% Involve Single Vehicle 22% Involve Rear End 11% Involve Other	69% Involve Single Vehicle 13% Involve Other 6% Involve Sideswipe (opposite)
	Violation or Behavior	25% Involve Speed too Fast for Conditions 13% Involve Drove in Opposing Lane 13% Involve Followed Too Closely	33% Involve Unknown 33% Involve Failure to Keep in Proper Lane 17% Involve Speed too Fast for Conditions	40% Involve Speed too Fast for Conditions 20% Involve No Improper Action 12% Involve Failure to Keep in Proper Lane	73% Involve Speed too Fast for Conditions 9% Involve Followed Too Closely 9% Involve Unknown	44% Involve Speed too Fast for Conditions 33% Involve Other 22% Involve Failure to Keep in Proper Lane	53% Involve Speed too Fast for Conditions 13% Involve Other 13% Involve Unknown
	Lighting Conditions	50% Occur in Dark-Unlighted Conditions 50% Occur in Daylight Conditions	67% Occur in Dark-Unlighted Conditions 17% Occur in Dusk Conditions 17% Occur in Daylight Conditions	67% Occur in Daylight Conditions 26% Occur in Dark-Unlighted Conditions 4% Occur in Dark-Lighted Conditions	64% Occur in Dark-Unlighted Conditions 36% Occur in Daylight Conditions	56% Occur in Daylight Conditions 22% Occur in Dark-Lighted Conditions 22% Occur in Dark-Unlighted Conditions	69% Occur in Daylight Conditions 31% Occur in Dark-Unlighted Conditions
	Surface Conditions	75% Involve Dry Conditions 13% Involve Ice/Frost Conditions 13% Involve Wet Conditions	100% Involve Dry Conditions	92% Involve Dry Conditions 4% Involve Ice/Frost Conditions 4% Involve Wet Conditions	100% Involve Dry Conditions	78% Involve Dry Conditions 22% Involve Wet Conditions	81% Involve Dry Conditions 6% Involve Water (standing or moving) Conditions 6% Involve Other Conditions
	First Unit Event	38% Involve a first unit event of Motor Vehicle in Transport 25% Involve a first unit event of Ran Off the Road (Left) 25% Involve a first unit event of Overturn	50% Involve a first unit event of Overturn 33% Involve a first unit event of Motor Vehicle in Transport 17% Involve a first unit event of Other Non-Collision	33% Involve a first unit event of Motor Vehicle in Transport 30% Involve a first unit event of Overturn 19% Involve a first unit event of Ran Off the Road (Left)	55% Involve a first unit event of Motor Vehicle in Transport 27% Involve a first unit event of Overturn 18% Involve a first unit event of Ran Off the Road (Left)	33% Involve a first unit event of Ran Off the Road (Right) 33% Involve a first unit event of Motor Vehicle in Transport 22% Involve a first unit event of Overturn	38% Involve a first unit event of Overturn 25% Involve a first unit event of Motor Vehicle in Transport 19% Involve a first unit event of Ran Off the Road (Left)
	Driver Physical Condition	38% Under the Influence of Drugs or Alcohol 38% Unknown 25% No Apparent Influence	33% Fatigued/Fell Asleep 33% Unknown 17% Under the Influence of Drugs or Alcohol	59% No Apparent Influence 15% Fatigued/Fell Asleep 15% Under the Influence of Drugs or Alcohol	36% No Apparent Influence 27% Under the Influence of Drugs or Alcohol 27% Unknown	44% No Apparent Influence 33% Unknown 11% Fatigued/Fell Asleep	31% Unknown 31% No Apparent Influence 25% Fatigued/Fell Asleep
	Safety Device Usage	50% Shoulder And Lap Belt Used 25% None Used 13% Not Applicable	50% Shoulder And Lap Belt Used 33% None Used 17% Not Applicable	59% Shoulder And Lap Belt Used 15% None Used 11% Unknown	45% Shoulder And Lap Belt Used 18% Unknown 18% Air Bag Deployed/Shoulder-Lap Belt	56% Shoulder And Lap Belt Used 22% None Used 11% Not Applicable	63% Shoulder And Lap Belt Used 13% Not Applicable 13% None Used
	Hot Spot Crash Summaries						
	Previously Completed Safety-Related Projects						
	District Interviews/Discussions						
	Contributing Factors						

	Segment Number	40E - 7	40E - 8	40E - 9	40E - 10	40E - 11	40E - 12	Corridor-Wide Crash Characteristics
	Segment Length (miles)	16	4	14	22	16	18	
	Segment Milepost (MP)	270 - 286	286 - 290	290 - 304	304 - 326	326 - 342	342 - 360	
	Final Need	Low	High	High	None	High	Low	
	Segment Crash Overview	4 Crashes were fatal 1 Crashes had suspected serious injuries 0 Crashes at intersections 3 Crashes involve lane departures 0 Crashes involve pedestrians 1 Crashes involve trucks 0 Crashes involve bicycles	3 Crashes were fatal 1 Crashes had suspected serious injuries 0 Crashes at intersections 4 Crashes involve lane departures 0 Crashes involve pedestrians 1 Crashes involve trucks 0 Crashes involve bicycles	8 Crashes were fatal 3 Crashes had suspected serious injuries 0 Crashes at intersections 9 Crashes involve lane departures 1 Crashes involve pedestrians 2 Crashes involve trucks 0 Crashes involve bicycles	0 Crashes were fatal 0 Crashes had suspected serious injuries 0 Crashes at intersections 0 Crashes involve lane departures 0 Crashes involve pedestrians 0 Crashes involve trucks 0 Crashes involve bicycles	8 Crashes were fatal 17 Crashes had suspected 0 Crashes at intersections 15 Crashes involve lane 0 Crashes involve pedestrians 2 Crashes involve trucks 1 Crashes involve bicycles	5 Crashes were fatal 8 Crashes had suspected 0 Crashes at intersections 7 Crashes involve lane 3 Crashes involve pedestrians 2 Crashes involve trucks 0 Crashes involve bicycles	60 Crashes were fatal 87 Crashes had suspected serious 0 Crashes at intersections 101 Crashes involve lane departures 9 Crashes involve pedestrians 31 Crashes involve trucks 1 Crashes involve bicycles
Segment Crash Summaries (Fatal and Suspected Serious Injury Crashes)	First Harmful Event Type	100% Involve Collision with Motor Vehicle	50% Involve Collision with Motor Vehicle 50% Involve Overturning	56% Involve Collision with Motor Vehicle 33% Involve Overturning 11% Involve Collision with Pedestrian	#### #DIV/0! #### #DIV/0! #### #DIV/0!	40% Involve Collision with Motor Vehicle 40% Involve Overturning 8% Involve Collision with Non-Fixed Object	23% Involve Collision with Pedestrian 23% Involve Collision with Fixed Object 23% Involve Collision with Motor Vehicle	40% Involve Overturning 39% Involve Collision with Motor Vehicle 8% Involve Collision with Fixed Object
	Collision Type	60% Involve Head On 40% Involve Rear End	50% Involve Single Vehicle 50% Involve Head On	33% Involve Single Vehicle 22% Involve Sideswipe (same) 11% Involve Sideswipe (opposite)	#### #DIV/0! #### #DIV/0! #### #DIV/0!	48% Involve Single Vehicle 24% Involve Rear End 16% Involve Sideswipe (same)	54% Involve Single Vehicle 38% Involve Other 8% Involve Rear End	42% Involve Rear End 21% Involve Other 17% Involve Head On
	Violation or Behavior	50% Involve Drove in Opposing Lane 50% Involve Speed too Fast for Conditions	50% Involve Speed too Fast for Conditions 25% Involve Drove in Opposing Lane 25% Involve No Improper Action	33% Involve Speed too Fast for Conditions 22% Involve Unknown 11% Involve Drove in Opposing Lane	#### #DIV/0! #### #DIV/0! #### #DIV/0!	33% Involve Speed too Fast for Conditions 17% Involve No Improper Action 17% Involve Failure to Keep in Proper Lane	46% Involve Speed too Fast for Conditions 23% Involve No Improper Action 15% Involve Other	26% Involve No Improper Action 19% Involve Other 18% Involve Failure to Keep in Proper Lane
	Lighting Conditions	40% Occur in Dark-Unlighted Conditions 40% Occur in Daylight Conditions 20% Occur in Dark-Lighted Conditions	50% Occur in Dark-Unlighted Conditions 25% Occur in Dusk Conditions 25% Occur in Daylight Conditions	44% Occur in Dark-Unlighted Conditions 44% Occur in Daylight Conditions 11% Occur in Dusk Conditions	#### #DIV/0! #### #DIV/0! #### #DIV/0!	42% Occur in Daylight Conditions 38% Occur in Dark-Unlighted Conditions 8% Occur in Dark-Lighted Conditions	54% Occur in Daylight Conditions 23% Occur in Dark-Unlighted Conditions 15% Occur in Dusk Conditions	51% Occur in Daylight Conditions 36% Occur in Dark-Unlighted Conditions 5% Occur in Dusk Conditions
	Surface Conditions	100% Involve Dry Conditions	75% Involve Dry Conditions 25% Involve Wet Conditions	100% Involve Dry Conditions	#### #DIV/0! #### #DIV/0! #### #DIV/0!	92% Involve Dry Conditions 4% Involve Unknown Conditions 4% Involve Wet Conditions	54% Involve Dry Conditions 38% Involve Wet Conditions 8% Involve Ice/Frost Conditions	88% Involve Dry Conditions 8% Involve Wet Conditions 2% Involve Ice/Frost Conditions
	First Unit Event	80% Involve a first unit event of Motor Vehicle in Transport 20% Involve a first unit event of Other Non-Collision	50% Involve a first unit event of Motor Vehicle in Transport 50% Involve a first unit event of Overturn	56% Involve a first unit event of Motor Vehicle in Transport 11% Involve a first unit event of Ran Off the Road (Left) 11% Involve a first unit event of Ran Off the Road (Right)	#### #DIV/0! #### #DIV/0! #### #DIV/0!	38% Involve a first unit event of Motor Vehicle in Transport 25% Involve a first unit event of Ran Off the Road (Left) 17% Involve a first unit event of Overturn	46% Involve a first unit event of Motor Vehicle in Transport 31% Involve a first unit event of Ran Off the Road (Right) 23% Involve a first unit event of Ran Off the Road (Left)	67% Involve a first unit event of Collision with Pedestrian 33% Involve a first unit event of Unknown 0% Involve a first unit event of Collision with Animal
	Driver Physical Condition	40% Under the Influence of Drugs or Alcohol 40% Unknown 20% Fatigued/Fell Asleep	75% Under the Influence of Drugs or Alcohol 25% No Apparent Influence	44% Under the Influence of Drugs or Alcohol 44% No Apparent Influence 11% Unknown	#### #DIV/0! #### #DIV/0! #### #DIV/0!	48% No Apparent Influence 24% Unknown 20% Under the Influence of Drugs or Alcohol	58% No Apparent Influence 25% Under the Influence of Drugs or Alcohol 17% Unknown	43% No Apparent Influence 23% Under the Influence of Drugs or Alcohol 22% Unknown
	Safety Device Usage	60% Shoulder And Lap Belt Used 20% Air Bag Deployed/Shoulder-Lap Belt 20% None Used	50% None Used 50% Shoulder And Lap Belt Used	56% Shoulder And Lap Belt Used 22% None Used 11% Not Applicable	#### #DIV/0! #### #DIV/0! #### #DIV/0!	71% Shoulder And Lap Belt Used 8% Unknown 8% None Used	31% Not Applicable 31% Shoulder And Lap Belt Used 23% None Used	58% Shoulder And Lap Belt Used 16% None Used 8% Air Bag Deployed/Shoulder-Lap Belt
	Hot Spot Crash Summaries							
	Previously Completed Safety-Related Projects							
	District Interviews/Discussions							
	Contributing Factors							

Freight Performance Needs Analysis – Step 1

Segment	Facility Operations	Segment Mileposts (MP)	Segment Length (miles)	Freight Index			Directional TTTR (trucks only)				
				Performance Score	Performance Objective	Level of Need	Performance Score		Performance Objective	Level of Need	
							NB/EB	SB/WB		NB/EB	SB/WB
40-1	Uninterrupted	196-202	6	1.12	Fair or Better	None	1.12	1.12	Fair or Better	None	None
40-2	Uninterrupted	202-212	10	1.09	Fair or Better	None	1.08	1.10	Fair or Better	None	None
40-3	Uninterrupted	212-234	22	1.06	Fair or Better	None	1.06	1.06	Fair or Better	None	None
40-4	Uninterrupted	234-246	12	1.10	Fair or Better	None	1.10	1.11	Fair or Better	None	None
40-5	Uninterrupted	246-258	12	1.06	Fair or Better	None	1.06	1.06	Fair or Better	None	None
40-6	Uninterrupted	258-270	12	1.09	Fair or Better	None	1.09	1.09	Fair or Better	None	None
40-7	Uninterrupted	270-286	16	1.13	Fair or Better	None	1.13	1.14	Fair or Better	None	None
40-8	Uninterrupted	286-290	4	1.06	Fair or Better	None	1.07	1.06	Fair or Better	None	None
40-9	Uninterrupted	290-304	14	1.06	Fair or Better	None	1.06	1.06	Fair or Better	None	None
40-10	Uninterrupted	304-326	22	1.06	Fair or Better	None	1.06	1.06	Fair or Better	None	None
40-11	Uninterrupted	326-342	16	1.11	Fair or Better	None	1.11	1.11	Fair or Better	None	None
40-12	Uninterrupted	342-359.63	17.63	1.09	Fair or Better	None	1.08	1.09	Fair or Better	None	None

Segment	Facility Operations	Segment Mileposts (MP)	Segment Length (miles)	Closure Duration (minutes/mile/year)					Bridge Clearance (feet)			Initial Need
				Performance Score		Performance Objective	Level of Need		Performance Score	Performance Objective	Level of Need	
				NB/EB	SB/WB		NB/EB	SB/WB				
40-1	Uninterrupted	196-202	6	116.62	53.05	Fair or Better	Medium	None	16.67	Fair or Better	None	Low
40-2	Uninterrupted	202-212	10	87.10	67.26	Fair or Better	Low	None	16.00	Fair or Better	Medium	Low
40-3	Uninterrupted	212-234	22	398.89	346.15	Fair or Better	High	High	15.96	Fair or Better	Medium	Low
40-4	Uninterrupted	234-246	12	35.45	24.73	Fair or Better	None	None	16.15	Fair or Better	Medium	Low
40-5	Uninterrupted	246-258	12	96.93	39.20	Fair or Better	Low	None	16.26	Fair or Better	Low	Low
40-6	Uninterrupted	258-270	12	34.12	29.92	Fair or Better	None	None	No UP	Fair or Better	None	None
40-7	Uninterrupted	270-286	16	41.79	56.74	Fair or Better	None	None	16.01	Fair or Better	Medium	Low
40-8	Uninterrupted	286-290	4	127.25	58.75	Fair or Better	Medium	None	16.96	Fair or Better	None	Low
40-9	Uninterrupted	290-304	14	209.81	124.11	Fair or Better	High	Medium	16.12	Fair or Better	Medium	Low
40-10	Uninterrupted	304-326	22	211.27	89.35	Fair or Better	High	Low	15.96	Fair or Better	Medium	Low
40-11	Uninterrupted	326-342	16	175.96	102.71	Fair or Better	High	Medium	16.06	Fair or Better	Medium	Low
40-12	Uninterrupted	342-359.63	17.63	233.05	412.67	Fair or Better	High	High	16.06	Fair or Better	Medium	Low

Segment	Segment Length (miles)	Segment Mileposts (MP)	Initial Need	Truck Height Restriction Hot Spots (Clearance < 16.25')	Relevant Recently Completed or Under Construction Projects (which supersede performance data)*	Final Need	Comments (may include tentatively programmed projects with potential to address needs or other relevant issues identified in previous reports)
40-1	6	196-202	Low	None	DMS installed at MP 197.61 WB	Low	**Planned**: Widen the mainline to six lanes (DCR), construct a new TI at Lone Tree (MP 196.7) (DCR), Reconstruct Butler TI (MP 198.28) (DCR) Install new DMS on I-40 WB, between 4th St and Country Cl (Statewide DMS Master Plan) Minor improvements to the existing Country Cl TI (DCR)
40-2	10	202-212	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (DCR), Reconstruct the TI at Walnut Canyon (MP 204.8) (DCR) Reconstruct the existing TI at Winona (MP 211.16) (DCR) Minor improvements to the exisitng Cosnino TI (DCR)
40-3	22	212-234	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (DCR)
40-4	12	234-246	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (BQAZ)
40-5	12	246-258	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (BQAZ)
40-6	12	258-270	None	None	None	None	**Planned**: Widen the mainline to six lanes (BQAZ)
40-7	16	270-286	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (BQAZ)
40-8	4	286-290	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (BQAZ)
40-9	14	290-304	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (BQAZ)
40-10	22	304-326	Low	None	None	Low	**Programmed**: Port of Entry improvements at Crazy Horse POE (MP 322) FY 17 Planned: Widen the mainline to six lanes (BQAZ)
40-11	16	326-342	Low	None	DMS installed at MP 340.44 WB	Low	**Planned**: Widen the mainline to six lanes (BQAZ)
40-12	17.63	342-359.63	Low	None	None	Low	**Planned**: Widen the mainline to six lanes (BQAZ), Lupton Traffic Interchange (MP 359.21) - construct a new TI (DCR)

Freight Performance Needs Analysis – Step 3

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	Weighted Average Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2040 LOS	% Trucks	
40-1	196-202	6	Low	Interstate	Urban	Rolling	2	65	No	Divided	0%	A-C	A-C	36	I-17 System Interchange MP 196, Transit Rail Station MP 196, Permanent Traffic Counter MP 196, DMS Sign MP 199
40-2	202-212	10	Low	Interstate	Fringe Urban	Rolling	2	75	No	Divided	0%	A-C	A-C	48	DMS Sign MP 212
40-3	212-234	22	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	45	Road Weather Information MP 229
40-4	234-246	12	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	46	Open Rest Area MP 240
40-5	246-258	12	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	38	DMS Sign MP 250, Transit Rail Station MP 254, Road Weather Information MP 256
40-6	258-270	12	None	Interstate	Rural	Level	2	75	No	Divided	0%	A/B	A/B	41	Traffic Counter MP 260, DMS Sign MP 260, Road Weather Information MP 269
40-7	270-286	16	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	41	Traffic Counter MP 275, DMS Sign MP 281
40-8	286-290	4	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	35	None
40-9	290-304	14	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	40	Weigh Station MP 291, DMS Sign MP 295
40-10	304-326	22	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	43	DMS Sign MP 310, Road Weather Information MP 312
40-11	326-342	16	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	41	DMS Sign MP 330, Weigh Station MP 341
40-12	342-359.63	17.63	Low	Interstate	Rural	Rolling	2	75	No	Divided	0%	A/B	A/B	38	Open Rest Area MP 357, DMS Sign MP 357, Road Weather Information MP 358

Freight Performance Needs Analysis – Step 3

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent: Total Number of Closures	Closure Extent: # Incidents/ Accidents	Closure Extent: % Incidents/ Accidents	Closure Extent: # Obstructions/ Hazards	Closure Extent: % Obstructions/ Hazards	Closure Extent: # Weather Related	Closure Extent: % Weather Related	Non-Actionable Conditions	Programmed and Planned Projects or Issues from Previous Documents Relevant to Final Need	Contributing Factors
40-1	196-202	6	Low	22	0	0%	0	0%	0	0%	None	Planned DMS between 4th St. and Country Club (WB) Install new DMS on I-40 WB, west of Butler Ave. [MP 196.7]	-High EB Freight Closure Need -Elevated Bridge Clearance Need
40-2	202-212	10	Low	22	7	32%	0	0%	0	0%	None		-High EB Freight Closure Need, Elevated for WB -Elevated Bridge Clearance Need -89% of Closure Incidents/Accident Related, 11% Remaining are Weather Related
40-3	212-234	22	Low	42	9	21%	4	10%	2	5%	None		-High EB Freight Closure Need
40-4	234-246	12	Low	11	0	0%	0	0%	0	0%	None		-High EB Freight Performance Index Need -High EB Need in PTI -High EB Freight Closure Need -High NB Buffer Performance Need
40-5	246-258	12	Low	33	8	24%	0	0%	0	0%	None		-Elevated EB Freight Closure Need -Elevated Bridge Clearance Need
40-6	258-270	12	None	14	0	0%	0	0%	0	0%	None		-No Reported Performance Need -100% of Closure Incidents/Accident Related
40-7	270-286	16	Low	19	2	11%	3	16%	0	0%	None		-Elevated Bridge Clearance Need -100% of Closure Incidents/Accident Related
40-8	286-290	4	Low	9	0	0%	0	0%	3	33%	None		-No Reported Performance Need -100% of Closure Incidents/Accident Related
40-9	290-304	14	Low	23	2	9%	0	0%	3	13%	None		-Elevated WB Freight Closure Need -Elevated Bridge Clearance Need -100% of Closure Incidents/Accident Related
40-10	304-326	22	Low	22	4	18%	0	0%	3	14%	None		-Elevated Bridge Clearance Need -100% of Closure Incidents/Accident Related
40-11	326-342	16	Low	16	3	19%	2	13%	3	19%	None	Install new DMS on I-40 westbound, east of US 191	-Elevated Bridge Clearance Need -100% of Closure Incidents/Accident Related
40-12	342-359.63	17.63	Low	28	5	18%	0	0%	4	14%	None		-Elevated Bridge Clearance Need -94% of Closure Incidents/Accident Related, 6% Remaining are Obstruction Related

Needs Summary Table

Performance Area	87-1 MP 196-202	87-2 MP 202-212	87-3 MP 212-234	87-4 MP 234-246	87-5 MP 246-258	87-6 MP 258-270	87-7 MP 270-286	260-8 MP 286-290	260-9 MP 290-304	260-10 MP 304-326	260-11 MP 326-342	260-12 MP 342-360
Pavement	High	Low	High	Low	High	High	High	High	High	High	Low	High
Bridge	Low	Low	Medium	Low	Low	Medium	Low	Low	Low	Low	Low	Low
Mobility*	None	Low	Low	Low	Low	None	Low	None	Low	Low	None	Low
Safety*	High	Medium	High	Low	High	High	Low	High	High	None	High	Low
Freight*	Low	Low	Low	Low	Low	None	Low	Low	Low	Low	Low	Low
Average Need	**1.77**	**1.23**	**2.15**	**1.00**	**1.92**	**1.85**	**1.60**	**1.77**	**1.60**	**1.23**	**1.31**	**1.46**

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	WEST WINSLOW PAVEMENT IMPROVEMENTS
Route	I-40
Milepost begin	246
Milepost end	258

Existing Roadway Characteristics			
Surface type (Asphalt or Concrete)	=	Asphalt	<<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)	=	9.9	
Right shoulder width (ft)	=	9.9	
Total roadway analysis segment length (centerline miles)	=	12	
Current year	=	2022	
Elevation (> 4,000 ft or < 4,000 ft)?	=	> 4,000 ft	<<Select from Pull-down List>>
Roadway width (ft) [each direction lanes & shoulders]	=	43.8	
Total lane-miles [total traffic direction lanes & shoulders]	=	87.6	
Total square feet [total traffic direction lanes & shoulders]	=	5,550,336	
Total square yards [total traffic direction lanes & shoulders]	=	616,704	

LCCA Parameters		
Analysis period (years)	=	40
Year of net present value	=	2023
First year of improvements	=	2027
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"	26-30	$609,000	$9.6	$87
Asphalt Reconstruction	8"-12"	22-26	$487,000	$7.7	$69
Concrete Medium Rehab	1"-3"	20-24	$131,000	$2.1	$19
Concrete Light Rehab	<1"	14-18	$87,000	$1.4	$12
Asphalt Medium Rehab	3"-8"	16-20	$183,000	$2.9	$26
Asphalt Light Rehab	<3"	10-14	$122,000	$1.9	$17

Reconstruction: Other Materials Cost Factor
1.60

Rehab: Other Materials Cost Factor
1.20

Total Cost Factor (e.g., includes design, mobilization, traffic control, conting
2.44

			Total Unit Cost ($) [includes material costs and indi			Bi-Directional Cost ($)
Treatment Type	Pavement Thickness	Typical Service Life (years	Lane-miles	Square Feet	Square Yards	Total Cost
Concrete Reconstruction	8"-12"	26-30	$2,377,536	$37.5	$338	$208,272,154
Asphalt Reconstruction	8"-12"	22-26	$1,901,248	$30.0	$270	$166,549,325
Concrete Medium Rehab	1"-3"	20-24	$383,568	$6.1	$54	$33,600,557
Concrete Light Rehab	<1"	14-18	$254,736	$4.0	$36	$22,314,874
Asphalt Medium Rehab	3"-8"	16-20	$535,824	$8.5	$76	$46,938,182
Asphalt Light Rehab	<3"	10-14	$357,216	$5.6	$51	$31,292,122

Pavement Service Life, Intervals, and Sequence of Improvements

I-40 MP 246 - MP 258

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	28	26-30	0	-	14
Asphalt Reconstruction	24	22-26	0	-	12
Concrete Medium Rehab	22	20-24	0	11	11
Concrete Light Rehab	16	14-18	0	8	8
Asphalt Medium Rehab	18	16-20	2.7	2	9
Asphalt Light Rehab	12	10-14	1	1	6
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

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Year	Project Number	Tracs No.	Direction of Improvement	Treatment Type	Improvement Description	Thickness (inches)	Beg. MP	End MP	Length (miles)
2007	IM -040-D(015)N	H458401C	EB/WB	Concrete Reconstruction	AB	4	253.2	254.17	0.97
					PCCP	14	253.2	254.17	0.97
					ARACFC	0.5	253.2	254.17	0.97
2008	NONE	H737301C	EB/WB	Asphalt Light Rehab	Fog Coat	0	249.8	259	9.2
2009	IM -040-D(200)A	H657001C	EB/WB	Asphalt Medium Rehab	4.25" AC Mill	4.25	240	250	10
					4.25" AC/ARACFC	4.25	240	250	10
2009	NONE	H762001C	EB/WB	Asphalt Light Rehab	Fog Coat	0	250.2	259.1	8.9
2010	IM -040-D(202)A	H756701C	EB/WB	Asphalt Medium Rehab	AC Mill	2.5	252	252.6	0.6
					AC/ACFC	2.5	252	252.6	0.6
					Fog Coat	0	252	252.6	0.6
2016	EB-IM-040-D(230)T	H867501C	EB/WB	Asphalt Medium Rehab	Remove 3.5" AC	3.5	250.2	259	8.8
					Remove 5" AC	5	250.2	259	8.8
					3" AC	3.5	250.2	259	8.8
					4.5" AC	5	250.2	259	8.8
					0.5" FC	0.5	250.2	259	8.8

Interval between Improvements in Years	
After Concrete Reconstruction:	
After Asphalt Light Rehab:	1
Asphalt Medium and Asphalt Light R	1
After Asphalt Medium Rehab:	1
After Asphalt Medium Rehab:	6

Treatment Type Options	Estimated Historical Interval Value between Improvements in Years
Concrete Reconstruction	
Asphalt Reconstruction	
Concrete Medium Rehab	
Concrete Light Rehab	
Asphalt Medium Rehab	2.7
Asphalt Light Rehab	1

Design Alternative # 1 - Concrete Reconstruction

I-40 MP 246 - MP 258

Enter Name of Design Alternative

Number of Years	Year	Concrete Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Concrete Reconstruction	$208,272,154	$185,047,111	$158,889,829
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	Concrete Light Rehab	$22,314,874	$13,107,636	$6,602,166
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	Concrete Medium Rehab	$33,600,557	$15,580,401	$5,785,864
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Concrete Light Rehab	$22,314,874	$7,475,102	$1,825,554
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Concrete Light Rehab	$12,552,116	$3,418,842	$639,486
Enter Year of Last Used DA Improvement >>		2060	Remaining Service Life Cost		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$217,791,408	$172,463,927
AGENCY COST	$273,950,341	

Design Alternative # 2 - Asphalt Reconstruction

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Enter Name of Design Alternative

Number of Years	Year	Asphalt Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Reconstruction	$166,549,325	$147,976,918	$127,059,682
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	Asphalt Light Rehab	$31,292,122	$19,500,216	$10,599,724
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	Asphalt Medium Rehab	$46,938,182	$24,496,665	$10,594,566
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	Asphalt Light Rehab	$31,292,122	$12,516,446	$3,841,828
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Asphalt Reconstruction	$166,549,325	$55,791,182	$13,625,207
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$117,972,438	$32,132,363	$6,010,275
Enter Year of Last Used DA Improvement >>		2060	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$228,149,084	$159,710,732
AGENCY COST	$324,648,637	

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Design Alternative # 3 - Asphalt Medium Rehab

Enter Name of Design Alternative

Number of Years	Year	sphalt Medium Rehab Focu	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Medium Rehab	$46,938,182	$41,703,967	$35,808,915
6	2028	None	$0	$0	$0
7	2029	Asphalt Light Rehab	$31,292,122	$26,206,659	$20,851,262
8	2030	Asphalt Reconstruction	$166,549,325	$135,419,842	$103,718,549
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	Asphalt Light Rehab	$31,292,122	$17,845,460	$8,652,532
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	Asphalt Medium Rehab	$46,938,182	$22,417,937	$8,648,322
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	Asphalt Light Rehab	$31,292,122	$11,454,322	$3,136,076
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	None	$0	$0	$0
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	Asphalt Reconstruction	$166,549,325	$51,056,835	$11,122,227
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$138,791,104	$37,802,780	$7,070,912
Enter Year of Last Used DA Improvement >>		2063	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$268,302,242	$184,866,971
AGENCY COST	$382,060,275	

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Design Alternative # 4 – Asphalt Light Rehab

Enter Name of Design Alternative

Number of Years	Year	Asphalt Light Rehab Focus	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Light Rehab	$31,292,122	$27,802,645	$23,872,610
6	2028	Asphalt Reconstruction	$166,549,325	$143,666,911	$118,747,367
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	Asphalt Light Rehab	$31,292,122	$18,932,248	$9,906,284
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	None	$0	$0	$0
24	2046	Asphalt Medium Rehab	$46,938,182	$23,783,190	$9,901,463
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	Asphalt Light Rehab	$31,292,122	$12,151,890	$3,590,493
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	None	$0	$0	$0
39	2061	Asphalt Reconstruction	$166,549,325	$54,166,196	$12,733,838
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$124,911,994	$34,022,502	$6,363,821
Enter Year of Last Used DA Improvement >>		2061	Remaining Service Life Cost		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$246,480,577	$172,388,235
AGENCY COST	$349,001,203	

Summary of LCCA Results

I-40 MP 246 - MP 258

	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehab Focus	Asphalt Light Rehab Focus
Net Present Value - 3%	$217,791,408	$228,149,084	$268,302,242	$246,480,577
Net Present Value - 7%	$172,463,927	$159,710,732	$184,866,971	$172,388,235
Agency Cost	$273,950,341	$324,648,637	$382,060,275	$349,001,203

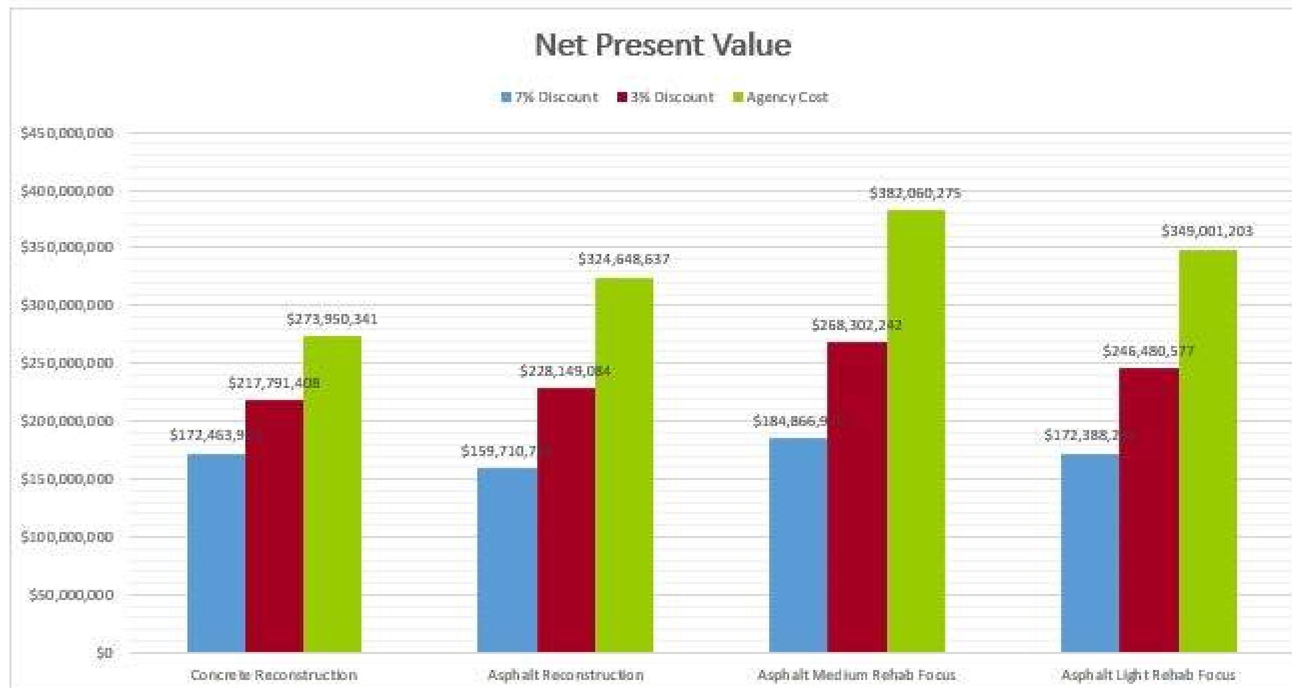
Cost Ratio at 3% Discount Rate

0.88 Ratio of Concrete Reconstruction to Lowest Cost Rehab
0.93 Ratio of Asphalt Reconstruction to Lowest Cost Rehab

Cost Ratio at 7% Discount Rate

1.00 Ratio of Concrete Reconstruction to Lowest Cost Rehab
0.93 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.



Pavement Life-Cycle Cost Analysis Worksheet

Project Details

Project title	
Route	I-40
Milepost begin	270
Milepost end	286

Existing Roadway Characteristics

Surface type (Asphalt or Concrete)	=	Asphalt	<<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)	=	10	
Right shoulder width (ft)	=	10	
Total roadway analysis segment length (centerline miles)	=	16	
Current year	=	2022	
Elevation (> 4,000 ft or < 4,000 ft)?	=	> 4,000 ft	<<Select from Pull-down List>>
Roadway width (ft) [each direction lanes & shoulders]	=	44	
Total lane-miles [total traffic direction lanes & shoulders]	=	117.3	
Total square feet [total traffic direction lanes & shoulders]	=	7,434,240	
Total square yards [total traffic direction lanes & shoulders]	=	826,027	

LCCA Parameters

Analysis period (years)	=	40
Year of net present value	=	2023
First year of improvements	=	2027
Discount rate (%) - low	=	3%
Discount rate (%) - high	=	7%

Design Alternatives (DA)

Characteristics			Pavement Material Cost ($)		
Treatment Type	*Pavement Thickness*	*Typical Service Life (yea*	*Lane-miles*	*Square Feet*	*Square Yards*
Concrete Reconstructio	8"-12"	26-30	$609,000	$9.6	$87
Asphalt Reconstruction	8"-12"	22-26	$487,000	$7.7	$69
Concrete Medium Rehat	1"-3"	20-24	$131,000	$2.1	$19
Concrete Light Rehab	<1"	14-18	$87,000	$1.4	$12
Asphalt Medium Rehab	3"-8"	16-20	$183,000	$2.9	$26
Asphalt Light Rehab	<3"	10-14	$122,000	$1.9	$17

Reconstruction: Other Materials Cost Factor

1.60

Rehab: Other Materials Cost Factor

1.20

Total Cost Factor (e.g., includes design, mobilization, traffic control, con

2.44

			'otal Unit Cost ($) [includes material costs and inc			3i-Directional Cost ($)
Treatment Type	Pavement Thickness	Typical Service Life (year	Lane-miles	Square Feet	Square Yards	Total Cost
Concrete Reconstructio	8"-12"	26-30	$2,377,536	$37.5	$338	$278,964,224
Asphalt Reconstruction	8"-12"	22-26	$1,901,248	$30.0	$270	$223,079,765
Concrete Medium Rehat	1"-3"	20-24	$383,568	$6.1	$54	$45,005,312
Concrete Light Rehab	<1"	14-18	$254,736	$4.0	$36	$29,889,024
Asphalt Medium Rehab	3"-8"	16-20	$535,824	$8.5	$76	$62,870,016
Asphalt Light Rehab	<3"	10-14	$357,216	$5.6	$51	$41,913,344

