FINAL REPORT

SR 87/SR 260/ SR 377 Corridor Profile Study

Junction 202L to Junction I-40

PREPARED FOR ADOT MARCH 2017

ADOT WORK TASK NO.
MPD 028-16

ADOT CONTRACT NO.
11-013152

Prepared by

Kimley»Horn

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PREPARED FOR:
ARIZONA DEPARTMENT OF TRANSPORTATION

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Table of Contents

EXECUTIVE SUMMARY ES-1

1.0 INTRODUCTION 1
1.1 Corridor Study Purpose 2
1.2 Study Goals and Objectives 2
1.3 Corridor Overview and Location 2
1.4 Corridor Segments 2
1.5 Corridor Characteristics 5
1.6 Corridor Stakeholders and Input Process 8
1.7 Prior Studies and Recommendations 8

2.0 CORRIDOR PERFORMANCE 14
2.1 Corridor Performance Framework 14
2.2 Pavement Performance Area 16
2.3 Bridge Performance Area 19
2.4 Mobility Performance Area 22
2.5 Safety Performance Area 26
2.6 Freight Performance Area 30
2.7 Corridor Performance Summary 33

3.0 NEEDS ASSESSMENT 37
3.1 Corridor Objectives 37
3.2 Needs Assessment Process 39
3.3 Corridor Needs Assessment 40

4.0 STRATEGIC SOLUTIONS 49
4.1 Screening Process 49
4.2 Candidate Solutions 56

5.0 SOLUTION EVALUATION AND PRIORITIZATION 60
5.1 Life-Cycle Cost Analysis 61
5.2 Performance Effectiveness Evaluation 63
5.3 Solution Risk Analysis 66
5.4 Candidate Solution Prioritization 67

6.0 SUMMARY OF CORRIDOR RECOMMENDATIONS 69
6.1 Prioritized Candidate Solution Recommendations 69
6.2 Other Corridor Recommendations 69
6.3 Policy and Initiative Recommendations 69
6.4 Next Steps 73

List of Figures

Figure 1: Corridor Study Area 1
Figure 2: Corridor Location and Segments 4
Figure 3: Corridor Assets 7
Figure 4: Corridor Recommendations from Previous Studies 13
Figure 5: Corridor Profile Performance Framework 14
Figure 6: Performance Area Template 15
Figure 7: Pavement Performance Measures 16
Figure 8: Pavement Performance 18
Figure 9: Bridge Performance Measures 19
Figure 10: Bridge Performance 21
Figure 11: Mobility Performance Measures 22
Figure 12: Mobility Performance 25
Figure 13: Safety Performance Measures 26
Figure 14: Safety Performance 29
Figure 15: Freight Performance Measures 30
Figure 16: Freight Performance 32
Figure 17: Performance Summary by Primary Measure 33
Figure 18: Corridor Performance Summary by Performance Measure 34
Figure 19: Needs Assessment Process 39
Figure 20: Initial Need Ratings in Relation to Baseline Performance (Bridge Example) 39
Figure 21 Corridor Needs Summary 48
Figure 22: Strategic Investment Areas 50
Figure 23: Candidate Solutions 59
Figure 24: Candidate Solution Evaluation Process 60
Figure 25: Risk Matrix 66
Figure 26: Numeric Risk Matrix 66
Figure 27: Prioritized Recommended Solutions 72

List of Tables

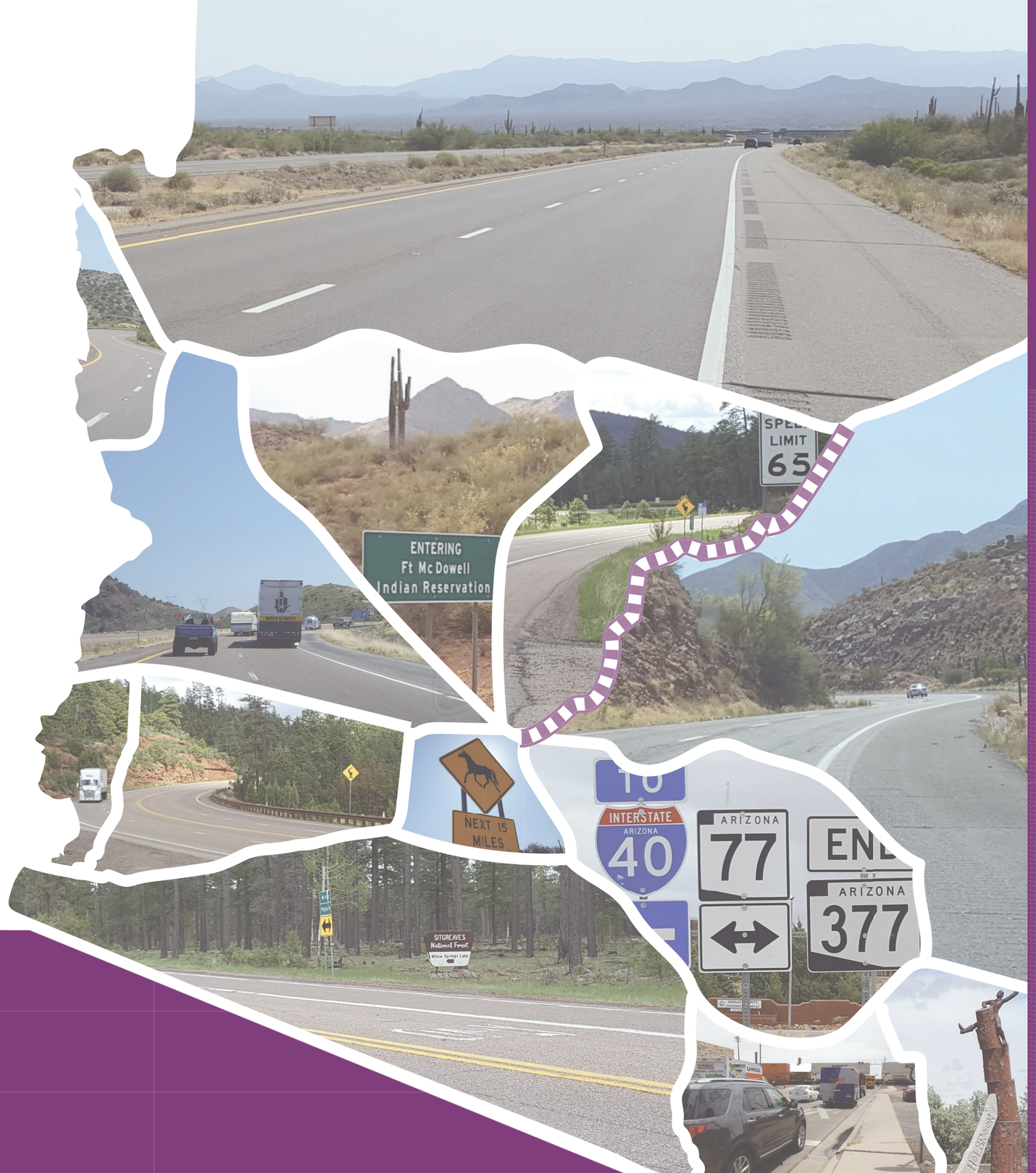
Table 1: SR 87/SR 260/SR 377 Corridor Segments 3
Table 2: Current and Future Population 6
Table 3: Corridor Recommendations from Previous Studies 10
Table 4: Corridor Performance Measures 15
Table 5: Pavement Performance 17
Table 6: Bridge Performance 20
Table 7: Mobility Performance 24
Table 8: Safety Performance 28
Table 9: Freight Performance 31
Table 10: Corridor Performance Summary by Segment and Performance Measure 35
Table 11: Corridor Performance Goals and Objectives 38
Table 12: Final Pavement Needs 41
Table 13: Final Bridge Needs 42
Table 14: Final Mobility Needs 43
Table 15: Final Safety Needs 44
Table 16: Final Freight Needs 45
Table 17: Summary of Needs by Segment 46
Table 18: Strategic Investment Area Screening 51
Table 19: Candidate Solutions 57
Table 20: Bridge Life-Cycle Cost Analysis Results 62
Table 21: Pavement Life-Cycle Cost Analysis Results 62
Table 22: Performance Effectiveness Scores 65
Table 23: Prioritization Scores 68
Table 24: Prioritized Recommended Solutions 70

Appendices

Appendix A: Corridor Performance Maps
Appendix B: Performance Area Detailed Calculation Methodologies
Appendix C: Performance Area Data
Appendix D: Needs Analysis Contributing Factors and Scores
Appendix E: Life-Cycle Cost Analysis
Appendix F: Crash Modification Factors and Factored Unit Construction Costs
Appendix G: Performance Area Risk Factors
Appendix H: Candidate Solution Cost Estimates
Appendix I: Performance Effectiveness Scores
Appendix J: Solution Prioritization Scores
Appendix K: Preliminary Scoping Reports for Prioritized Solutions

ACRONYMS & ABBREVIATIONS

AADT	Average Annual Daily Traffic
ABISS	Arizona Bridge Information and Storage System
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
ASLD	Arizona State Land Department
AZTDM	Arizona Statewide Travel Demand Model
BLM	Bureau of Land Management
BQAZ	Building a Quality Arizona
CAG	Central Arizona Governments
CCTV	Closed Circuit Television
CR	Cracking Rating
DCR	Design Concept Report
DMS	Dynamic Message Sign
EB	Eastbound
FHWA	Federal Highway Administration
FY	Fiscal Year
HCRS	Highway Condition Reporting System
HERE	Real time traffic conditions database produced by American Digital Cartography Inc.
HPMS	Highway Performance Monitoring System
I	Interstate
IRI	International Roughness Index
ITS	Intelligent Transportation System
LCCA	Life-Cycle Cost Analysis
LOS	Level of Service
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
NB	Northbound
NPV	Net Present Value
OP	Overpass
P2P	Planning-to-Programming
PA	Project Assessment
PARA	Planning Assistance for Rural Areas
PDI	Pavement Distress Index
PES	Performance Effectiveness Score
PSR	Pavement Serviceability Rating
PTI	Planning Time Index
RWIS	Road Weather Information System
SATS	Small Area Transportation Study
SB	Southbound
SHSP	Strategic Highway Safety Plan
SOV	Single Occupancy Vehicle
SR	State Route
TAC	Technical Advisory Committee
TI	Traffic Interchange
TOAS	Traffic Operational Analysis Study
TPTI	Truck Planning Time Index
TTI	Travel Time Index
TTTI	Truck Travel Time Index
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 State Route 87 (SR 87)/State Route 260 (SR 260)/State Route 377 (SR 377) between State Route 202L (Loop 202) and Interstate 40 (I-40). This study examines key performance measures relative to the SR 87/SR 260/SR 377 corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT is conducting eleven CPS within three separate groupings. The SR 87/SR 260/SR 377 corridor, depicted in **Figure ES-1**, is one of the strategic statewide corridors identified and the subject of this CPS.