Pavement Service Life, Intervals, and Sequence of Improvements

I-40 MP 270 - MP 286

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	28	26-30	0	-	14
Asphalt Reconstruction	24	22-26	0	-	12
Concrete Medium Rehab	22	20-24	0	11	11
Concrete Light Rehab	16	14-18	0	8	8
Asphalt Medium Rehab	18	16-20	3.666666667	3	9
Asphalt Light Rehab	12	10-14	0	6	6
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-40 MP 270 - MP 286

Year	Project Number	Tracs No.	Direction of Improvement	Treatment Type	Improvement Description	Thickness (inches)	Beg. MP	End MP	Length (miles)
2000			EB/WB	Asphalt Medium Rehab	4" AC Mill	4	277	284	7
					5" AC/ARAC/ARACFC	5	277	284	7
2001			EB/WB	Asphalt Reconstruction	13" AC/ARAC/ARACFC	13	279	280	1
2005	IM-040-D(012)A	H584701C	EB/WB	Asphalt Medium Rehab	4" AC Mill	4	270	277.4	7.4
					6" AC/ARAC/ARACFC	6	270	277.4	7.4
2010			EB/WB	Asphalt Medium Rehab	2.5" AC Mill	2.5	273	283	10
					2.5" AC/ACFC	2.5	273	283	10
					Fog Coat	0	273	283	10
2012			EB/WB	Asphalt Medium Rehab	3.25" AC Mill	3.25	283	290	7
					3.25" AC/ARACFC	3.25	283	290	7
2022	102781	F047001D, F047001C		Asphalt Medium Rehab	Pavement Rehab	0	282.8	290.3	7.5
2023	101685	F038401D, F038401C	EB/WB	Asphalt Medium Rehab	Pavement Rehab	0	277.58	282.8	5.22

***Note:** This project is not included in the interval between years calculation because it's a programmed project (or not yet completed). Additionaly, the treatment type was assumed to be asphalt medium rehab based on available project information

***Note:** This project is not included in the interval between years calculation because it's a programmed project (or not yet completed). Additionaly, the treatment type was assumed to be asphalt medium rehab based on available project information

Interval between Improvements in Years

Asphalt Medium Rehab:	
Asphalt Reconstruction:	1
Asphalt Medium Rehab:	4
Asphalt Medium Rehab:	5
Asphalt Medium Rehab:	2
Asphalt Medium Rehab:	

Treatment Type Options	Estimated Historical Interval Value between Improvements in Years
Concrete Reconstruction	
Asphalt Reconstruction	
Concrete Medium Rehab	
Concrete Light Rehab	
Asphalt Medium Rehab	3.666666667
Asphalt Light Rehab	

Design Alternative # 1 - Concrete Reconstruction

I-40 MP 270 - MP 286

Enter Name of Design Alternative

Number of Years	Year	Concrete Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$62,870,016	$64,756,116	$67,270,917
1	2023	Asphalt Medium Rehab	$62,870,016	$62,870,016	$62,870,016
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	Asphalt Light Rehab	$41,913,344	$38,356,647	$34,213,774
5	2027	None	$0	$0	$0
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	Concrete Reconstruction	$278,964,224	$213,802,849	$151,738,054
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	None	$0	$0	$0
24	2046	Concrete Light Rehab	$29,889,024	$15,144,522	$6,304,936
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	Concrete Medium Rehab	$45,005,312	$18,001,546	$5,525,437
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	None	$0	$0	$0
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	Concrete Light Rehab	$29,889,024	$8,636,709	$1,743,384
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Concrete Light Rehab	$26,152,896	$7,123,311	$1,332,397
Enter Year of Last Used DA Improvement >>		2065	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$414,445,095	$328,334,182
AGENCY COST	$525,248,064	

Design Alternative # 2 - Asphalt Reconstruction

I-40 MP 270 - MP 286

Enter Name of Design Alternative

Number of Years	Year	Asphalt Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$62,870,016	$64,756,116	$67,270,917
1	2023	Asphalt Medium Rehab	$62,870,016	$62,870,016	$62,870,016
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	Asphalt Light Rehab	$41,913,344	$38,356,647	$34,213,774
5	2027	None	$0	$0	$0
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	Asphalt Reconstruction	$223,079,765	$170,972,065	$121,340,612
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	Asphalt Light Rehab	$41,913,344	$22,530,488	$10,122,621
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	Asphalt Medium Rehab	$62,870,016	$28,303,393	$10,117,695
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	Asphalt Light Rehab	$41,913,344	$14,461,463	$3,668,904
38	2060	None	$0	$0	$0
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	Asphalt Reconstruction	$223,079,765	$64,460,356	$13,011,924
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$204,489,785	$55,697,247	$10,418,025
Enter Year of Last Used DA Improvement >>		2065	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$411,013,897	$312,198,437
AGENCY COST	$556,019,826	

Design Alternative # 3 - Asphalt Medium Rehab

I-40 MP 270 - MP 286

Enter Name of Design Alternative

Number of Years	Year	sphalt Medium Rehab Focu	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$62,870,016	$64,756,116	$67,270,917
1	2023	Asphalt Medium Rehab	$62,870,016	$62,870,016	$62,870,016
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	Asphalt Light Rehab	$41,913,344	$38,356,647	$34,213,774
5	2027	None	$0	$0	$0
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	Asphalt Reconstruction	$223,079,765	$170,972,065	$121,340,612
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	Asphalt Light Rehab	$41,913,344	$22,530,488	$10,122,621
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	Asphalt Medium Rehab	$62,870,016	$28,303,393	$10,117,695
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	Asphalt Light Rehab	$41,913,344	$14,461,463	$3,668,904
38	2060	None	$0	$0	$0
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	Asphalt Reconstruction	$223,079,765	$64,460,356	$13,011,924
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$204,489,785	$55,697,247	$10,418,025
Enter Year of Last Used DA Improvement >>		2065	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$411,013,897	$312,198,437
AGENCY COST	$556,019,826	

Design Alternative # 4 – Asphalt Light Rehab

I-40 MP 270 - MP 286

Enter Name of Design Alternative

Number of Years	Year	Asphalt Light Rehab Focu:	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$62,870,016	$64,756,116	$67,270,917
1	2023	Asphalt Medium Rehab	$62,870,016	$62,870,016	$62,870,016
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	Asphalt Light Rehab	$41,913,344	$38,356,647	$34,213,774
5	2027	None	$0	$0	$0
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	Asphalt Reconstruction	$223,079,765	$170,972,065	$121,340,612
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	Asphalt Light Rehab	$41,913,344	$22,530,488	$10,122,621
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	Asphalt Medium Rehab	$62,870,016	$28,303,393	$10,117,695
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	Asphalt Light Rehab	$41,913,344	$14,461,463	$3,668,904
38	2060	None	$0	$0	$0
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	Asphalt Reconstruction	$223,079,765	$64,460,356	$13,011,924
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$204,489,785	$55,697,247	$10,418,025
Enter Year of Last Used DA Improvement >>		2065	Remaining Service Life Cost		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$411,013,897	$312,198,437
AGENCY COST	$556,019,826	

Summary of LCCA Results

I-40 MP 270 - MP 286

	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehab Focus	Asphalt Light Rehab Focus
Net Present Value - 3%	$414,445,095	$411,013,897	$411,013,897	$411,013,897
Net Present Value - 7%	$328,334,182	$312,198,437	$312,198,437	$312,198,437
Agency Cost	$525,248,064	$556,019,826	$556,019,826	$556,019,826

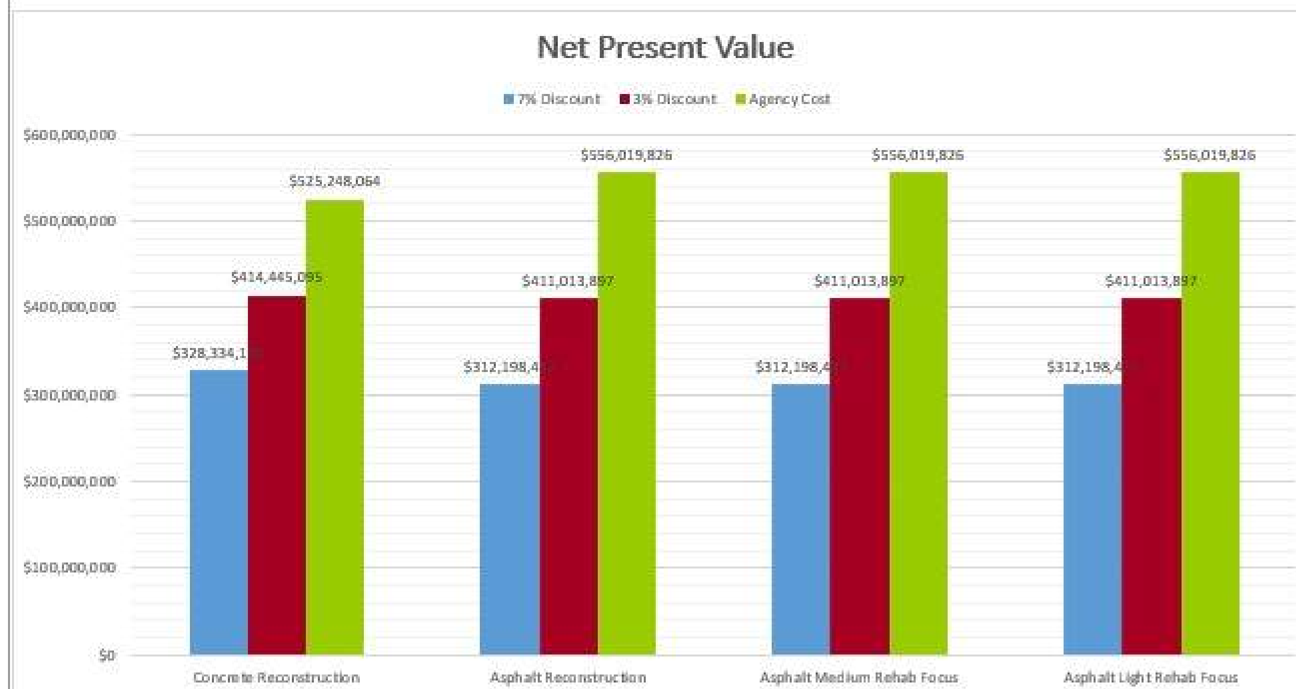
Cost Ratio at 3% Discount Rate

1.01 Ratio of Concrete Reconstruction to Lowest Cost Rehab
1.00 Ratio of Asphalt Reconstruction to Lowest Cost Rehab

Cost Ratio at 7% Discount Rate

1.05 Ratio of Concrete Reconstruction to Lowest Cost Rehab
1.00 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.



Pavement Life-Cycle Cost Analysis Worksheet

Project Details

Project title	CS40.18 Holbrook Pavement Improvements
Route	I-40
Milepost begin	286
Milepost end	290

Existing Roadway Characteristics

Surface type (Asphalt or Concrete)	=	Asphalt	<<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)	=	10	
Right shoulder width (ft)	=	10	
Total roadway analysis segment length (centerline miles)	=	4	
Current year	=	2022	
Elevation (> 4,000 ft or < 4,000 ft)?	=	> 4,000 ft	<<Select from Pull-down List>>
Roadway width (ft) [each direction lanes & shoulders]	=	44	
Total lane-miles [total traffic direction lanes & shoulders]	=	29.3	
Total square feet [total traffic direction lanes & shoulders]	=	1,858,560	
Total square yards [total traffic direction lanes & shoulders]	=	206,507	

LCCA Parameters

Analysis period (years)	=	40
Year of net present value	=	2023
First year of improvements	=	2027
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"	26-30	$609,000	$3.6	$87
Asphalt Reconstruction	8"-12"	22-26	$487,000	$7.7	$69
Concrete Medium Rehab	1"-3"	20-24	$131,000	$2.1	$19
Concrete Light Rehab	<1"	14-18	$87,000	$1.4	$12
Asphalt Medium Rehab	3"-8"	16-20	$183,000	$2.9	$26
Asphalt Light Rehab	<3"	10-14	$122,000	$1.9	$17

Reconstruction: Other Materials Cost Factor

1.60

Rehab: Other Materials Cost Factor

1.20

Total Cost Factor (e.g., includes design, mobilization, traffic control, continge

2.44

			Total Unit Cost ($) [includes material costs and indi			Bi-Directional Cost ($)
Treatment Type	Pavement Thickness	Typical Service Life (years)	Lane-miles	Square Feet	Square Yards	Total Cost
Concrete Reconstruction	8"-12"	26-30	$2,377,536	$37.5	$338	$69,741,056
Asphalt Reconstruction	8"-12"	22-26	$1,901,248	$30.0	$270	$55,769,941
Concrete Medium Rehab	1"-3"	20-24	$383,568	$6.1	$54	$11,251,328
Concrete Light Rehab	<1"	14-18	$254,736	$4.0	$36	$7,472,256
Asphalt Medium Rehab	3"-8"	16-20	$535,824	$8.5	$76	$15,717,504
Asphalt Light Rehab	<3"	10-14	$357,216	$5.6	$51	$10,478,336

Pavement Service Life, Intervals, and Sequence of Improvements

I-40 MP 286 - MP 290

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	28	26-30	0	-	14
Asphalt Reconstruction	24	22-26	0	-	12
Concrete Medium Rehab	22	20-24	0	11	11
Concrete Light Rehab	16	14-18	0	8	8
Asphalt Medium Rehab	18	16-20	5	5	9
Asphalt Light Rehab	12	10-14	0	6	6
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-40 MP 286 - MP 290

Year	Project Number	Tracs No.	Direction of Improvement	Treatment Type	Improvement Description	Thickness (inches)	Beg. MP	End MP	Length (miles)
2002			EB/WB	Asphalt Reconstruction	4" AC Mill	4	286	290	4
					4.5" AC/ARACFC	4.5	286	290	4
2010			EB/WB	Asphalt Medium Rehab	2.5" AC Mill	2.5	273	283	10
					2.5" AC/ACFC	2.5	273	283	10
					Fog Coat	0	273	283	10
2012			EB/WB	Asphalt Medium Rehab	3.25" AC Mill	3.25	283	290	7
					3.25" AC/ARACFC	3.25	283	290	7
2022	102781	F047001D, F047001C		Asphalt Medium Rehab	Pavement Rehab	0	282.8	290.3	7.5

***Note:** This project is not included in the interva between years calculation because it's a programmed project (or not yet completed). Additionally, the treatment type was assumed to asphalt medium rehab based on available projec information. As this is programmed, it is the first scheduled treatment for all alternatives.

Interval between Improvements in Years

Asphalt Reconstruction:	
Asphalt Medium Rehab:	8
Asphalt Medium Rehab:	2
Asphalt Medium Rehab:	

Treatment Type Options	Estimated Historical Interval Value between Improvements in Years
Concrete Reconstruction	
Asphalt Reconstruction	
Concrete Medium Rehab	
Concrete Light Rehab	
Asphalt Medium Rehab	5
Asphalt Light Rehab	

Design Alternative # 1 - Concrete Reconstruction

I-40 MP 286 - MP 290

Enter Name of Design Alternative

Number of Years	Year	Concrete Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$15,717,504	$16,189,029	$16,817,729
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Light Rehab	$10,478,336	$9,309,866	$7,993,872
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	Concrete Reconstruction	$69,741,056	$51,893,895	$35,452,816
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	Concrete Light Rehab	$7,472,256	$3,675,855	$1,473,130
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	Concrete Medium Rehab	$11,251,328	$4,369,307	$1,290,990
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	None	$0	$0	$0
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	Concrete Light Rehab	$7,472,256	$2,096,289	$407,333
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Concrete Light Rehab	$7,005,240	$1,908,030	$356,892
Enter Year of Last Used DA Improvement >>		2066	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$85,626,211	$63,078,979
AGENCY COST	$115,127,496	

Design Alternative # 2 - Asphalt Reconstruction

I-40 MP 286 - MP 290

Enter Name of Design Alternative

Number of Years	Year	Asphalt Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$15,717,504	$16,189,029	$16,817,729
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Light Rehab	$10,478,336	$9,309,866	$7,993,872
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	Asphalt Reconstruction	$55,769,941	$41,498,074	$28,350,610
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	Asphalt Light Rehab	$10,478,336	$5,468,565	$2,365,098
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	Asphalt Medium Rehab	$15,717,504	$6,869,756	$2,363,947
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Asphalt Light Rehab	$10,478,336	$3,510,064	$857,220
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	Asphalt Reconstruction	$55,769,941	$15,645,863	$3,040,169
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$53,446,194	$14,557,235	$2,722,893
Enter Year of Last Used DA Improvement >>		2066	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$83,933,981	$59,065,754
AGENCY COST	$120,963,705	

Design Alternative # 3 - Asphalt Medium Rehab

I-40 MP 286 - MP 290

Enter Name of Design Alternative

Number of Years	Year	sphalt Medium Rehab Foc	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$15,717,504	$16,189,029	$16,817,729
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Light Rehab	$10,478,336	$9,309,866	$7,993,872
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	Asphalt Reconstruction	$55,769,341	$41,498,074	$28,350,610
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	Asphalt Light Rehab	$10,478,336	$5,468,565	$2,365,098
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	Asphalt Medium Rehab	$15,717,504	$6,869,756	$2,363,947
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Asphalt Light Rehab	$10,478,336	$3,510,064	$857,220
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	Asphalt Reconstruction	$55,769,341	$15,645,863	$3,040,169
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$53,446,194	$14,557,235	$2,722,893
Enter Year of Last Used DA Improvement >>		2066	Remaining Service Life Cost		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$83,933,981	$59,065,754
AGENCY COST	$120,963,705	

Design Alternative # 4 - Asphalt Light Rehab

I-40 MP 286 - MP 290

Enter Name of Design Alternative

Number of Years	Year	Asphalt Light Rehab Focus	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	Asphalt Medium Rehab	$15,717,504	$16,189,029	$16,817,729
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Light Rehab	$10,478,336	$9,309,866	$7,993,872
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	Asphalt Reconstruction	$55,769,341	$41,498,074	$28,350,610
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	Asphalt Light Rehab	$10,478,336	$5,468,565	$2,365,098
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	Asphalt Medium Rehab	$15,717,504	$6,869,756	$2,363,947
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Asphalt Light Rehab	$10,478,336	$3,510,064	$857,220
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	Asphalt Reconstruction	$55,769,341	$15,645,863	$3,040,169
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$53,446,194	$14,557,235	$2,722,893
Enter Year of Last Used DA Improvement >>		2066	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$83,933,981	$59,065,754
AGENCY COST	$120,963,705	

Summary of LCCA Results

I-40 MP 286 - MP 290

	Concrete Reconstruction	sphalt Reconstruction	sphalt Medium Rehab Focus	sphalt Light Rehab Focus
Net Present Value - 3%	$85,626,211	$83,933,981	$83,933,981	$83,933,981
Net Present Value - 7%	$63,078,979	$59,065,754	$59,065,754	$59,065,754
Agency Cost	$115,127,496	$120,963,705	$120,963,705	$120,963,705

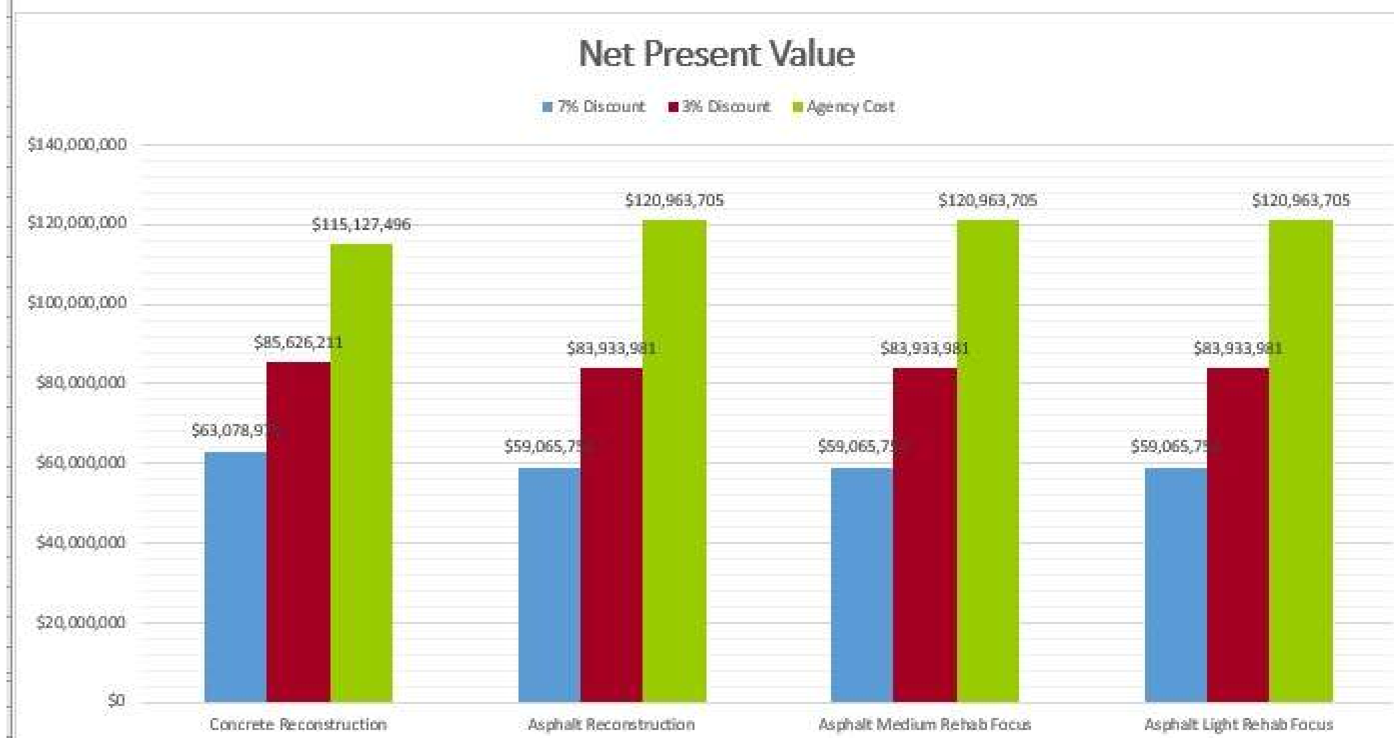
Cost Ratio at 3% Discount Rate

1.02 Ratio of Concrete Reconstruction to Lowest Cost Rehab
1.00 Ratio of Asphalt Reconstruction to Lowest Cost Rehab

Cost Ratio at 7% Discount Rate

1.07 Ratio of Concrete Reconstruction to Lowest Cost Rehab
1.00 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.



Pavement Life-Cycle Cost Analysis Worksheet

Project Details

Project title	HOUCK PAVEMENT IMPROVEMENTS
Route	I-40
Milepost begin	342
Milepost end	360

Existing Roadway Characteristics

Surface type (Asphalt or Concrete)	=	Asphalt	<<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)	=	9.7	
Right shoulder width (ft)	=	9.7	
Total roadway analysis segment length (centerline miles)	=	18	
Current year	=	2022	
Elevation (> 4,000 ft or < 4,000 ft)?	=	> 4,000 ft	<<Select from Pull-down List>>
Roadway width (ft) [each direction lanes & shoulders]	=	43.4	
Total lane-miles [total traffic direction lanes & shoulders]	=	130.2	
Total square feet [total traffic direction lanes & shoulders]	=	8,249,472	
Total square yards [total traffic direction lanes & shoulders]	=	916,608	

LCCA Parameters

Analysis period (years)	=	40
Year of net present value	=	2023
First year of improvements	=	2027
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"	26-30	$609,000	$9.6	$87
Asphalt Reconstruction	8"-12"	22-26	$487,000	$7.7	$69
Concrete Medium Rehab	1"-3"	20-24	$131,000	$2.1	$19
Concrete Light Rehab	<1"	14-18	$87,000	$1.4	$12
Asphalt Medium Rehab	3"-8"	16-20	$183,000	$2.9	$26
Asphalt Light Rehab	<3"	10-14	$122,000	$1.9	$17

Reconstruction: Other Materials Cost Factor

1.60

Rehab: Other Materials Cost Factor

1.20

Total Cost Factor (e.g., includes design, mobilization, traffic control, continge

2.44

			Total Unit Cost ($) [includes material costs and indi			Bi-Directional Cost ($)
Treatment Type	Pavement Thickness	Typical Service Life (years)	Lane-miles	Square Feet	Square Yards	Total Cost
Concrete Reconstruction	8"-12"	26-30	$2,377,536	$37.5	$338	$309,555,187
Asphalt Reconstruction	8"-12"	22-26	$1,901,248	$30.0	$270	$247,542,490
Concrete Medium Rehab	1"-3"	20-24	$383,568	$6.1	$54	$49,940,554
Concrete Light Rehab	<1"	14-18	$254,736	$4.0	$36	$33,166,627
Asphalt Medium Rehab	3"-8"	16-20	$535,824	$8.5	$76	$69,764,285
Asphalt Light Rehab	<3"	10-14	$357,216	$5.6	$51	$46,509,523

Pavement Service Life, Intervals, and Sequence of Improvements

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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	28	26-30	0	-	14
Asphalt Reconstruction	24	22-26	0	-	12
Concrete Medium Rehab	22	20-24	0	11	11
Concrete Light Rehab	16	14-18	0	8	8
Asphalt Medium Rehab	18	16-20	4.25	4	9
Asphalt Light Rehab	12	10-14	0	6	6
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

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. . .

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

Pavement Improvement Project History

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Year	Project Number	Tracs No.	Direction of Improvement	Treatment Type	Improvement Description	Thickness (inches)	Beg. MP	End MP	Length (miles)
2000			WB	Asphalt Medium Rehab	1.5" AC Mill	1.5	344	345	1
					1.75" AC/ARACFC	1.75	344	345	1
					Fog Coat	0	344	345	1
2002			EB/WB	Asphalt Medium Rehab	Remove 4.5" AC	4.5	354	360	6
					6.5" AC/ARAC/ARACFC	6.5	354	360	6
2006			EB/WB	Asphalt Medium Rehab	Remove 5" AC	5	342	354	12
					7" AC/ARAC/ARACFC	7	342	354	12
2011			EB/WB	Asphalt Medium Rehab	3.75" AC Mill	3.75	354	360	6
					3.75" AC/ARACFC	3.75	354	360	6
2017			EB/WB	Asphalt Medium Rehab	Remove 3.5" AC	3.5	353	359	6
					Remove 5" AC	5	353	359	6
					2.5" AC	2.5	353	359	6
					4.5" AC	4.5	353	359	6
					0.5" FC *EB MP 357.7-359.6*	0.5	353	359	6

Interval between Improvements in Years	
Asphalt Medium Rehab:	
Asphalt Medium Rehab:	2
Asphalt Medium Rehab:	4
Asphalt Medium Rehab:	5
Asphalt Medium Rehab:	6

Treatment Type Options	Estimated Historical Interval Value between Improvements in Years
Concrete Reconstruction	
Asphalt Reconstruction	
Concrete Medium Rehab	
Concrete Light Rehab	
Asphalt Medium Rehab	4.25
Asphalt Light Rehab	

Design Alternative # 1 - Concrete Reconstruction

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Enter Name of Design Alternative

Number of Years	Year	Concrete Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Concrete Reconstruction	$309,555,187	$275,035,774	$236,158,170
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	Concrete Light Rehab	$33,166,627	$19,481,898	$9,812,808
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	Concrete Medium Rehab	$49,940,554	$23,157,171	$8,599,538
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Concrete Light Rehab	$33,166,627	$11,110,254	$2,713,323
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Concrete Light Rehab	$18,656,228	$5,081,430	$950,468
Enter Year of Last Used DA Improvement >>		2060	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$323,703,668	$256,333,372
AGENCY COST	$407,172,767	

Design Alternative # 2 - Asphalt Reconstruction

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Enter Name of Design Alternative

Number of Years	Year	Asphalt Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Reconstruction	$247,542,490	$219,938,296	$188,848,980
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	Asphalt Light Rehab	$46,509,523	$28,983,197	$15,754,385
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	Asphalt Medium Rehab	$69,764,285	$36,409,457	$15,746,718
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	Asphalt Light Rehab	$46,509,523	$18,603,211	$5,710,114
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Asphalt Reconstruction	$247,542,490	$82,922,510	$20,251,164
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$175,342,597	$47,758,376	$8,933,080
Enter Year of Last Used DA Improvement >>		2060	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$339,098,296	$237,378,280
AGENCY COST	$482,525,714	

Design Alternative # 3 - Asphalt Medium Rehab

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Enter Name of Design Alternative

Number of Years	Year	sphalt Medium Rehab Foca	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Medium Rehab	$69,764,285	$61,984,663	$53,222,839
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	Asphalt Light Rehab	$46,509,523	$36,715,047	$27,068,966
10	2032	None	$0	$0	$0
11	2033	None	$0	$0	$0
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	Asphalt Reconstruction	$247,542,490	$163,654,748	$96,001,245
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	None	$0	$0	$0
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	Asphalt Light Rehab	$46,509,523	$21,566,221	$8,008,730
28	2050	None	$0	$0	$0
29	2051	None	$0	$0	$0
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	Asphalt Medium Rehab	$69,764,285	$27,092,055	$8,004,833
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	None	$0	$0	$0
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	Asphalt Light Rehab	$46,509,523	$13,842,536	$2,902,732
43	2065	None	$0	$0	$0
44	2066	None	$0	$0	$0
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Light Rehab	$34,882,142	$9,500,911	$1,777,121
Enter Year of Last Used DA Improvement >>		2064	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$315,354,359	$193,432,225
AGENCY COST	$491,717,486	

Design Alternative # 4 - Asphalt Light Rehab

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Enter Name of Design Alternative

Number of Years	Year	Asphalt Light Rehab Focus	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2022	None	$0	$0	$0
1	2023	None	$0	$0	$0
2	2024	None	$0	$0	$0
3	2025	None	$0	$0	$0
4	2026	None	$0	$0	$0
5	2027	Asphalt Light Rehab	$46,509,523	$41,323,109	$35,481,893
6	2028	None	$0	$0	$0
7	2029	None	$0	$0	$0
8	2030	None	$0	$0	$0
9	2031	None	$0	$0	$0
10	2032	None	$0	$0	$0
11	2033	Asphalt Reconstruction	$247,542,490	$184,194,860	$125,838,049
12	2034	None	$0	$0	$0
13	2035	None	$0	$0	$0
14	2036	None	$0	$0	$0
15	2037	None	$0	$0	$0
16	2038	None	$0	$0	$0
17	2039	None	$0	$0	$0
18	2040	None	$0	$0	$0
19	2041	None	$0	$0	$0
20	2042	None	$0	$0	$0
21	2043	None	$0	$0	$0
22	2044	None	$0	$0	$0
23	2045	Asphalt Light Rehab	$46,509,523	$24,272,971	$10,497,812
24	2046	None	$0	$0	$0
25	2047	None	$0	$0	$0
26	2048	None	$0	$0	$0
27	2049	None	$0	$0	$0
28	2050	None	$0	$0	$0
29	2051	Asphalt Medium Rehab	$69,764,285	$30,492,347	$10,492,703
30	2052	None	$0	$0	$0
31	2053	None	$0	$0	$0
32	2054	None	$0	$0	$0
33	2055	None	$0	$0	$0
34	2056	None	$0	$0	$0
35	2057	None	$0	$0	$0
36	2058	None	$0	$0	$0
37	2059	None	$0	$0	$0
38	2060	Asphalt Light Rehab	$46,509,523	$15,579,897	$3,804,890
39	2061	None	$0	$0	$0
40	2062	None	$0	$0	$0
41	2063	None	$0	$0	$0
42	2064	None	$0	$0	$0
43	2065	None	$0	$0	$0
44	2066	Asphalt Reconstruction	$247,542,490	$69,446,297	$13,494,205
45	2067	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life >>		Asphalt Reconstruction	$237,228,219	$64,614,273	$12,085,932
Enter Year of Last Used DA Improvement >>		2066	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$300,695,208	$187,523,620
AGENCY COST	$467,149,614	

Summary of LCCA Results

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	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehab Focus	Asphalt Light Rehab Focus
Net Present Value - 3%	$323,703,668	$339,098,296	$315,354,359	$300,695,208
Net Present Value - 7%	$256,333,372	$237,378,280	$193,432,225	$187,523,620
Agency Cost	$407,172,767	$482,525,714	$491,717,486	$467,149,614

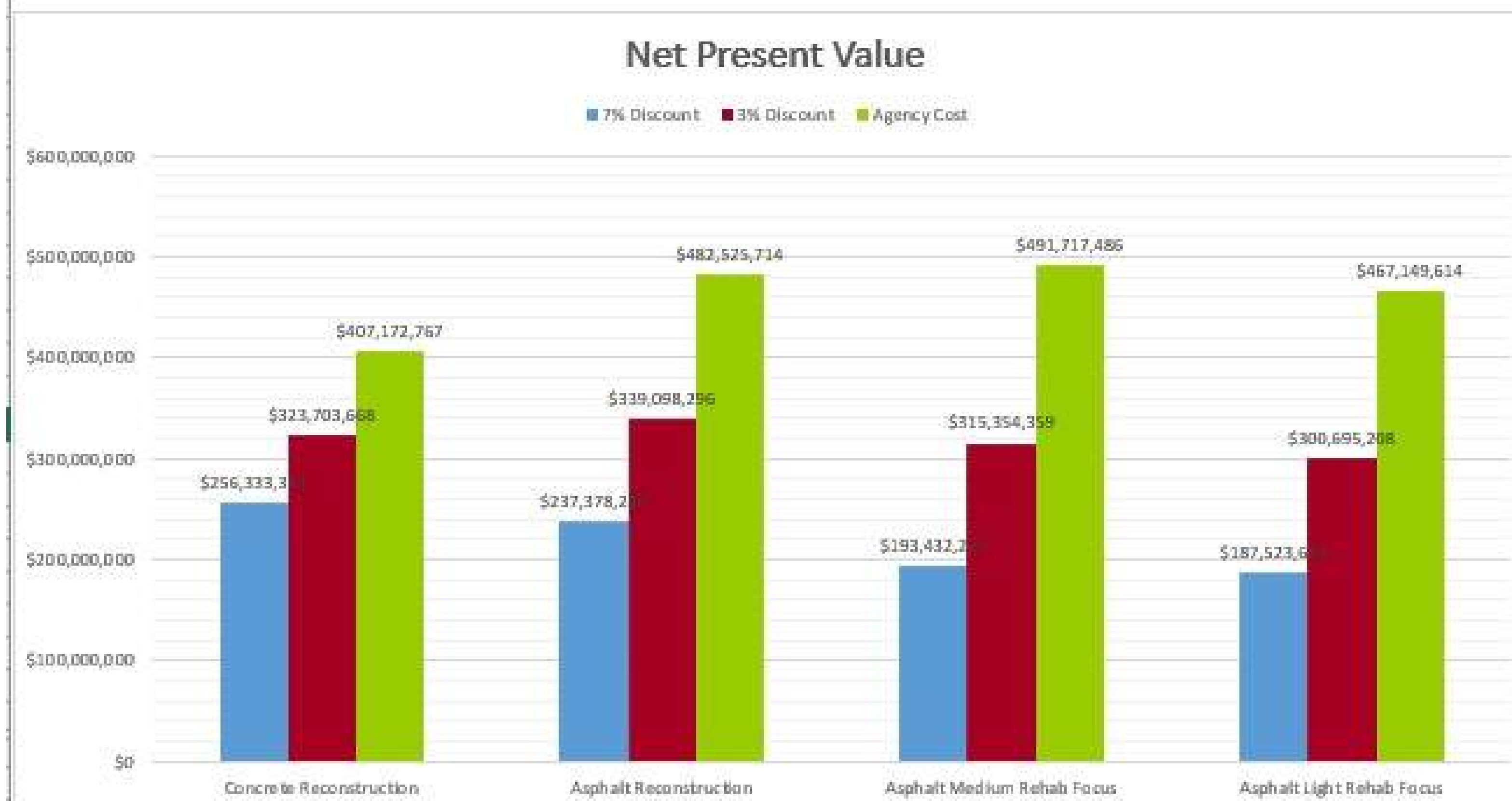
Cost Ratio at 3% Discount Rate

1.08 Ratio of Concrete Reconstruction to Lowest Cost Rehab
1.13 Ratio of Asphalt Reconstruction to Lowest Cost Rehab

Cost Ratio at 7% Discount Rate

1.37 Ratio of Concrete Reconstruction to Lowest Cost Rehab
1.27 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.



Appendix F: Crash Modification Factors and Factored Unit Construction Costs

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
REHABILITATION											
Rehabilitate Pavement (AC)	$276,500	1.74	$481,110	Mile	2.20	$610,000	$1,060,000	Mill and replace 1"-3" AC pavement; accounts for 38' width; for one direction of travel on two-lane roadway; includes pavement, striping, delineators, RPMs, rumble strips	0.70	0.68	Updated to include 2 additional values (in addition to 3 previous values) from CMF Clearinghouse and revised combination of rehabilitate pavement (0.88), striping, delineators, RPMs (0.77 for combination), and rumble strips (0.89) = 0.68
Rehabilitate Bridge	$65	1.74	$113	SF	2.20	$140	$250	Based on deck area; bridge only - no other costs included	0.95	0.95	Assumed - should have a minor effect on crashes at the bridge
GEOMETRIC IMPROVEMENT											
Re-profile Roadway	$974,500	1.74	$1,695,630	Mile	2.20	$2,140,000	$3,730,000	Includes excavation of approximately 3", pavement replacement (AC), striping, delineators, RPMs, rumble strips, for one direction of travel on two-lane roadway (38' width)	0.70	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	1.74	$5,150,400	Mile	2.20	$6,510,000	$11,330,000	All costs per direction except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.50	0.50	Based on Caltrans and NCDOT
Improve Skid Resistance	$675,000	1.74	$1,174,500	Mile	2.20	$1,490,000	$2,580,000	Average cost of pavement 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	0.65	Updated to include 6 additional values (in addition to 6 previous values) from CMF Clearinghouse (0.71) and calculated composite CMF value using that 0.71 value, the HSM value (0.87) for skid resistance; striping, delineators, RPMs (0.77 for combination), and rumble strips (0.89) = 0.65
INFRASTRUCTURE IMPROVEMENT											
Reconstruct to Urban Section	$1,000,000	1.74	$1,740,000	Mile	2.20	$2,200,000	$3,828,000	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	0.88	From HSM

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Auxiliary Lanes (AC)	$914,000	1.74	$1,590,360	Mile	2.20	$2,011,000	$3,499,000	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	0.78	Average of 4 values from clearinghouse
Construct Climbing Lane (High)	$3,000,000	1.74	$5,220,000	Mile	2.20	$6,600,000	$11,484,000	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	0.75	From HSM
Construct Climbing Lane (Medium)	$2,250,000	1.74	$3,915,000	Mile	2.20	$4,950,000	$8,613,000	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	0.75	From HSM
Construct Climbing Lane (Low)	$1,500,000	1.74	$2,610,000	Mile	2.20	$3,300,000	$5,742,000	In one direction; all costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.75	0.75	From HSM
Construct Reversible Lane (Low)	$2,400,000	1.74	$4,176,000	Lane-Mile	2.20	$5,280,000	$9,190,000	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	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a concrete barrier
Construct Reversible Lane (High)	$4,800,000	1.74	$8,352,000	Lane-Mile	2.20	$10,560,000	$18,370,000	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	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a concrete barrier
Construct Passing Lane	$1,500,000	1.74	$2,610,000	Mile	2.20	$3,300,000	$5,742,000	In one direction; all costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.63	0.63	Average of 3 values from clearinghouse
Construct Entry/Exit Ramp	$730,000	1.74	$1,270,200	Each	2.20	$1,610,000	$2,790,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, typical earthwork & drainage; does not include any major structures or improvements on crossroad	1.09	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	1.74	$1,331,100	Each	2.20	$1,680,000	$2,930,000	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	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.