Corridor Study Purpose, Goals and Objectives

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

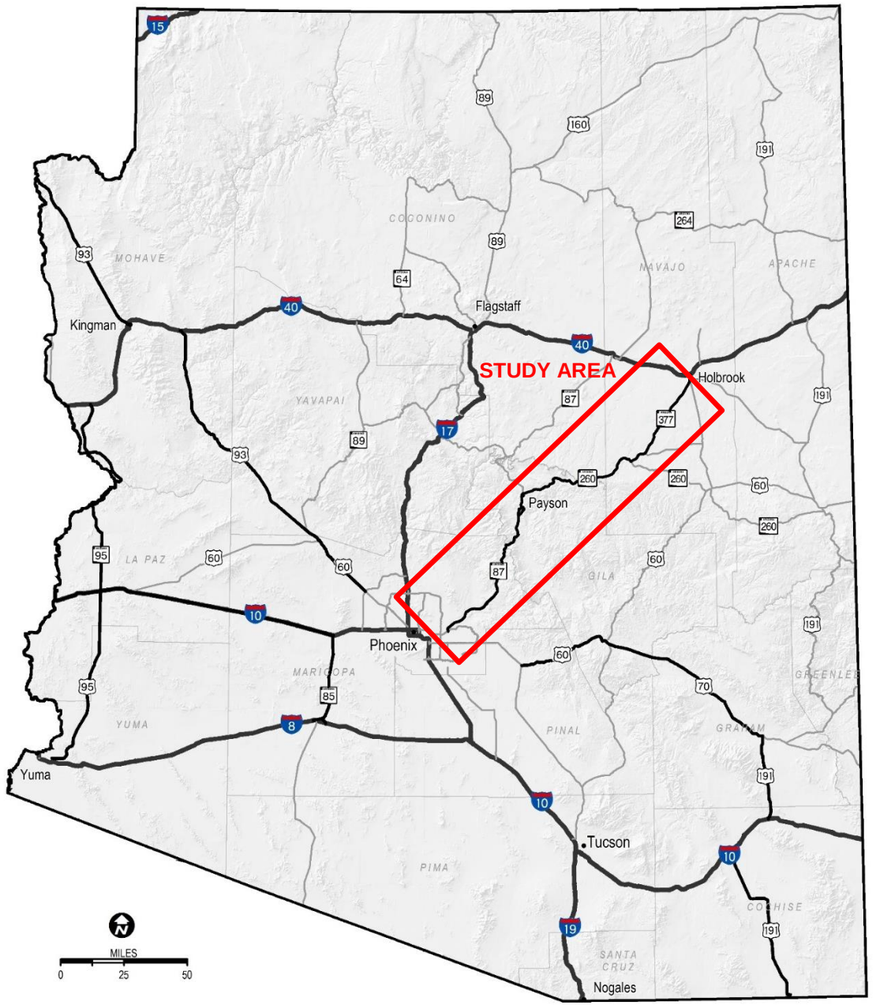
- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the 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 SR 87/SR 260/SR 377 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

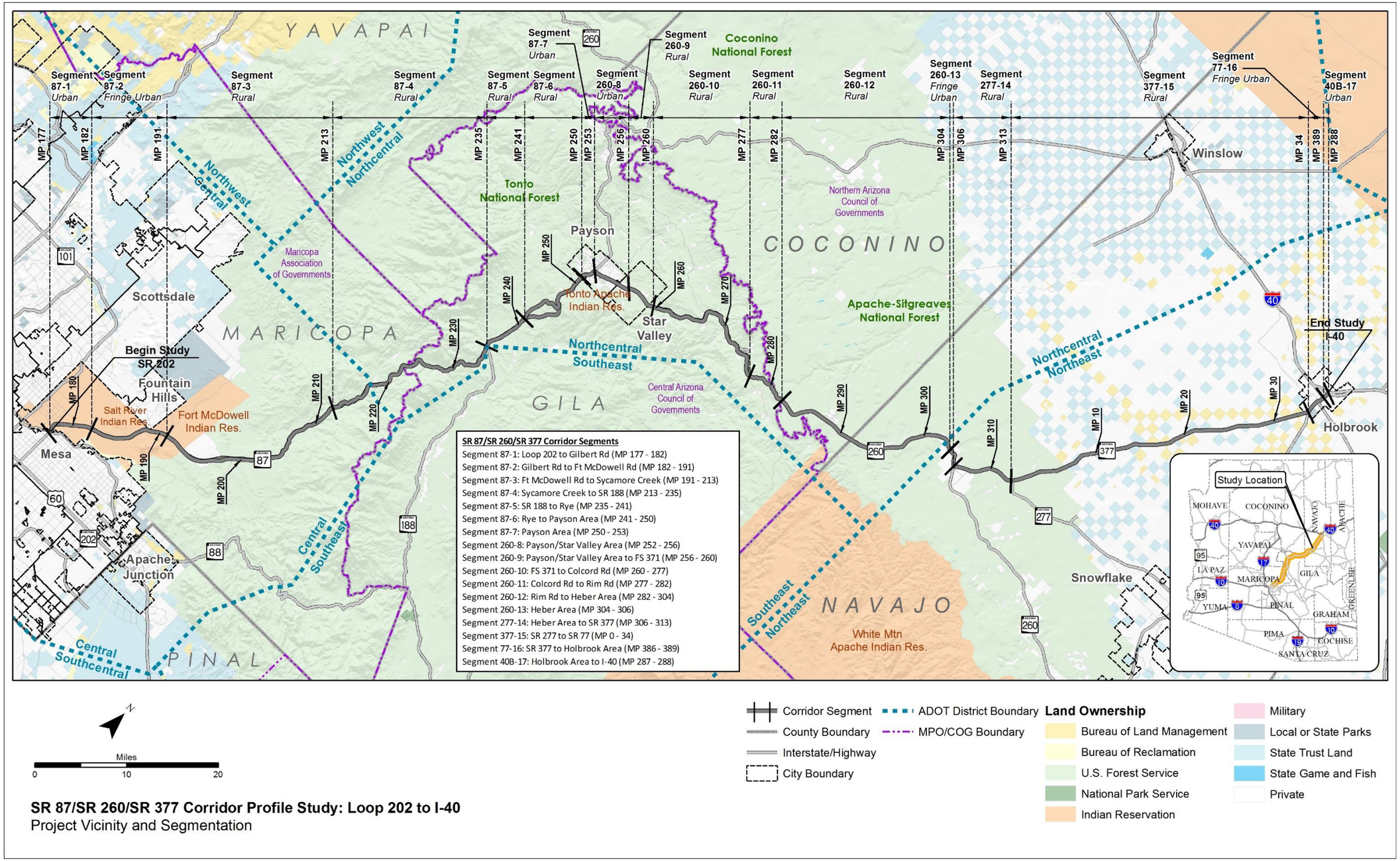
Figure ES-1: Corridor Study Area



Study Location and Corridor Segments

The SR 87/SR 260/SR 377 corridor is divided into 17 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

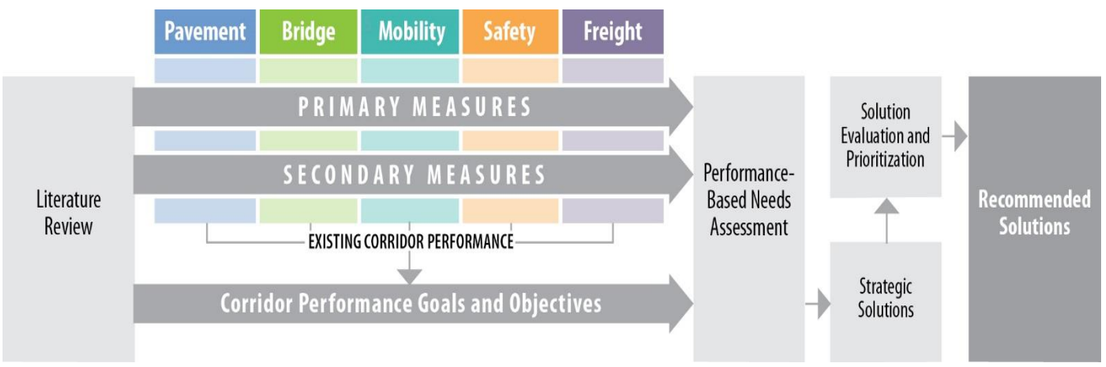
A series of performance measures is used to assess the SR 87/SR 260/SR 377 corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

Corridor Performance Framework

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

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

Figure ES-3: Corridor Profile Performance Framework



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

- Pavement
- Bridge
- Mobility
- Safety
- Freight

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

Table ES-1: Corridor Performance Measures

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

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

Good/Above Average Performance – Rating is above the identified desirable/average range

Fair/Average Performance – Rating is within the identified desirable/average range

Poor/Below Average Performance – Rating is below the identified desirable/average range

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

Corridor Performance Summary

Table ES-2 shows a summary of corridor performance for all primary measures and secondary measure indicators for the SR 87/SR 260/SR 377 corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure as shown in **Table ES-2**. The following general observations were made related to the performance of the SR 87/SR 260/SR 377 corridor:

- Overall Performance: The Pavement, Bridge, and Mobility performance areas show generally "good" or "fair" performance; Safety and Freight performance areas show generally "poor/below average" or "fair/average" performance
- Pavement Performance: The weighted average of the Pavement Index shows "good" overall performance; exceptions include Segments 260-13, 277-14, and 77-16, which show either "poor" or "fair" performance for the Pavement Index, Directional Pavement Serviceability Rating (PSR), and % Area Failure measures; no data was available for Segment 40B-17
- Bridge Performance: The weighted average of the Bridge Index shows "good" overall performance; all segments that include bridges have "good" or "fair" performance for Bridge Index, Sufficiency Rating, and Lowest Bridge Rating measures; Segment 77-16 shows "poor" performance for the % of Deck Area on Functionally Obsolete Bridges; Segments 87-6, 87-7, 260-8, 260-9, 277-14, 377-15, and 40B-17 contain no bridges
- Mobility Performance: The weighted average of the Mobility Index shows "good" overall performance; Closure Extent, Directional Planning Time Index (PTI), % Bicycle Accommodation, and % Non-Single Occupancy Vehicle (SOV) Trips show "poor" or "fair" performance for the corridor; Segments 87-2, 87-7, 260-9, and 77-16 show either "poor" or "fair" performance in the Mobility Index and Future Daily V/C measures
- Safety Performance: The weighted average of the Safety Index and Directional Safety Index show "below average" overall performance; in the 2010-2014 analysis period, there were 48 fatal crashes and 81 incapacitating crashes on the corridor; Segments 87-7, 260-9, 260-13, 277-14, 77-16, and 40B-17 have "insufficient data", meaning that there was not enough data available to generate reliable performance ratings so no values were calculated
- Freight Performance: The weighted average of the Freight Index shows "poor" performance; Closure Duration, Directional Truck Travel Time Index (TTTI), and Directional Truck PTI show "poor" or "fair" performance for the corridor; no TTTI or TPTI data was available for Segments 277-14 and 377-15; no Closure Duration data was available for Segment 40B-17
- Lowest Performing Segments: Segments 87-3, 87-4, 260-9, and 77-16 show "poor/below average" performance for many performance measures
- Highest Performing Segments: Segments 87-2 and 87-7 show "good/above average" performance for many performance measures

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

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area											
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	% of Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/ milepost/year/mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			NB/EB	SB/WB								NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB		
87-1[1*a]	5	4.19	4.03	4.11	10.0%	7.00	85.00	0.0%	7	0.65	0.86	0.34	0.34	0.37	0.32	1.22	1.06	4.01	3.03	45%	13.6%
87-2[1* a]	9	4.25	4.01	4.14	0.0%	7.00	96.50	0.0%	7	0.73	1.01	0.45	0.45	0.46	0.04	1.15	1.23	2.36	3.86	93%	14.4%
87-3[2^ a]	22	3.80	3.80	3.88	11.4%	6.95	96.20	0.0%	6	0.21	0.29	0.14	0.13	0.87	0.11	1.05	1.04	1.54	1.48	99%	16.7%
87-4[2^ a]	22	4.05	3.84	3.93	0.0%	6.31	89.18	0.0%	6	0.23	0.27	0.20	0.21	1.47	0.15	1.17	1.05	2.05	1.47	86%	5.2%
87-5[2^ a]	5	4.55	4.35	4.36	0.0%	6.31	99.60	0.0%	6	0.15	0.14	0.15	0.15	0.23	0.07	1.01	1.08	1.42	1.51	92%	12.9%
87-6[2^ a]	10	4.15	4.10	3.96	0.0%	No Bridges				0.21	0.21	0.19	0.19	0.18	0.27	1.31	1.15	2.38	1.94	79%	12.4%
87-7[1* b]	2	3.54	3.36	3.48	0.0%	No Bridges				0.75	0.94	0.57	0.50	0.07	0.20	1.18	1.86	4.43	6.48	56%	18.4%
260-8[1* b]	4	4.31	4.24		0.0%	No Bridges				0.54	0.68	0.47	0.51	0.05	0.00	1.46	1.10	7.15	4.97	16%	18.5%
260-9[2^ c]	3	4.27	4.12		0.0%	No Bridges				0.94	1.15	1.29	1.33	0.30	0.55	1.12	1.00	1.61	1.16	2%	15.1%
260-10[2^ a]	17	4.03	3.79	3.81	0.0%	6.81	99.52	0.0%	6	0.08	0.08	0.13	0.11	0.49	0.48	1.13	1.06	1.64	1.40	93%	16.2%
260-11[2^ c]	5	4.13	3.98		0.0%	6.73	79.13	0.0%	6	0.12	0.14	0.14	0.13	0.40	0.88	1.23	1.00	2.16	1.14	49%	12.5%
260-12[2^ c]	22	3.78	3.52		4.5%	7.00	98.40	0.0%	7	0.36	0.39	0.34	0.34	0.43	0.85	1.00	1.05	1.18	1.36	2%	10.8%
260-13[1^ b]	2	3.11	2.87		50.0%	6.00	93.70	0.0%	6	0.14	0.15	0.14	0.14	0.00	0.40	1.02	1.21	1.63	2.98	15%	6.7%
277-14[2^ c]	7	2.05	3.03		71.4%	No Bridges				0.09	0.10	0.07	0.06	0.11	0.00	No Data				0%	17.5%
377-15[2^ c]	34	4.12	4.03		0.0%	No Bridges				0.09	0.10	0.13	0.13	0.04	0.05	No Data				0%	18.2%
77-16[1* c]	2	3.25	3.10		40.0%	6.00	59.00	100.0%	6	0.85	1.09	0.60	0.65	0.00	0.00	1.08	1.49	3.84	6.79	1%	18.7%
40B-17[1* b]	1	No Data				No Bridges				0.45	0.57	0.32	0.32	No Data		1.80	1.31	12.93	10.56	27%	20.7%
Weighted Corridor Average		3.94	3.83	3.86	6.4%	6.70	95.46	1.6	6.06	0.26	0.32	0.24	0.23	0.49	0.27	1.13	1.09	2.15	2.03	49%	14.0%

SCALES

Performance Level	Non-Interstate		All				Urban and Fringe Urban	All	Uninterrupted		All	
Good/Above Average	> 3.50	< 5%	> 6.5	> 80	< 12%	> 6	< 0.71	< 0.22	< 1.15	< 1.3	> 90%	> 17%
Fair/Average	2.90 - 3.50	5% - 20%	5.0 - 6.5	50 - 80	12% - 40%	5 - 6	0.71 - 0.89	0.22 - 0.62	1.15 - 1.33	1.3 - 1.5	60% - 90%	11% - 17%
Poor/Below Average	< 2.90	> 20%	< 5.0	< 50	> 40%	< 5	> 0.89	> .62	> 1.33	> 1.5	< 60%	< 11%

Performance Level	Rural	Interrupted	
Good/Above Average	< 0.56	< 1.3	< 3.0
Fair/Average	0.56 - 0.76	1.3 – 2.0	3.0 – 6.0
Poor/Below Average	> 0.76	> 2.0	> 6.0

^Uninterrupted Flow Facility
*Interrupted Flow Facility

[a]2 or 3 or 4 Lane Divided Highway
[b]4 or 5 Lane Undivided Highway
[c]2 or 3 Lane Undivided Highway

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

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

Segment #	Segment Length (miles)	Safety Performance Area							Freight Performance Area							
		Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Freight Index	Directional TTTI		Directional TPTI		Closure Duration (minutes/milepost/ year/mile)		Bridge Vertical Clearance (feet)
			NB/EB	SB/WB						NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	
87-1[1]*	5	3.01	4.05	1.98	29%	Insufficient Data	Insufficient Data	Insufficient Data	0.28	1.29	1.10	3.88	3.38	129.19	61.92	No UP
87-2[1]*	9	0.62	1.21	0.04	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.29	1.19	1.32	2.72	4.06	119.84	147.44	No UP
87-3[2]^	22	1.19	0.48	1.90	44%	Insufficient Data	39%	Insufficient Data	0.53	1.11	1.23	1.38	2.38	2674.13	59.23	16.97
87-4[2]^	22	1.62	1.48	1.76	30%	Insufficient Data	50%	Insufficient Data	0.51	1.37	1.14	2.38	1.56	4359.89	34.01	18.75
87-5[2]^	5	1.22	0.08	2.36	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.56	1.12	1.21	1.45	2.13	49.20	21.67	No UP
87-6[2]^	10	2.11	0.09	4.13	71%	Insufficient Data	14%	Insufficient Data	0.44	1.55	1.22	2.52	2.01	37.16	287.98	No UP
87-7[1]*	2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.28	1.20	1.91	3.29	3.88	21.33	693.60	No UP
260-8[1]*	4	0.28	0.56	0.00	43%	Insufficient Data	Insufficient Data	Insufficient Data	0.15	1.66	1.17	9.64	4.11	11.45	0.00	No UP
260-9[2]^	3	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.47	1.20	1.00	3.09	1.21	71.85	726.90	No UP
260-10[2]^	17	0.93	0.62	1.24	50%	Insufficient Data	13%	Insufficient Data	0.58	1.23	1.12	1.82	1.61	157.49	797.71	No UP
260-11[2]^	5	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.54	1.45	1.00	2.53	1.18	144.40	922.04	No UP
260-12[2]^	22	1.43	2.25	0.62	46%	Insufficient Data	15%	Insufficient Data	0.69	1.00	1.10	1.19	1.69	117.01	901.62	No UP
260-13[1]^	2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.36	1.09	1.35	2.75	2.82	0.00	739.30	No UP
277-14[2]^	7	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	No Data					20.03	0.00	No UP
377-15[2]^	34	1.18	1.21	1.16	82%	Insufficient Data	0%	Insufficient Data	No Data					10.14	9.29	No UP
77-16[1]*	2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.22	1.12	1.54	3.52	5.65	0.00	0.00	No UP
40B-17[1]*	1	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.05	2.15	1.51	29.93	8.45	No Data		No UP
Weighted Corridor Average		1.32	1.20	1.45	54%	Insufficient Data	21%	Insufficient Data	0.50	1.24	1.18	2.46	2.25	957.0	289.9	17.87

SCALES

Performance Level	2 or 3 or 4 Lane Divided Highway					Uninterrupted			All	
Good/Above Average	< 0.77	< 44%	< 4%	< 16%	< 2%	> 0.77	< 1.15	< 1.3	< 44.18	> 16.5
Fair/Average	0.77 - 1.23	44% - 54%	4% - 7%	16% - 26%	2% - 4%	0.67 - 0.77	1.15 - 1.33	1.3 - 1.5	44.18-124.86	16.0 - 16.5
Poor/Below Average	> 1.23	> 54%	> 7%	> 26%	> 4%	< 0.67	> 1.33	> 1.5	> 124.86	< 16.0
Performance Level	**2 or 3 Lane Undivided Highway**					**Interrupted**				
Good/Above Average	< 0.94	< 51%	< 6%	< 19%	< 5%	> 0.33	< 1.3	< 3.0		
Fair/Average	0.94 - 1.06	51% - 58%	6% - 10%	19% - 27%	5% - 8%	0.17 - 0.33	1.3 - 2.0	3.0 - 6.0		
Poor/Below Average	> 1.06	> 58%	> 10%	> 27%	> 8%	< 0.17	> 2.0	> 6.0		
Performance Level	**4 or 5 Undivided Highway**									
Good/Above Average	< 0.80	< 42%	< 6%	< 6%	< 5%					
Fair/Average	0.80 - 1.20	42% - 51%	6% - 10%	6% - 9%	5% - 8%					
Poor/Below Average	> 1.20	> 51%	> 10%	> 9%	> 8%					

^Uninterrupted Flow Facility
*Interrupted Flow Facility

[a]2 or 3 or 4 Lane Divided Highway
[b]4 or 5 Lane Undivided Highway
[c]2 or 3 Lane Undivided Highway

[1]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 SR 87/SR 260/SR 377 corridor is an important travel corridor in the central/northeastern part of the state. The corridor functions as a route for recreational, tourist, and regional traffic and provides critical connections between the communities it serves and the rest of the regional and interstate network.

Corridor Objectives

Statewide goals and performance measures were established by the ADOT Long-Range Transportation Plan (LRTP), 2010-2035. Statewide performance goals that are relevant to SR 87/SR 260/SR 377 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 SR 87/SR 260/SR 377 corridor: Mobility, Safety, and Freight.

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

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

Needs Assessment Process

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

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

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

Figure ES-4: Needs Assessment Process

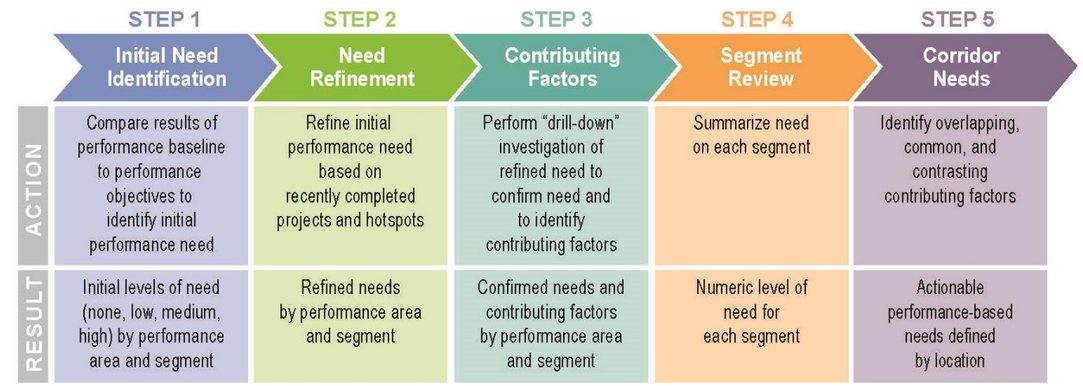


Figure ES-5: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need	Description
6.5	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
	Fair		
	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 (Mobility, Safety, and Freight for the SR 87/SR 260/SR 377 corridor). There is one segment with a High average need (77-16), fourteen segments with a Medium average need, and two segments with a Low average need. More information on the identified final needs in each performance area is provided below.

Pavement Needs

- Seven segments (87-1, 87-3, 87-4, 260-12, 260-13, 277-14, and 77-16) contain Pavement hot spots, but one of these segments had recent paving projects that addressed the need
- Segments 87-1, 87-3, 87-4, and 40B-17 have final needs of Low and Segments 260-13 and 77-16 have final needs of Medium. Segment 277-14 is the only High need segment of the corridor; all other segments of the corridor have a final need of None

Bridge Needs

- Seven segments (87-6, 87-7, 260-8, 260-9, 277-14, 377-15, and 40B-17) do not include any bridges
- Segment 77-16 includes one bridge, the Little Colorado River Bridge, which is functionally obsolete
- There are no final Bridge needs along the corridor

Mobility Needs

- Low Mobility needs exist on fifteen of the seventeen segments of the corridor
- Two segments (260-9 and 77-16) have High final needs
- Segment 260-9 has high existing, directional, and future V/C needs
- Many segments contain Medium or High directional PTI needs
- Bicycle accommodation needs are High on ten of the seventeen segments of the corridor

Safety Needs

- High Safety needs exist on six of the seventeen segments
- Safety hot spots exist in Segments 87-4, 87-6, and 260-8
- Many of the segments of the corridor (87-7, 260-9, 260-11, 260-13, 277-14, 77-16, 40B-17) contain insufficient data to determine levels of need, so a need value is not available (N/A)

Freight Needs

- High Freight needs exist on eleven of the seventeen segments
- Many segments of the corridor contain High directional PTI and closure duration needs
- No Freight hot spots exist along the corridor
- Segments 277-14 and 377-15 have no data to determine a level of need

Overlapping Needs

This section identifies overlapping performance needs on the SR 87/SR 260/SR 377 corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need. Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided below:

- Segments 87-3, 87-4, 87-5, 87-6 and 260-12 all contain elevated needs in the Safety and Freight performance areas
- Segment 77-16, which has the highest average need score of all the segments of the corridor, has elevated needs in the Pavement, Mobility, and Freight performance areas
- Segment 260-9 contains elevated needs in the Mobility and Freight performance areas

Table ES-3: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)																
	87-1	87-2	87-3	87-4	87-5	87-6	87-7	260-8	260-9	260-10	260-11	260-12	260-13	277-14	377-15	77-16	40B-17^
	MP 177-182	MP 182-191	MP 191-213	MP 213-235	MP 235-241	MP 241-250	MP 250-253	MP 252-256	MP 256-260	MP 260-277	MP 277-282	MP 282-304	MP 304-306	MP 306-313	MP 0-34	MP 386-389	MP 287-288
Pavement	Low	None	Low	Low	None	None	None	None	None	None	None	None	Medium	High	None	Medium	Low
Bridge	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	Low	None
Mobility+	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low
Safety+	High	Low	High	High	Medium	High	N/A#	Low	N/A	Low	N/A	High	N/A	N/A	High	N/A	N/A
Freight+	Low	Low	High	High	High	High	Low	High	High	High	High	High	High	N/A	N/A	Medium	High
Average Need	**1.31**	**0.69**	**1.77**	**1.77**	**1.38**	**1.62**	**0.60**	**1.15**	**1.80**	**1.15**	**1.20**	**1.62**	**1.60**	**1.29**	**1.20**	**2.10**	**1.40**

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

+ Identified as an emphasis area for the SR 87/SR 260/SR 377 corridor.