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Construct Turn Lanes	$42,500	1.74	$73,950	Each	2.20	$93,500	$163,000	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	0.81	Average 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	1.74	$774,300	Each	2.20	$979,000	$1,703,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, minor earthwork, & drainage; For converting existing ramp to parallel-type configuration	0.21	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	1.74	$1,077,060	Each	2.20	$1,361,800	$2,370,000	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	0.21	Will be same as "Modify Ramp"
Replace Pavement (AC) (with overexcavation)	$1,446,500	1.74	$2,516,910	Mile	2.20	$3,180,000	$5,540,000	Accounts for 38' width; for one direction of travel on two-lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	0.70	Same as rehab
Replace Pavement (PCCP) (with overexcavation)	$1,736,500	1.74	$3,021,510	Mile	2.20	$3,820,000	$6,650,000	Accounts for 38' width; for one direction of travel on two-lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	0.70	Same as rehab
Replace Bridge (Short)	$125	1.74	$218	SF	2.20	$280	$480	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing small washes	0.95	0.95	Assumed - should have a minor effect on crashes at the bridge
Replace Bridge (Medium)	$160	1.74	$278	SF	2.20	$350	$610	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	0.95	Assumed - should have a minor effect on crashes at the bridge
Replace Bridge (Long)	$180	1.74	$313	SF	2.20	$400	$690	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing large rivers or canyons	0.95	0.95	Assumed - should have a minor effect on crashes at the bridge
Widen Bridge	$175	1.74	$305	SF	2.20	$390	$670	Based on deck area; bridge only - no other costs included	0.90	0.90	Assumed - should have a minor effect on crashes at the bridge

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Install Pedestrian Bridge	$135	1.74	$235	SF	2.20	$300	$520	Includes cost to construct bridge based on linear feet of the bridge. This cost includes and assumes ramps and sidewalks leading to the structure.	0.1 (pedestrian only)	0.1 (pedestrian only)	Assumed direct access on both sides of structure
Implement Automated Bridge De-icing	$115	1.74	$200	SF	2.20	$250	$440	Includes cost to replace bridge deck and install system	0.72 (snow/ice)	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice
Install Wildlife Crossing Under Roadway	$650,000	1.74	$1,131,000	Each	2.20	$1,430,000	$2,488,000	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)	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	1.74	$1,983,600	Each	2.20	$2,508,000	$4,364,000	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)	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	1.74	$487,200	Each	2.20	$616,000	$1,072,000	Includes 3-36" pipes and roadway reconstruction (approx. 1,000 ft) to install pipes	0.70	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Intermediate	$540,000	1.74	$939,600	Each	2.20	$1,188,000	$2,067,000	Includes 5 barrel 8'x6' RCBC and roadway reconstruction (approx. 1,000 ft) to install RCBC	0.70	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Major	$8,000	1.74	$13,920	LF	2.20	$17,600	$30,600	Includes bridge that is 40' wide and reconstruction of approx. 500' on each approach	0.70	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Install Acceleration Lane	$127,500	1.74	$221,850	Each	2.20	$280,500	$488,000	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	0.85	Average of 6 values from the FHWA Desktop Reference for Crash Reduction Factors
Install Curb and Gutter	$211,200	1.74	$367,488	Mile	2.20	$465,000	$808,000	In both directions; curb and gutter	0.89	0.89	From CMF Clearinghouse
Install Sidewalks, Curb, and Gutter	$475,200	1.74	$826,848	Mile	2.20	$1,045,000	$1,819,000	In both directions; 5' sidewalks, curb, and gutter	0.89 installing sidewalk 0.24 (pedestrian crashes only)	0.89 installing sidewalk 0.24 (pedestrian crashes only)	From CMF Clearinghouse Avg of 6 values from FHWA Desktop Reference

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Install Sidewalks	$264,000	1.74	$459,360	Mile	2.20	$581,000	$1,011,000	In both directions; 5' sidewalks	0.24 (pedestrian crashes only)	0.24 (pedestrian crashes only)	Avg of 6 values from FHWA Desktop Reference
OPERATIONAL IMPROVEMENT											
Implement Variable Speed Limits (Wireless, Overhead)	$718,900	1.25	$898,625	Mile	2.20	$1,580,000	$1,980,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Variable Speed Limits (Wireless, Ground-mount)	$169,700	1.25	$212,125	Mile	2.20	$373,300	$467,000	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Variable Speed Limits (Wireless, Solar, Overhead)	$502,300	1.25	$627,875	Mile	2.20	$1,110,000	$1,380,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors, solar power	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Variable Speed Limits (Wireless, Solar, Ground-mount)	$88,400	1.25	$110,500	Mile	2.20	$194,500	$243,000	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors, solar power	0.92	0.91 (all crashes) 0.69 (weather-related)	Originally only 1 value from CMF Clearinghouse. Updated to include 1 value for all crashes and 2 additional values for weather-related crashes
Implement Ramp Metering (Low)	$25,000	1.25	$31,250	Each	2.20	$55,000	$68,800	For each entry ramp location; urban area with existing ITS backbone infrastructure; includes signals, poles, timer, pull boxes, etc.	0.64	0.64	From 1 value from clearinghouse; CMF applied to crashes 0.25 miles after gore
Implement Ramp Metering (High)	$150,000	1.25	$187,500	Mile	2.20	$330,000	$413,000	Area without existing ITS backbone infrastructure; in addition to ramp meters, also includes conduit, fiber optic lines, and power	0.64	0.64	From 1 value from clearinghouse
Implement Signal Coordination	$140,000	1.25	$175,000	Mile	2.20	$308,000	$385,000	Includes conduit, conductors, and controllers for 4 intersections that span a total of approximately 2 miles	0.90	0.90	Assumed

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Implement Left-Turn Phasing	$7,500	1.25	$9,375	Each	2.20	$16,500	$20,600	Includes four new signal heads (two in each direction) and associated conductors for one intersection	0.88 (protected) 0.98 (permitted /protected or protected/ permitted)	0.88 (protected) 0.98 (permitted/ protected or protected/ permitted)	From HSM; CMF = 0.94 for each protected approach and 0.99 for each permitted/protected or protected/permitted approach. CMFs of different approaches should be multiplied together. CMF applied to crashes within intersection
Install Adaptive Signal Control and Signal Coordination	$363,500	1.25	$454,375	mile	2.20	$800,000	$1,000,000	Controller upgrades, advanced detection, software configuration, cameras; includes conduit, conductors, and controllers for 4 intersections that span a total of approximately 2 miles for coordination	0.81 (adaptive control)0.90 (signal coordination)	0.78 (adaptive control)0.90 (signal coordination)	Updated to include 15 additional values (in addition to 2 previous values) for adaptive control from CMF Clearinghouse
ROADSIDE DESIGN											
Install Guardrail	$130,000	1.74	$226,200	Mile	2.20	$286,000	$498,000	One side of road	0.62 (ROR)	0.62 (ROR)	0.62 is average of 2 values from clearinghouse
Install Cable Barrier	$80,000	1.74	$139,200	Mile	2.20	$176,000	$306,000	In median	0.81	0.65	Updated to include 5 additional values (in addition to 5 previous values) from CMF Clearinghouse
Widen Shoulder (AC)	$256,000	1.74	$445,440	Mile	2.20	$563,000	$980,000	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')	0.68 (1-4') 0.64 (>= 4')	0.86 is average 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	1.74	$196,620	Mile	2.20	$249,000	$433,000	One direction of travel (14' total shoulder 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	0.72	0.98 is average of 34 values on clearinghouse for shoulder 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.)

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Replace Shoulder (AC)	$364,000	1.74	$633,360	Mile	2.20	$801,000	$1,393,000	One direction of travel (14' total shoulder 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	0.72	0.98 is average of 34 values on clearinghouse for shoulder 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	1.74	$9,570	Mile	2.20	$12,000	$21,000	Both edges - one direction of travel; includes only rumble strip; no shoulder rehab or paving or striping	0.89	0.89	Average of 75 values on clearinghouse and consistent with HSM
Install Centerline Rumble Strip	$2,800	1.74	$4,872	Mile	2.20	$6,000	$11,000	Includes rumble strip only; no pavement rehab or striping	0.85	0.85	From HSM
Install Wildlife Fencing	$340,000	1.74	$591,600	Mile	2.20	$748,000	$1,302,000	Fencing only plus jump outs for 1 mile (both directions)	0.50 (wildlife)	0.50 (wildlife)	Assumed
Remove Tree/Vegetation	$200,000	1.74	$348,000	Mile	2.20	$440,000	$766,000	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)	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice
Increase Clear Zone	$59,000	1.74	$102,660	Mile	2.20	$130,000	$226,000	In one direction; includes widening the clear zone by 10' to a depth of 3'	0.71	0.71	Median of 14 values from FHWA Desktop Reference for Crash Reduction Values
Install Access Barrier Fence	$15	1.74	$26	LF	2.20	$33	$60	8' fencing along residential section of roadway	0.10 (pedestrian only)	0.10 (pedestrian only)	Equal to pedestrian overpass
Install Rock-Fall Mitigation - Wire Mesh	$1,320,000	1.74	$2,296,800	Mile	2.20	$2,904,000	$5,053,000	Includes wire mesh and rock stabilization (one direction)	0.75 (debris)	0.75 (debris)	Assumed
Install Rock-Fall Mitigation - Containment Fence & Barrier	$2,112,000	1.74	$3,674,880	Mile	2.20	$4,646,000	$8,085,000	Includes containment fencing, concrete barrier, and rock stabilization (one direction)	0.75 (debris)	0.75 (debris)	Assumed
Install Raised Concrete Barrier in Median	$650,000	1.74	$1,131,000	Mile	2.20	$1,430,000	$2,488,000	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)	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	1.74	$13,050	Each	2.20	$17,000	$29,000	Includes paving and signage (signs, posts, and foundations) - approximately 4,200 sf	0.97	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign

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Formalize Pullout (Medium)	$27,500	1.74	$47,850	Each	2.20	$61,000	$105,000	Includes paving and signage (signs, posts, and foundations) - approximately 22,500 sf	0.97	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	1.74	$140,070	Each	2.20	$177,100	$308,000	Includes paving and signage (signs, posts, and foundations) - approximately 70,000 sf	0.97	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	1.74	$261,000	Each	2.20	$330,000	$574,000	4-legged intersection; includes poles, foundations, conduit, controller, heads, luminaires, mast arms, etc.	0.95	0.95	From HSM; CMF applied to crashes within intersection only
Improve Signal Visibility	$35,000	1.74	$60,900	Each	2.20	$77,000	$134,000	4-legged intersection; signal head size upgrade, installation of new back-plates, and installation of additional signal heads on new poles.	0.85	0.85	Average of 7 values from clearinghouse; CMF applied to crashes within intersection only
Install Raised Median	$360,000	1.74	$626,400	Mile	2.20	$792,000	$1,378,000	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	0.83	Average from HSM
Install Transverse Rumble Strip/Pavement Markings	$3,000	1.74	$5,220	Each	2.20	$7,000	$11,000	Includes pedestrian markings and rumble strips only across a 30' wide travelway; no pavement rehab or other striping	0.95	0.95	Average of 17 values from clearinghouse; CMF applied to crashes within 0.5 miles after the rumble strips and markings
Construct Single-Lane Roundabout	$1,500,000	1.74	$2,610,000	Each	2.20	$3,300,000	$5,742,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.22	0.22	From HSM; CMF applied to crashes within intersection only
Construct Double-Lane Roundabout	$1,800,000	1.74	$3,132,000	Each	2.20	$3,960,000	$6,890,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.40	0.40	From HSM; CMF applied to crashes within intersection only
Install Indirect Left Turn Intersection	$1,140,000	1.74	$1,983,600	each	2.20	$2,500,000	$4,364,000	Raised concrete median improvements; intersection improvements; turn lanes	0.80	0.76	Updated to include 2 additional values (in addition to 1 previous value) from CMF Clearinghouse

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Convert Standard Diamond Interchange to Diverging Diamond Interchange	$2,272,700	1.74	$3,954,498	each	2.20	$5,000,000	$8,700,000	Convert traditional diamond interchange into diverging diamond interchange; assumes re-use of existing bridges	0.67	0.56	Updated to include 2 additional values (in addition to 1 previous value) from CMF Clearinghouse
Left-in Only Center Raised Median Improvements	$84,100	1.74	$146,334	each	2.20	$185,000	$322,000	Left-in only center raised median improvements	0.87	0.87	CMF Clearinghouse
ROADWAY DELINEATION											
Install High-Visibility Edge Line Striping	$10,800	1.25	$13,500	Mile	2.20	$23,800	$29,700	2 edge lines and lane line - one direction of travel	0.77	0.77	Average 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	1.25	$8,125	Mile	2.20	$14,300	$17,900	Both edges - one direction of travel			Average 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	1.25	$2,500	Mile	2.20	$4,400	$5,500	Both edges - one direction of travel			Average 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	1.25	$7,500	Each	2.20	$13,200	$16,500	Installation of a series of three in-lane route markings in one lane	0.95	0.95	Assumed; CMF applied to crashes within 1.0 mile before the gore
IMPROVED VISIBILITY											
Cut Side Slopes	$80	1.74	$139	LF	2.20	$200	$300	For small grading to correct sight distance issues; not major grading	0.85	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	1.74	$469,800	Mile	2.20	$594,000	$1,034,000	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)	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM

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Install Lighting (solar powered LED)	$10,000	1.74	$17,400	Pole	2.20	$22,000	$38,300	Offset lighting, not high-mast; solar power LED; includes poles, luminaire, solar panel	0.75 (night)	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM
DRIVER INFORMATION/WARNING											
Install Dynamic Message Sign (DMS)	$250,000	1.25	$312,500	Each	2.20	$550,000	$688,000	Includes sign, overhead structure, and foundations; wireless communication; does not include power supply	1.00	1.00	Not expected to reduce crashes
Install Dynamic Weather Warning Beacons	$40,000	1.25	$50,000	Each	2.20	$88,000	$110,000	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)	0.80 (weather-related)	Average of 3 values from FHWA Desktop Reference for Crash Reduction Factors; CMF applies to crashes within 0.25 miles after a sign
Install Dynamic Speed Feedback Signs	$25,000	1.25	$31,250	Each	2.20	$55,000	$68,800	Assumes solar operation and no communication; ground mounted; includes regulatory sign, posts, foundations, solar panel, and dynamic sign	0.94	0.94	Average of 2 clearinghouse values; CMF applies to crashes within 0.50 miles after a sign
Install Chevrons	$18,400	1.25	$23,000	Mile	2.20	$40,500	$50,600	On one side of road - includes signs, posts, and foundations	0.79	0.79	Average of 11 clearinghouse values
Install Curve Warning Signs	$2,500	1.25	$3,125	Each	2.20	$5,500	$6,900	Includes 2 signs, posts, and foundations	0.83	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	1.25	$3,125	Each	2.20	$5,500	$6,900	Includes 2 signs, posts, and foundations	0.85	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	1.25	$3,125	Each	2.20	$5,500	$6,900	Includes 2 signs, posts, and foundations	0.97	0.97	Assumed; CMF applies to crashes within 0.25 miles after a sign

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Wildlife Warning System	$162,000	1.25	$202,500	Each	2.20	$356,400	$446,000	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)	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	1.25	$18,750	Each	2.20	$33,000	$41,300	In both directions; includes warning sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.75	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 Rectangular Rapid Flashing Beacons (RRFB)	$15,000	1.25	$18,750	Each	2.20	$33,000	$41,300	In both directions; includes warning sign, post, and foundation, and flashing beacons (assumes solar power) at one location	n/a	0.53 (pedestrian)	CMF Clearinghouse Countermeasures Tech Sheet
Install Larger Stop Sign with Beacons	$10,000	1.25	$12,500	Each	2.20	$22,000	$27,500	In one direction; includes large stop sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.85/0.81	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
Install Advanced Warning Signal System	$108,000	1.25	$135,000	each	2.20	$238,000	$297,000	Overhead static sign with flashing beacons, detectors, and radar system. Signs for each mainline approach of the intersection (2)	0.61	0.61	FHWA Desktop Reference for CRF
DATA COLLECTION											
Install Roadside Weather Information System (RWIS)	$60,000	1.25	$75,000	Each	2.20	$132,000	$165,000	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	1.00	Not expected to reduce crashes
Install Closed Circuit Television (CCTV) Camera	$25,000	1.25	$31,250	Each	2.20	$55,000	$68,800	Assumes connection to existing ITS backbone or wireless communication; does not include fiber-optic backbone infrastructure; includes pole, camera, etc.	1.00	1.00	Not expected to reduce crashes
Install Vehicle Detection Stations	$15,000	1.25	$18,750	Each	2.20	$33,000	$41,300	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	1.00	Not expected to reduce crashes

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Flood Sensors (Activation)	$15,000	1.25	$18,750	Each	2.20	$33,000	$41,300	Sensors with activation cabinet to alert through texting (agency)	1.00	1.00	Not expected to reduce crashes
Install Flood Sensors (Gates)	$100,000	1.25	$125,000	Each	2.20	$220,000	$275,000	Sensors with activation cabinet to alert through texting (agency) and beacons (public) plus gates	1.00	1.00	Not expected to reduce crashes
WIDEN CORRIDOR											
Construct New General Purpose Lane (PCCP)	$1,740,000	1.74	$3,027,600	Mile	2.20	$3,830,000	$6,660,000	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	0.90	North Carolina DOT uses 0.90 and Florida DOT uses 0.87
Construct New General Purpose Lane (AC)	$1,200,000	1.74	$2,088,000	Mile	2.20	$2,640,000	$4,590,000	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	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	1.74	$2,742,240	Mile	2.20	$3,467,200	$6,030,000	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	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	1.74	$1,832,220	Mile	2.20	$2,316,600	$4,030,000	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	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	1.74	$5,220,000	Mile	2.20	$6,600,000	$11,484,000	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	0.67	Assumed
Construct 4-Lane Divided Highway (No Use of Existing Roads)	$6,000,000	1.74	$10,440,000	Mile	2.20	$13,200,000	$22,968,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.67	0.67	Assumed

SOLUTION	2016 CONST UNIT COST	INFLATION FACTOR 2016-2022	2022 CONST UNIT COST	UNIT	FACTOR^	2016 FACTORED CONST UNIT COST	2022 FACTORED CONST UNIT COST	DESCRIPTION	2016 CMF FOR CORRIDOR PROFILE STUDIES	2022 CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Bridge over At-Grade Railroad Crossing	$10,000,000	1.74	$17,400,000	Each	2.20	$22,000,000	$38,280,000	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)	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	1.74	$26,100,000	Each	2.20	$33,000,000	$57,420,000	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)	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	1.74	$1,566,000	Mile	2.20	$1,980,000	$3,445,000	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	0.95	Similar to general purpose lane
ALTERNATE ROUTE											
Construct Frontage Roads	$2,400,000	1.74	$4,176,000	Mile	2.20	$5,280,000	$9,190,000	For 2-lane AC frontage road; includes all costs except bridges; for generally at-grade facility with minimal walls	0.90	0.90	Assumed - similar to new general purpose lane
Construct 2-Lane Undivided Highway	$3,000,000	1.74	$5,220,000	Mile	2.20	$6,600,000	$11,484,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.90	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
- 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

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 Travel Time Reliability
- 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

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

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)	Grade (%)	Interrupted Flow (Y/N)	Outside/ Right Shoulder Width (ft)	1-lane each direction	Segment	Bridge	Pavement	Mobility	Safety	Freight
CS40.03	37,769	4		6,950				13,597	n	3	n	10.04	n	1	n	n	y	y	y
CS40.04	37,769	6		6,950				13,597	n	3	n	10.04	n	1	n	n	y	y	y
CS40.05-A	37,769	2		6,820				13,597	n	3	n	10.04	n	1	n	n	y	y	y
CS40.05-B	22,377	5		6,790				10,741	y	3.6	n	10	n	2	n	n	y	y	y
CS40.06	22,377	5		6,500				10,741	y	2.9	n	10	n	2	n	n	y	y	y
CS40.09	20,278	6		6,190				9,125	y	2.1	n	9.97	n	3	n	n	y	y	y
CS40.10	20,278	2		5,980				9,125	y	2.1	n	9.97	n	3	n	n	y	y	y
CS40.11	20,278	9		5,860				9,125	y	2.4	n	9.97	n	3	n	n	y	y	y
CS40.12	20,278	1		5,520				9,125	y	2.4	n	9.97	n	3	n	n	y	y	y
CS40.13	20,278.21	4		5,430				9,125	y	2.4	n	9.97	n	3	n	n	y	y	y
CS40.14	20,075.46	2		5,030				9,235	y	1.6	n	9.87	n	4	n	n	y	y	y
CS40.15	19,906.55	12		4,880				7,564	y	1.3	n	9.97	n	5	n	y	y	y	y
CS40.16	19,906.55	12		4,880				7,564	y	1.3	n	9.97	n	5	n	n	y	y	y
CS40.17	20,757.13	8		4,980				8,510	y	1.3	n	10	n	6	n	n	y	y	y
CS40.18	23,040	4		5,270				8,064	n	2.7	n	10	n	8	n	y	y	y	y
CS40.19	18,627	16		5,760				7,637	n	4.1	n	9.68	n	11	n	n	y	y	y
CS40.20	22,222	18		5,990				8,444	n	2.9	n	9.43	n	12	n	y	y	y	y

Solution Number	Bridge	Pavement	Mobility	Safety	Freight	Risk Score (0 to 10)				
						Bridge	Pavement	Mobility	Safety	Freight
CS40.03	n	n	y	y	y	0.00	0.00	2.92	2.72	3.22
CS40.04	n	n	y	y	y	0.00	0.00	3.19	2.72	3.22
CS40.05-A	n	n	y	y	y	0.00	0.00	2.17	2.66	3.22
CS40.05-B	n	n	y	y	y	0.00	0.00	5.96	2.63	6.44
CS40.06	n	n	y	y	y	0.00	0.00	5.96	2.16	6.44
CS40.09	n	n	y	y	y	0.00	0.00	6.05	1.97	6.33
CS40.10	n	n	y	y	y	0.00	0.00	4.77	1.89	6.33
CS40.11	n	n	y	y	y	0.00	0.00	6.40	1.84	6.33
CS40.12	n	n	y	y	y	0.00	0.00	4.15	1.71	6.33
CS40.13	n	n	y	y	y	0.00	0.00	5.59	1.67	6.33
CS40.14	n	n	y	y	y	0.00	0.00	4.76	1.54	6.34
CS40.15	n	y	y	y	y	0.00	5.21	6.55	1.44	6.17
CS40.16	n	n	y	y	y	0.00	0.00	6.55	1.44	6.17
CS40.17	n	n	y	y	y	0.00	0.00	6.33	1.50	6.27
CS40.18	n	y	y	y	y	0.00	5.71	2.41	1.69	2.89
CS40.19	n	n	y	y	y	0.00	0.00	3.28	2.52	2.84
CS40.20	n	y	y	y	y	0.00	6.18	3.32	2.18	2.93

Appendix H: Candidate Solution Cost Estimates

Candidate Solution #	Candidate Solution Name	Solution	BMP	EMP	Quantity	Unit	Factored Construction Unit Cost	Construction Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Total Cost
40.03	Flagstaff Safety Improvements	Install Roadside Weather Information System (RWIS)	196.0	202.0		each	$ 165,000.00	$ 165,000	$ 5,000	$ 17,000	$ -	$ 187,000
		Implement variable speed limits (wireless, ground mount)	196.0	200.0	8	mile	$ 467,000	$ 3,736,000	$ 112,000	$ 374,000	$ -	$ 4,222,000
		Rehabilitate shoulder	196.0	200.0	8	mile	$ 433,000	$ 3,464,000	$ 104,000	$ 346,000	$ -	$ 3,914,000
		Widen inside shoulder	196.0	200.0	8	mile	$ 980,000	$ 7,840,000	$ 235,000	$ 784,000	$ -	$ 8,859,000
		Install in-lane route pavement markings WB I-40 at I-17/I-40	196.0	200.0		each	$ 16,500	$ 33,000	$ 1,000	$ 3,000	$ -	$ 37,000
		Install rock fall mitigation	198.5	199.0	1	mile	$ 5,053,000	$ 5,053,000	$ 152,000	$ 505,000	$ -	$ 5,710,000
		TOTAL						**$ 20,291,000**	**$ 609,000**	**$ 2,029,000**		**$ 22,929,000**
40.04	Flagstaff Lighting	Install lighting	196.0	202.0	12	mile	$ 594,000	**$ 7,128,000**	**$ 214,000**	**$ 713,000**	$ -	**$ 8,055,000**
40.05	East Flagstaff Safety Improvements	Implement variable speed limits (wireless, ground mount)	200	207	14	mile	$ 467,000	$ 6,538,000	$ 196,000	$ 654,000	$ -	$ 7,388,000
		Rehabilitate shoulder	200	207	14	mile	$ 433,000	$ 6,062,000	$ 182,000	$ 606,000	$ -	$ 6,850,000
		Widen inside shoulder	200	207	14	mile	$ 980,000	$ 13,720,000	$ 412,000	$ 1,372,000	$ -	$ 15,504,000
		Install chevrons	200.0	202.0	4	mile	$ 50,600	$ 202,400	$ 6,000	$ 20,000	$ -	$ 228,400
		Install curve warning signs	200.0	202.0		each	$ 6,900	$ 6,900	$ -	$ 1,000	$ -	$ 7,900
		Improve skid resistance (reconstruct pavement, increase superelevation, or mill and replace)	200.0	202.0	4	mile	$ 2,580,000	$ 10,320,000	$ 310,000	$ 1,032,000	$ -	$ 11,662,000
		TOTAL						**$ 36,849,300**	**$ 1,106,000**	**$ 3,685,000**	**$ -**	**$ 41,640,300**
40.06	Winona Safety Improvements	Improve skid resistance (reconstruct pavement, increase superelevation, or mill and replace)	207.0	208.0	2	mile	$ 2,580,000	$ 5,160,000	$ 155,000	$ 516,000	$ -	$ 5,831,000
		Improve skid resistance (reconstruct pavement, increase superelevation, or mill and replace)	210.0	212.0	4	mile	$ 2,580,000	$ 10,320,000	$ 310,000	$ 1,032,000	$ -	$ 11,662,000
		Rehabilitate shoulder	207.0	212.0	10	mile	$ 433,000	$ 4,330,000	$ 130,000	$ 433,000	$ -	$ 4,893,000
		Widen inside shoulder	207.0	212.0	10	mile	$ 980,000	$ 9,800,000	$ 294,000	$ 980,000	$ -	$ 11,074,000
		Install high visibility striping	207.0	212.0	10	mile	$ 29,700	$ 297,000	$ 9,000	$ 30,000		$ 336,000
		Install high-visibility delineators	207.0	212.0	10	mile	$ 17,900	$ 179,000	$ 5,000	$ 18,000		$ 202,000

Candidate Solution #	Candidate Solution Name	Solution	BMP	EMP	Quantity	Unit	Factored Construction Unit Cost	Construction Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Total Cost
40.06 (continued)		Install rumble strips	207.0	212.0	10	mile	$ 21,000	$ 210,000	$ 6,000	$ 21,000		$ 237,000
		Implement variable speed limits (wireless, ground mount)	207.0	212.0	10	mile	$ 467,000	$ 4,670,000	$ 140,000	$ 467,000		$ 5,277,000
		Install chevrons	207.0	208.0	2	mile	$ 50,600	$ 101,200	$ 3,000	$ 10,000	$ -	$ 114,200
		Install curve warning signs	207.0	208.0		each	$ 6,900	$ 6,900	$ -	$ 1,000	$ -	$ 7,900
		Install chevrons	210.0	212.0	4	mile	$ 50,600	$ 202,400	$ 6,000	$ 20,000	$ -	$ 228,400
		Install curve warning signs	210.0	212.0		each	$ 6,900	$ 6,900	$ -	$ 1,000	$ -	$ 7,900
		Install new EB DMS with CCTV	212.1	212.1		each	$ 688,000	$ 688,000	$ 21,000	$ 69,000		$ 778,000
		Install Roadside Weather Information System (RWIS)	212.0	212.0	-	each	$ 165,000	$ 165,000	$ 5,000	$ 17,000		$ 187,000
		TOTAL						**$ 36,136,400**	**$ 1,084,000**	**$ 3,615,000**	**$ -**	**$ 40,835,400**
40.09	East Winona Safety Improvements	Rehabilitate shoulder	212	218	12	mile	$ 433,000	$ 5,196,000	$ 156,000	$ 520,000	$ -	$ 5,872,000
		Widen inside shoulder	212	218	6	mile	$ 980,000	$ 5,880,000	$ 176,000	$ 588,000	$ -	$ 6,644,000
		Improve skid resistance (reconstruct pavement, increase superelevation, or mill and replace)	212	218	12	mile	$ 2,580,000	$ 30,960,000	$ 929,000	$ 3,096,000	$ -	$ 34,985,000
		Install high visibility striping	212	218	12	mile	$ 29,700	$ 356,400	$ 11,000	$ 36,000	$ -	$ 403,400
		Install high visibility delineators	212	218	12	mile	$ 17,900	$ 214,800	$ 6,000	$ 21,000	$ -	$ 241,800
		Implement variable speed limits (wireless, ground mount)	212	218	12	mile	$ 467,000	$ 5,604,000	$ 168,000	$ 560,000	$ -	$ 6,332,000
		TOTAL						**$ 48,211,200**	**$ 1,446,000**	**$ 4,821,000**		**$ 54,478,200**
40.1	Canyon Diablo West Safety Improvements	Improve skid resistance (reconstruct pavement, increase superelevation, or mill and replace)	218.0	220.0	4	mile	$ 2,580,000	$ 10,320,000	$ 310,000	$ 1,032,000	$ -	$ 11,662,000
		Install chevrons	218.0	220.0	4	mile	$ 50,600	$ 202,400	$ 6,000	$ 20,000		$ 228,400
		Install curve warning signs	218.0	220.0		each	$ 6,900	$ 6,900	$ -	$ 1,000	$ -	$ 7,900
		Install dynamic speed feedback system (EB)	218.0	218.0		each	$ 68,800	$ 68,800	$ 2,000	$ 7,000		$ 77,800

Candidate Solution #	Candidate Solution Name	Solution	BMP	EMP	Quantity	Unit	Factored Construction Unit Cost	Construction Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Total Cost
40.1 (continued		Install dynamic speed feedback system (WB)	220.0	220.0		each	$ 68,800	$ 68,800	$ 2,000	$ 7,000		$ 77,800
		Install high visibility striping	218	220	4	mile	$ 29,700	$ 118,800	$ 4,000	$ 12,000	$ -	$ 134,800
		Install high visibility delineators	218	220	4	mile	$ 17,900	$ 71,600	$ 2,000	$ 7,000	$ -	$ 80,600
		TOTAL						**$ 10,857,300**	**$ 326,000**	**$ 1,086,000**		**$ 12,269,300**
40.11	Canyon Diablo Safety Improvement	Rehabilitate shoulder	220.0	229.0	18	mile	$ 433,000	$ 7,794,000	$ 234,000	$ 779,000	$ -	$ 8,807,000
		Widen inside shoulder	220.0	229.0	18	mile	$ 980,000	$ 17,640,000	$ 529,000	$ 1,764,000	$ -	$ 19,933,000
		TOTAL						**$ 7,794,000**	**$ 234,000**	**$ 779,000**		**$ 8,807,000**
40.12	Canyon Diablo East Safety Improvements	Install dynamic speed feedback system (WB)	230.0	230.0		each	$ 68,800	$ 68,800	$ 2,000	$ 7,000	$ -	$ 77,800
		Install dynamic speed feedback system (EB)	229.0	229.0		each	$ 68,800	$ 68,800	$ 2,000	$ 7,000	$ -	$ 77,800
		Install high visibility striping	229	230	2	mile	$ 29,700	$ 59,400	$ 2,000	$ 6,000	$ -	$ 67,400
		Install high visibility delineators	229	230	2	mile	$ 17,900	$ 35,800	$ 1,000	$ 4,000	$ -	$ 40,800
		Rehabilitate shoulder	229.0	230.0	2	mile	$ 433,000	$ 866,000	$ 26,000	$ 87,000	$ -	$ 979,000
		Widen inside shoulder	229.0	230.0	2	mile	$ 980,000	$ 1,960,000	$ 59,000	$ 196,000	$ -	$ 2,215,000
		TOTAL						**$ 3,058,800**	**$ 92,000**	**$ 307,000**		**$ 3,457,800**
40.13	Two Guns Safety Improvements	Rehabilitate shoulder	230.0	234.0	8	mile	$ 433,000	$ 3,464,000	$ 104,000	$ 346,000	$ -	$ 3,914,000
		Widen inside shoulder	230.0	234.0	8	mile	$ 980,000	$ 7,840,000	$ 235,000	$ 784,000	$ -	$ 8,859,000
		Install high visibility striping	230	234	8	mile	$ 29,700	$ 237,600	$ 7,000	$ 24,000	$ -	$ 268,600
		Install high-visibility delineators	230	234	8	mile	$ 17,900	$ 143,200	$ 4,000	$ 14,000	$ -	$ 161,200
		Install rumble strips	230	234	8	mile	$ 21,000	$ 168,000	$ 5,000	$ 17,000	$ -	$ 190,000
		TOTAL						**$ 3,464,000**	**$ 104,000**	**$ 346,000**		**$ 3,914,000**