 # N/A indicates insufficient or no data available to determine level of need

^ Segment 40B-17 Pavement Need estimated based on field review

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

STRATEGIC SOLUTIONS

The principal objective of the CPS is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State's key transportation corridors. One of the first steps in the development of strategic solutions is to identify areas of elevated levels of need as addressing these needs will have the greatest effect on corridor performance. Segments with Medium or High needs and specific locations of hot spots are considered strategic investment areas for which strategic solutions should be developed. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. The SR 87/SR 260/SR 377 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 SR 87/SR 260/SR 377 corridor will be considered along with other candidate projects in the ADOT statewide programming process.

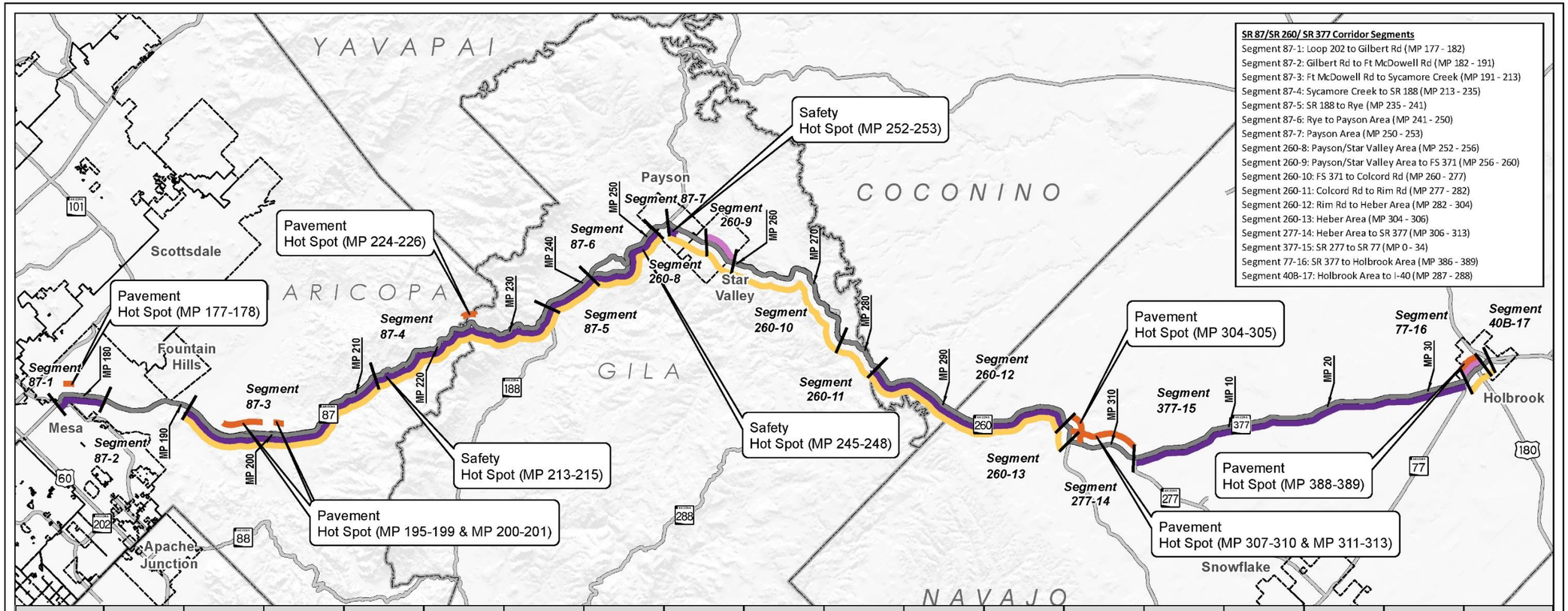
Candidate solutions include some or all of the following characteristics:

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

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

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

Figure ES-6: Strategic Investment Areas



Performance Area	87-1	87-2	87-3	87-4	87-5	87-6	87-7	260-8	260-9	260-10	260-11	260-12	260-13	277-14	377-15	77-16	40B-17^	Performance Area
	MP 177-182	MP 182-191	MP 191-213	MP 213-235	MP 235-241	MP 241-250	MP 250-253	MP 252-256	MP 256-260	MP 260-277	MP 277-282	MP 282-304	MP 304-306	MP 306-313	MP 0-34	MP 386-389	MP 287-288	
Pavement	Hot Spot	-	Hot Spot	Hot Spot	-	-	-	-	-	-	-	-	Medium	High	-	Medium	-	Pavement
Bridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Bridge
Mobility*	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	High	-	Mobility*
Safety*	High	-	High	High	Medium	High	N/A#	Hot Spot	N/A	-	N/A	High	N/A	N/A	High	N/A	N/A	Safety*
Freight*	-	-	High	High	High	High	-	High	High	High	High	High	High	N/A	N/A	Medium	High	Freight*

* Identified as emphasis area for SR 87/SR 260/SR 377 Corridor

^40B-17 Pavement Need estimated bases on field review

N/A indicate insufficient or no data available to determine level of need

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

SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Strategic Investment Areas

N

Miles
0 9 18

Performance Area Needs

- Corridor Segment
- County Boundary
- Interstate/Highway
- City Boundary
- Pavement
- Mobility
- Safety
- Freight
- Bridge

Level of Need
Low
Medium
High

SOLUTION EVALUATION AND PRIORITIZATION

Candidate solutions are evaluated using the following steps: LCCA (where applicable), Performance Effectiveness Evaluation, Solution Risk Analysis, and Candidate Solution Prioritization. The methodology and approach to this evaluation 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.

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

Performance Effectiveness Evaluation

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

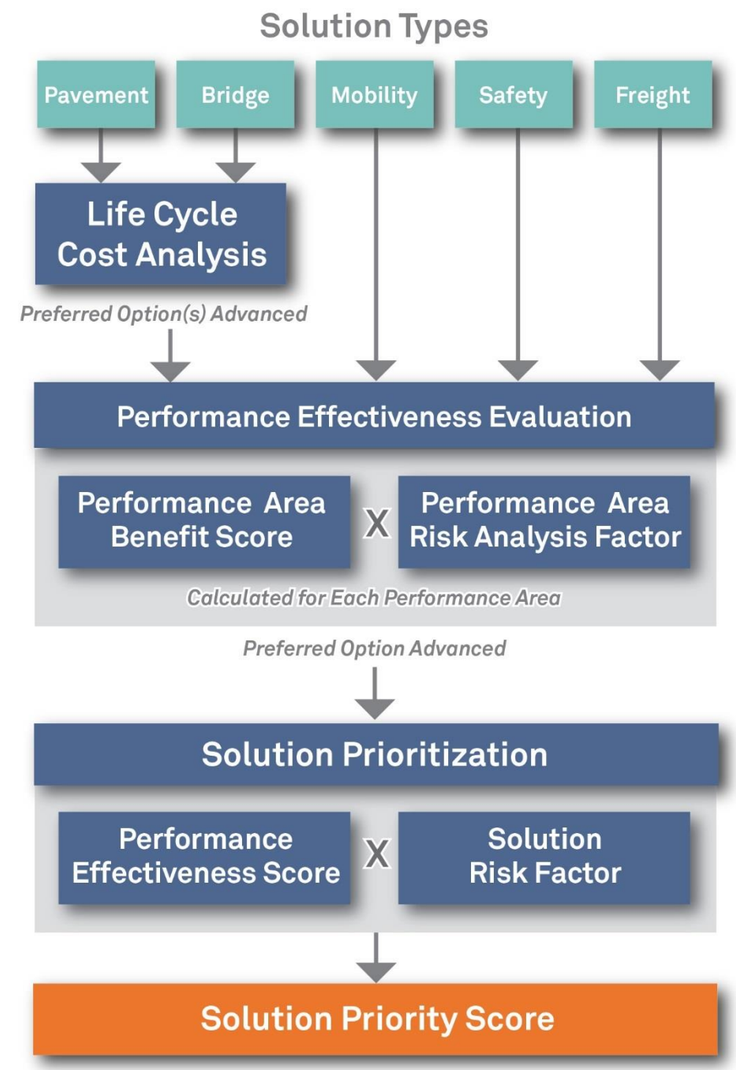
Solution Risk Analysis

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

Candidate Solution Prioritization

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

Figure ES-7: Candidate Solution Evaluation Process



SUMMARY OF CORRIDOR RECOMMENDATIONS

Prioritized Candidate Solution Recommendations

Table ES-4 and **Figure ES-8** show the prioritized candidate solutions recommended for the SR 87/SR 260/SR 377 corridor. Implementation of these solutions is anticipated to improve performance of the SR 87/SR 260/SR 377 corridor, primarily in the Mobility, Safety, and Freight performance areas. The highest priority solutions address needs in the Rye area (SR 87 MP 235-241), Salt River area (SR 87 MP 177-182), and near the Payson area (SR 87 MP 246-251).

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 SR 87/SR 260/SR 377 corridor:

- Implement a driving impaired and speeding safety education campaign along the corridor
- Coordinate with the Arizona Game and Fish Department (AGFD) to conduct a study on vehicle/wildlife conflicts on SR 87 between MP 233 and 241
- Conduct an access management study on SR 87 and SR 260 through the Town of Payson

Policy and Initiative Recommendations

In addition to location-specific needs, general corridor and system-wide needs have also been identified through the CPS process. While these needs are more overarching and cannot be individually evaluated through the CPS process, it is important to document them. A list of recommended policies and initiatives was developed for consideration when programming future projects not only on the SR 87/SR 260/SR 377 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 Round 1, Round 2, and Round 3 CPS:

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

Next Steps

Candidate solutions developed for the SR 87/SR 260/SR 377 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. Recommendation from such studies are still relevant to addressing the ultimate corridor objectives.