Candidate Solution #	Candidate Solution Name	Solution	BMP	EMP	Quantity	Unit	Factored Construction Unit Cost	Construction Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Total Cost
40.14	Red Gap Ranch Safety Improvements	Rehabilitate shoulder	240.0	242.0	4	mile	$ 433,000	$ 1,732,000	$ 52,000	$ 173,000	$ -	$ 1,957,000
		Widen inside shoulder	240.0	242.0	4	mile	$ 980,000	$ 3,920,000	$ 118,000	$ 392,000	$ -	$ 4,430,000
		Install high visibility striping	240.0	242.0	4	mile	$ 29,700	$ 118,800	$ 4,000	$ 12,000	$ -	$ 134,800
		Install high-visibility delineators	240.0	242.0	4	mile	$ 17,900	$ 71,600	$ 2,000	$ 7,000	$ -	$ 80,600
		Install rumble strips	240.0	242.0	4	mile	$ 21,000	$ 84,000	$ 3,000	$ 8,000	$ -	$ 95,000
		Install dynamic speed feedback system				each	$ 68,800	$ 68,800	$ 2,000	$ 7,000	$ -	$ 77,800
		TOTAL						**$ 5,995,200**	**$ 181,000**	**$ 599,000**		**$ 6,775,200**
40.15	West Winslow Pavement Improvements	Rehabilitate/repair pavement	246	258	24	mile	$ 1,060,000	$ 25,440,000	$ 763,000	$ 2,544,000	$ -	$ 28,747,000
		Solution A TOTAL						**$ 25,440,000**	**$ 763,000**	**$ 2,544,000**		**$ 28,747,000**
		Replace pavement	246	258	24	mile	$ 5,540,000	$ 132,960,000	$ 3,989,000	$ 13,296,000	$ -	$ 150,245,000
		Solution B TOTAL						**$ 132,960,000**	**$ 3,989,000**	**$ 13,296,000**		**$ 150,245,000**
40.16	West Winslow Safety Improvements	Widen inside shoulder	246	258	24	mile	$ 980,000	$ 23,520,000	$ 706,000	$ 2,352,000	$ -	$ 26,578,000
		Improve skid resistance (reconstruct pavement, increase superelevation, or mill and replace)	248	251	6	mile	$ 2,580,000	$ 15,480,000	$ 464,000	$ 1,548,000	$ -	$ 17,492,000
		TOTAL						**$ 330,360,000**	**$ 9,911,000**	**$ 33,036,000**		**$ 373,307,000**
40.17	East Winslow Safety Improvements	Improve skid resistance (reconstruct pavement, increase superelevation, or mill and replace)	258.0	260.0	4	mile	$ 2,580,000	$ 10,320,000	$ 310,000	$ 1,032,000	$ -	$ 11,662,000
		Install dynamic speed feedback system (WB)	260.0	260.0		each	$ 68,800	$ 68,800	$ 2,000	$ 7,000	$ -	$ 77,800
		Install dynamic speed feedback system (EB)	258.0	258.0		each	$ 68,800	$ 68,800	$ 2,000	$ 7,000	$ -	$ 77,800
		TOTAL						**$ 10,457,600**	**$ 314,000**	**$ 1,046,000**	**$ -**	**$ 11,817,600**
40.18	Holbrook Pavement Improvements	Rehabilitate/repair pavement	286.0	290.0	8	mile	$ 1,060,000	$ 8,480,000	$ 254,000	$ 848,000	$ -	$ 9,582,000
		Solution A TOTAL						**$ 8,480,000**	**$ 254,000**	**$ 848,000**		**$ 9,582,000**
		Replace pavement	286.0	290.0	8	mile	$ 5,540,000	$ 44,320,000	$ 1,330,000	$ 4,432,000	$ -	$ 50,082,000
		Solution B TOTAL						**$ 44,320,000**	**$ 1,330,000**	**$ 4,432,000**		**$ 50,082,000**

Candidate Solution #	Candidate Solution Name	Solution	BMP	EMP	Quantity	Unit	Factored Construction Unit Cost	Construction Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Total Cost
40.19	Chambers Safety Improvements	Rehabilitate shoulder	326.0	342.0	32	mile	$ 249,000	$ 7,968,000	$ 239,000	$ 797,000	$ -	$ 9,004,000
		Widen inside shoulder	326.0	342.0	32	mile	$ 563,000	$ 18,016,000	$ 540,000	$ 1,802,000	$ -	$ 20,358,000
		Install high visibility striping	326.0	342.0	32	mile	$ 29,700	$ 950,400	$ 29,000	$ 95,000	$ -	$ 1,074,400
		Install high-visibility delineators	326.0	342.0	32	mile	$ 17,900	$ 572,800	$ 17,000	$ 57,000	$ -	$ 646,800
		Install rumble strips	326.0	342.0	32	mile	$ 21,000	$ 672,000	$ 20,000	$ 67,000	$ -	$ 759,000
		TOTAL						**$ 28,179,200**	**$ 845,000**	**$ 2,818,000**		**$ 31,842,200**
40.2	Houck Pavement Improvements	Rehabilitate/repair pavement	342.0	360.0	36	mile	$ 1,060,000	$ 38,160,000	$ 1,145,000	$ 3,816,000	$ -	$ 43,121,000
		Solution A TOTAL							**$ 1,145,000**	**$ 3,816,000**		**$ 43,121,000**
		Replace pavement	342.0	360.0	36	mile	$ 5,540,000	$ 199,440,000	$ 5,983,000	$ 19,944,000	$ -	$ 225,367,000
		Solution B TOTAL							**$ 5,983,000**	**$ 19,944,000**		**$ 225,367,000**

Appendix I: Performance Effectiveness Scores

Need Reduction

		Solution #	40.03	40.04	40.05-A	40.05-B	40.06	40.09	40.10	40.11	40.12
		Description	Flagstaff Safety Improvements	Flagstaff Lighting	East Flagstaff Safety Improvements	East Flagstaff Safety Improvements	Winona Safety Improvements	East Winona Safety Improvements	Canyon Diablo West Safety Improvements	Canyon Diablo Safety Improvements	Canyon Diablo East Safety Improvements
	LEGEND	Project Beg MP	196	196	200	202	207	212	218	220	229
		Project End MP	200	202	202	207	212	218	220	229	230
		Project Length (miles)	4	6	2	5	5	6	2	9	1
		Segment Beg MP	196	196	196	202	202	212	212	212	212
		Segment End MP	202	202	202	212	212	234	234	234	234
		Segment Length (miles)	6	6	6	10	10	22	22	22	22
		Segment #	1	1	1	2	2	3	3	3	3
		Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4
		Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
		Additional Lanes (one-way)	0	0	0	0	0	0	0	0	0
		Pre-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
		Description									
SAFETY	DIRECTIONAL SAFETY	Orig Segment Directional Safety In	2.290	2.290	2.290	1.110	1.110	1.640	1.640	1.640	1.640
		Orig Segment Directional Fatal Cra	4	4	4	2	2	6	6	6	6
		Orig Segment Directional Suspecte	1	1	1	2	2	11	11	11	11
		Original Fatal Crashes in project lim	4	4	2	1	1	0	4	1	0
		Original Suspected Serious Crashe	1	1	0	3	2	1	2	2	2
		CMF 1 (NB/EB)(lowest CMF)		0.75	0.65	0.68		0.65	0.65	0.68	0.68
		CMF 2 (NB/EB)		1	0.68	0.72		0.68	0.77	0.72	0.72
		CMF 3 (NB/EB)	Total CMF Calculation in Separate Workbook	1	0.72	0.91	Total CMF Calculation in Separate Workbook	0.72	0.79	1	0.77
		CMF 4 (NB/EB)		1	0.79	1		0.77	0.83	1	0.94
		CMF 5 (NB/EB)		1	0.83	1		0.91	0.94	1	1
		Total CMF (NB/EB)	1.000	0.750	0.500	0.558	1.000	0.500	0.500	0.585	0.502
		Fatal Crash reduction (NB/EB)	1.330	1.000	1.000	0.442	0.500	0.000	2.000	0.415	0.000
		Suspected Serious Crash reduction	0.891	0.250	0.000	1.325	1.000	0.500	1.000	0.830	0.996
		Post-Project Segment Directional	2.670	3.000	3.000	1.558	1.500	6.000	4.000	5.585	6.000
		Post-Project Segment Directional	0.109	0.750	1.000	0.675	1.000	10.500	10.000	10.170	10.004
		Post-Project Segment Directional	1.510	1.720	1.730	0.840	0.820	1.640	1.140	1.530	1.630
		Post-Project Segment Directional	1.510	1.720	1.730	0.840	0.820	1.640	1.140	1.530	1.630
		Orig Segment Directional Safety In	1.170	1.170	1.170	1.060	1.060	1.320	1.320	1.320	1.320
		Orig Segment Directional Fatal Cra	2	2	2	2	2	5	5	5	5
		Orig Segment Directional Suspecte	1	1	1	0	0	5	5	5	5
		Original Fatal Crashes in project lim	1	1	0	2	1	4	0	2	0
		Original Suspected Serious Crashe	1	1	0	0	0	1	1	1	1
		CMF 1 (SB/WB)(lowest CMF)		0.75	0.65	0.68		0.65	0.65	0.68	0.68
		CMF 2 (SB/WB)		1	0.68	0.72		0.68	0.77	0.72	0.72
		CMF 3 (SB/WB)	Total CMF Calculation in Separate Workbook	1	0.72	0.91	Total CMF Calculation in Separate Workbook	0.72	0.79	1	0.77
		CMF 4 (SB/WB)		1	0.79	1		0.77	0.83	1	0.94
		CMF 5 (SB/WB)		1	0.83	1		0.91	0.94	1	1
		Total CMF (SB/WB)	1.000	0.750	0.500	0.558	1.000	0.500	0.500	0.585	0.502
		Fatal Crash reduction (SB/WB)	0.439	0.250	0.000	0.883	0.500	2.000	0.000	0.830	0.000
		Suspected Serious Crash reduction	0.439	0.250	0.000	0.000	0.000	0.500	0.500	0.415	0.498
		Post-Project Segment Directional	1.561	1.750	2.000	1.117	1.500	3.000	5.000	4.170	5.000
		Post-Project Segment Directional	0.561	0.750	1.000	0.000	0.000	4.500	4.500	4.585	4.502
		Post-Project Segment Directional	0.910	1.020	1.170	0.590	0.790	0.810	1.310	1.110	1.310
		Post-Project Segment Directional	0.910	1.020	1.170	0.590	0.790	0.810	1.310	1.110	1.310
	SAFETY INDEX	Current Safety Index	1.730	1.730	1.730	1.085	1.085	1.480	1.480	1.480	1.480
		Post-Project Safety Index	1.210	1.370	1.450	0.715	0.805	1.225	1.225	1.320	1.470
	Needs	Original Segment Safety Need	4.769	4.769	4.769	1.929	1.929	4.730	4.730	4.730	4.730
		Post-Project Segment Safety Need	2.655	3.234	3.525	0.452	0.508	3.515	3.539	4.003	4.682

		Solution #	40.13	40.14	40.15	40.16	40.17	40.18	40.19	40.20	40.21
		Description	Two Guns Safety Improvements	Red Gap Ranch Safety Improvements	West Winslow Pavement Improvements	West Winslow Safety Improvements	East Winslow Safety Improvements	Holbrook Pavement Improvements	Chambers Safety Improvements	Houck Pavement Improvements	Window Rock TI OP WB Bridge
	LEGEND	Project Beg MP	230	240	246	246	258	286	326	342	358
		Project End MP	234	242	258	258	266	290	342	360	358
		Project Length (miles)	4	2	12	12	2	4	16	18	0
		Segment Beg MP	212	234	246	246	258	286	326	342	342
		Segment End MP	234	246	258	258	270	290	342	360	360
		Segment Length (miles)	22	12	12	12	12	4	16	18	18
		Segment #	3	4	5	5	6	8	11	12	12
		Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4
		Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
		Additional Lanes (one-way)	0	0	0	0	0	0	0	0	0
		Pre-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
		Description									
SAFETY	DIRECTIONAL SAFETY	Orig Segment Directional Safety In	1.640	0.110	1.270	1.270	1.460	2.740	1.570	0.390	0.390
		Orig Segment Directional Fatal Cra	6	0	3	3	3	2	4	1	1
		Orig Segment Directional Suspecte	11	4	7	7	11	1	7	5	5
		Original Fatal Crashes in project lim	0	0	3	3	3	2	0	1	0
		Original Suspected Serious Crashe	3	1	7	7	2	1	2	5	1
		CMF 1 (NB/EB)(lowest CMF)	0.68	0.68	0.68			0.68	0.68	0.68	0.95
		CMF 2 (NB/EB)	0.72	0.72	0.7			0.7	0.72	0.7	0.95
		CMF 3 (NB/EB)	0.77	0.77	1	Total CMF Calculated in Separate Workbook	Total CMF Calculated in Separate Workbook	1	0.77	1	1
		CMF 4 (NB/EB)	0.89	0.89	1			1	0.89	1	1
		CMF 5 (NB/EB)	1	0.94	1			1	1	1	1
		Total CMF (NB/EB)	0.500	0.500	0.578	1.000	1.000	0.578	0.500	0.578	0.926
		Fatal Crash reduction (NB/EB)	0.000	0.000	1.266	0.960	0.000	0.844	0.000	0.422	0.000
		Suspected Serious Crash reduction	1.500	0.500	2.954	2.374	0.000	0.422	1.000	2.110	0.074
		Post-Project Segment Directional	6.000	0.000	1.734	2.040	3.000	1.156	4.000	0.578	1.000
		Post-Project Segment Directional	9.500	3.500	4.046	4.626	11.000	0.578	6.000	2.890	4.926
		Post-Project Segment Directional	1.620	0.090	0.830	0.970	1.460	1.580	1.550	0.230	0.260
		Post-Project Segment Directional	1.620	0.090	0.830	0.970	1.460	1.580	1.550	0.230	0.260
		Orig Segment Directional Safety In	1.320	0.180	0.950	0.950	1.120	1.330	1.260	1.270	1.270
		Orig Segment Directional Fatal Cra	5	0	2	2	2	1	3	4	4
		Orig Segment Directional Suspecte	5	7	4	4	7	0	10	3	3
		Original Fatal Crashes in project lim	0	0	2	2	0	1	2	4	0
		Original Suspected Serious Crashe	1	4	4	4	4	0	4	3	0
		CMF 1 (SB/WB)(lowest CMF)	0.68	0.68	0.68			0.68	0.68	0.68	0.95
		CMF 2 (SB/WB)	0.72	0.72	0.7			0.7	0.72	0.7	0.95
		CMF 3 (SB/WB)	0.77	0.77	1	Total CMF Calculated in Separate Workbook	Total CMF Calculated in Separate Workbook	1	0.77	1	1
		CMF 4 (SB/WB)	0.89	0.89	1			1	0.89	1	1
		CMF 5 (SB/WB)	1	0.94	1			1	1	1	1
		Total CMF (SB/WB)	0.500	0.500	0.578	1.000	1.000	0.578	0.500	0.578	0.926
		Fatal Crash reduction (SB/WB)	0.000	0.000	0.844	0.640	0.000	0.422	1.000	1.688	0.000
		Suspected Serious Crash reduction	0.500	2.000	1.688	1.280	0.700	0.000	2.000	1.266	0.000
		Post-Project Segment Directional	5.000	0.000	1.156	1.360	2.000	0.578	2.000	2.312	4.000
		Post-Project Segment Directional	4.500	5.000	2.312	2.720	6.300	0.000	8.000	1.734	3.000
		Post-Project Segment Directional	1.310	0.130	0.550	0.650	1.100	0.770	0.870	0.730	1.270
		Post-Project Segment Directional	1.310	0.130	0.550	0.650	1.100	0.770	0.870	0.730	1.270
	SAFETY INDEX	Current Safety Index	1.480	0.145	1.110	1.110	1.290	2.035	1.415	0.830	0.830
		Post-Project Safety Index	1.465	0.110	0.690	0.810	1.280	1.175	1.210	0.480	0.765
	Needs	Original Segment Safety Need	4.730	0.092	2.429	2.429	3.56	6.368	3.656	0.708	0.708
		Post-Project Segment Safety Need	4.66	0.069	1.055	1.164	3.525	2.452	2.613	0.303	0.667

LEGEND:
- user entered value
- calculated value for reference only
- calculated value for entry/use in other spreadsheet
- for input into Performance Effectiveness Scores spreadsheet
- assumed values (do not modify)

Category	Notes and Directions	Description	40.03	40.04	40.05-A	40.05-B	40.06	40.09	40.1	40.11
		Solution #	40.03	40.04	40.05-A	40.05-B	40.06	40.09	40.1	40.11
		Description	Flagstaff Safety Improvements	Flagstaff Lighting	East Flagstaff Safety Improvements	East Flagstaff Safety Improvements	Winona Safety Improvements	East Winona Safety Improvements	Canyon Diablo West Safety Improvements	Canyon Diablo Safety Improvements
		Project Beg MP	196	196	200	202	207	212	218	220
		Project End MP	200	202	202	207	212	218	220	229
		Project Length (miles)	4	6	2	5	5	6	2	9
		Segment Beg MP	196	196	196	202	202	212	212	212
		Segment End MP	202	202	202	212	212	234	234	234
		Segment Length (miles)	6	6	6	10	10	22	22	22
		Segment #	1	1	1	2	2	3	3	3
		Current # of Lanes (both directions)	4	4	4	4	4	4	4	4
		Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
		Additional Lanes (one-way)	0	0	0	0	0	0	0	0
		Pre-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
MOBILITY – MOBILITY INDEX	Input current value from performance system	Original Segment Mobility Index	0.580	0.580	0.580	0.360	0.360	0.440	0.440	0.440
	Enter in Mobility Index Spreadsheet to determine new segment level Mobility Index	Post-Project # of Lanes (both directions)	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
	Input value from updated Mobility Index spreadsheet	Post-Project Segment Mobility Index	0.530	0.580	0.530	0.330	0.330	0.400	0.440	0.440
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Mobility Index	0.530	0.580	0.530	0.330	0.330	0.400	0.440	0.440
MOBILITY – FUT V/C	Input current value from performance system	Original Segment Future V/C	0.650	0.650	0.650	0.400	0.400	0.490	0.490	0.490
	Input value from updated Mobility Index spreadsheet	Post-Project Segment Future V/C	0.590	0.650	0.590	0.370	0.370	0.450	0.490	0.490
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Future V/C	0.590	0.650	0.590	0.370	0.370	0.450	0.490	0.490
MOBILITY – PEAK HOUR V/C	Input current value from performance system (direction 1)	Original Segment Peak Hour V/C (NB)	0.390	0.390	0.390	0.250	0.250	0.270	0.270	0.270
	Input current value from performance system (direction 2)	Original Segment Peak Hour V/C (SB)	0.390	0.390	0.390	0.250	0.250	0.270	0.270	0.270
	***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	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 Segment Peak Hr V/C (NB)	0.340	0.390	0.340	0.220	0.220	0.230	0.270	0.270
	Input value from updated Mobility Index spreadsheet (direction 2)	Post-Project Segment Peak Hr V/C (SB)	0.340	0.390	0.340	0.220	0.220	0.230	0.270	0.270
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Peak Hr V/C (NB)	0.340	0.390	0.340	0.220	0.220	0.230	0.270	0.270
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need	Post-Project Segment Peak Hr V/C (SB)	0.340	0.390	0.340	0.220	0.220	0.230	0.270	0.270
MOBILITY – LOTTR	Calculated Value (both directions)	Safety Reduction Factor	0.699	0.792	0.838	0.659	0.742	0.828	0.828	0.892
	Calculated Value (both directions)	Safety Reduction	0.301	0.208	0.162	0.341	0.258	0.172	0.172	0.108
	Calculated Value (both directions)	Mobility Reduction Factor	0.914	1.000	0.914	0.917	0.917	0.909	1.000	1.000
	Calculated Value (both directions)	Mobility Reduction	0.086	0.000	0.086	0.083	0.083	0.091	0.000	0.000
	Assumed effect on LOTTR (% of mobility reduction)	Mobility effect on LOTTR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
	Assumed effect on LOTTR (% of safety reduction)	Safety effect on LOTTR	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	Input current value from performance system (direction 1)	Original Directional Segment LOTTR (NB)	1.030	1.030	1.030	1.020	1.020	1.020	1.020	1.020
	Input current value from performance system (direction 2)	Original Directional Segment LOTTR (SB)	1.030	1.030	1.030	1.030	1.030	1.020	1.020	1.020
	Calculated Value (both directions)	Reduction Factor for Segment LOTTR	0.107	0.062	0.066	0.119	0.094	0.070	0.052	0.032
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 1)	Post-Project Directional Segment LOTTR (NB)	1.015	1.015	1.015	1.010	1.010	1.010	1.010	1.010
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 2)	Post-Project Directional Segment LOTTR (SB)	1.015	1.015	1.015	1.015	1.015	1.010	1.010	1.010
MOBILITY – CLOSURE EXTENT	Input current value from performance system (direction 1)	Orig Segment Directional Closure Extent (NB)	0.470	0.470	0.470	0.220	0.220	1.110	1.110	1.110
	Input current value from performance system (direction 2)	Orig Segment Directional Closure Extent (SB)	0.3	0.3	0.3	0.22	0.22	0.920	0.920	0.920
	Input value from HCRS	Segment Closures with Fatalities/injuries	12	12	12	7	7	24	24	24
	Input value from HCRS	Total Segment Closures	22	22	22	22	22	42	42	42
	Calculated Value (both directions)	% Closures with Fatality/Injury	0.55	0.55	0.55	0.32	0.32	0.57	0.57	0.57
	Calculated Value (both directions)	Closure Reduction	0.164	0.114	0.088	0.109	0.082	0.098	0.098	0.062
	Calculated Value (both directions)	Closure Reduction Factor	0.836	0.886	0.912	0.891	0.918	0.902	0.902	0.938
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 1)	Post-Project Segment Directional Closure Extent (NB)	0.393	0.417	0.429	0.196	0.202	1.001	1.001	1.041
	Enter in Mobility Needs spreadsheet to update segment level Mobility Need (direction 2)	Post-Project Segment Directional Closure Extent (SB)	0.251	0.266	0.274	0.196	0.202	0.829	0.829	0.863
BICYCLE ACCOM	Input current value from performance system	Orig Segment Bicycle Accommodation %	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	10.04	10.04	10.04	10	10	9.97	9.97	9.97
	Input value from updated Mobility Index spreadsheet	Post-Project Segment Outside Shoulder width	12.00	10.04	12.00	12	12	12	9.97	12
	Input value from updated Mobility Index spreadsheet	Post-Project Segment Bicycle Accommodation (%)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Enter in Mobility Needs spreadsheet to calculate new segment level Mobility Need	Post-Project Segment Bicycle Accommodation (%)	100.0%	100.0%	100.0%	45.0%	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	0.770	0.770	0.770	0.462	0.462	1.248	1.248	1.248
	User entered value from Mobility Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Mobility Need	0.660	0.727	0.691	0.426	0.428	1.129	1.173	1.201

Description	40.12	40.13	40.14	40.15	40.16	40.17	40.18	40.19	40.2	40.21
Solution #	40.12	40.13	40.14	40.15	40.16	40.17	40.18	40.19	40.2	40.21
Description	Canyon Diablo East Safety Improvements	Two Guns Safety Improvements	Red Gap Ranch Safety Improvements	West Winslow Pavement Improvements	West Winslow Safety Improvements	East Winslow Safety Improvements	Holbrook Pavement Improvements	Chambers Safety	Houck Pavement	Window Rock TI OP WB
Project Beg MP	229	230	240	246	246	258	286	326	342	358
Project End MP	230	234	242	258	258	266	290	342	360	358
Project Length (miles)	1	4	2	12	12	8	4	16	18	0
Segment Beg MP	212	212	234	246	246	258	286	326	342	342
Segment End MP	234	234	246	258	258	270	290	342	360	360
Segment Length (miles)	22	22	12	12	12	12	4	16	18	18
Segment #	3	3	4	5	5	6	8	11	12	12
Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4
Project Type (one-way or 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)	0	0	0	0	0	0	0	0	0	0
Pre-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Original Segment Mobility Index	0.440	0.440	0.440	0.410	0.410	0.330	0.460	0.400	0.460	0.460
Post-Project # of Lanes (both directions)	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	4.00	4.00
Post-Project Segment Mobility Index	0.400	0.440	0.440	0.410	0.410	0.330	0.460	0.400	0.460	0.46
Post-Project Segment Mobility Index	0.400	0.440	0.440	0.410	0.410	0.330	0.460	0.400	0.460	0.460
Original Segment Future V/C	0.490	0.490	0.490	0.450	0.450	0.360	0.510	0.440	0.510	0.510
Post-Project Segment Future V/C	0.490	0.490	0.490	0.450	0.450	0.360	0.510	0.440	0.510	0.510
Post-Project Segment Future V/C	0.490	0.490	0.490	0.450	0.450	0.360	0.510	0.440	0.510	0.510
Original Segment Peak Hour V/C (NB)	0.270	0.270	0.240	0.270	0.270	0.170	0.340	0.230	0.250	0.250
Original Segment Peak Hour V/C (SB)	0.270	0.270	0.240	0.270	0.270	0.170	0.340	0.230	0.250	0.250
Adjusted total # of Lanes for use in directional peak hr	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#REF!	N/A	N/A
Post-Project Segment Peak Hr V/C (NB)	0.270	0.270	0.240	0.270	0.270	0.170	0.340	0.230	0.250	0.250
Post-Project Segment Peak Hr V/C (SB)	0.270	0.270	0.240	0.270	0.270	0.170	0.340	0.230	0.250	0.250
Post-Project Segment Peak Hr V/C (NB)	0.270	0.270	0.240	0.270	0.270	0.170	0.340	0.230	0.250	0.250
Post-Project Segment Peak Hr V/C (SB)	0.270	0.270	0.240	0.270	0.270	0.170	0.340	0.230	0.250	0.250
Safety Reduction Factor	0.993	0.990	0.759	0.622	0.730	0.992	0.577	0.855	0.578	0.922
Safety Reduction	0.007	0.010	0.241	0.378	0.270	0.008	0.423	0.145	0.422	0.078
Mobility Reduction Factor	0.909	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mobility Reduction	0.091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mobility effect on LOTTR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Safety effect on LOTTR	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Original Directional Segment LOTTR (NB)	1.020	1.020	1.030	1.020	1.020	1.030	1.030	1.030	1.030	1.030
Original Directional Segment LOTTR (SB)	1.020	1.020	1.040	1.020	1.020	1.030	1.020	1.040	1.030	1.030
Reduction Factor for Segment LOTTR	0.020	0.003	0.072	0.114	0.081	0.002	0.127	0.043	0.127	0.023
Post-Project Directional Segment LOTTR (NB)	1.010	1.017	1.015	1.010	1.010	1.028	1.015	1.015	1.015	1.006
Post-Project Directional Segment LOTTR (SB)	1.010	1.017	1.020	1.010	1.010	1.028	1.010	1.020	1.015	1.006
Orig Segment Directional Closure Extent (NB)	1.110	1.110	0.100	0.380	0.380	0.130	0.350	0.430	0.590	0.590
Orig Segment Directional Closure Extent (SB)	0.920	0.920	0.080	0.180	0.180	0.100	0.200	0.320	1.090	1.090
Segment Closures with Fatalities/injuries	24	24	7	17	17	10	3	3	15	15
Total Segment Closures	42	42	11	33	33	14	9	16	28	28
% Closures with Fatality/Injury	0.57	0.57	0.64	0.52	0.52	0.71	0.33	0.19	0.54	0.54
Closure Reduction	0.004	0.006	0.154	0.195	0.139	0.006	0.141	0.027	0.226	0.042
Closure Reduction Factor	0.996	0.994	0.846	0.805	0.861	0.994	0.859	0.973	0.774	0.958
Post-Project Segment Directional Closure Extent (NB)	1.106	1.104	0.085	0.306	0.327	0.129	0.301	0.418	0.457	0.565
Post-Project Segment Directional Closure Extent (SB)	0.916	0.915	0.068	0.145	0.155	0.099	0.172	0.311	0.844	1.044
Orig Segment Bicycle Accommodation %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	96.0%	96.0%
Orig Segment Outside Shoulder width	9.97	9.97	9.87	9.97	9.97	10	10	9.68	9.43	9.43
Post-Project Segment Outside Shoulder width	12	12	12	9.97	12	10	10	12	9.43	9.43
Post-Project Segment Bicycle Accommodation (%)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	96.0%	96.0%
Post-Project Segment Bicycle Accommodation (%)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	96.0%	96.0%
Original Segment Mobility Need	1.248	1.248	0.575	0.621	0.621	0.462	0.661	0.682	1.182	1.182
Post-Project Segment Mobility Need	1.245	1.245	0.570	0.586	0.590	0.461	0.650	0.667	1.030	1.156

			Solution #	40.03	40.04	40.05-A	40.05-B	40.06	40.09	40.1	40.11	40.12	40.13	40.14	40.15	40.16	40.17	40.18	40.19	40.2	40.21
			Description	Flagstaff Safety Improvements	Flagstaff Lighting	East Flagstaff Safety Improvements	East Flagstaff Safety Improvements	Winona Safety Improvements	East Winona Safety Improvements	Canyon Diablo West Safety Improvements	Canyon Diablo Safety Improvements	Canyon Diablo East Safety Improvements	Two Guns Safety Improvements	Red Gap Ranch Safety Improvements	West Winslow Pavement Improvements	West Winslow Safety Improvements	East Winslow Safety Improvements	Holbrook Pavement Improvements	Chambers Safety	Houck Pavement	Window Rock TI OP WB Bridge
		LEGEND:	Project Beg MP	196	196	200	202	207	212	218	220	229	230	240	246	246	258	286	326	342	358
		- user entered value	Project End MP	200	202	202	207	212	218	220	229	230	234	242	258	258	266	290	342	360	358
		- calculated value for reference only	Project Length (miles)	4	6	2	5	5	6	2	9	1	4	2	12	12	8	4	16	18	0
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	196	196	196	202	202	212	212	212	212	212	234	246	246	258	286	326	342	342
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	202	202	202	212	212	234	234	234	234	234	246	258	258	270	290	342	360	360
		- assumed values (do not modify)	Segment Length (miles)	6	6	6	10	10	22	22	22	22	22	12	12	12	12	4	16	18	18
			Segment #	1	1	1	2	2	3	3	3	3	3	4	5	5	6	8	11	12	12
			Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
			Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	two-way	two-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)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
		Notes and Directions	**Description**																		
Freight	TTTR	Assumed effect on TTTR (% of mobility reduction)	Mobility effect on TTTR	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		Assumed effect on TTTR (% of safety reduction)	Safety effect on TTTR	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
		Input current value from performance system (direction 1)	Original Directional Segment TTTR (NB)	1.120	1.120	1.120	1.080	1.080	1.060	1.060	1.060	1.060	1.060	1.100	1.060	1.060	1.088	1.070	1.110	1.08	1.08
		Input current value from performance system (direction 2)	Original Directional Segment TTTR (SB)	1.120	1.120	1.120	1.100	1.100	1.060	1.060	1.060	1.060	1.060	1.110	1.060	1.060	1.088	1.060	1.110	1.09	1.09
		Calculated Value (both directions)	Reduction Factor for Segment TTTR (both directions)	0.054	0.031	0.033	0.059	0.047	0.035	0.026	0.016	0.010	0.002	0.036	0.057	0.041	0.001	0.063	0.022	0.063	0.012
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 1)	Part-Project Directional Segment TTTR (NB)	1.060	1.085	1.083	1.016	1.029	1.023	1.033	1.043	1.049	1.058	1.060	1.030	1.017	1.087	1.002	1.086	1.012	1.067
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 2)	Part-Project Directional Segment TTTR (SB)	1.060	1.085	1.083	1.035	1.048	1.023	1.033	1.043	1.049	1.058	1.070	1.030	1.017	1.087	1.030	1.086	1.021	1.077
	FREIGHT INDEX	Value from above	Original Segment MAX TTTR (NB)	1.120	1.120	1.120	1.080	1.080	1.060	1.060	1.060	1.060	1.060	1.100	1.060	1.060	1.088	1.070	1.110	1.080	1.080
		Value from above	Original Segment MAX TTTR (SB)	1.120	1.120	1.120	1.100	1.100	1.060	1.060	1.060	1.060	1.060	1.110	1.060	1.060	1.088	1.060	1.110	1.090	1.090
		Calculated Value	Original Segment Freight Index	1.1200	1.1200	1.1200	1.0900	1.0900	1.0600	1.0600	1.0600	1.0600	1.0600	1.1050	1.0600	1.0600	1.0880	1.0650	1.1100	1.0850	1.0850
		Calculated Value	Part-Project Segment MAX TTTR (NB)	1.060	1.085	1.083	1.016	1.029	1.023	1.033	1.043	1.049	1.058	1.060	1.030	1.017	1.087	1.002	1.086	1.012	1.067
		Calculated Value	Part-Project Segment MAX TTTR (SB)	1.060	1.085	1.083	1.035	1.048	1.023	1.033	1.043	1.049	1.058	1.070	1.030	1.017	1.087	1.030	1.086	1.021	1.077
		Enter in Freight Needs spreadsheet to update segment level Freight Need	Part-Project Segment Freight Index	1.060	1.085	1.083	1.025	1.039	1.023	1.033	1.043	1.049	1.058	1.065	1.030	1.017	1.087	1.016	1.086	1.016	1.072
	CLOSURE DURATION	Input current value from performance system (direction 1)	Orig Segment Directional Closure Duration (dir 1)	116.620	116.620	116.620	87.100	87.100	398.890	398.890	398.890	398.890	398.890	35.450	96.930	96.930	34.120	127.250	175.960	233.050	233.050
		Input current value from performance system (direction 2)	Orig Segment Directional Closure Duration (dir 2)	53.050	53.050	53.050	67.260	67.260	346.150	346.150	346.150	346.150	346.150	24.730	39.200	39.200	29.920	58.750	102.710	412.670	412.670
		Calculated Value	Segment Closures with Fatalities	12	12	12	7	7	24	24	24	24	24	7	17	17	10	3	3	15	15
		Calculated Value	Total Segment Closures	22	22	22	22	22	42	42	42	42	42	11	33	33	14	9	16	28	28
		Calculated Value	% Closures with Fatality	0.55	0.55	0.55	0.32	0.32	0.57	0.57	0.57	0.57	0.57	0.64	0.52	0.52	0.71	0.33	0.19	0.54	0.54
		Calculated Value	Closure Reduction	0.164	0.114	0.088	0.109	0.082	0.098	0.098	0.062	0.004	0.006	0.154	0.195	0.139	0.006	0.141	0.027	0.226	0.042
		Calculated Value	Closure Reduction Factor	0.836	0.886	0.912	0.891	0.918	0.902	0.902	0.938	0.996	0.994	0.846	0.805	0.861	0.994	0.859	0.973	0.774	0.958
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 1)	Part-Project Segment Directional Closure Duration (NB)	97.500	103.383	106.325	77.649	79.948	359.617	359.617	374.248	397.350	396.580	30.005	78.036	83.434	33.931	109.325	171.180	180.403	223.273
		Enter in Freight Needs spreadsheet to update segment level Freight Need (direction 2)	Part-Project Segment Directional Closure Duration (SB)	44.352	47.029	48.367	59.962	61.737	312.070	312.070	324.766	344.814	344.145	20.931	31.559	33.742	29.754	50.474	99.920	319.446	395.357
	VERT CLR	Input current value from performance system	Original Segment Vertical Clearance	16.67	16.67	16.67	16.00	16.00	15.96	15.96	15.96	15.96	15.96	16.15	16.26	16.26	NO UP	16.96	16.06	16.06	16.06
		Input current value from performance system	Original vertical clearance for specific bridge																		0.00
		Input part-project value (depends on solution)	Part-Project vertical clearance for specific bridge																		
		Input part-project value (depends on solution) (forces segment clearance to equal this specific bridge)	Part-Project Segment Vertical Clearance	16.67	16.67	16.67	16.00	16.00	15.96	15.96	15.96	15.96	15.96	16.15	16.26	16.26	NO UP	16.96	16.06	16.06	16.06
		Enter in Freight Needs spreadsheet to update segment level Freight Need	Part-Project Segment Vertical Clearance	16.67	16.67	16.67	16.00	16.00	15.96	15.96	15.96	15.96	15.96	16.15	16.26	16.26	NO UP	16.96	16.06	16.06	16.06
	Needs	User entered value from Freight Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Freight Need	1.097	1.097	1.097	1.325	1.325	2.445	2.445	2.445	2.445	2.445	1.122	1.005	1.005	0.653	0.818	1.711	2.31	2.31
		User entered value from Freight Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Part-Project Segment Freight Need	0.828	0.938	0.936	1.032	1.096	2.166	2.205	2.294	2.397	2.429	0.965	0.821	0.793	0.648	0.6	1.603	1.76	2.195

LEGEND:
- user entered value
- calculated value for reference only
- calculated value for entry/use in other spreadsheet
- for input into Performance Effectiveness Score spreadsheet
- assumed values (do not modify)

	Notes and Directions	Description	40.01	40.02	40.03	40.04	40.05-B	40.06	40.07	40.08	40.09	40.1	40.11	40.12	40.13	40.14	40.15	40.16	40.17	40.18	40.21
		Solution #	40.01	40.02	40.03	40.04	40.05-B	40.06	40.07	40.08	40.09	40.1	40.11	40.12	40.13	40.14	40.15	40.16	40.17	40.18	40.21
		Description	Lone Tree Road OP EB Bridge	Lone Tree Road OP WB Bridge	Flagstaff Safety Improvements	Flagstaff Lighting	East Flagstaff Safety Improvements	Winona Safety Improvements	Canyon Diablo Bridge WB	Buffalo Range TI OP WB Bridge	East Winona Safety Improvements	Canyon Diablo West Safety Improvements	Canyon Diablo Safety Improvements	Canyon Diablo East Safety Improvements	Two Guns Safety Improvements	Red Gap Ranch Safety Improvements	West Winslow Pavement Improvements	West Winslow Safety Improvements	East Winslow Safety Improvements	Holbrook Pavement Improvements	Window Rock TI OP WB Bridge
		Project Beg MP	196	196	196	196	202	207	229	225	212	218	220	229	230	240	246	246	258	286	358
		Project End MP	196	196	200	202	207	212	229	225	218	220	229	230	234	242	258	258	266	290	358
		Project Length (miles)	0	0	4	6	5	5	0	0	6	2	9	1	4	2					
		Segment Beg MP	196	196	196	196	202	202	212	212	212	212	212	212	212	234	246	246	258	286	342
		Segment End MP	202	202	202	202	212	212	234	234	234	234	234	234	234	246	258	258	270	290	360
		Segment Length (miles)	6	6	6	6	10	10	22	22	22	22	22	22	22	12					
		Segment #	1	1	1	1	2	2	3	3	3	3	3	3	3	4	5	5	6	8	12
		Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-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)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pro-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00					
	Notes and Directions	**Description**																			
BRIDGE – BRIDGE INDEX	Input current value from performance system	Original Segment Bridge Index																			
BRIDGE – BRIDGE INDEX	Input current value from performance system	Original lowest rating for specific bridge																			
BRIDGE – BRIDGE INDEX	Input post-project value (For repair +1, rehab +2, replace=8)	Post-Project lowest rating for specific bridge																			
BRIDGE – BRIDGE INDEX	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	0	0	0	0	0	0	0	0	0	0	0
BRIDGE – BRIDGE INDEX	Input updated segment value from updated Bridge Index spread	Post-Project Segment Bridge Index																			
BRIDGE – BRIDGE INDEX	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BRIDGE – SUFF RATING	Input current value from performance system	Original Segment Sufficiency Rating																			
BRIDGE – SUFF RATING	Input current value from performance system	Original Sufficiency Rating for specific bridge																			
BRIDGE – SUFF RATING	Input post-project value (For repair +10, rehab +20, replace=98)	Post-Project Sufficiency Rating for specific bridge																			
BRIDGE – SUFF RATING	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BRIDGE – SUFF RATING	Input updated segment value from updated Bridge Index spread	Post-Project Segment Sufficiency Rating																			
BRIDGE – SUFF RATING	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BRIDGE – BR RTNG	Input current value from performance system	Original Segment Bridge Rating																			
BRIDGE – BR RTNG	Input updated segment value from updated Bridge Index spread	Post-Project Segment Bridge Rating																			
BRIDGE – BR RTNG	Enter in Bridge Needs spreadsheet to update segment level Bridge Need	Post-Project Segment Bridge Rating	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRIDGE – **Needs**	User entered value from Bridge Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Bridge Need																			
BRIDGE – **Needs**	User entered value from Bridge Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Bridge Need																			

			Solution #	40.03	40.04	40.05-A	40.05-B	40.06	40.09	40.1	40.11
			Description	Flagstaff Safety Improvements	Flagstaff Lighting	East Flagstaff Safety Improvements	East Flagstaff Safety Improvements	Winona Safety Improvements	East Winona Safety Improvements	Canyon Diablo West Safety Improvements	Canyon Diablo Safety Improvements
	LEGEND:		Project Beg MP	196	196	200	202	207	212	218	220
		- user entered value	Project End MP	200	202	202	207	212	218	220	229
		- calculated value for reference only	Project Length (miles)	4	6	2	5	5	6	2	9
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	196	196	196	202	202	212	212	212
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	202	202	202	212	212	234	234	234
		- assumed values (do not modify)	Segment Length (miles)	6	6	6	10	10	22	22	22
			Segment #	1	1	1	2	2	3	3	3
			Current # of Lanes (both directions)	4	4	4	4	4	4	4	4
			Project Type (one-way or two-way)	two-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
		Notes and Directions	**Description**								
PAVEMENT	PAVEMENT INDEX	Input current value from performance system	Original Segment Pavement Index								
		Input current value from performance system	Original Segment IRI in project limits								
		Input current value from performance system	Original Segment Cracking in project limits								
		Input current value from performance system	Original Segment Rutting in project limits								
		Input post-project value (For rehab, increase to 45; for replace increase to 30)	Post-Project IRI in project limits								
		Enter in Pavement Index spreadsheet to calculate new Paveme	Post-Project IRI in project limits	0	0	0	0	0	0	0	0
		Input post-project value (Lower to 0 for rehab or replace)	Post-Project Cracking in project limits								
		Enter in Pavement Index spreadsheet to calculate new Paveme	Post-Project Cracking in project limits	0	0	0	0	0	0	0	0
		Input post-project value (Lower to 0 for rehab or replace)	Post-Project Rutting in project limits								
		Enter in Pavement Index spreadsheet to calculate new Paveme	Post-Project Rutting in project limits	0	0	0	0	0	0	0	0
		Input updated segment value from updated Pavement Index spreadsheet	Post-Project Segment Pavement Index								
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Pavement Index	0	0	0	0	0	0	0	0
	DIRECTION PSR	Input current value from performance system (direction 1)	Original Segment Directional PSR (NB)								
		Input current value from performance system (direction 2)	Original Segment Directional PSR (SB)								
		Value from above	Original Segment IRI in project limits	0	0	0	0	0	0	0	0
		Value from above	Post-Project directional IRI in project limits	0	0	0	0	0	0	0	0
		Input updated segment value from updated Pavement Index spreadsheet (direction 1)	Post-Project Segment Directional PSR (NB)								
		Input updated segment value from updated Pavement Index spreadsheet (direction 2)	Post-Project Segment Directional PSR (SB)								
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (NB)	0	0	0	0	0	0	0	0
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (SB)	0	0	0	0	0	0	0	0
	% FAIL	Input current value from performance system	Original Segment % Failure								
		Input value from updated Pavement Index spreadsheet	Post-Project Segment % Failure								
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment % Failure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Needs	User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Pavement Need								
		User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Pavement Need								

			Solution #	40.12	40.13	40.14	40.15	40.16	40.17	40.18	40.19	40.2	40.21
			Description	Canyon Diablo East Safety Improvements	Two Guns Safety Improvements	Red Gap Ranch Safety Improvements	West Winslow Pavement Improvements	West Winslow Safety Improvements	East Winslow Safety Improvements	Holbrook Pavement Improvements	Chambers Safety Improvements	Houck Pavement	Window Rock TI OP WB Bridge
	LEGEND:		Project Beg MP	229	230	240	246	246	258	286	326	342	358
		- user entered value	Project End MP	230	234	242	258	258	266	290	342	360	358
		- calculated value for reference only	Project Length (miles)	1	4	2	12	12	8	4	16	18	0
		- calculated value for entry/use in other spreadsheet	Segment Beg MP	212	212	234	246	246	258	286	326	342	342
		- for input into Performance Effectiveness Score spreadsheet	Segment End MP	234	234	246	258	258	270	290	342	360	360
		- assumed values (do not modify)	Segment Length (miles)	22	22	12	12	12	12	4	16	18	18
			Segment #	3	3	4	5	5	6	8	11	12	12
			Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4
			Project Type (one-way or 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)	0	0	0	0	0	0	0	0	0	0
			Pro-Rated # of Lanes	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
		Notes and Directions	**Description**										
PAVEMENT	PAVEMENT INDEX	Input current value from performance system	Original Segment Pavement Index				1.77			2.79		2.2	
		Input current value from performance system	Original Segment IRI in project limits				49.31			65.75		46.8	
		Input current value from performance system	Original Segment Cracking in project limits				2.71			4.85		10.32	
		Input current value from performance system	Original Segment Rutting in project limits				0.16			0.3		0.15	
		Input post-project value (For rehab, increase to 45; for replace increase to 30)	Post-Project IRI in project limits				30			30		30	
		Enter in Pavement Index spreadsheet to calculate new Paveme	Post-Project IRI in project limits	0	0	0	30	0	0	30	0	30	0
		Input post-project value (Lower to 0 for rehab or replace)	Post-Project Cracking in project limits				0			0		0	
		Enter in Pavement Index spreadsheet to calculate new Paveme	Post-Project Cracking in project limits	0	0	0	0	0	0	0	0	0	0
		Input post-project value (Lower to 0 for rehab or replace)	Post-Project Rutting in project limits				0			0		0	
		Enter in Pavement Index spreadsheet to calculate new Paveme	Post-Project Rutting in project limits	0	0	0	0	0	0	0	0	0	0
		Input updated segment value from updated Pavement Index spreadsheet	Post-Project Segment Pavement Index				3.18			4.35		3.61	
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Pavement Index	0	0	0	3.18	0	0	4.35	0	3.61	0
	DIRECTION PSR	Input current value from performance system (direction 1)	Original Segment Directional PSR (NB)				4.15			3.9		4.19	
		Input current value from performance system (direction 2)	Original Segment Directional PSR (SB)				4.25			3.96		4.2	
		Value from above	Original Segment IRI in project limits	0	0	0	49.31	0	0	65.75	0	46.8	0
		Value from above	Post-Project directional IRI in project limits	0	0	0	30	0	0	30	0	30	0
		Input updated segment value from updated Pavement Index spreadsheet (direction 1)	Post-Project Segment Directional PSR (NB)				4.46			4.46		4.46	
		Input updated segment value from updated Pavement Index spreadsheet (direction 2)	Post-Project Segment Directional PSR (SB)				4.25			3.96		4.2	
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (NB)	0	0	0	4.46	0	0	4.46	0	4.46	0
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment Directional PSR (SB)	0	0	0	4.25	0	0	3.96	0	4.2	0
	% FAIL	Input current value from performance system	Original Segment % Failure				13.0%			25.0%		42.0%	
		Input value from updated Pavement Index spreadsheet	Post-Project Segment % Failure				13.0%			13.0%		14.0%	
		Enter in Pavement Needs spreadsheet to update segment level Pavement Need	Post-Project Segment % Failure	0.0%	0.0%	0.0%	13.0%	0.0%	0.0%	13.0%	0.0%	14.0%	0.0%
	Needs	User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Original Segment Pavement Need				3.056			2.92		3.534	0
		User entered value from Pavement Needs spreadsheet and for use in Performance Effectiveness spreadsheet	Post-Project Segment Pavement Need				1.84			0.22		0.54	0

CMF Application

CS40.06 (MP 207-212)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effect CMF	Current Fatal	Current Incap	Post-Project Fatal	Post-Project Incap	Reduction Fatal	Reduction Incap
196	199	0.68	0.72	0.92	1	EB	0.561	2	1	1.123	0.561	0.877	0.439
196	199	0.68	0.72	0.92	1	WB	0.561	1	1	0.561	0.561	0.439	0.439
199	199	0.68	0.72	0.75	0.92	EB	0.500	0	0	0.000	0.000	0.000	0.000
199	199	0.68	0.72	0.75	0.92	WB	0.500	0	0	0.000	0.000	0.000	0.000
199	200	0.68	0.72	0.92	1	EB	0.561	0	0	0.000	0.000	0.000	0.000
199	200	0.68	0.72	0.92	1	WB	0.561	0	0	0.000	0.000	0.000	0.000
I-17/I40	I-17/40	0.68	0.72	0.92	0.95	EB	0.547	1	1	0.547	0.547	0.453	0.453
I-17/I40	I-17/40	0.68	0.72	0.92	0.95	WB	0.547	0	0	0.000	0.000	0.000	0.000
												1.330	**0.891**
												0.439	**0.439**

CS40.06 (MP 207-212)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effect CMF	Current Fatal	Current Incap	Post-Project Fatal	Post-Project Incap	Reduction Fatal	Reduction Incap
207	208	0.65	0.79	0.83	0.77	EB	0.500	0	0	0.000	0.000	0.000	0.000
207	208	0.65	0.79	0.83	0.77	WB	0.500	0	0	0.000	0.000	0.000	0.000
208	210	0.68	0.72	0.77	0.89	EB	0.500	1	0	0.500	0.000	0.500	0.000
208	210	0.68	0.72	0.77	0.89	WB	0.500	1	0	0.500	0.000	0.500	0.000
210	212	0.65	0.79	0.83	0.77	EB	0.500	0	2	0.000	1.000	0.000	1.000
210	212	0.65	0.79	0.83	0.77	WB	0.500	0	0	0.000	0.000	0.000	0.000
												0.500	**1.000**
												0.500	**0.000**

CS40.16 (MP 246-258)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effect CMF	Current Fatal	Current Incap	Post-Project Fatal	Post-Project Incap	Reduction Fatal	Reduction Incap
246	248	0.68	1	1	1	EB	0.680	0	4	0.000	2.720	0.000	1.280
246	248	0.68	1	1	1	WB	0.680	0	1	0.000	0.680	0.000	0.320
248	251	0.65	0.68	1	1	EB	0.546	0	1	0.000	0.546	0.000	0.454
248	251	0.65	0.68	1	1	WB	0.546	0	0	0.000	0.000	0.000	0.000
251	258	0.68	1	1	1	EB	0.680	3	2	2.040	1.360	0.960	0.640
251	258	0.68	1	1	1	WB	0.680	2	3	1.360	2.040	0.640	0.960
												0.960	**2.374**
												0.640	**1.280**

CS40.17 (MP 258-266)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effect CMF	Current Fatal	Current Incap	Post-Project Fatal	Post-Project Incap	Reduction Fatal	Reduction Incap
258	258	0.94	1	1	1	EB	0.940	0	0	0.000	0.000	0.000	0.000
258	260	0.65	1	1	1	EB	0.650	0	0	0.000	0.000	0.000	0.000
258	260	0.65	1	1	1	WB	0.650	0	2	0.000	1.300	0.000	0.700
260	260	0.94	1	1	1	WB	0.940	0	0	0.000	0.000	0.000	0.000
												0.000	**0.000**
												0.000	**0.700**

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	
40.03	Flagstaff Safety Improvements	196-200	22.93	3.200	3.200	0.000	0.00	0.000	0.200	0.200	0.000	0.00	0.000	4.769	2.655	2.114	2.72	5.750	0.770	0.660	0.110	2.92	0.321	1.097	0.828	0.269	3.22	0.866	6.937
40.04	Flagstaff Lighting	196-202	8.06	3.200	3.200	0.000	0.00	0.000	0.200	0.200	0.000	0.00	0.000	4.769	3.238	1.531	2.72	4.164	0.770	0.727	0.043	3.19	0.137	1.097	0.938	0.159	3.22	0.512	4.813
40.05-A	East Flagstaff Safety Improvements	200-202	11.9	3.200	3.200	0.000	0.00	0.000	0.200	0.200	0.000	0.00	0.000	4.769	3.525	1.244	2.66	3.309	0.770	0.691	0.079	2.17	0.171	1.097	0.936	0.161	3.22	0.518	3.999
40.05-B	East Flagstaff Safety Improvements	200-207	41.64	0.6	0.6	0.000	0.00	0.000	1.2	1.2	0.000	0.00	0.000	1.929	0.452	1.477	2.63	3.885	0.462	0.426	0.036	5.96	0.215	1.325	1.032	0.293	6.44	1.887	5.986
40.05	East Flagstaff Safety Improvements		53.54			0.000		0.000					0.000	6.698	3.977			7.194	1.232	1.117		8.130	0.386	2.422	1.968	0.454		2.405	9.985
40.06	Winona Safety Improvements	207-212	40.84	0.600	0.600	0.000	0.00	0.000	1.200	1.200	0.000	0.00	0.000	1.929	0.508	1.421	2.16	3.069	0.462	0.428	0.034	5.96	0.203	1.325	1.096	0.229	6.44	1.475	4.747
40.09	East Winona Safety Improvements	212-218	54.48	3.400	3.400	0.000	0.00	0.000	2.200	2.200	0.000	0.00	0.000	4.730	3.515	1.215	1.97	2.394	1.248	1.129	0.119	6.05	0.720	2.445	2.166	0.279	6.33	1.766	4.880
40.1	Canyon Diablo West Safety Improvements	218-220	12.27	3.400	3.400	0.000	0.00	0.000	2.200	2.200	0.000	0.00	0.000	4.730	3.539	1.191	1.89	2.251	1.248	1.173	0.075	4.77	0.358	2.445	2.205	0.240	6.33	1.519	4.128
40.11	Canyon Diablo Safety Improvements	220-229	8.81	3.400	3.400	0.000	0.00	0.000	2.200	2.200	0.000	0.00	0.000	4.730	4.003	0.727	1.84	1.338	1.248	1.201	0.047	6.40	0.301	2.445	2.294	0.151	6.33	0.956	2.594
40.12	Canyon Diablo East Safety Improvements	229-230	3.46	3.400	3.400	0.000	0.00	0.000	2.200	2.200	0.000	0.00	0.000	4.730	4.682	0.048	1.71	0.082	1.248	1.245	0.003	4.15	0.012	2.445	2.397	0.048	6.33	0.304	0.398
40.13	Two Guns Safety Improvements	230-234	3.91	3.400	3.400	0.000	0.00	0.000	2.200	2.200	0.000	0.00	0.000	4.730	4.660	0.070	1.67	0.117	1.248	1.245	0.003	5.59	0.017	2.445	2.429	0.016	6.33	0.101	0.235
40.14	Red Gap Ranch Safety Improvements	240-242	6.78	0.600	0.600	0.000	0.00	0.000	0.200	0.200	0.000	0.00	0.000	0.092	0.069	0.023	1.54	0.035	0.570	0.570	0.000	4.76	0.000	1.122	0.965	0.157	6.34	0.995	1.031
40.15	West Winslow Pavement Improvements	246-258	150.25	3.056	1.840	1.216	5.21	6.335	1.200	1.200	0.000	0.00	0.000	2.429	1.055	1.374	1.44	1.979	0.621	0.586	0.035	6.55	0.229	1.005	0.821	0.184	6.17	1.135	9.678
40.16	West Winslow Safety Improvements	246-258	373.31	3.200	3.200	0.000	0.00	0.000	1.200	1.200	0.000	0.00	0.000	2.429	1.164	1.265	1.44	1.822	0.621	0.590	0.031	6.55	0.203	1.005	0.793	0.212	6.17	1.308	3.333
40.17	East Winslow Safety Improvements	258-266	11.82	2.600	2.600	0.000	0.00	0.000	1.200	1.200	0.000	0.00	0.000	3.560	3.525	0.035	1.50	0.053	0.462	0.461	0.001	6.33	0.006	0.653	0.648	0.005	6.27	0.031	0.090
40.18	Holbrook Pavement Improvements	286-290	50.08	2.920	0.220	2.700	5.71	15.417	1.400	1.400	0.000	0.00	0.000	6.368	2.452	3.916	1.69	6.618	0.661	0.650	0.011	2.41	0.027	0.818	0.600	0.218	2.89	0.630	22.692
40.19	Chambers Safety Improvements	326-342	31.84	0.600	0.600	0.000	0.00	0.000	0.200	0.200	0.000	0.00	0.000	3.656	2.613	1.043	2.52	2.628	0.682	0.667	0.015	3.28	0.049	1.711	1.603	0.108	2.84	0.307	2.984
40.2	Houck Pavement Improvements	342-360	225.37	3.534	0.540	2.994	6.18	18.503	1.200	1.200	0.000	0.00	0.000	0.708	0.303	0.405	2.18	0.883	1.182	1.030	0.152	3.32	0.505	2.310	1.760	0.550	2.93	1.612	21.502

Emphasis Area Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Safety Emphasis Area						Pavement Emphasis Area						Bridge 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
40.03	Flagstaff Safety Improvements	196-200	22.93	1.593	1.510	0.083	2.72	1.50	0.339	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.04	Flagstaff Lighting	196-202	8.06	1.593	1.536	0.057	2.72	1.50	0.233	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.05-A	East Flagstaff Safety Improvmeents	200-202	11.9	1.593	1.548	0.045	2.66	1.50	0.180	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.05-B	East Flagstaff Safety Improvmeents	200-207	41.64	1.593	1.496	0.097	2.63	1.50	0.383	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.05	East Flagstaff Safety Improvements		53.54	1.593					0.562						0.000						0.000
40.06	Winona Safety Improvements	207-212	40.84	1.593	1.520	0.073	2.16	1.50	0.237	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.09	East Winona Safety Improvements	212-218	54.48	1.593	1.444	0.149	1.97	1.50	0.440	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.1	Canyon Diablo West Safety Improvements	218-220	12.27	1.593	1.444	0.149	1.89	1.50	0.422	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.11	Canyon Diablo Safety Improvements	220-229	8.81	1.593	1.499	0.094	1.84	1.50	0.259	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.12	Canyon Diablo East Safety Improvements	229-230	3.46	1.593	1.587	0.006	1.71	1.50	0.015	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.13	Two Guns Safety Improvements	230-234	3.91	1.593	1.584	0.009	1.67	1.50	0.023	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.14	Red Gap Ranch Safety Improvements	240-242	6.78	1.593	1.582	0.011	1.54	1.50	0.025	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.15	West Winslow Pavement Improvements	246-258	150.25	1.593	1.460	0.133	1.44	1.50	0.287	2.636	2.601	0.035	5.21	1.50	0.274	1.639	1.639	0.000	0.00	1.50	0.000
40.16	West Winslow Safety Improvements	246-258	373.31	1.593	1.498	0.095	1.44	1.50	0.205	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.17	East Winslow Safety Improvements	258-266	11.82	1.593	1.591	0.002	1.50	1.50	0.005	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.18	Holbrook Pavement Improvements	286-290	50.08	1.593	1.502	0.091	1.69	1.50	0.231	2.636	2.623	0.013	5.71	1.50	0.111	1.639	1.639	0.000	0.00	1.50	0.000
40.19	Chambers Safety Improvements	326-342	31.84	1.593	1.505	0.088	2.52	1.50	0.333	2.636	2.636	0.000	0.00	1.50	0.000	1.639	1.639	0.000	0.00	1.50	0.000
40.2	Houck Pavement Improvements	342-360	225.37	1.593	1.426	0.167	2.18	1.50	0.546	2.636	2.585	0.051	6.18	1.50	0.473	1.639	1.639	0.000	0.00	1.50	0.000

Performance Effectiveness Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Total Factored Benefit	VMT Factor	NPV Factor	Performance Effectiveness Score	miles	2018 ADT	1-way or 2-way	VMT
40.03	Flagstaff Safety Improvements	196-200	22.93	7.276	4.39	15.3	21.3	4.00	37769	2	151077
40.04	Flagstaff Lighting	196-202	8.06	5.046	4.79	15.3	45.8	6.00	37769	2	226615
40.05-A	East Flagstaff Safety Improvmeents	200-202	11.9	4.178	3.25	15.3	17.5	2.00	37769	2	75538.4
40.05-B	East Flagstaff Safety Improvmeents	200-207	41.64	6.369	3.94	15.3	9.2	5.00	22377	2	111887
40.05	East Flagstaff Safety Improvements		53.54	5.309	4.63	15.3	7.0	7.00			187425
40.06	Winona Safety Improvements	207-212	40.84	4.983	3.94	15.3	7.4	5.00	22377	2	111887
40.09	East Winona Safety Improvements	212-218	54.48	5.320	4.08	15.3	6.1	6.00	20278	2	121669
40.1	Canyon Diablo West Safety Improvements	218-220	12.27	4.550	2.15	15.3	12.2	2.00	20278	2	40556.4
40.11	Canyon Diablo Safety Improvements	220-229	8.81	2.854	4.60	15.3	22.8	9.00	20278	2	182504
40.12	Canyon Diablo East Safety Improvements	229-230	3.46	0.414	1.23	15.3	2.2	1.00	20278	2	20278.2
40.13	Two Guns Safety Improvements	230-234	3.91	0.257	3.38	15.3	3.4	4.00	20278	2	81112.8
40.14	Red Gap Ranch Safety Improvements	240-242	6.78	1.056	2.14	15.3	5.1	2.00	20075	2	40150.9
40.15	West Winslow Pavement Improvements	246-258	150.25	10.239	4.82	15.3	5.0	12.00	19907	2	238879
40.16	West Winslow Safety Improvements	246-258	373.31	3.538	4.82	15.3	0.7	12.00	19907	2	238879
40.17	East Winslow Safety Improvements	258-266	11.82	0.095	2.19	15.3	0.3	2.00	20757	2	41514.3
40.18	Holbrook Pavement Improvements	286-290	50.08	23.034	3.61	15.3	25.4	4.00	23040	2	92158.1
40.19	Chambers Safety Improvements	326-342	31.84	3.317	4.92	15.3	7.8	16.00	18627	2	298025
40.2	Houck Pavement Improvements	342-360	225.37	22.521	4.98	15.3	7.6	18.00	22222	2	400001

Appendix J: Solution Prioritization Scores

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost ($ millions)	Pavement Score	Pavement %	Bridge Score	Bridge %	Safety Score	Safety %	Mobility Score	Mobility %	Freight Score	Freight %	Total Factored Score	Risk Factors: Pavement	Risk Factors: Bridge	Risk Factors: Safety	Risk Factors: Mobility	Risk Factors: Freight	Weighted Risk Factor	Segment Need	Prioritization Score
40.03	Flagstaff Safety Improvements	196-200	22.93	0.000	0.0%	0.000	0.0%	6.089	83.7%	0.321	4.4%	0.866	11.9%	7.276	1.14	1.51	1.78	1.36	1.36	1.711	1.77	64.5
40.04	Flagstaff Lighting	196-202	8.06	0.000	0.0%	0.000	0.0%	4.397	87.1%	0.137	2.7%	0.512	10.1%	5.046	1.14	1.51	1.78	1.36	1.36	1.726	1.77	140.0
40.05-A	East Flagstaff Safety Improvmeents	200-202	11.9	0.000	0.0%	0.000	0.0%	3.489	83.5%	0.171	4.1%	0.518	12.4%	4.178	1.14	1.51	1.78	1.36	1.36	1.711	1.77	52.9
40.05-B	East Flagstaff Safety Improvmeents	200-207	41.64	0.000	0.0%	0.000	0.0%	4.267	67.0%	0.215	3.4%	1.887	29.6%	6.369	1.14	1.51	1.78	1.36	1.36	1.641	1.23	18.6
40.05	East Flagstaff Safety Improvmeents		53.54	0	0.0%	0	0.0%	7.755765	73.5%	0.38599	3.7%	2.40534	22.8%	10.547095	1.14	1.51	1.78	1.36	1.36	1.669	1.38	16.2
40.06	Winona Safety Improvements	207-212	40.84	0.000	0.0%	0.000	0.0%	3.306	66.3%	0.203	4.1%	1.475	29.6%	4.983	1.14	1.51	1.78	1.36	1.36	1.639	1.23	14.8
40.09	East Winona Safety Improvements	212-218	54.48	0.000	0.0%	0.000	0.0%	2.834	53.3%	0.720	13.5%	1.766	33.2%	5.320	1.14	1.51	1.78	1.36	1.36	1.584	2.15	20.7
40.1	Canyon Diablo West Safety Improvements	218-220	12.27	0.000	0.0%	0.000	0.0%	2.673	58.8%	0.358	7.9%	1.519	33.4%	4.550	1.14	1.51	1.78	1.36	1.36	1.607	2.15	42.2
40.11	Canyon Diablo Safety Improvements	220-229	8.81	0.000	0.0%	0.000	0.0%	1.597	56.0%	0.301	10.5%	0.956	33.5%	2.854	1.14	1.51	1.78	1.36	1.36	1.595	2.15	78.3
40.12	Canyon Diablo East Safety Improvements	229-230	3.46	0.000	0.0%	0.000	0.0%	0.097	23.6%	0.012	3.0%	0.304	73.4%	0.414	1.14	1.51	1.78	1.36	1.36	1.459	2.15	7.0
40.13	Two Guns Safety Improvements	230-234	3.91	0.000	0.0%	0.000	0.0%	0.139	54.2%	0.017	6.5%	0.101	39.3%	0.257	1.14	1.51	1.78	1.36	1.36	1.587	2.15	11.6
40.14	Red Gap Ranch Safety Improvements	240-242	6.78	0.000	0.0%	0.000	0.0%	0.061	5.8%	0.000	0.0%	0.995	94.2%	1.056	1.14	1.51	1.78	1.36	1.36	1.384	1.00	7.1
40.15	West Winslow Pavement Improvements	246-258	150.25	6.609	64.5%	0.000	0.0%	2.266	22.1%	0.229	2.2%	1.135	11.1%	10.239	1.14	1.51	1.78	1.36	1.36	1.311	1.92	12.6
40.16	West Winslow Safety Improvements	246-258	373.31	0.000	0.0%	0.000	0.0%	2.027	57.3%	0.203	5.7%	1.308	37.0%	3.538	1.14	1.51	1.78	1.36	1.36	1.601	1.92	2.1
40.17	East Winslow Safety Improvements	258-266	11.82	0.000	0.0%	0.000	0.0%	0.057	60.2%	0.006	6.7%	0.031	33.1%	0.095	1.14	1.51	1.78	1.36	1.36	1.613	1.85	0.8
40.18	Holbrook Pavement Improvements	286-290	50.08	15.528	67.4%	0.000	0.0%	6.849	29.7%	0.027	0.1%	0.630	2.7%	23.034	1.14	1.51	1.78	1.36	1.36	1.337	1.77	60.1
40.19	Chambers Safety Improvements	326-342	31.84	0.000	0.0%	0.000	0.0%	2.961	89.3%	0.049	1.5%	0.307	9.2%	3.317	1.14	1.51	1.78	1.36	1.36	1.735	1.31	17.8
40.2	Houck Pavement Improvements	342-360	225.37	18.976	84.3%	0.000	0.0%	1.429	6.3%	0.505	2.2%	1.612	7.2%	22.521	1.14	1.51	1.78	1.36	1.36	1.201	1.46	13

Appendix K: Preliminary Scoping Reports for Prioritized Solutions

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Salt River Area Safety Improvements	
City/Town Name: -	**County: Maricopa**
Primary Route/Street: SR 87	
Beginning Limit: MP 177	
End Limit: MP 182	
Project Length: 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: *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 177-182 has a Safety Index significantly above the statewide average, particularly in the NB direction. Secondary performance scores are average or better. Crash data analysis indicates percent of crashes above statewide average related to collisions with pedestrians and fixed objects, 29% failure to yield, 58% in dark conditions, and 29% under the influence. 6 fatal crashes.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high safety need due to crashes.			

1

ADOT **PRELIMINARY SCOPING REPORT**

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 $132,000	Design $416,000	Right-of-Way $0	Construction $4,125,800	Total $4,673,800

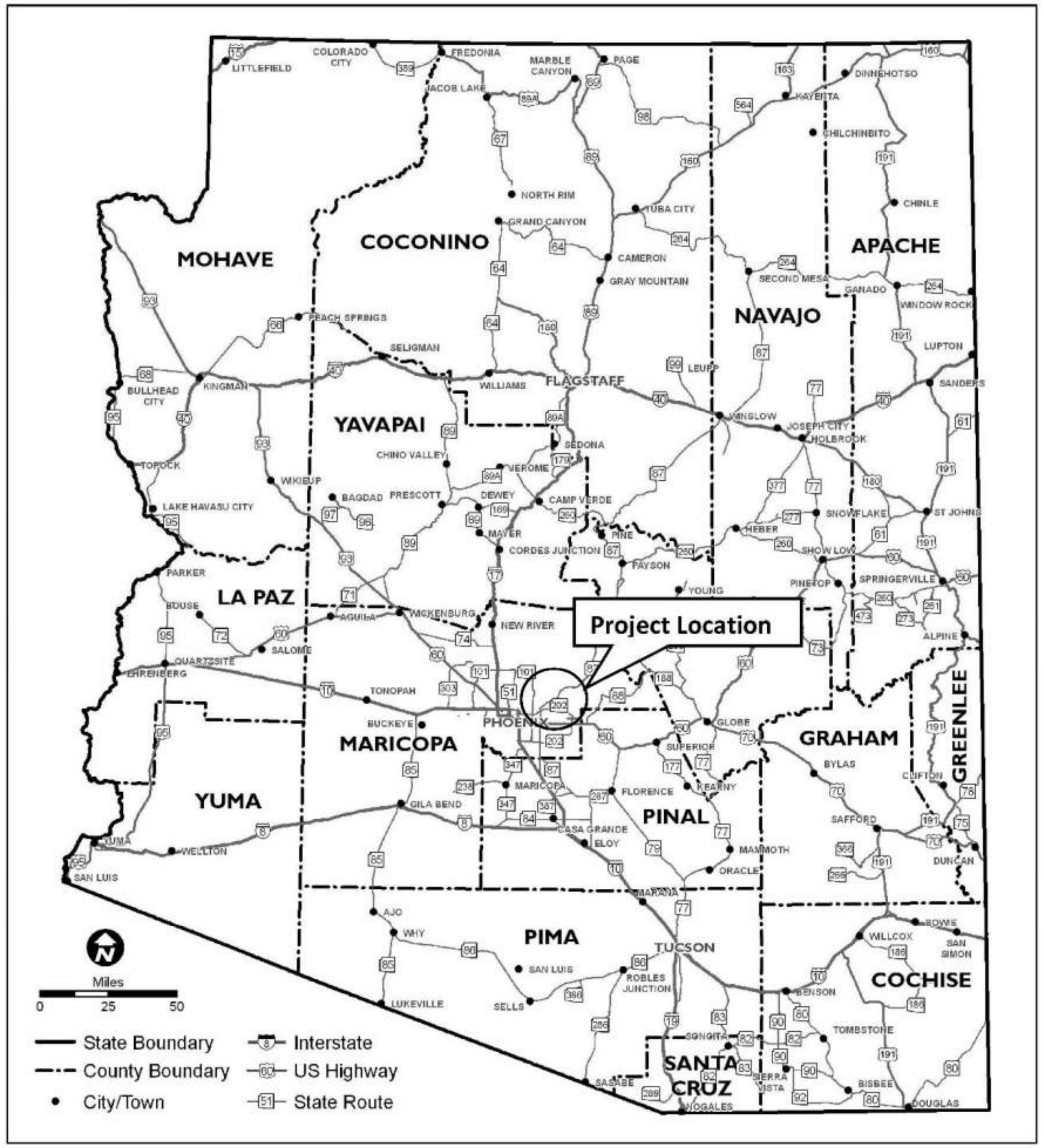
PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**

2

ATTACHMENT 1 – STATE LOCATION MAP



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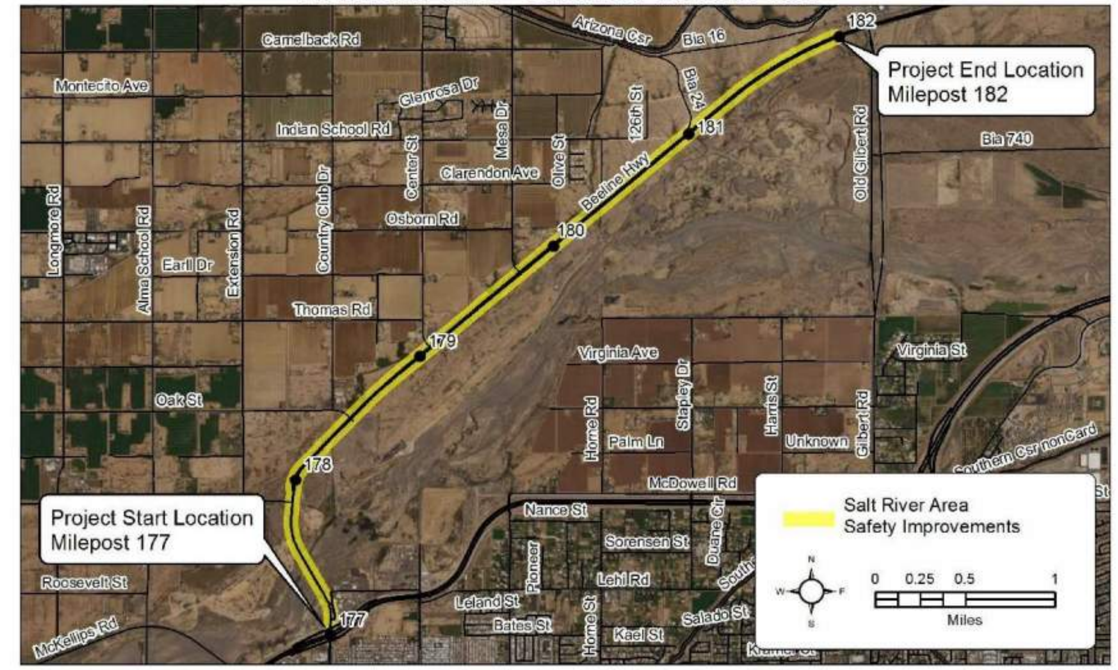
ATTACHMENT 2 – PROJECT VICINITY MAP



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ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install warning signs and chevrons on curved Salt River bridge approaches • Install raised pavement markers along the outside edge line • Install lighting at Oak St (MP 178.0), Center St (MP 179.1), Mesa Dr (MP 179.7), and Camelback Rd (MP 181.1) • Install raised concrete barrier in median on Salt River bridge and approaches (MP 177.0-177.5)

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Bush Highway Area Safety and Freight Improvements	
City/Town Name: -	**County: Maricopa**
Primary Route/Street: SR 87	
Beginning Limit: MP 191	
End Limit: MP 213	
Project Length: 14 miles in total	
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: *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 191-213, high level of need in the SB direction, motorcycle crashes. Crash data analysis indicates percent of crashes above statewide average related to overturning and other non-collision crashes, 72% involve single vehicle, 50% run off road (left or right), and 11% sideswipe in same direction. 7 fatal crashes and 7 involving motorcycles. Freight Need: MP 191-213 has a high level of need based on the overall Freight Index, SB directional PTI scores, closure duration in the NB direction.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high safety and freight needs.			