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

Table ES-4: Prioritized Recommended Solutions

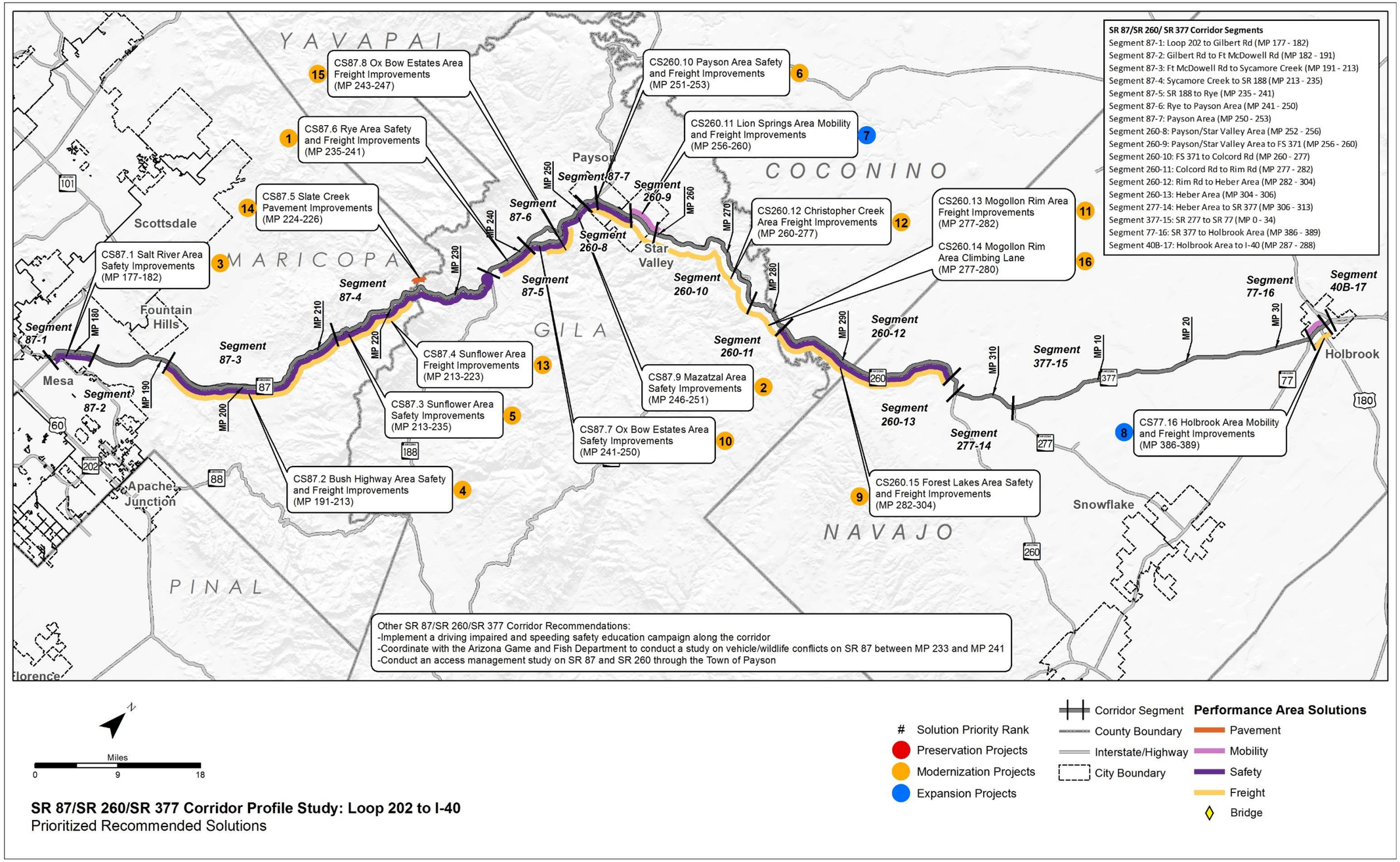
Rank	Candidate Solution #	Option*	Candidate Solution Name	Candidate Solution Scope	Estimated Cost (in millions)	Investment Category (Preservation [P] Modernization [M] Expansion [E])	Prioritization Score
1	CS87.6	-	Rye Area Safety and Freight Improvements (SR 87 MP 235-241)	-Install advisory sign about approaching area with intersections (Deer Creek Drive [MP 237.6], Gisela Road [MP 239.5], two intersections in Rye [MP 240.5 and MP 240.9]) -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	$0.2	M	261
2	CS87.9	-	Mazatzal Area Safety Improvements (SR 87 MP 246-251)	-Widen shoulders SB MP 246.2-250.9	$2.3	M	216
3	CS87.1	-	Salt River Area Safety Improvements (SR 87 MP 177-182)	-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 177-177.5)	$4.7	M	212
4	CS87.2	-	Bush Highway Area Safety and Freight Improvements (SR 87 MP 191-213)	-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 211-209)	$6.8	M	210
5	CS87.3	-	Sunflower Area Safety Improvements (SR 87 MP 213-235)	-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)	$18.3	M	189
6	CS260.10	-	Payson Area Safety and Freight Improvements (SR 87 MP 251-SR 260 MP 253)	-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 Parkway [BIA101]) -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	$0.4	M	171
7	CS260.11	-	Lion Springs Area Mobility and Freight Improvements (SR 260 MP 256-260)	-Reconstruct to 4-lane divided highway (using the existing 2-lane road for one direction) [Design already programmed for FY 2021 in ADOT 5-year program]	$50.0	E	160
8	CS77.16	C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77) (SR 77 MP 386-389)	-Construct new roadway connection between SR 377/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook; includes new bridge over the Little Colorado River and overpass at railroad crossing	$43.8	E	136
		A	*Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)* (SR 77 MP 386-389)	*-Construct new roadway connection between US 180/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook; includes new bridge over the Little Colorado River and overpass at railroad crossing*	*$92.1*	*E*	*67*
		B	*Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)* (SR 77 MP 386-389)	*-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*	*$75.8*	*E*	*46*
9	CS260.15	-	Forest Lakes Area Safety and Freight Improvements (SR 260 MP 282-304)	-Widen shoulders -Construct alternating passing lanes (varying locations for 11 miles of the segment)	$56.5	M	130
10	CS87.7	-	Ox Bow Estates Area Safety Improvements (SR 87 MP 241-250)	-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	$4.1	M	123
11	CS260.13	-	Mogollon Rim Area Freight Improvements (SR 260 MP 277-282)	-Install centerline rumble strips -Install rock-fall mitigation (WB MP 278.4-278.6, 279.8-280.9, 281.4-282.0) -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	$9.5	M	12

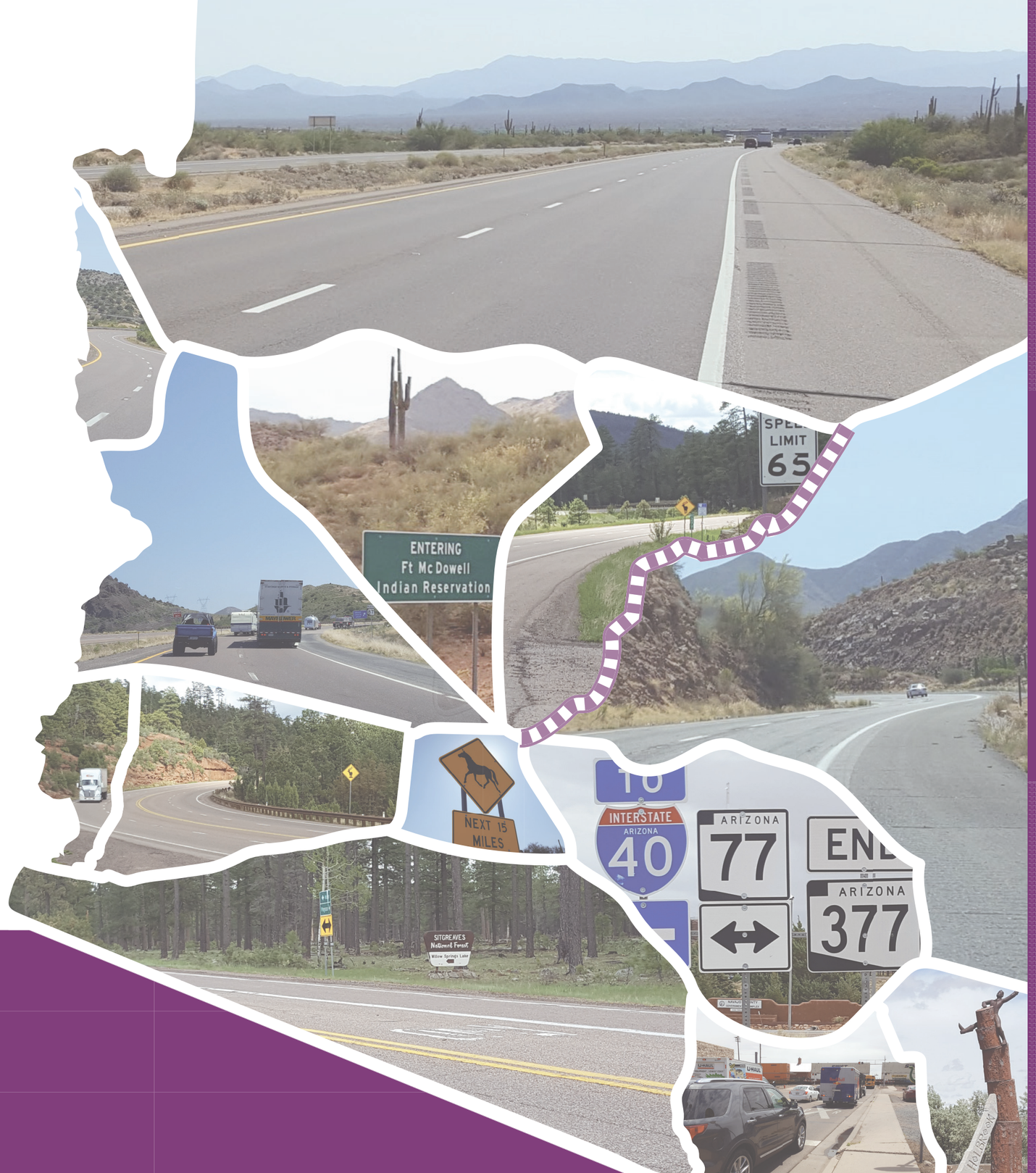
Table ES-4: Prioritized Recommended Solutions (continued)

Rank	Candidate Solution #	Option*	Candidate Solution Name	Candidate Solution Scope	Estimated Cost (in millions)	Investment Category (Preservation [P] Modernization [M] Expansion [E])	Prioritization Score
12	CS260.12	-	Christopher Creek Area Freight Improvements (SR 260 MP 260-277)	-Install rock-fall mitigation (WB MP 262.2-262.6, 261.6-261.9, 269.0-269.1, 269.7-269.8, 271.3-271.5; EB MP 269.8-269.9, 272.6-272.7) -Implement variable speed limits at MP 272-277 and new DMS and CCTV at MP 272 EB	$7.2	M	11
13	CS87.4	-	Sunflower Area Freight Improvements (SR 87 MP 213-223)	-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	$43.4	M	10
14	CS87.5	-	Slate Creek Pavement Improvements (SR 87 MP 224-226)	-Replace Pavement	$7.2	M	9
15	CS87.8	-	Ox Bow Estates Area Freight Improvements (SR 87 MP 243-247)	-Construct NB climbing lane	$22.4	M	2
16	CS260.14	-	Mogollon Rim Area Climbing Lane (SR 260 MP 277-280)	-Construct EB climbing lane	$16.8	M	1

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

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 State Route 87 (SR 87)/State Route 260 (SR 260)/State Route 377 (SR 377) between Junction State Route 202L (Loop 202) and Junction Interstate 40 (I-40). The study examines key performance measures relative to the SR 87/SR 260/SR 377 corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT is conducting eleven CPS within three separate groupings.

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

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

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

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

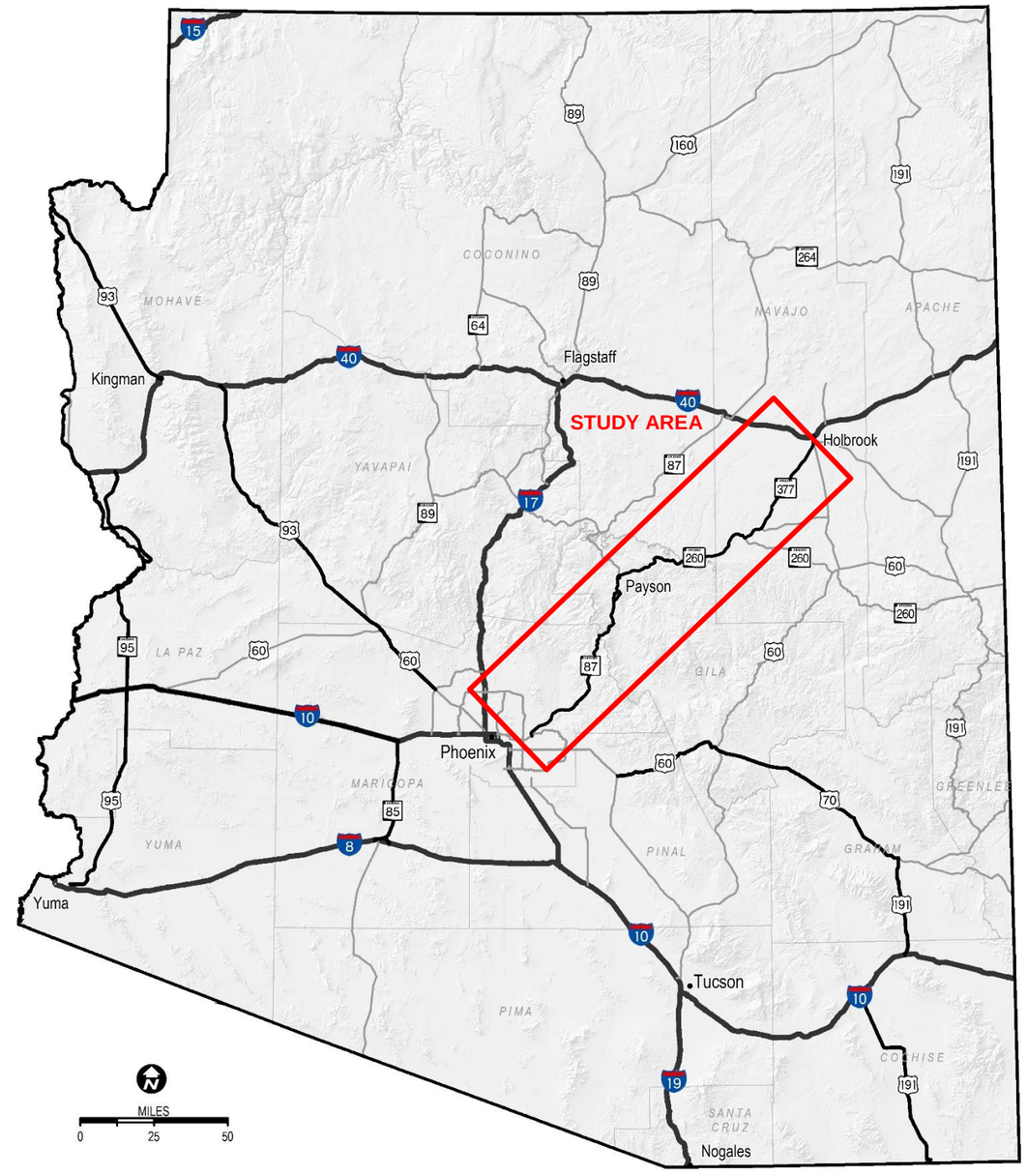
The third round (Round 3) of studies, initiated in Fall 2015, includes:

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

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

The SR 87/SR 260/SR 377 corridor, depicted in **Figure 1,** is one of the strategic statewide corridors identified and the subject of this Round 3 CPS.

Figure 1: Corridor Study Area



1.1 Corridor Study Purpose

The purpose of the CPS is to measure corridor performance to inform the development of strategic solutions that are cost-effective and account for potential risks. 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 SR 87/SR 260/SR 377 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 SR 87/SR 260/SR 377 corridor. Proposed actions are compared based on their likelihood of achieving desired performance levels, life-cycle costs, cost-effectiveness, and risk analysis to produce a prioritized list of solutions that help achieve corridor goals.

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

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

1.3 Corridor Overview and Location

The SR 87/SR 260/SR 377 corridor between Loop 202 and I-40 provides movement for freight, tourism, and recreation needs within Arizona. It provides a key link between the Phoenix metropolitan area and the northeast region of the state and serves intrastate, interstate, and international commerce. The corridor connects Mesa, Fountain Hills, Payson, Heber-Overgaard and Holbrook as well as the Salt River Pima Maricopa Indian Community (SRPMIC), Fort McDowell-Yavapai, and Tonto Apache tribes. This corridor also serves a number of recreational areas and National Forests. The SR 87/SR 260/SR 377 corridor includes portions of SR 87, SR 260, SR 277, SR 377, SR 77 and I-40 Business Route (40B). The SR 87/SR 260/SR 377 corridor between Loop 202 and I-40 is approximately 175 miles in length.

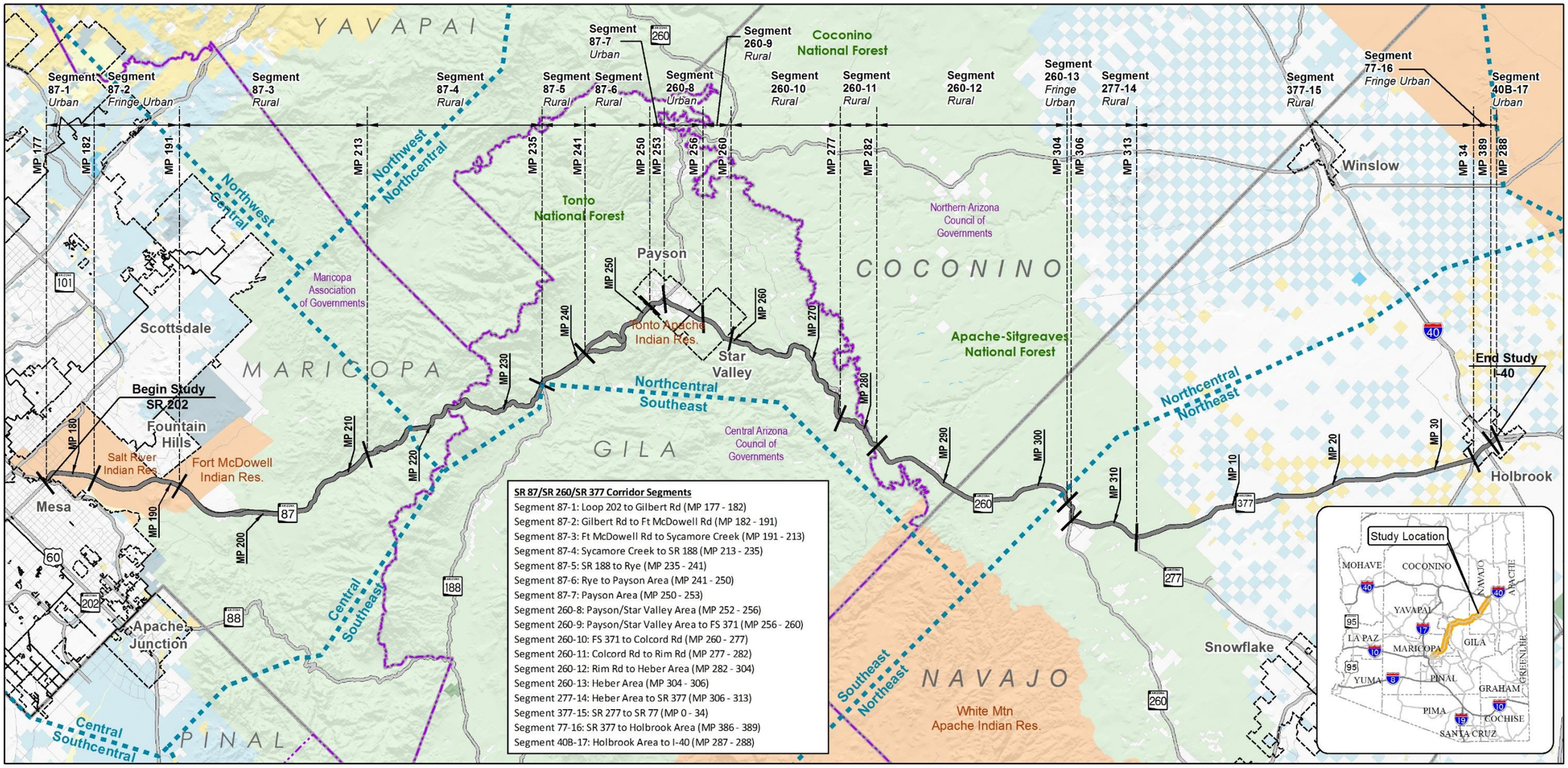
1.4 Corridor Segments

The SR 87/SR 260/SR 377 corridor is divided into 17 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: SR 87/SR 260/SR 377 Corridor Segments

Segment #	Route	Begin	End	Approx. Begin Milepost	Approx. End Milepost	Approx. Length (miles)	Typical Through Lanes (NB/EB, SB/WB)	2014/2035 Average Annual Daily Traffic Volume (vpd)	Character Description
87-1	SR 87	Loop 202	Gilbert Rd	177	182	5	2,2	15,116/29,291	This segment has interrupted flow, numerous access points, consistent traffic volumes, a five-lane undivided or four-lane divided section, and is located in the Phoenix metropolitan urban area.
87-2	SR 87	Gilbert Rd	Fort McDowell Rd	182	191	9	2,2	15,450/34,330	This segment has interrupted flow characteristics, access points, consistent traffic volumes, a four-lane divided section, and is located in the fringes of the Phoenix metropolitan urban area.
87-3	SR 87	Fort McDowell Rd	Sycamore Creek	191	213	22	2,2	9,827/20,289	This rural four-lane divided segment with uninterrupted flow has consistent topography and traffic volumes.
87-4	SR 87	Sycamore Creek	SR 188	213	235	22	2,2	10,778/14,624	This rural four-lane divided segment with uninterrupted flow has steep terrain and a curvy alignment.
87-5	SR 87	SR 188	Rye	235	241	6	2,2	11,717/9,852	This rural four-lane divided segment with uninterrupted flow has flatter terrain than surrounding segments.
87-6	SR 87	Rye	Green Valley Pkwy/BIA 101	241	250	9	2,2	11,717/11,151	This rural segment with uninterrupted flow is a climbing four-lane divided section.
87-7	SR 87	Green Valley Pkwy/BIA 101	SR 260	250	253	3	2,2	19,185/31,821	This segment has interrupted flow, numerous access points, is comprised of a five-lane undivided section, and is located in the Payson urban area.
260-8	SR 260	SR 87	Mayfield Canyon Rd	252	256	4	2,2	14,233/23,706	This segment is comprised of a five-lane undivided section. It is located in the Payson/Star Valley urban area.
260-9	SR 260	Mayfield Canyon Rd	FS 371	256	260	4	1,1	13,796/21,891	This rural segment with uninterrupted flow is comprised of a two-lane undivided section.
260-10	SR 260	FS 371	Colcord Rd	260	277	17	2,2	6,270/5,766	This rural segment with uninterrupted flow is comprised of a four-lane divided section. It is a climbing section.
260-11	SR 260	Colcord Rd	Rim Rd	277	282	5	2,2	6,112/7,752	This rural segment with uninterrupted flow is comprised of a four-lane undivided section. It includes a climbing section to the top of Mogollon Rim.
260-12	SR 260	Rim Rd	Black Canyon Ln	282	304	22	1,1	5,954/7,172	This rural segment with uninterrupted flow is comprised of a two-lane undivided section.
260-13	SR 260	Black Canyon Ln	SR 277	304	306	2	2,2	7,627/9,164	This segment with uninterrupted flow is comprised of a five-lane undivided section. It is located in the fringes of the Heber-Overgaard urban area.
277-14	SR 277	SR 260	SR 377	306	313	7	1,1	1,082/1,514	This rural segment with uninterrupted flow is a two-lane undivided section.
377-15	SR 377	SR 277	SR 77	0	34	34	1,1	2,091/2,701	This rural segment with uninterrupted flow is a two-lane undivided section.
77-16	SR 77	SR 377	I-40B	386	389	3	1,1	7,694/13,573	This segment has interrupted flow, numerous access points, a two-lane or four-lane undivided section, and is located in the fringes of the Holbrook urban area.
40B-17	I-40B	SR 77	I-40/Navajo Blvd TI	287	288	1	2,2	10,996/18,620	This segment has interrupted flow, numerous access points, a four-lane or five-lane undivided section, and is located in the Holbrook urban area.

Figure 2: Corridor Location and Segments



SR 87/SR 260/SR 377 Corridor Segments

Segment 87-1: Loop 202 to Gilbert Rd (MP 177 - 182)
Segment 87-2: Gilbert Rd to Ft McDowell Rd (MP 182 - 191)
Segment 87-3: Ft McDowell Rd to Sycamore Creek (MP 191 - 213)
Segment 87-4: Sycamore Creek to SR 188 (MP 213 - 235)
Segment 87-5: SR 188 to Rye (MP 235 - 241)
Segment 87-6: Rye to Payson Area (MP 241 - 250)
Segment 87-7: Payson Area (MP 250 - 253)
Segment 260-8: Payson/Star Valley Area (MP 252 - 256)
Segment 260-9: Payson/Star Valley Area to FS 371 (MP 256 - 260)
Segment 260-10: FS 371 to Colcord Rd (MP 260 - 277)
Segment 260-11: Colcord Rd to Rim Rd (MP 277 - 282)
Segment 260-12: Rim Rd to Heber Area (MP 282 - 304)
Segment 260-13: Heber Area (MP 304 - 306)
Segment 277-14: Heber Area to SR 377 (MP 306 - 313)
Segment 377-15: SR 277 to SR 77 (MP 0 - 34)
Segment 77-16: SR 377 to Holbrook Area (MP 386 - 389)
Segment 40B-17: Holbrook Area to I-40 (MP 287 - 288)

N

Miles
0 10 20

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
ADOT District Boundary
MPO/COG Boundary

Land Ownership
Bureau of Land Management
Bureau of Reclamation
U.S. Forest Service
National Park Service
Indian Reservation
Military
Local or State Parks
State Trust Land
State Game and Fish
Private

SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Project Vicinity and Segmentation

1.5 Corridor Characteristics

The SR 87/SR 260/SR 377 corridor is an important travel corridor in the central/northeastern part of the state. The corridor functions as a route for recreational, tourist, and regional traffic and provides critical connections between the communities it serves and the rest of the regional and interstate network.

National Context

The SR 87/SR 260/SR 377 corridor is a strategic transportation link across central/northeastern Arizona for freight and intercity travel. The SR 87/SR 260/SR 377 corridor also functions as an alternate route to I-40/I-17 when either of those facilities is closed due to adverse weather or incidents.