1

ADOT **PRELIMINARY SCOPING REPORT**

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:	

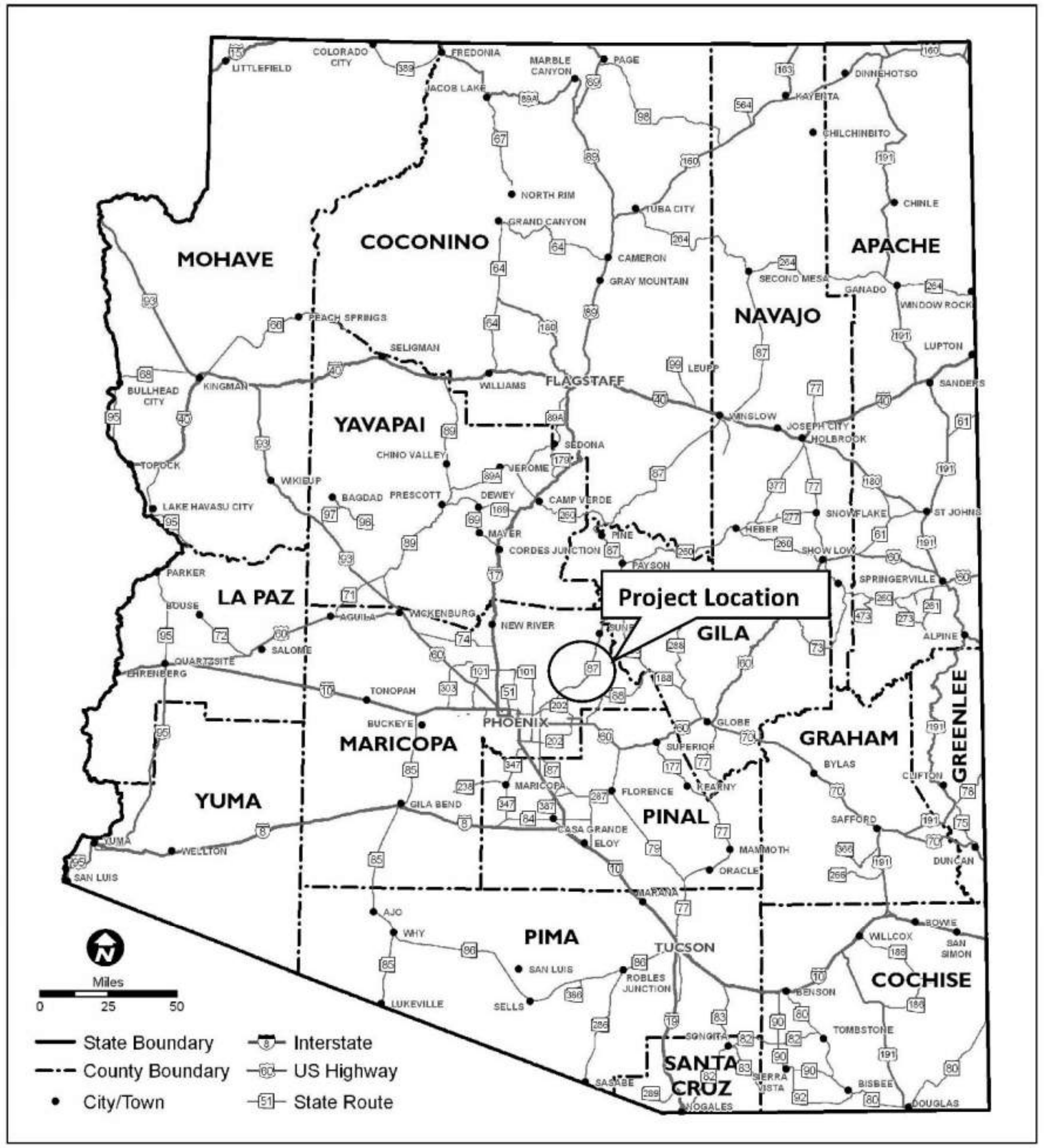
COST ESTIMATE				
Preliminary Engineering $180,000	Design $600,000	Right-of-Way $0	Construction $6,016,000	Total $6,796,000

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**

2

ATTACHMENT 1 – STATE LOCATION MAP



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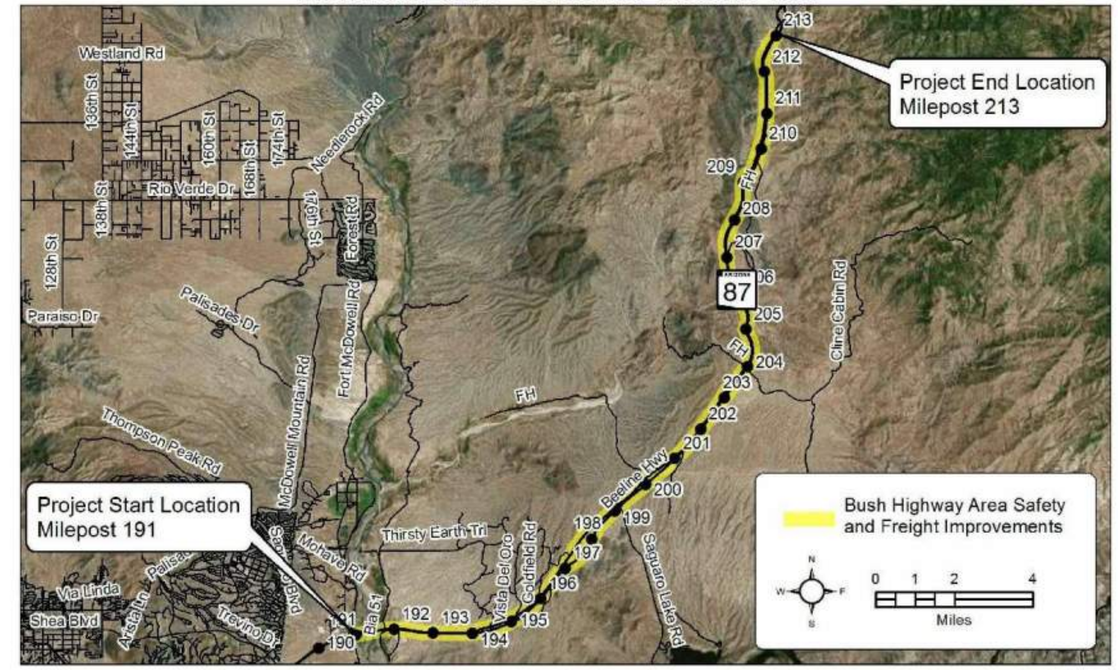
ATTACHMENT 2 – PROJECT VICINITY MAP



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ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Rehabilitate shoulders (NB/SB MP 194-205) • Install speed feedback signs (NB MP 206.5 and 207.7, NB/SB before curves and intersection with FR 68 [MP 209.6]) • Widen inside shoulders (SB MP 209-211

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Sunflower Area Safety Improvements	
City/Town Name: -	**County: Maricopa/Gila**
Primary Route/Street: SR 87	
Beginning Limit: MP 213	
End Limit: MP 235	
Project Length: 21 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: *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 213-235 high level of need relative to the Safety Index with little directional variation, motorcycle-related crashes. Crash data analysis indicates percent of crashes above statewide average related to collision with fixed object and other non-collision crashes, 80% involve single vehicle, 53% speed to fast for conditions, and 80% run off road (left or right), and 80% single vehicle. 9 fatal crashes, 21 incapacitating injury, and 15 involving motorcycles.

Safety Hot Spot: Crash concentration NB MP 213-215

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

Address high safety need and high crash concentration NB MP 213-215

1

ADOT **PRELIMINARY SCOPING REPORT**

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
$480,000	$1,630,000	$0	$16,215,000	$18,325,000

PROJECT DELIVERY

Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:

Design Program Year: FY

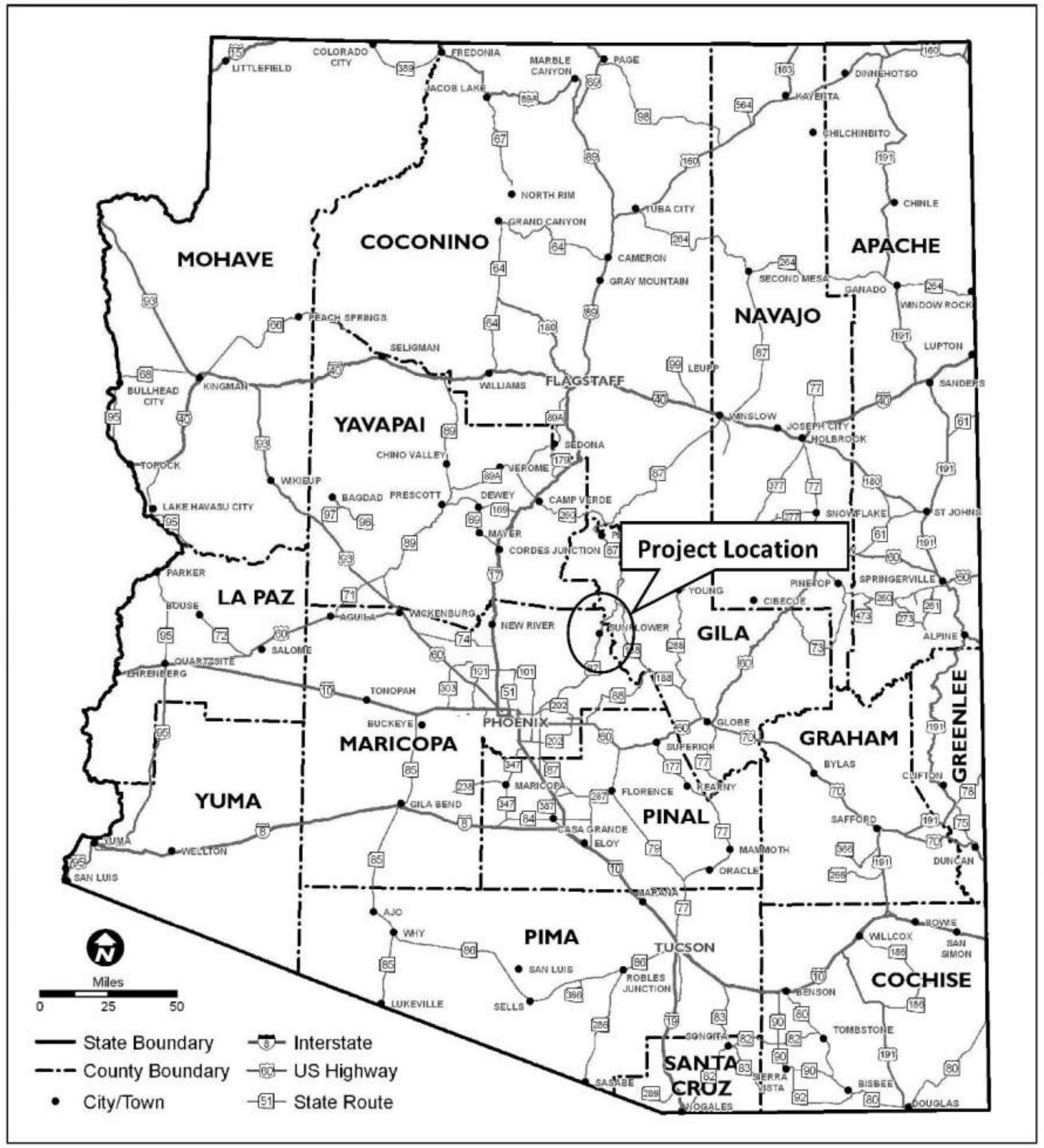
Construction Program Year: FY

ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**

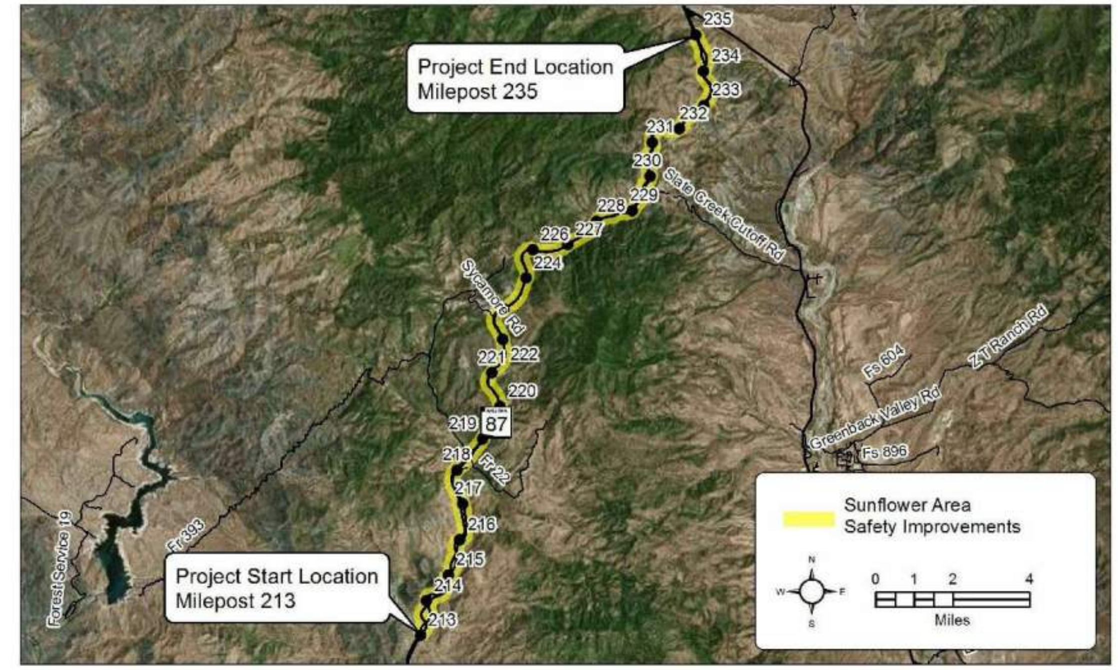
2

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install speed feedback signs and speed advisory warning signs with flashing beacons at curves (NB MP 213.2, 214.0, 217.8, 220.5, 224.5, 232.5; SB MP 231.0, 229.3, 221.0, 219.6, 216.0, 214.3) • Rehabilitate shoulders • Widen inside shoulders (SB MP 228.5-226.0) • Install rock-fall mitigation (NB MP 214.2-214.6; SB MP 228.9-228.7, 228.5-228.0, 217.6-218.0).

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Sunflower Area Freight Improvements	
City/Town Name: -	**County: Maricopa/Gila**
Primary Route/Street: SR 87	
Beginning Limit: MP 213	
End Limit: MP 223	
Project Length: 6 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: *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: MP 213-215 has a high level of need based on the overall Freight Index, NB directional Travel Time Index (TTI), and both directional Planning Time Index scores, and closure duration in the NB direction.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high freight need.			

1

ADOT **PRELIMINARY SCOPING REPORT**

PROJECT TYPE		
Pavement Preservation ☐	Roadway Widening ☐	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☐	Sign Replacement ☐
Other ☒ :Bridge Widening		

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:	

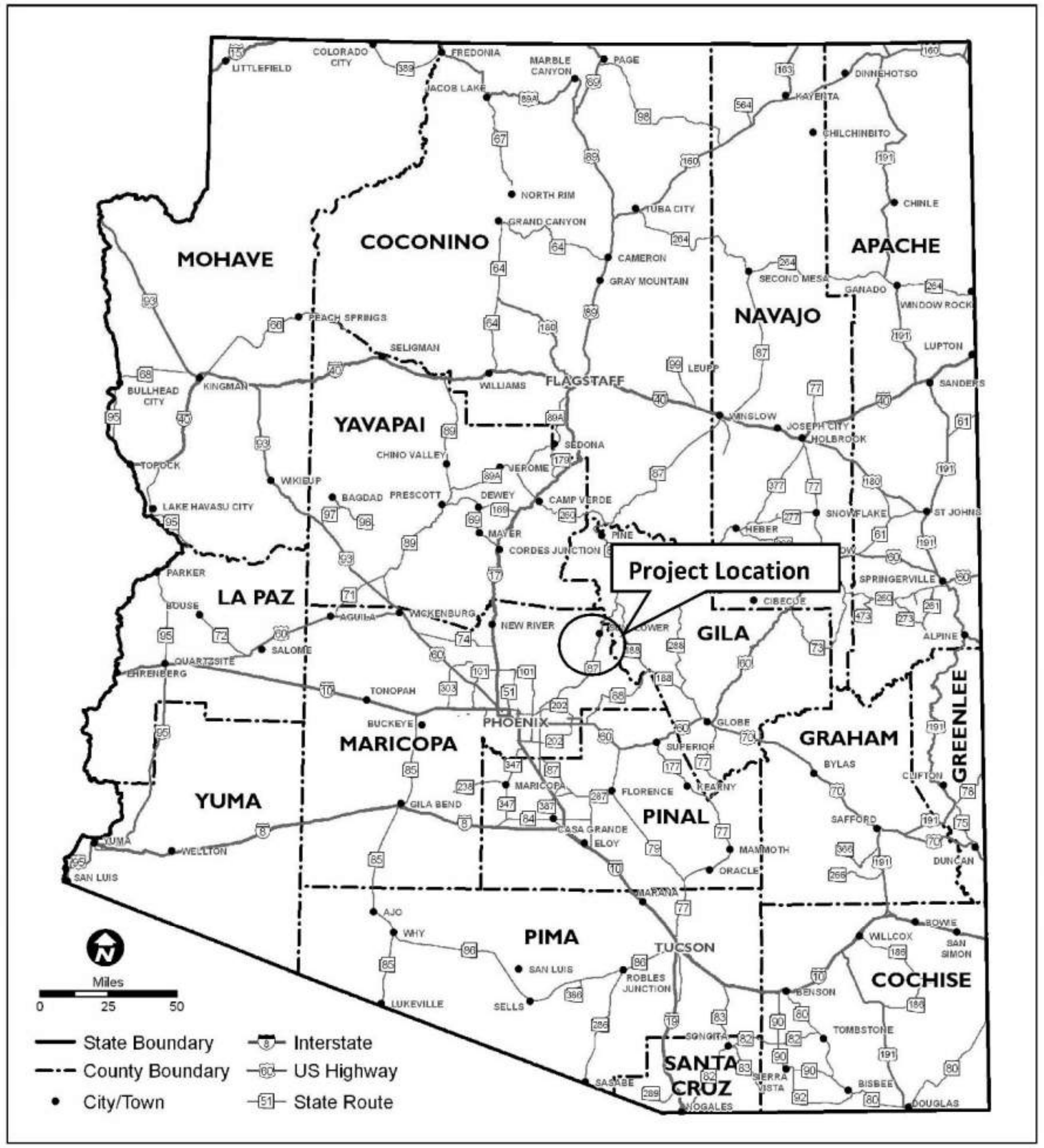
COST ESTIMATE				
Preliminary Engineering $1,160,000	Design $3,840,000	Right-of-Way $0	Construction $38,353,710	Total $43,353,710

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**

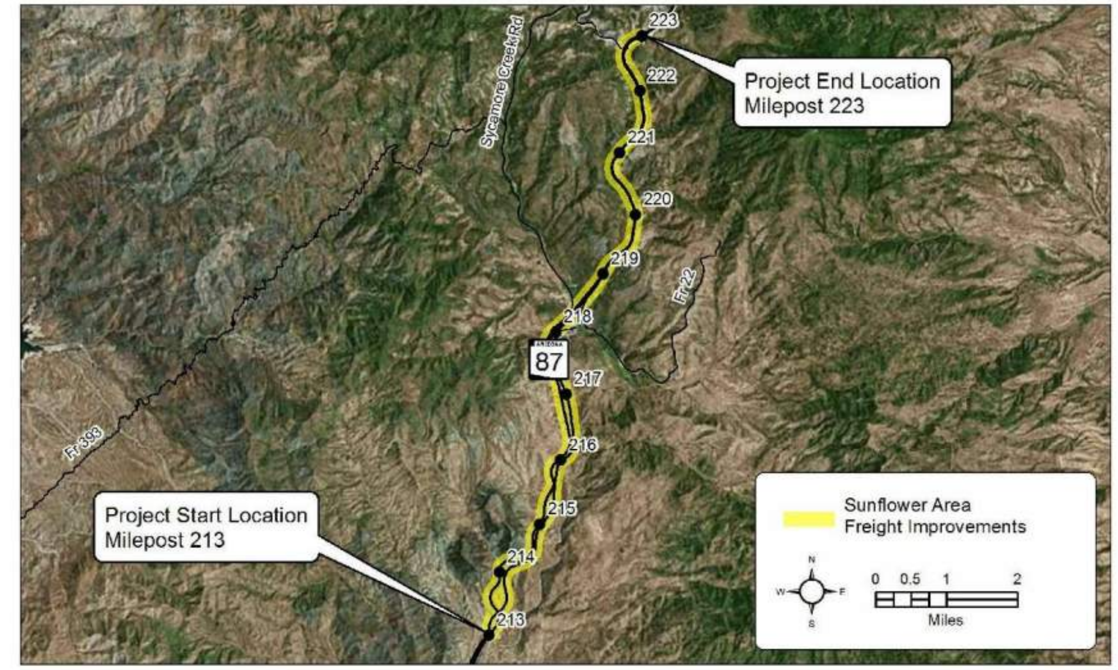
2

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct NB climbing lane, MP 213-215 and MP 219-223 • Widen Whiskey Springs Bridge, #2515 MP 220.32 • Widen Upper Kitty Joe Bridge, #2497 MP 221.39

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Slate Creek Pavement Improvements	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 87	
Beginning Limit: MP 224	
End Limit: MP 226	
Project Length: 1 mile	
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: *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
Pavement Need: MP 224-226 NB/SB - District feedback suggests poor pavement performance in the area. High historical investment identified.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address pavement need.			

1

ADOT **PRELIMINARY SCOPING REPORT**

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:	

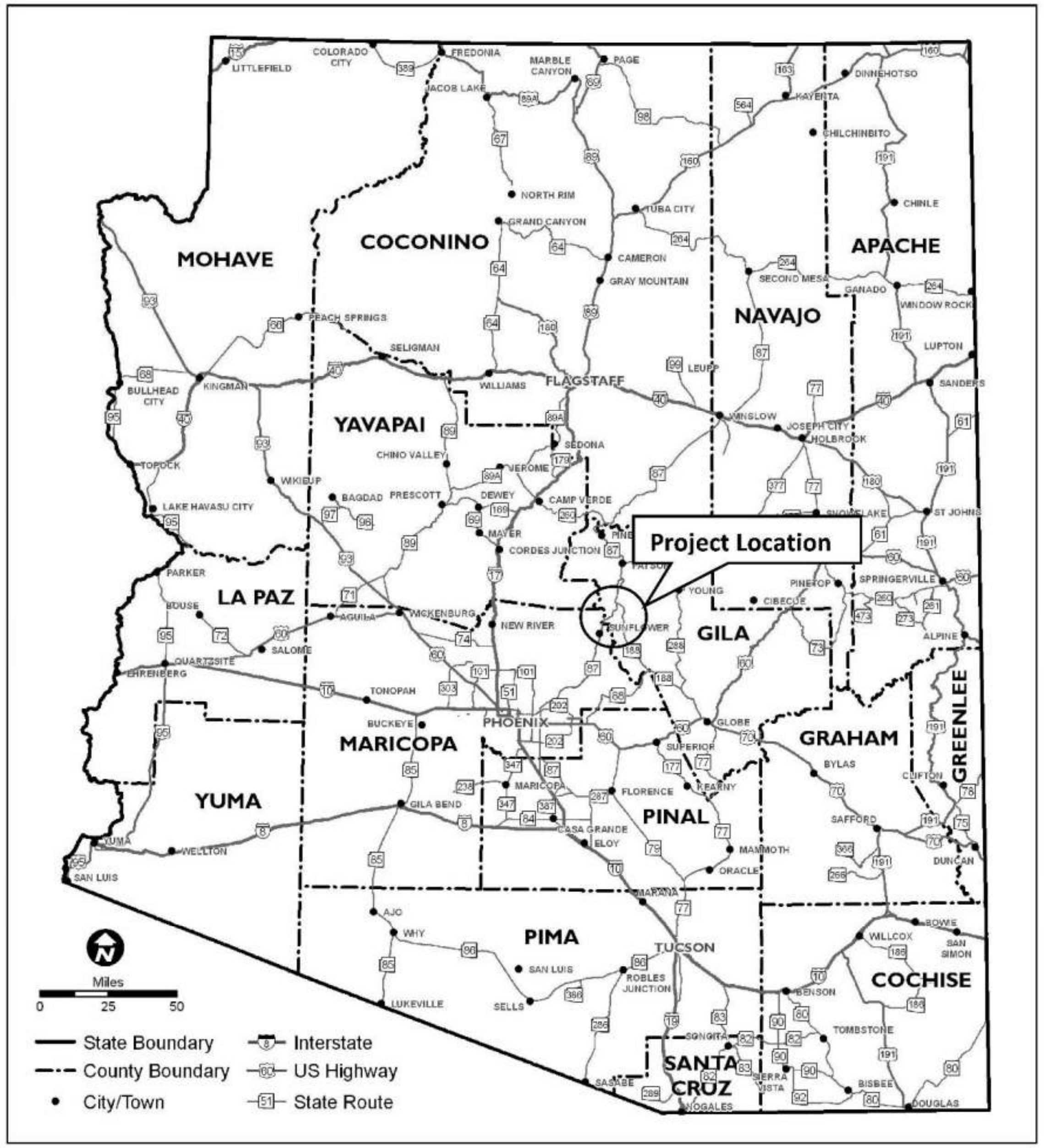
COST ESTIMATE				
Preliminary Engineering $190,000	Design $640,000	Right-of-Way $0	Construction $6,360,000	Total $7,190,000

PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

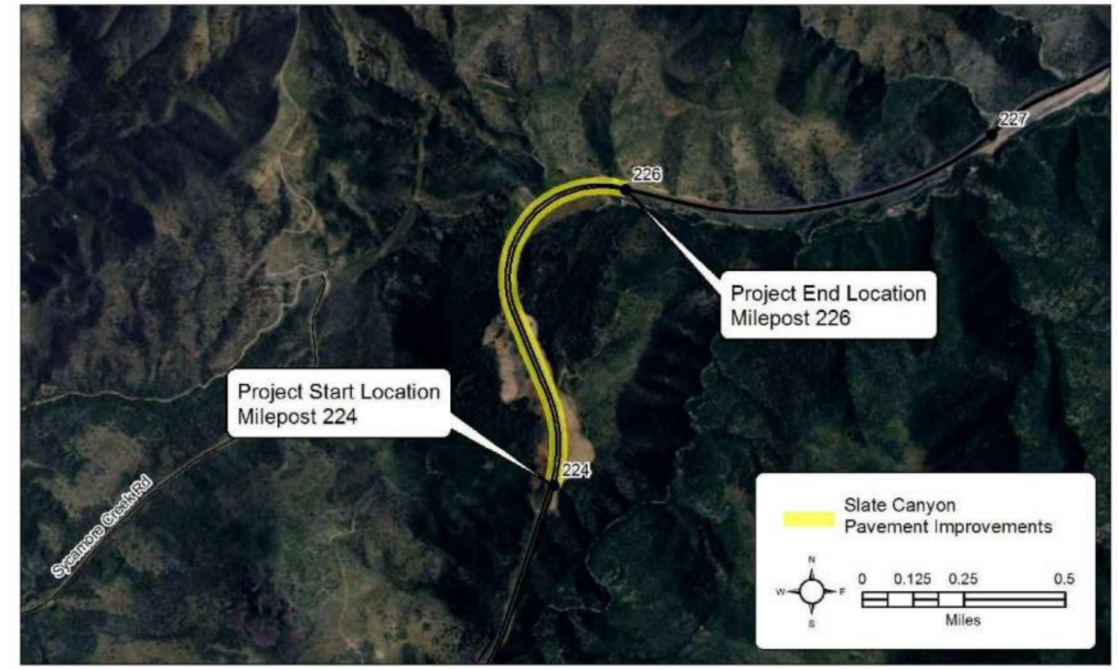
ATTACHMENTS
1) **State Location Map** 2) **Project Vicinity Map** 3) **Project Scope of Work**

2

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Replace pavement MP 224-226

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Rye Area Safety and Freight Improvements	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 87	
Beginning Limit: MP 235	
End Limit: MP 241	
Project Length: 6 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: *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: MP 235-241 has a high level of need based on the overall Freight Index, SB directional PTI scores. Safety Need: MP 235-241 SB Directional Safety Index high level of need.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address safety and freight need.			

1

ADOT **PRELIMINARY SCOPING REPORT**

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:	

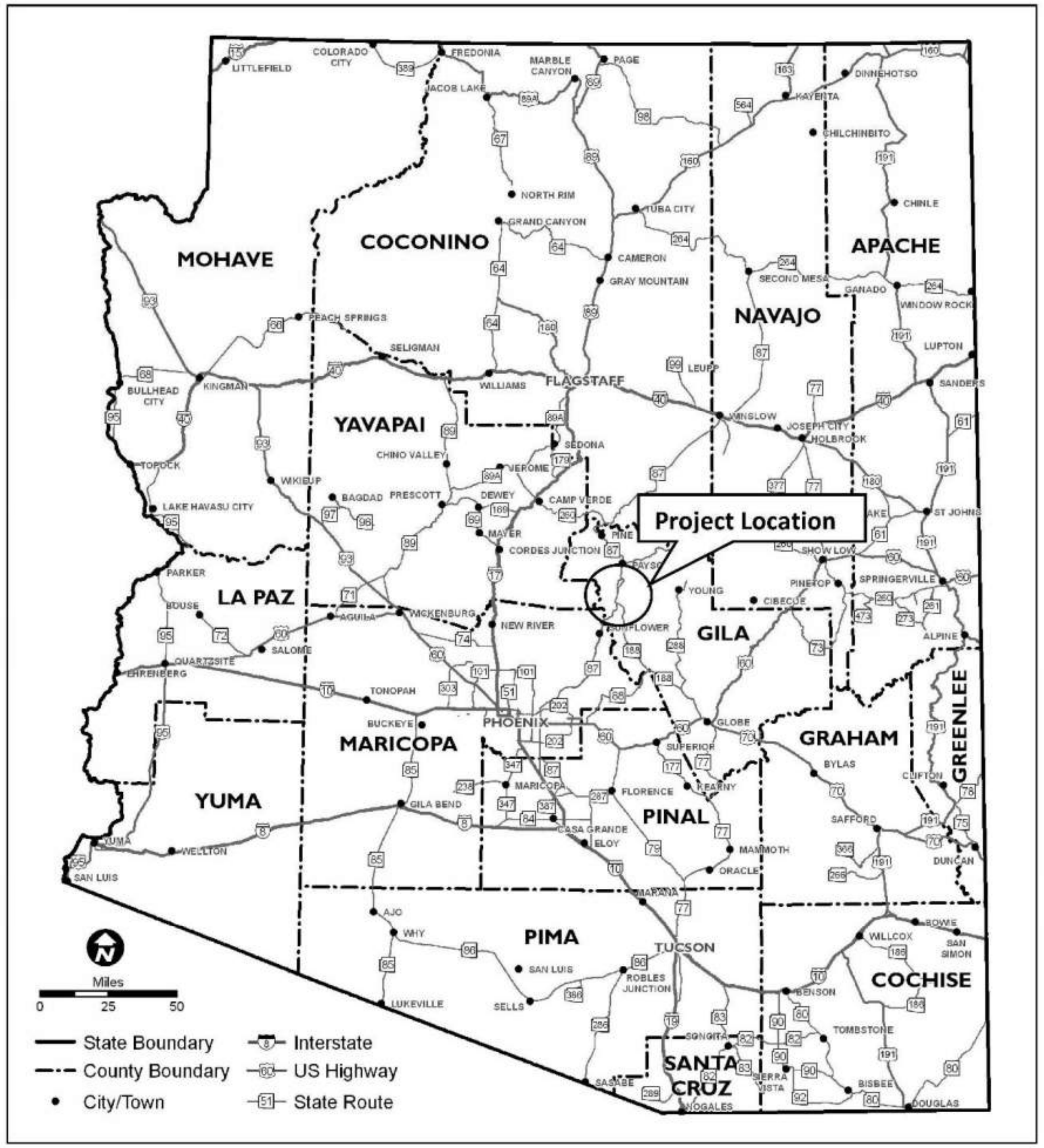
COST ESTIMATE				
Preliminary Engineering $6,000	Design $18,000	Right-of-Way $0	Construction $198,000	Total $222,000

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**

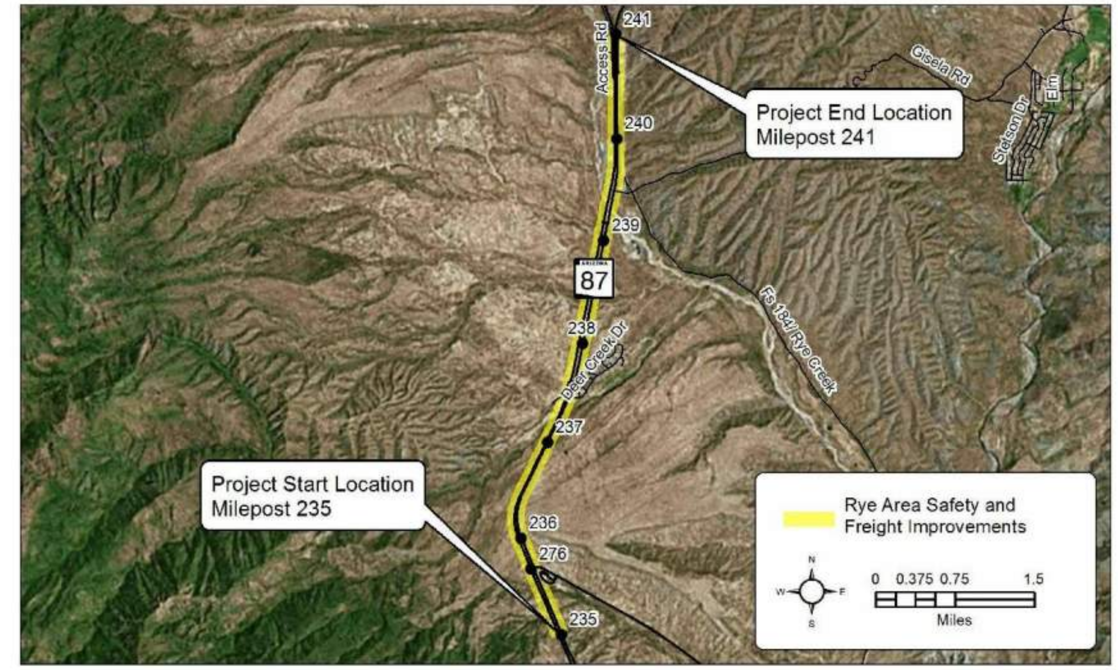
2

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install advisory sign about approaching area with intersections (Deer Creek Drive [MP 237.6], Gisela Road [MP 239.5], two intersections in Rye [MP 240.5 and MP 240.8]) • Install reduced speed advisory sign on SR 87 (NB MP 240, SB MP 241) • Install speed feedback signs (NB MP 240, SB MP 241) • On SR 188 approaching SR 87 add flashing beacons to WB stop sign.

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Ox Bow Estates Area Safety Improvements	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 87	
Beginning Limit: MP 241	
End Limit: MP 250	
Project Length: 9 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: *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 Needs: MP 241-250 has a high level of need based on the SB directional Safety Index and high rate of fatal and incapacitating injury crashes involving Strategic Highway Safety Plan Top 5 Emphasis Areas. Crash data analysis indicates percent of crashes above statewide average related to collision with fixed object, overturning, and other non-collision crashes, 86% involve single vehicle, 21% inattention, and 93% run off road (left or right) or crossed centerline, and 50% under the influence. 6 fatal crashes, 8 incapacitating injury crashes, and 2 involving motorcycles. Safety Hot Spot: Crash concentration SB MP 245-248

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address safety need and high crash concentration MP 245-248			

1

ADOT **PRELIMINARY SCOPING REPORT**

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:	

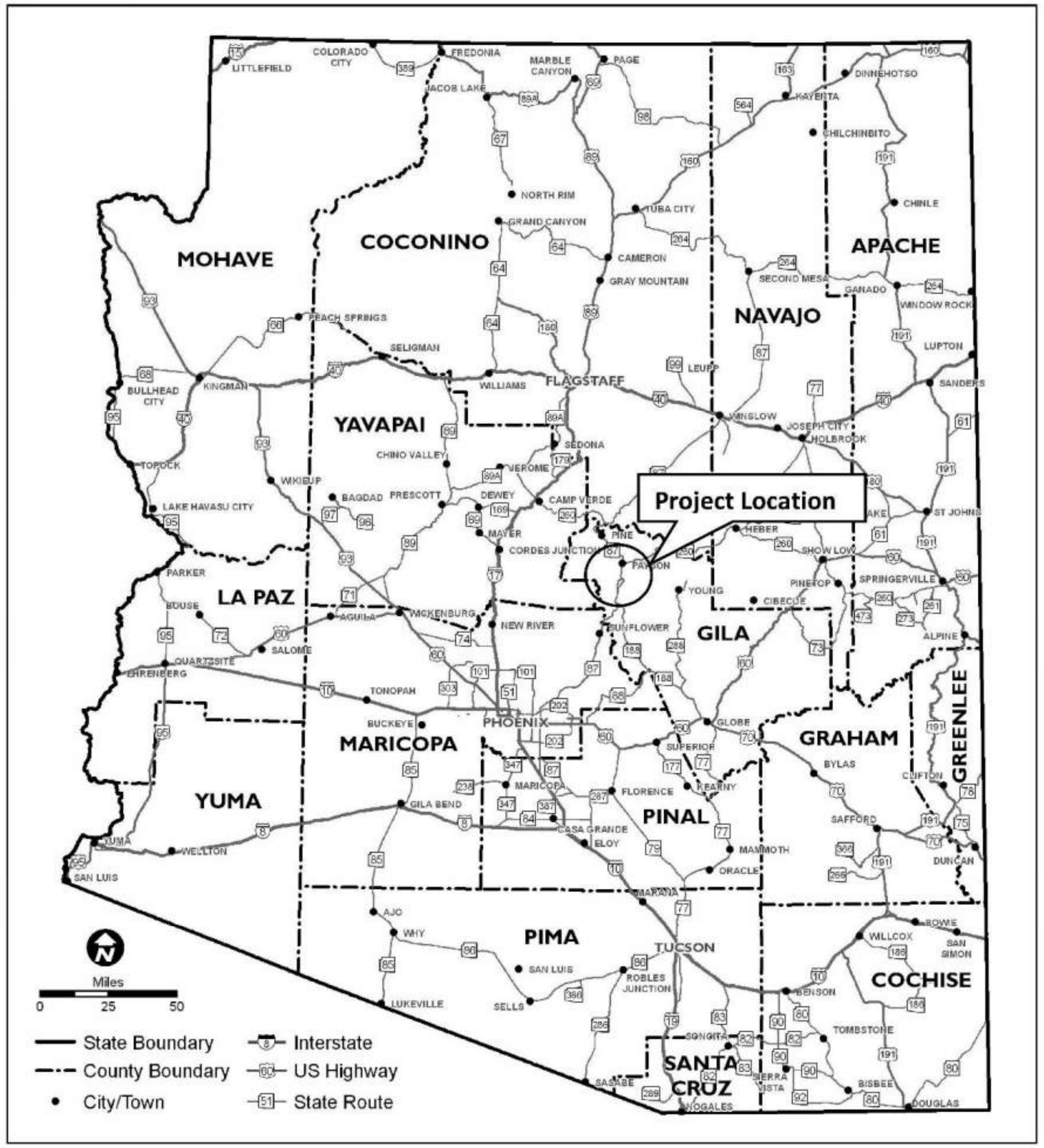
COST ESTIMATE				
Preliminary Engineering $112,000	Design $360,000	Right-of-Way $0	Construction $3,639,000	Total $4,111,000

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**

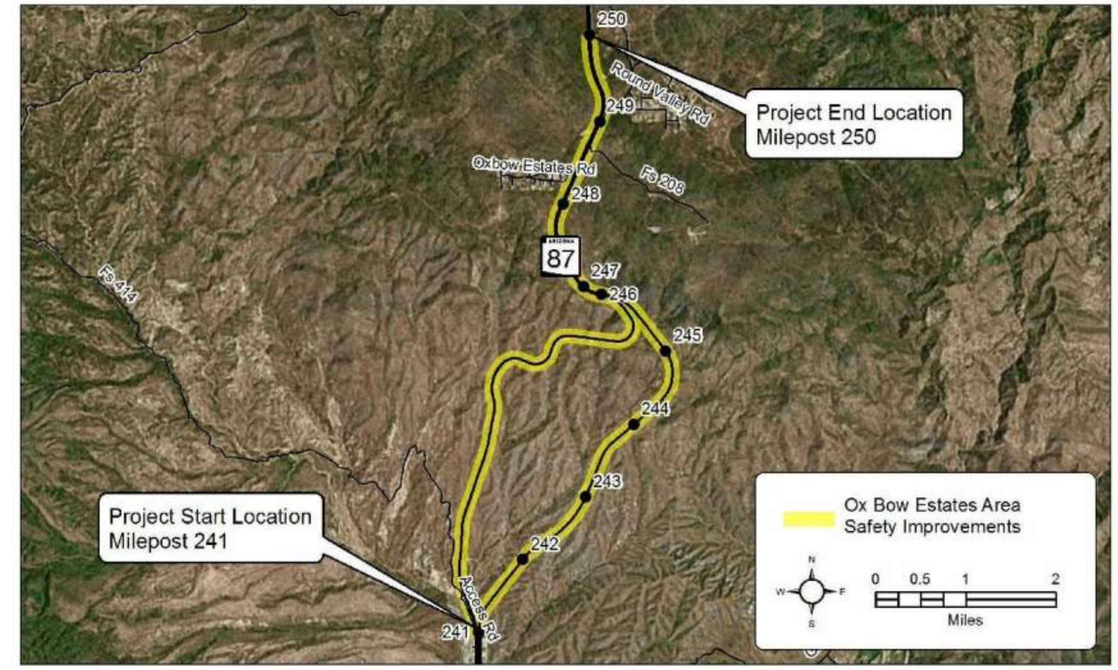
2

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install speed feedback signs and speed advisory warning signs with flashing beacons at curves (SB MP 247, MP 245) • Implement variable speed limits MP 241-246 with new DMS and CCTV SB at MP 247 and new DMS and CCTV NB at MP 240 • Install RWIS at MP 245 with dynamic weather warning beacons

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Ox Bow Estates Area Freight Improvements	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 87	
Beginning Limit: MP 243	
End Limit: MP 247	
Project Length: 4 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: *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: MP 241-250 has a high level of need based on the overall Freight Index, NB directional TTI, and both directional PTI scores, closure duration in the SB direction.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high freight need.			

1

ADOT **PRELIMINARY SCOPING REPORT**

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 $590,000	Design $1,980,000	Right-of-Way $0	Construction $19,800,000	Total $22,370,000

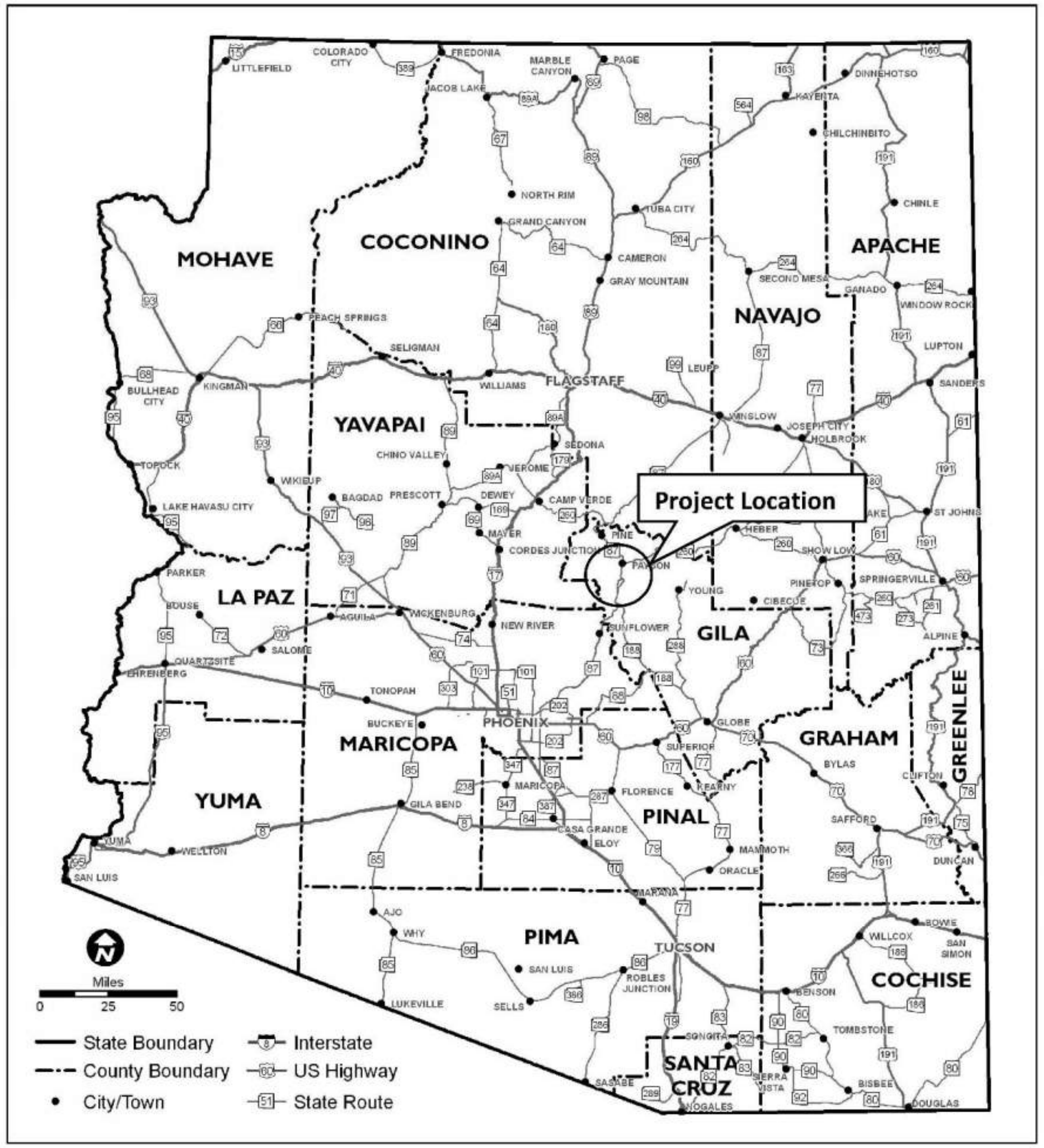
PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**

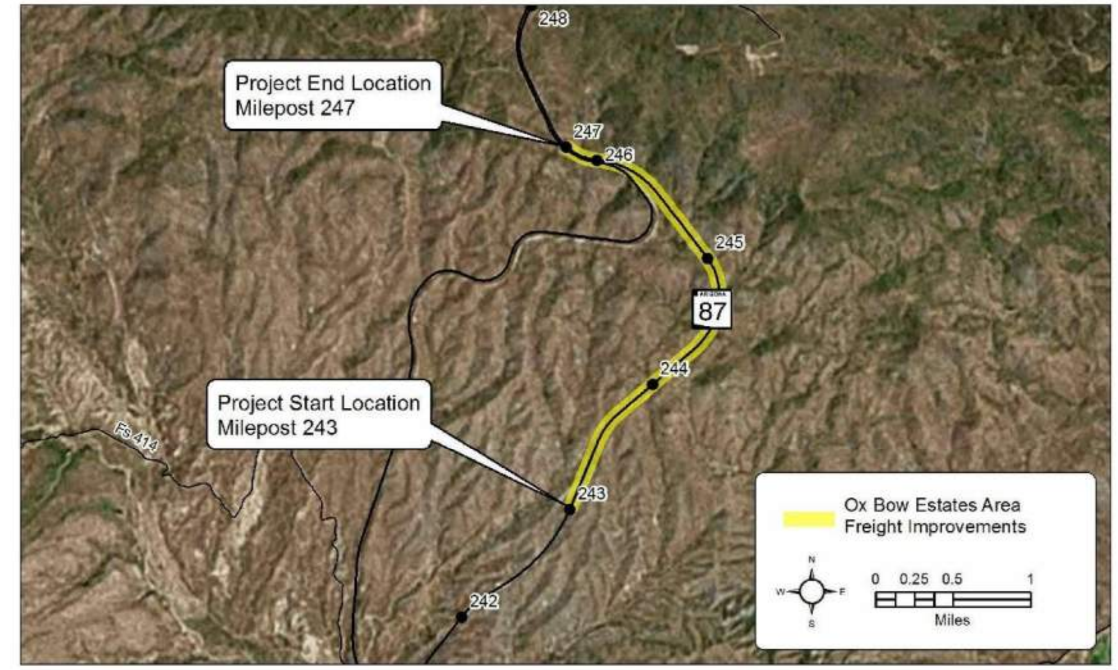
2

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct NB climbing lane •

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Mazatzal Area Safety Improvements	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 87	
Beginning Limit: MP 246	
End Limit: MP 251	
Project Length: 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: *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 241-250 has a high level of need based on the SB directional Safety Index and high rate of fatal and incapacitating injury crashes involving Strategic Highway Safety Plan (SHSP) Top 5 Emphasis Areas. Crash data analysis indicates percent of crashes above statewide average related to collision with fixed object, overturning, and other non-collision crashes, 86% involve single vehicle, 21% inattention, and 93% run off road (left or right) or crossed centerline, and 50% under the influence. 6 fatal crashes, 8 incapacitating injury crashes, and 2 involving motorcycles. Safety Hot Spot: Crash concentration SB MP 245-248

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high safety need and high crash concentration MP 245-248			

1

ADOT **PRELIMINARY SCOPING REPORT**

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:	

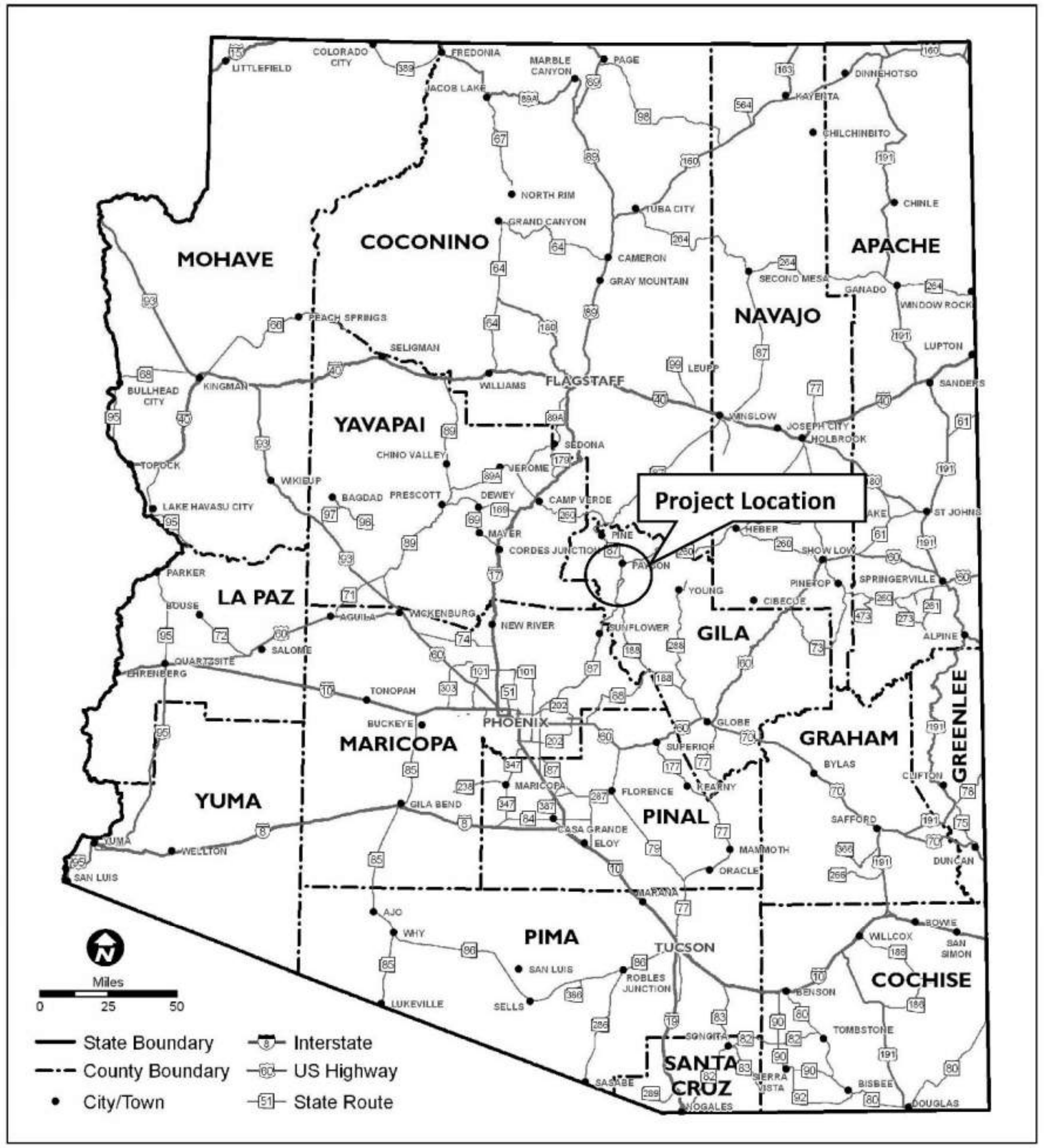
COST ESTIMATE				
Preliminary Engineering $60,000	Design $200,000	Right-of-Way $0	Construction $2,021,000	Total $2,281,000

PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

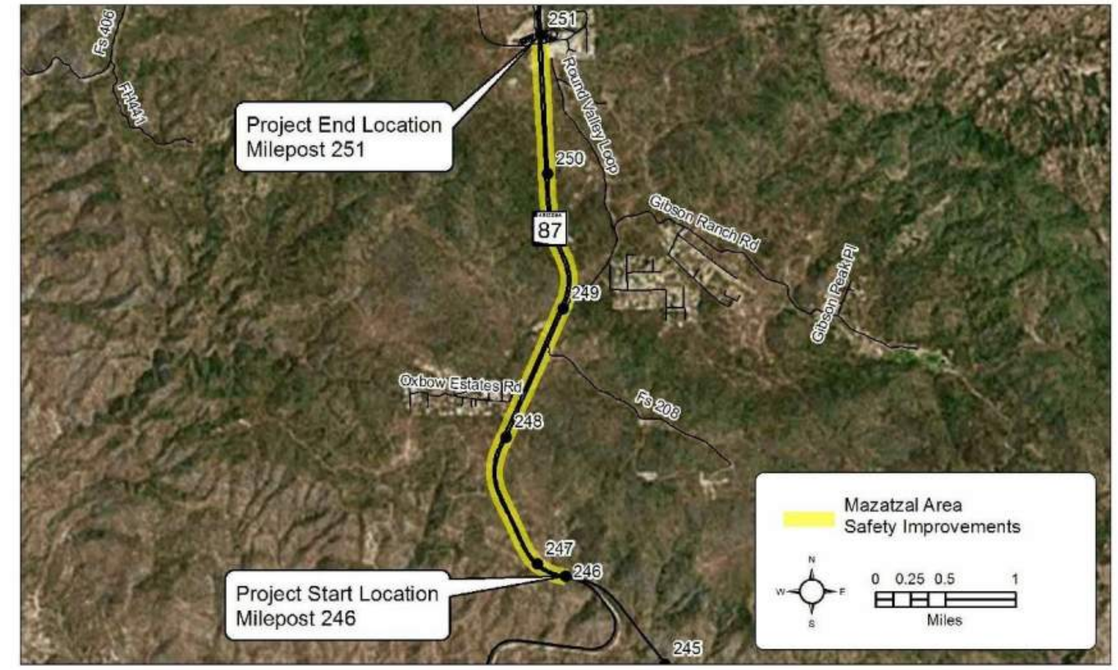
ATTACHMENTS
1) State Location Map **2) Project Vicinity Map** **3) Project Scope of Work**

2

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Widen shoulders SB MP 246.2-250.9

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Payson Area Safety and Freight Improvements	
City/Town Name: Payson, AZ	**County: Gila**
Primary Route/Street: SR 87/SR 260	
Beginning Limit: SR 87 MP 251	
End Limit: SR 260 MP 253	
Project Length: 3 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: *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: High level of need based on the overall Freight Index, EB directional PTI scores. Safety Hot Spot: Crash concentration EB MP 252-253

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high freight need and high crash concentration.			

ADOT **PRELIMINARY SCOPING REPORT**

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)*	

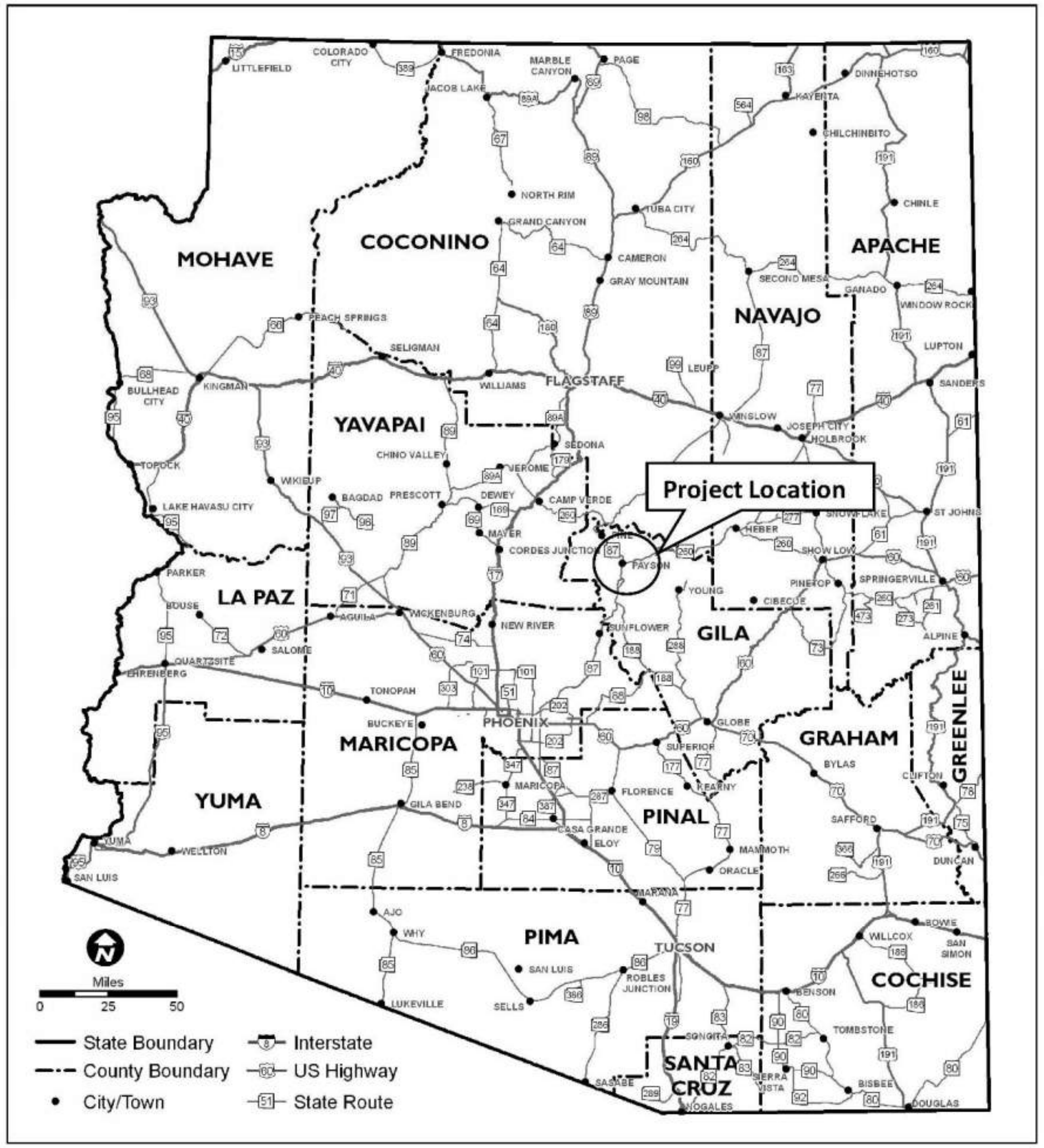
FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$11,000	$35,000	$0	$395,500	$441,500

PROJECT DELIVERY		
Delivery: ☐ Design-Bid-Build	☐ Design-Build	☐ Other:
Design Program Year: FY		
Construction Program Year: FY		

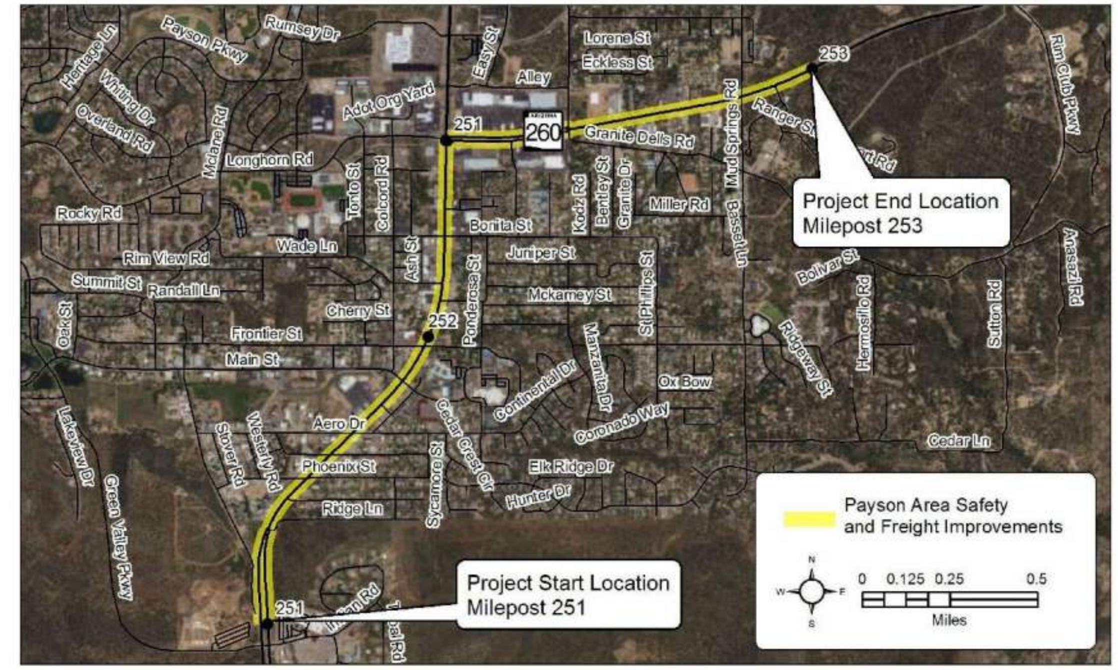
ATTACHMENTS
1) **State Location Map** 2) **Project Vicinity Map** 3) **Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Implement signal coordination/adaptive control for six signals in Payson urban area (SR 87/SR 260 intersection, SR 260/Payson Village Center, SR 260/Manzanita Dr, SR 87/Main St, SR 87/Bonita St, and SR 87/Green Valley Pkwy [BIA 101])   • Implement protected/permitted left-turn phasing at SR 87/Manzanita Dr intersection (NB and SB approaches) and provide advance signal advisory sign with flashing beacons WB on SR 260

5

PRELIMINARY SCOPING REPORT

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Lion Springs Area Mobility and Freight Improvements	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 260	
Beginning Limit: MP 256	
End Limit: MP 260	
Project Length: 4 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: *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

Mobility Need: MP 256-260 has a poor Mobility Index performance score that reflects a high level of need for both existing and future Volume/Capacity performance. This segment also exhibits poor performance in the EB directional PTI and poor Bicycle accommodation. This segment has a percentage of weather related closures greater than the statewide average.

Freight Need: MP 256-260 has a high level of need based on the overall Freight Index, EB directional PTI scores, closure duration in the WB direction.

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☐	Expansion ☒

Address high mobility and freight needs.

1

ADOT

PRELIMINARY SCOPING REPORT

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 $1,200,000	Design $4,000,000	Right-of-Way $4,815,360	Construction $39,984,640	Total $50,000,000

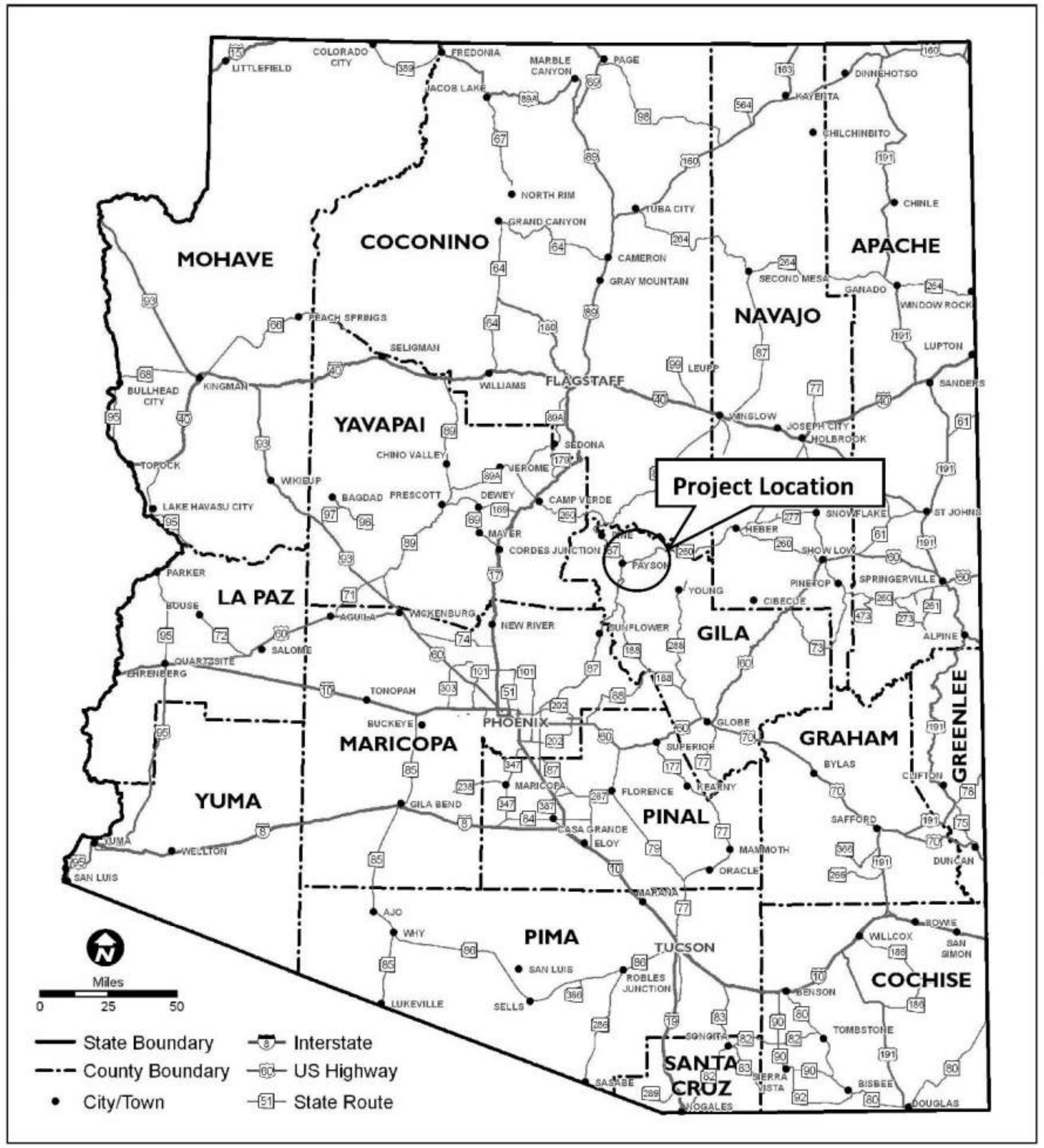
PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY 2021
Construction Program Year: FY

ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**

2

ATTACHMENT 1 – STATE LOCATION MAP



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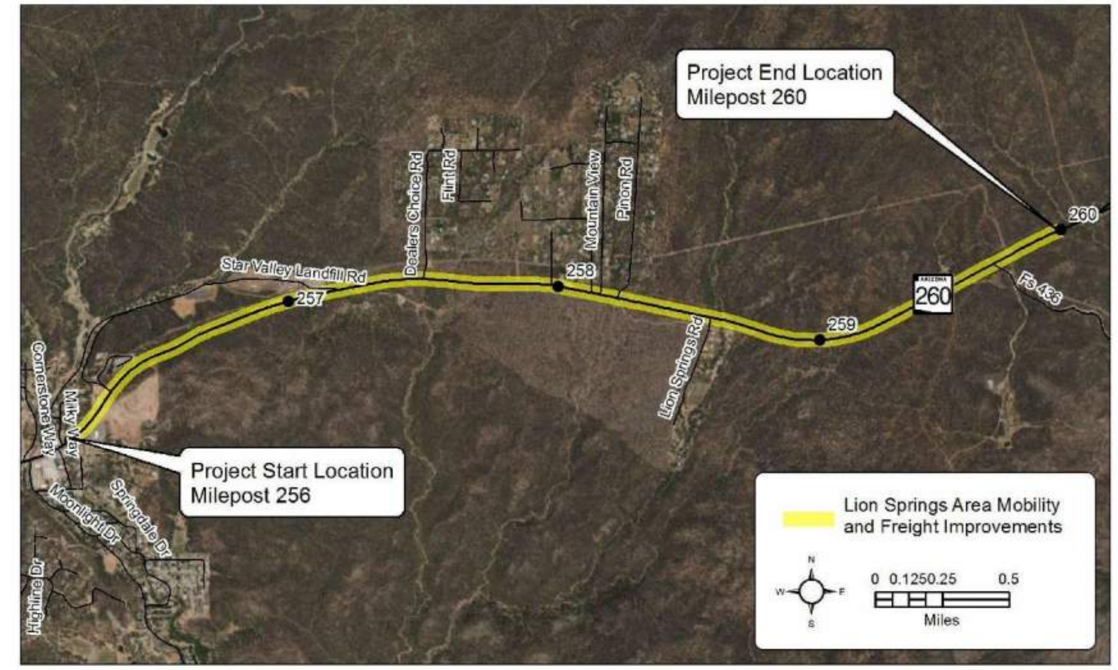
ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Reconstruct to 4-lane divided highway (using the existing 2-lane road for one direction)

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Christopher Creek Area Freight Improvements	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 260	
Beginning Limit: MP 260	
End Limit: MP 277	
Project Length: Approx. 6 miles in total	
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: *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: MP 260-277 has a high level of need based on the overall Freight Index, both directional PTI scores, and closure duration in both directions.

PROJECT PURPOSE

What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

Address high freight need.