Regional Connectivity

The SR 87/SR 260/SR 377 corridor between Loop 202 and I-40 provides movement for freight, tourism, and recreation needs within Arizona. The corridor is located in three ADOT Districts (Central, Northcentral, and Northeast); three planning areas (Maricopa Association of Governments [MAG], Central Arizona Government [CAG], and Northern Arizona Council of Governments [NACOG]); and four counties (Maricopa, Gila, Coconino, and Navajo). Within the corridor study limits, SR 87/SR 260/SR 377 offers connections to several major roadways, including Loop 202, Bush Highway, SR 188, SR 87, SR 260, SR 277, SR 77, I-40B, and I-40. This corridor serves Arizona cities and towns including Mesa, Fountain Hills, Payson, Heber-Overgaard, and Holbrook as well as SRPMIC, Fort McDowell-Yavapai, and Tonto Apache tribes.

Commercial Truck Traffic

Communities along the SR 87/SR 260/SR 377 corridor are dependent on the corridor to access the state economy through freight deliveries and travel to other locations. Freight traffic (trucks) comprise from 2% to 12% of the total traffic flow on the corridor, with the higher truck percentages within the SR 87 portion of the corridor.

Commuter Traffic

A majority of the commuter traffic along the SR 87/SR 260/SR 377 corridor occurs within the urbanized areas of Mesa, Payson, and Holbrook. These areas are economic centers along what is considered mostly a rural combination of state routes. According to the most recent traffic volume data maintained by ADOT, traffic volumes range from approximately 1,200 vehicles per day on SR 277 and SR 377 portions of the corridor to approximately 19,000 vehicles per day in the Town of Payson area on SR 87 and SR 260.

According to the 2013 American Community Survey data from the US Census Bureau, 86% of the workforce in areas along the corridor relies on a private vehicle to get to work.

Recreation and Tourism

SR 87/SR 260/SR 377 provides access to many Arizona attractions such as state parks, national forests, and other recreational activities.

SR 87/SR 260/SR 377 provides access to the Tonto National Forest and Apache-Sitgreaves National Forest. Other recreational destinations accessible from the SR 87/SR 260/SR 377 corridor include Petrified Forest National Park (via I-40 near Holbrook), Roosevelt Lake (via SR 188), and Tonto Natural Bridge State Park (via SR 87 north of Payson), to name a few.

Multimodal Uses

Freight Rail

The BNSF Railway, one of the top transporters of intermodal freight in North America, crosses through the City of Holbrook. The BNSF "Transcon Corridor" connects Los Angeles with Chicago and passes through northern Arizona, paralleling I-40. The BNSF Transcon Corridor typically carries up to about 120 trains per day. The BNSF Railway currently interchanges with a short line railroad, the Apache Railway, in Holbrook. The Apache Railway, which is no longer in service, terminates in Holbrook and travels southward, and was primarily used for paper and mining products[1].

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 Corridor and is subject to delays caused by freight traffic. It travels at an average speed of 63 miles per hour across the State. There is no passenger station in Holbrook. The nearest passenger stations are in Winslow, Arizona and Gallup, New Mexico.

Bicycles/Pedestrians

Opportunities for bicycle and pedestrian travel are limited on SR 87/SR 260/SR 377. Bicycle traffic is permitted on the mainline outside shoulder; however, outside shoulder widths are relatively narrow and often less than the preferred 4-foot minimum width. SR 87, from milepost (MP) 182 to MP 250, has wider outside shoulders that are approximately 10 feet wide.

Bus/Transit

Valley Metro, the transit service for the Greater Phoenix Metropolitan area, offers two express bus routes near the southern terminus of the corridor in nearby Scottsdale and Mesa. The White Mountain Connection offers bus service from Holbrook to smaller communities south such as Snowflake, Taylor, Show Low, and Pinetop-Lakeside, along with stops at the Navajo County Government offices and Northland Pioneer College campuses. Greyhound operates intercity bus transit along I-40 in Arizona, with a stop in Holbrook.

[1] Source: Arizona State Rail Plan (2011), Appendix A

Aviation

There are two general aviation facilities in proximity to the SR 87/SR 260/SR 377 corridor. These include the Holbrook Municipal Airport, owned and operated by the City of Holbrook, and the Payson Municipal Airport, owned and operated by the Town of Payson. The southern portion of the corridor serves as a connection to numerous other airports located in the Phoenix Metropolitan area (via Loop 202).

Land Ownership, Land Uses and Jurisdictions

As shown previously in **Figure 2**, the SR 87/SR 260/SR 377 corridor traverses multiple jurisdictions and land owned or managed by various entities in four Arizona counties: Maricopa, Gila, Coconino, and Navajo. The southern section of the corridor traverses the SRPMIC and Fort McDowell Indian reservation lands. A majority of the corridor (from approximately SR 87 MP 195 to SR 377 MP 5) traverses Tonto and Apache-Sitgreaves National Forest land. Land ownership in and surrounding the Payson and Holbrook urban areas is mainly private, with the northern section of the corridor (SR 377 and SR 77) traversing a mix of private land, State Trust Land, and Bureau of Land Management (BLM) land.

Population Centers

Population centers of various sizes exist along the SR 87/SR 260/SR 377 corridor. **Table 2** provides a summary of the populations for communities along the corridor. Moderate population growth is projected between 2010 and 2040 in the major population centers along the corridor according to the Arizona State Demographer's Office.

Table 2: Current and Future Population

Community	2010 Population	2015 Population	2040 Population	% Change 2010-2040	Total Growth
Maricopa County	3,824,058	4,076,438	6,030,950	58%	2,206,892
Mesa	439,929	460,950	597,200	36%	157,271
Fountain Hills	22,444	23,346	30,400	35%	7,956
Gila County	53,565	54,406	54,531	2%	966
Payson	15,270	15,675	17,095	12%	1,825
Star Valley	2,303	2,325	2,252	-2%	-51
Navajo County	107,677	109,671	120,094	12%	12,417
Heber-Overgaard	2,829	2,930	3,395	20%	566
Holbrook	5,055	5,094	5,606	11%	551

Source: Arizona Department of Administration – Employment and Population Statistics

Major Traffic Generators

The Phoenix Metropolitan area, along with the Town of Payson and City of Holbrook, are major traffic generators for the SR 87/SR 260/SR 377 corridor.

Tribes

A southern portion of the corridor traverses the SRPMIC (SR 87/202L Junction to SR 87 MP 188) and Fort McDowell-Yavapai (SR 87 MP 188 to SR 87 MP 193) Indian reservations. The Yavapai Tonto Apache Reservation is immediately adjacent to SR 87 near the southern portion of the Town of Payson (SR 87 MP 251). The Navajo and White Mountain Apache Reservations are in the vicinity of the northern portion of the corridor but not immediately adjacent to it.

Wildlife Linkages

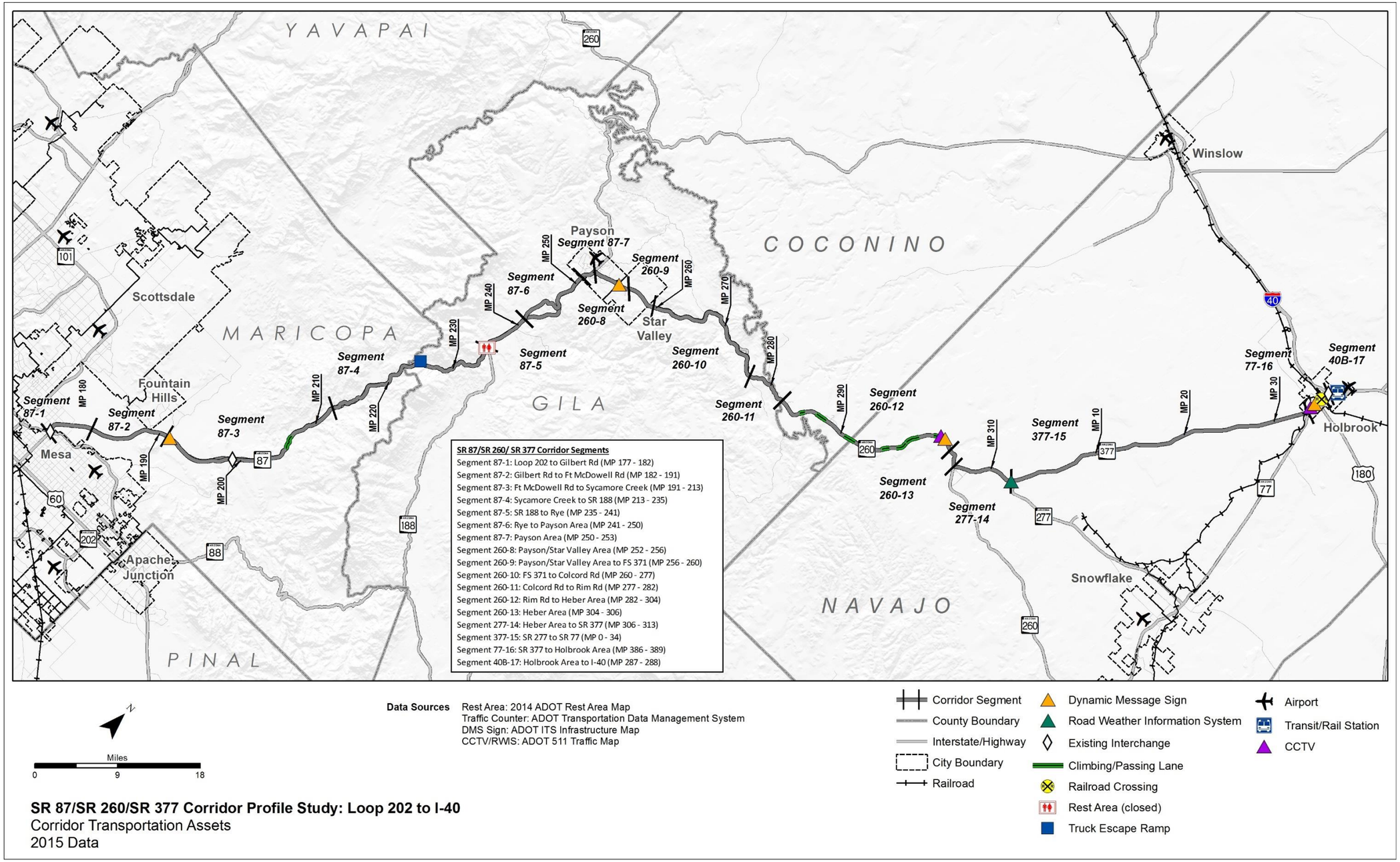
The Arizona State Wildlife Action Plan (SWAP) provides a 10-year vision for the entire state, identifying wildlife and habitats in need of conservation, insight regarding the stressors to those resources, and actions that can be taken to alleviate those stressors. Using the Habimap Tool that creates an interactive database of information included in the SWAP, the following were identified in relation to the SR 87/SR 260/SR 377 corridor:

- Arizona Game and Fish Department (AGFD) Wildlife Waters are scattered near the corridor, specifically in the areas south of Payson, near Heber-Overgaard, and along SR 377
- Arizona Important Bird Areas: The southern portion of the corridor is near the Salt and Verde Riparian Ecosystem Important Bird Area
- The corridor travels through allotments controlled by the Arizona State Land Department (ASLD), BLM, and United States Forest Service
- Riparian areas include a few areas adjacent to SR 87 MP 207-224 and MP 230-245, numerous crossings along SR 260, SR 77, and SR 377, and along parts of I-40B
- Arizona Wildlife Linkages: No missing linkages are noted, but there are potential Arizona Wildlife Linkage Zones along SR 87 from MP 215 to MP 235, along SR 260 from MP 253 to MP 302, and from SR 377 MP 6 to the northern terminus of the corridor in Holbrook on I-40B
- According to the Species and Habitat Conservation Guide (SHCG), sensitive habitats that have moderate to high conservation potential exist along the corridor; these areas are located south of the Town of Payson and between Payson and Holbrook
- Areas where Species of Greatest Conservation Need (SGCN) are high or moderately vulnerable are similar to the areas identified in the SHCG (see above)
- Identified areas of moderate or high levels of Species of Economic and Recreational Importance are in the vicinity of SR 87, from approximately MP 195 to MP 245, and along SR 260 from approximately MP 253 to MP 302

Corridor Assets

Corridor transportation assets are summarized in **Figure 3**. There are six passing lanes on the SR 260 portion of the corridor between MP 285 and MP 305. There is one climbing lane on SR 87 SB at approximately MP 205. The corridor includes three grade-separated traffic interchanges (TI): one interchange involving SR 87 and Bush Highway at approximately MP 199, one at the southern terminus of the corridor involving SR 87 and 202L, and one at the northern terminus of the corridor involving I-40B and I-40.