ADOT **PRELIMINARY SCOPING REPORT**

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:	

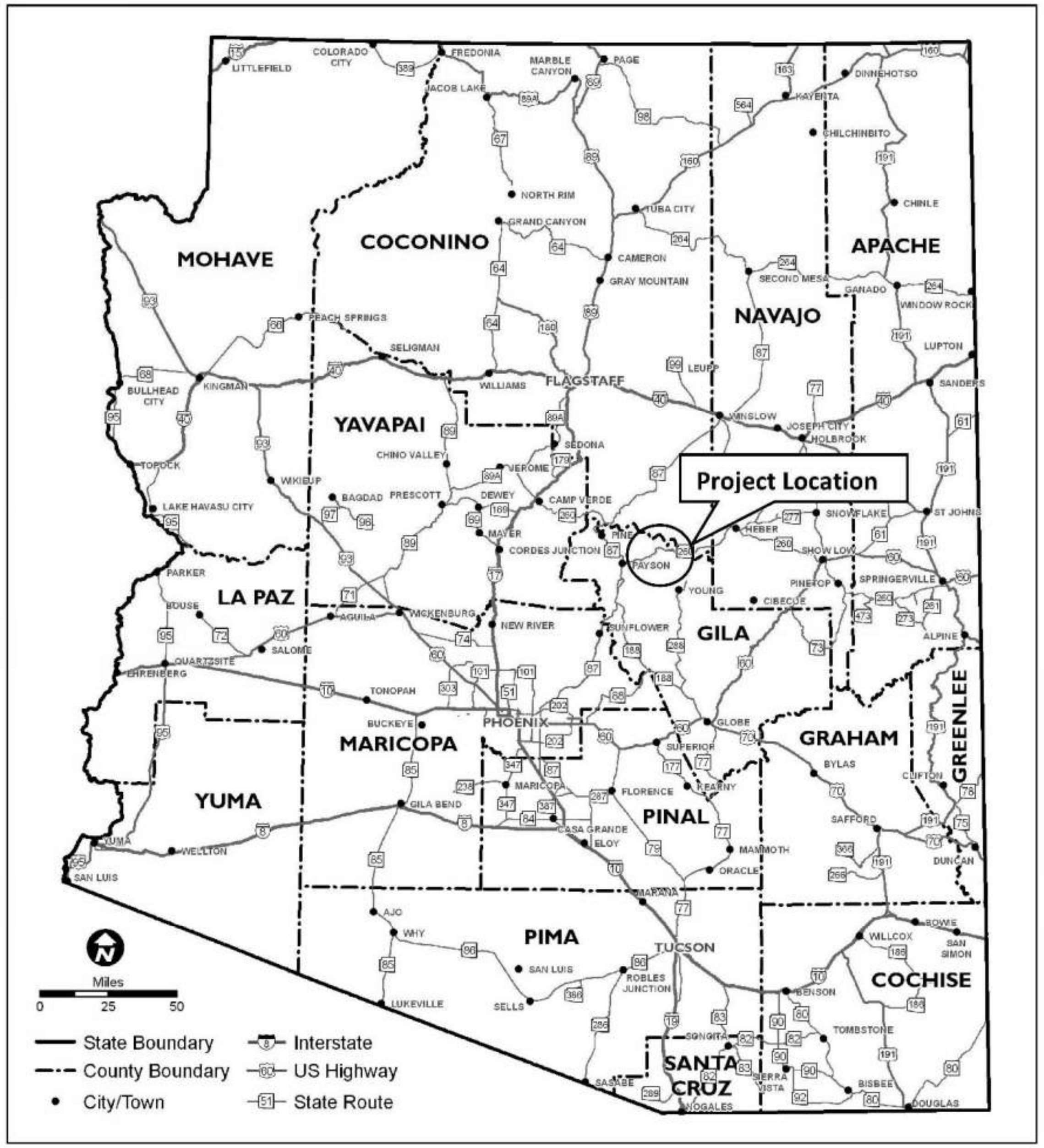
COST ESTIMATE				
Preliminary Engineering $192,000	Design $640,000	Right-of-Way $0	Construction $6,325,200	Total $7,157,200

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**

ATTACHMENT 1 – STATE LOCATION MAP



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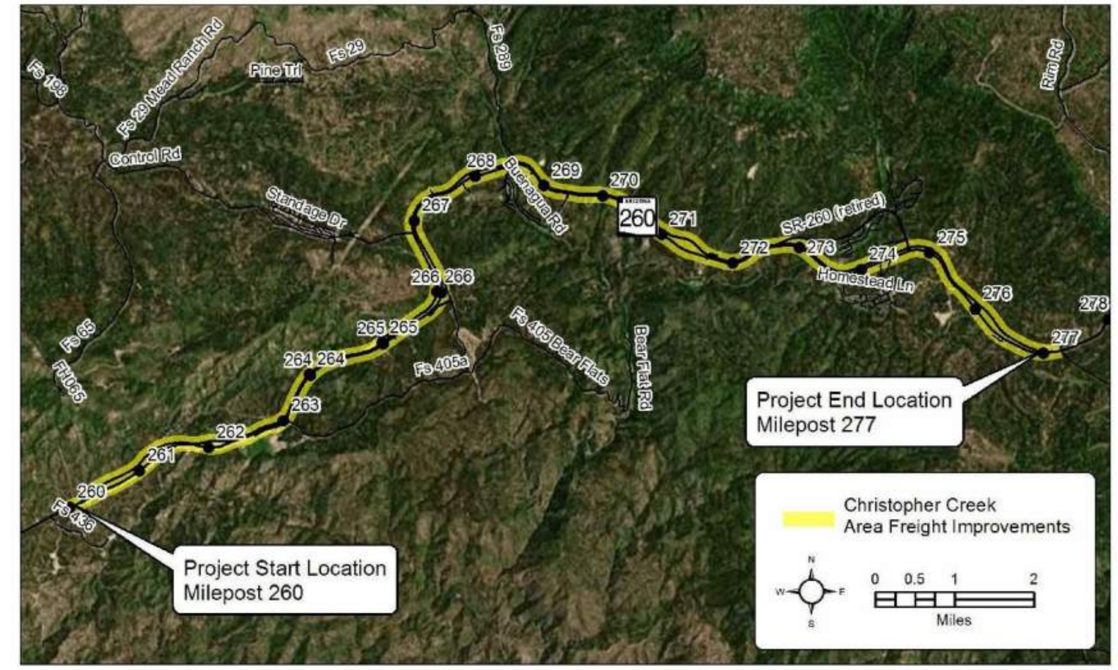
ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install rock-fall mitigation (WB MP 262.2-262.6, 261.9-261.6, 269.8-267.0; EB MP 269.9, 271.5, 272.7) • Implement variable speed limits at MP 272-277 and new DMS and CCTV at MP 272 EB.

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Mogollon Rim Area Freight Improvements	
City/Town Name: -	**County: Gila/Coconino**
Primary Route/Street: SR 260	
Beginning Limit: MP 277	
End Limit: MP 282	
Project Length: 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: *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: MP 277-282 has a high level of need based on the overall Freight Index, EB directional TTI and PTI scores, and closure duration in both directions.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high freight needs.			

1

ADOT **PRELIMINARY SCOPING REPORT**

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:	

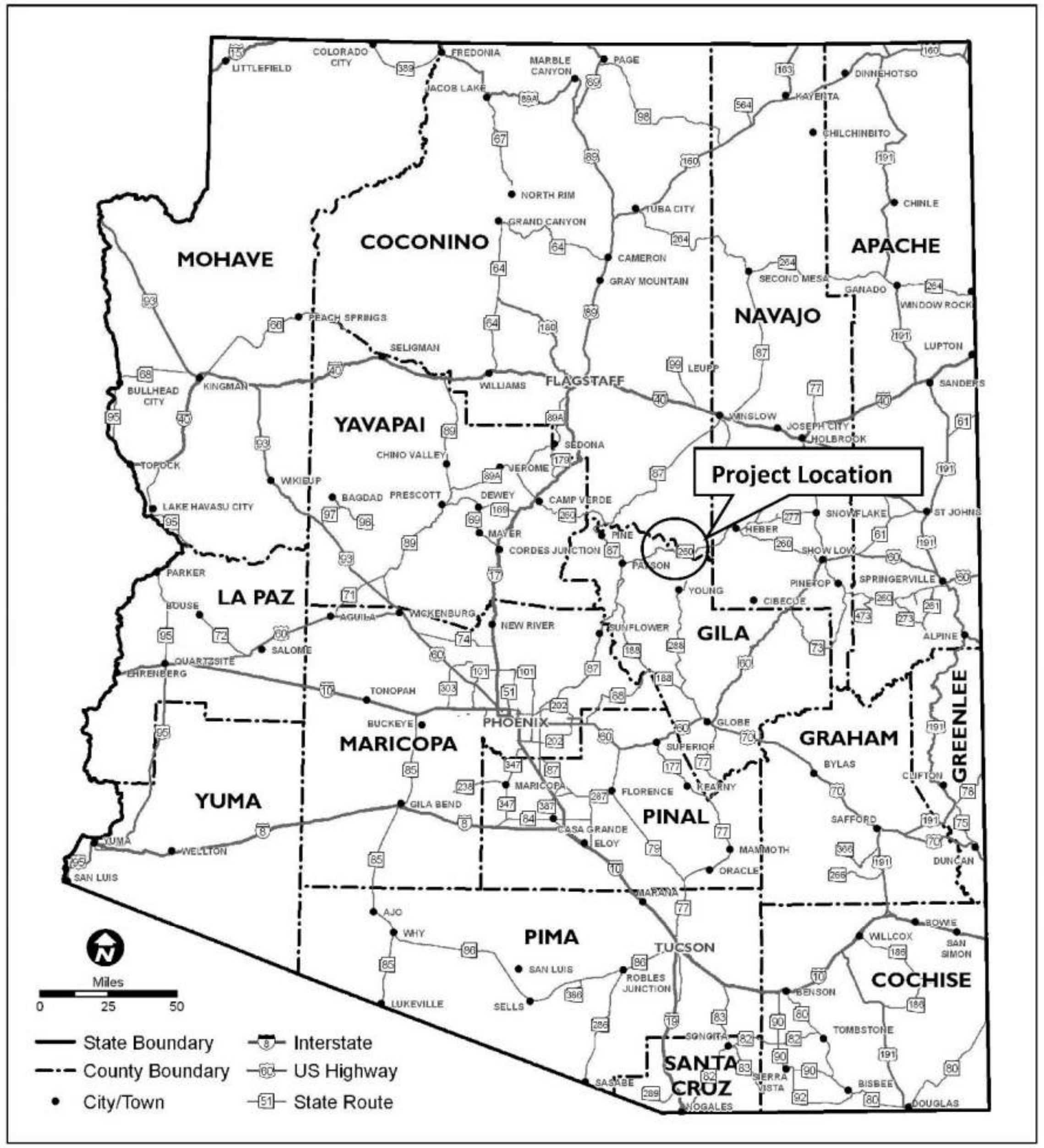
COST ESTIMATE				
Preliminary Engineering $267,000	Design $843,000	Right-of-Way $0	Construction $8,405,600	Total $9,515,600

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**

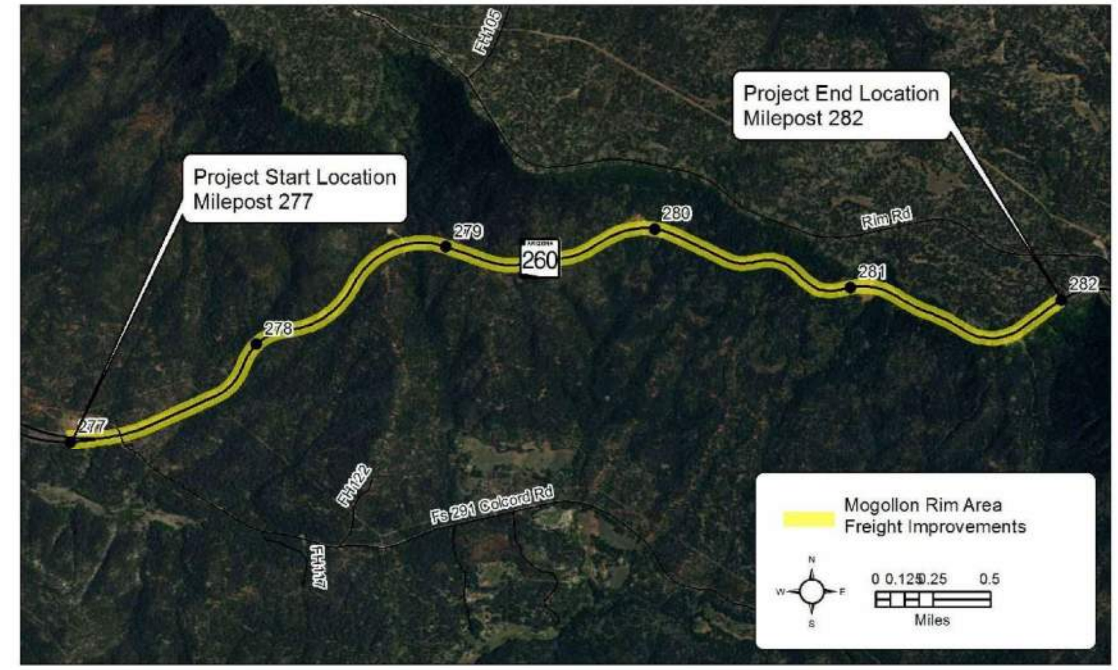
2

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Install centerline rumble strips • Install rock-fall mitigation (WB MP 278.4-278.6, 279.8-280.9, 281.4-282) • Install RWIS at MP 282 with dynamic weather warning beacons • Implement variable speed limits at MP 277-282 and new DMS and CCTV at MP 282 WB.

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Mogollon Rim Area Climbing Lane	
City/Town Name: -	**County: Gila**
Primary Route/Street: SR 260	
Beginning Limit: MP 277	
End Limit: MP 280	
Project Length: 3 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: *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: MP 277-282 has a high level of need based on the overall Freight Index, EB directional TTI and PTI scores, and closure duration in both directions.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐

Address high freight need.

ADOT **PRELIMINARY SCOPING REPORT**

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:	

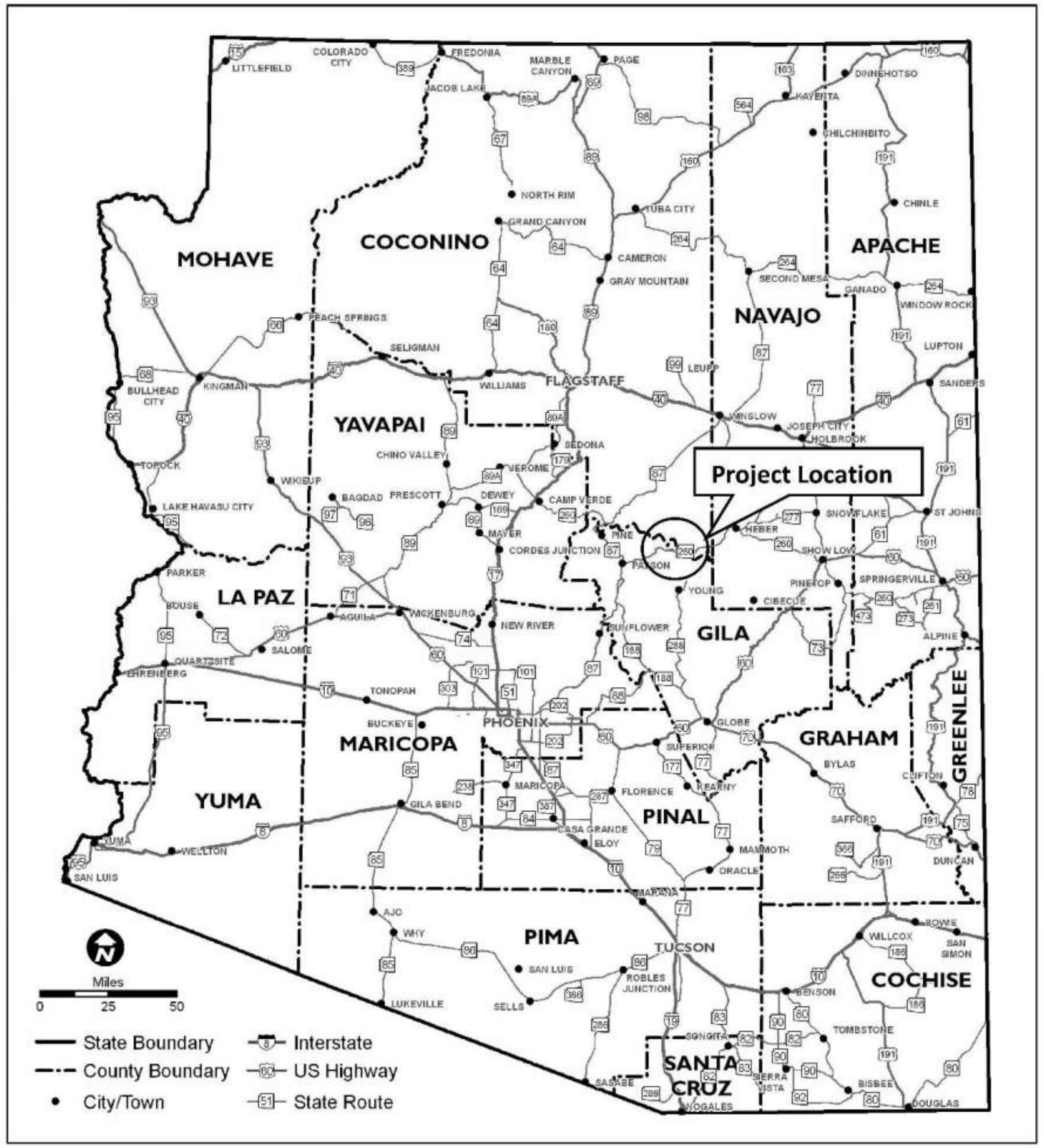
COST ESTIMATE				
Preliminary Engineering $450,000	Design $1,490,000	Right-of-Way $0	Construction $14,850,000	Total $16,790,000

PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS

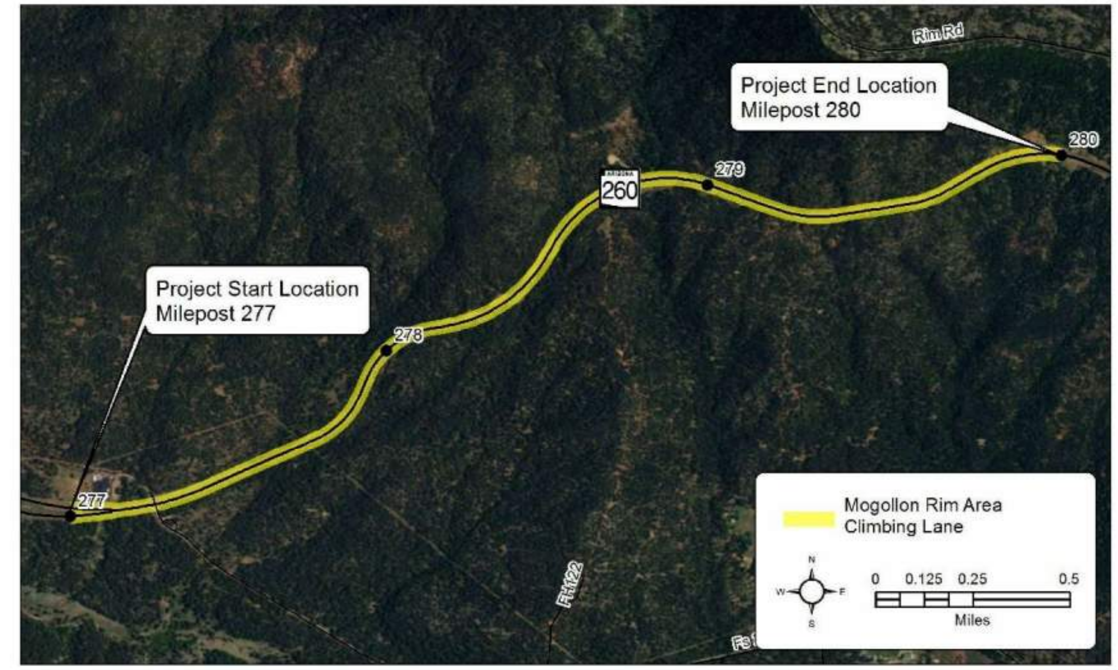
1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Construct EB climbing lane MP 277-280

5

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Forest Lakes Area Safety and Freight Improvements	
City/Town Name: Heber, AZ	**County: Coconino/Navajo**
Primary Route/Street: SR 260	
Beginning Limit: MP 282	
End Limit: MP 304	
Project Length: 22 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: *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 282-304 EB Directional Safety Index high level of need with significant directional split. Freight Need: MP 282-304 has a medium level of need based on the overall Freight Index, WB directional PTI, and closure duration in the WB direction.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☒	Expansion ☐
Address high safety and freight needs.			

1

ADOT **PRELIMINARY SCOPING REPORT**

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:	

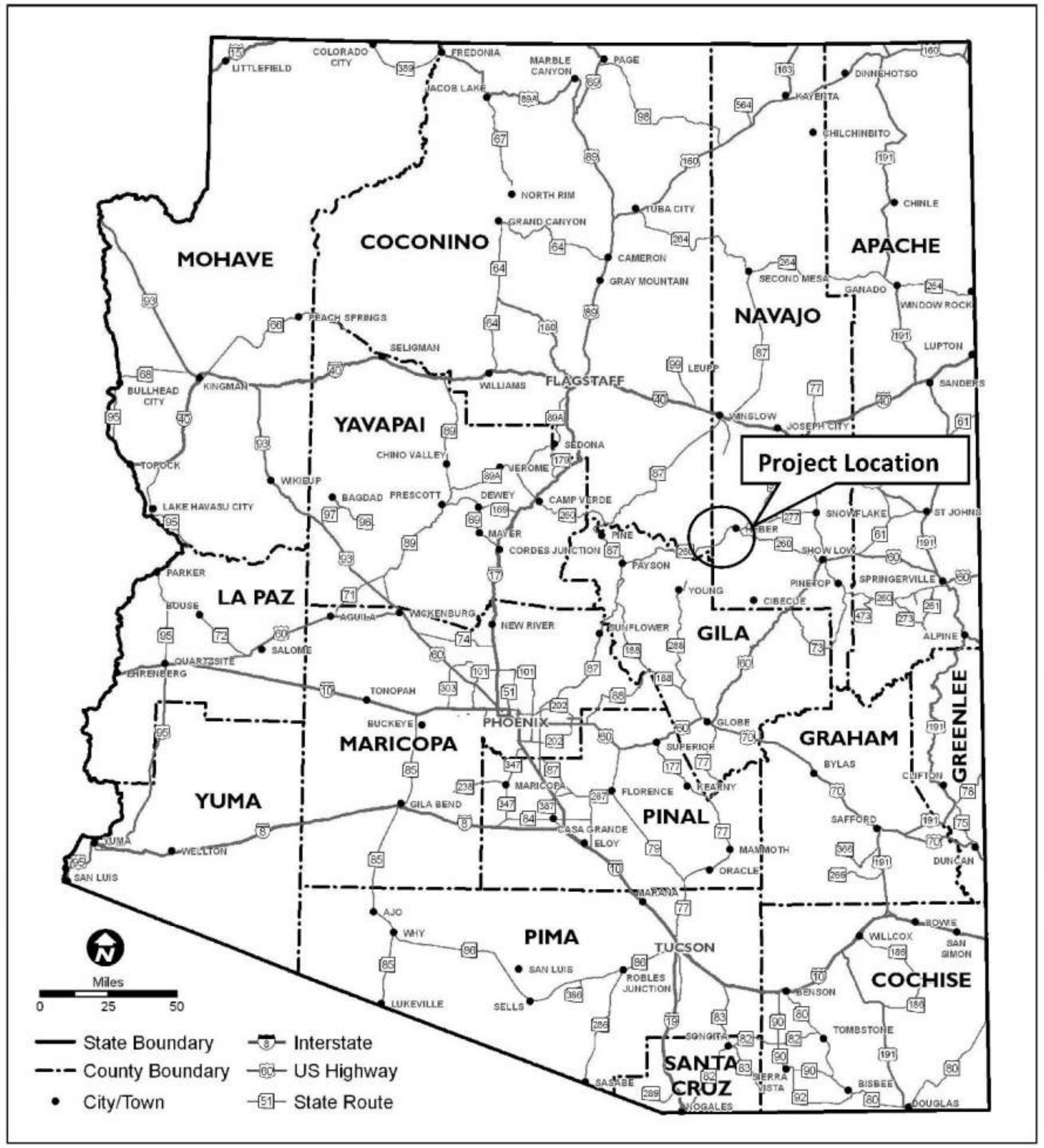
COST ESTIMATE				
Preliminary Engineering $1,500,000	Design $5,000,000	Right-of-Way $0	Construction $49,984,000	Total $56,484,000

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**

2

ATTACHMENT 1 – STATE LOCATION MAP



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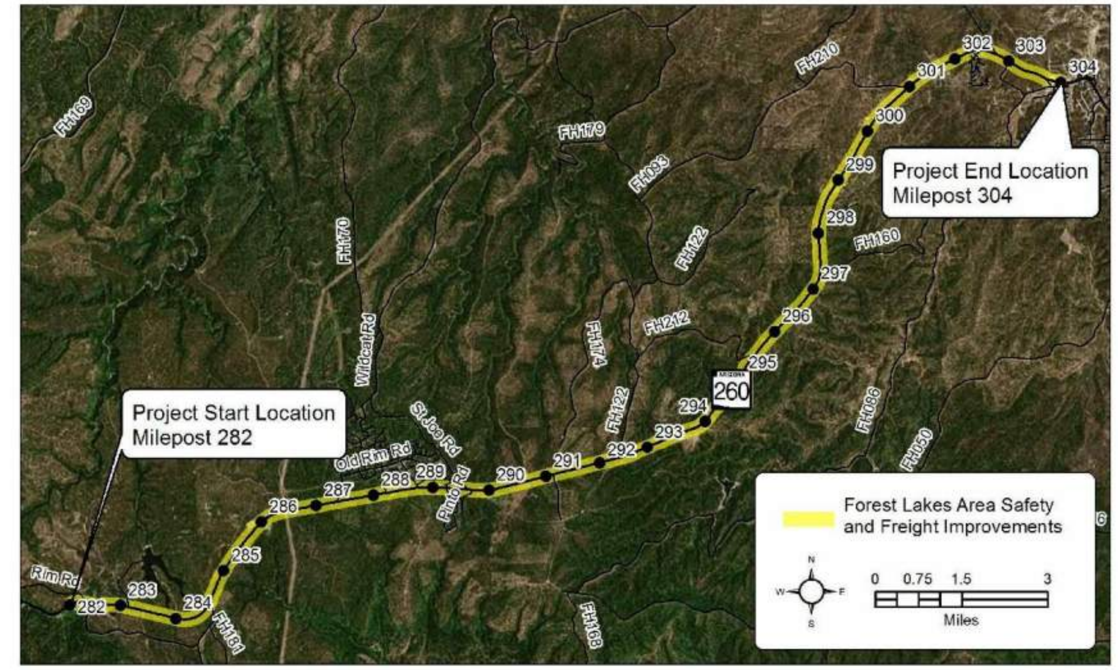
ATTACHMENT 2 – PROJECT VICINITY MAP



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ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Widen shoulders • Construct alternating passing lanes (varying locations for 11 miles)

ADOT **PRELIMINARY SCOPING REPORT**

GENERAL PROJECT INFORMATION	
Date: 01-31-2017	**ADOT Project Manager:**
Project Name: Holbrook Area Mobility and Freight Improvements – Option A, B, and C	
City/Town Name: Holbrook, AZ	**County: Navajo**
Primary Route/Street: SR 77	
Beginning Limit: MP 386	
End Limit: MP 389	
Project Length: 3 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: *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

Mobility Need: MP 386-389 has a high level of need driven by a poor future V/C and poor bicycle accommodation. The segment also has an at grade railroad crossing.

Freight Need: MP 386-389 has a medium level of need based on the overall Freight Index.

PROJECT PURPOSE			
What is the Primary Purpose of the Project?	Preservation ☐	Modernization ☐	Expansion ☒

Address high mobility and medium freight needs.

1

ADOT **PRELIMINARY SCOPING REPORT**

PROJECT TYPE		
Pavement Preservation ☐	Roadway Widening ☒	System Enhancement ☒
Bridge Scour/Rehab ☐	Bridge Replacement ☒	Sign Replacement ☐
Other ☒ :New roadway alignment		

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
$2,150,000 (option A) $1,830,000 (option B) $1,090,000 (option C)	$7,170,000 (option A) $6,120,000 (option B) $3,660,000 (option C)	$11,030,000 (option A) $6,590,000 (option B) $2,480,000 (option C)	$71,723,300 (option A) $61,223,300 (option B) $36,586,400 (option C)	$92,073,300 (option A) $75,763,300 (option B) $43,816,400 (option C)

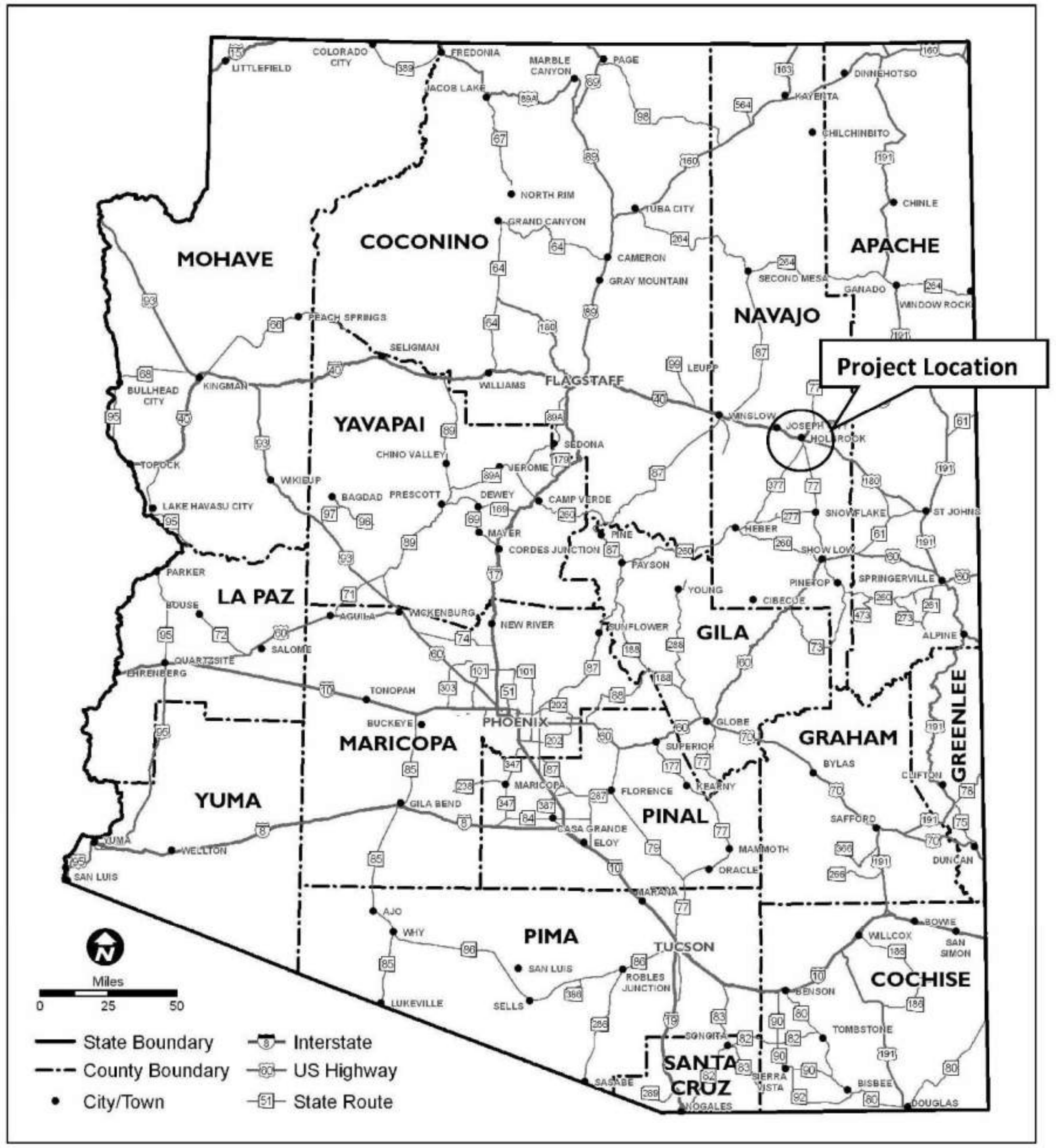
PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

ATTACHMENTS

1) **State Location Map**
2) **Project Vicinity Map**
3) **Project Scope of Work**

2

ATTACHMENT 1 – STATE LOCATION MAP



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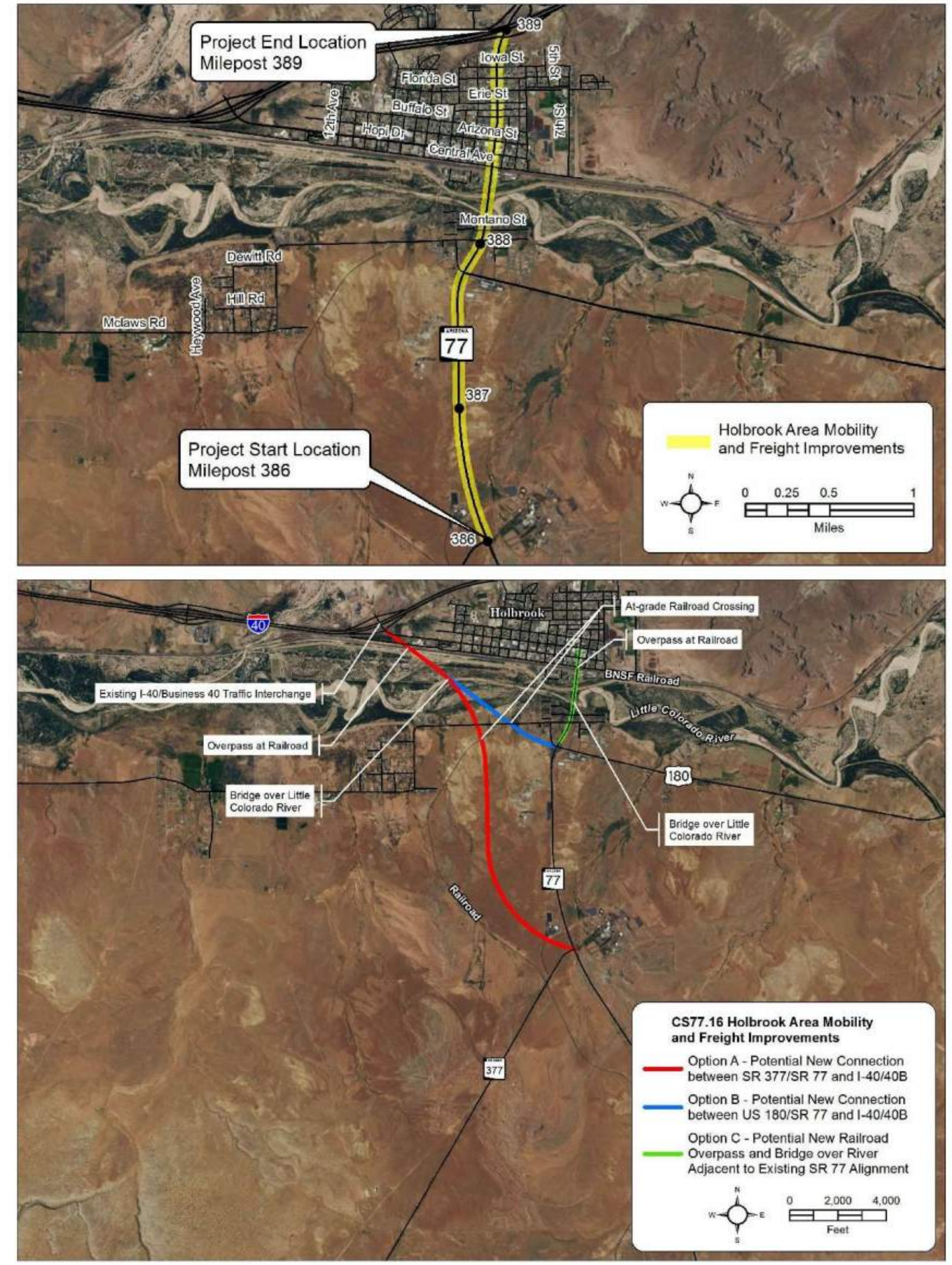
ATTACHMENT 2 – PROJECT VICINITY MAP



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ATTACHMENT 3 – SCOPE OF WORK

SCOPE OF WORK
• Option A: • Construct new roadway connection between SR 377/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook • Construct new bridge over the Little Colorado River and overpass at railroad crossing • Option B: • Construct new roadway connection between US 180/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook • Construct new bridge over the Little Colorado river and overpass at railroad crossing • Option C: • Construct overpass at at-grade railroad crossing and new bridge over the Little Colorado River adjacent to existing SR 77 alignment • Remove existing Little Colorado River Bridge