Figure 3: Corridor Assets



SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Corridor Transportation Assets
2015 Data

Other assets include a rest area (Mazatzal Rest Area SR 87 EB MP 235.7, currently closed); dynamic message signs (DMS) located at SR 87 NB, MP 191.2; SR 260 EB, MP 255.0; SR 260 EB/WB, MP 302.4; and SR 77 SB, MP 387.5; and permanent traffic counters located at SR 87 MP 183, SR 87 MP 235, SR 260 MP 260, and SR 377 MP 30. There is a Road Weather Information System (RWIS) device located at the SR 277 and SR 377 intersection and a truck escape ramp on SR 87 NB near MP 227. Closed-circuit television (CCTV) cameras are located at SR 260 EB/WB, MP 302.4 and SR 77 NB/SB, MP 387.5.

1.6 Corridor Stakeholders and Input Process

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

Key stakeholders identified for this study included:

- ADOT Northcentral District
- ADOT Northwest District
- ADOT Central District
- ADOT Technical Groups
- MAG
- NACOG
- CAG
- AGFD
- ASLD
- Federal Highway Administration (FHWA)

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

1.7 Prior Studies and Recommendations

This study identified recommendations from previous studies, plans, and preliminary design documents. Studies, plans, and programs pertinent to the SR 87/SR 260/SR 377 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 2017-2021 Five-Year Transportation Facilities and Construction Program
- ADOT Statewide Bicycle and Pedestrian Plan Update
- ADOT Climbing and Passing Lane Prioritization Study
- Arizona Key Commerce Corridors
- Arizona Multimodal Freight Analysis Study
- Arizona Roadway Departure Safety Implementation Plan
- Arizona State Rail Plan
- Arizona Statewide Dynamic Message Sign (DMS) Master Plan
- Arizona Statewide Rail Framework Study
- Arizona Statewide Travel Demand Model (AZTDM)
- Arizona Wildlife Action Plan/Arizona Wildlife Linkages Assessment
- Building a Quality Arizona (BQAZ)
- What Moves You Arizona? LRTP 2010-2035

Regional Planning Studies

- MAG, 2035 Regional Transportation Plan
- CAG, 10-Year Transportation Improvement Plan
- NACOG, 10-Year Transportation Improvement Program

Planning Assistance for Rural Areas and Small Area Transportation Studies

- Gila County Transportation Study (2014)
- Payson Small Area Transportation Study (2011)
- SRPMIC 2010 LRTP
- Navajo County Central Region Transportation Study (2010)

Design Concept Reports and Project Assessments

- SR 87: New Four Peaks Road to Dos S Ranch – Final DCR (2008)
- SR 87: MP 224 to 226, Mt. Ord to Slate Creek Final PA (2012)
- SR 260: Wildlife-Vehicle Collision Mitigation for Safer Wildlife Movement across Highways (2012)
- SR 260: MP 282.49 to 305.90, Rim Road to Gibson Road Final PA (2014)
- SR 260: Payson to Heber, Location/DCR (May 2000)
- SR 377: HES Evaluation – Accident Analysis, MP 0 – MP 33.8 (2005)
- SR 377: SR 277-Holbrook Initial PA (2007)
- Road Safety Assessment (RSA): SR 87 MP 252.3 to 252.9, SR 260 MP 251.9 to 252.3 (2010)

Summary of Prior Recommendations

Various studies and plans, including several DCRs, have recommended improvements to the SR 87/SR 260/SR 377 corridor as shown in **Table 3** and **Figure 4**. They include, but are not limited to:

- Widening of numerous sections of SR 87/SR 260/SR 377, some of which will require right-of-way acquisition; many other proposed improvements are associated with the recommended widening:
  - Adding one general purpose lane in each direction on SR 87 from MP 177 to MP 253
  - Adding one general purpose lane in each direction on SR 260 from MP 256 to MP 260
  - Adding one general purpose lane in each direction on SR 277 from MP 306 to MP 313
  - Adding one general purpose lane in each direction on SR 377 from MP 0 to MP 34
  - Adding one general purpose lane in each direction on SR 77 from MP 386 to MP 389
- Climbing and passing lanes have been recommended throughout the SR 87/SR 260/SR 377 corridor based on the Climbing and Passing Lane Prioritization Study
- Many intersections within the Town of Payson on SR 87 or SR 260 have recommendations for studies to be performed or recommendations from previous studies that should be implemented
- Constructing alternative routes to the Payson and Holbrook urban areas has been recommended

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)?	
SR 87											
1	177	253	76	Widen/upgrade SR 87 to 6 lanes			√		N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
2	180 181 183 188 201	180 181 183 188 201	-	Construct Dynamic Message Sign		√			N/A	N	Arizona Statewide Dynamic Message Sign Master Plan (2011)
3	224	226	1	Construct landslide mitigation measures	√				N/A	N	SR 87, MP 224 to MP 226, Final Project Assessment (2012)
4	251.6	251.6	-	SR 87/Aero Drive intersection - Conduct a traffic warrant study. Intersection needs to be reconstructed to fix sight distance issues if traffic signal not warranted		√			N/A	N	Payson Transportation Study (2011)
5	251.9	253	1.1	SR 87- Main Street to SR 260 - Incorporate recommendations from Road Safety Assessment (RSA) and Traffic Operational Analysis Study (TOAS).		√			N/A	N	Payson Transportation Study (2011)
6	251.5	251.5	-	SR 87/ Phoenix Street intersection - Conduct intersection safety study and implement recommendations.		√			N/A	N	Payson Transportation Study (2011)
7	253	253	-	SR 87/SR 260 intersection - Incorporate recommendations from RSA and TOAS.		√			N/A	N	Payson Transportation Study (2011) RSA: SR 87 MP 252.3 to 252.9, SR 260 MP 251.9 to 252.3 (2010)
8	251.9 252	251.9 252	-	SR 87/Main Street, SR 87/ Frontier Street and two other locations - Conduct one traffic safety study that covers all intersections.		√			N/A	N	Payson Transportation Study (2011)
9	252	253	1	SR 87 – North of Aero Drive to north of Frontier Street - Conduct a drainage study.		√			N/A	N	Payson Transportation Study (2011)
10	N/A	N/A	-	Construct alternative route to SR 87/SR 260 Corridor in Payson			√		N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010) Payson Transportation Study (2011)

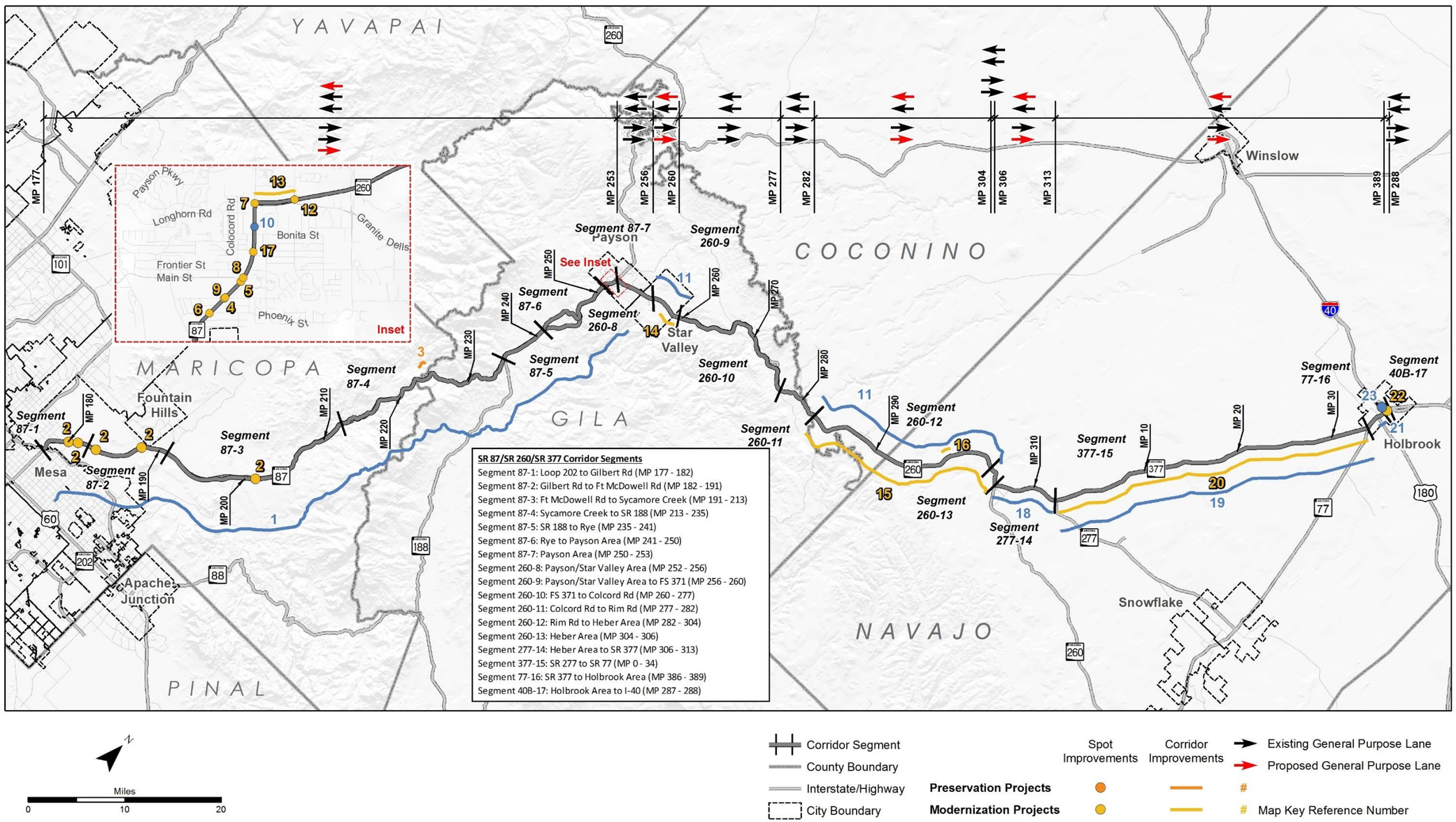
Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N)?	
SR 260											
11	256 282	260 304	26	Widen/upgrade SR 260 to 4 lanes			√		N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
12	252.3	252.3	-	SR 260/Manzanita Drive intersection - Incorporate recommendations from RSA and TOAS		√			N/A	N	Payson Transportation Study (2011)
13	250	252.3	2.3	SR 260 - SR 87 to Manzanita Drive - Incorporate recommendations from RSA and TOAS		√			N/A	N	Payson Transportation Study (2011)
14	258	260	2	SR 260, Lion Springs Section, rural corridor reconstruction to 4-lane divided highway			√	FY2021 (Design)	21301/ Fxxxx01D	N	ADOT 2017-2021, Five-Year Facility Construction Program
15	282.5	305.9	23.4	Construct shoulder widening, Rim Rd to Gibson Rd Segment 2. The project also includes pipe and culvert extensions and relocation of roadside culverts, as well as adding guardrail at two locations.		√			N/A	N	SR 260, MP 282.5 to 305.9, Rim Road to Gibson Road Final PA (2014)
16	288	289	1	Construct climbing lane on SR 260 EB MP 288 to 289		√			N/A	N	ADOT Climbing and Passing Lane Prioritization Study (2015)
17	N/A	N/A	-	Provide a minor transit center in Payson		√			N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
SR 277											
18	306	313	7	Widen/upgrade SR 277 to 4 lanes			√		N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
SR 377											
19	0	34	34	Widen/upgrade SR 377 to 4 lanes			√		N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
20	0	34	34	SR 377: SR 277 to SR 77 various locations, reconstruct curves		√		FY2018	6710/ H893001C	N	ADOT 2017-2021, Five-Year Facility Construction Program SR 377 HES Evaluation, MP 0 - MP 34 (2005) SR 377: SR 277 Holbrook, Initial PA (2007)

Table 3: Corridor Recommendations from Previous Studies (continued)

Map Key Ref. #	Begin MP	End MP	Length (miles)	Project Description	Investment Category (Preservation [P], Modernization [M], Expansion [E])			Status of Recommendation			Name of Study
					P	M	E	Program Year	Project No.	Environmental Documentation (Y/N)?	
SR 77											
21	386	389	3	Widen SR 77 Holbrook to Tucson			√		N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
I-40 Business											
22	N/A	N/A	-	Provide a major transit center in Holbrook		√			N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
23	N/A	N/A	-	Provide an alternative, grade-separated route from SR 77 to I-40			√		N/A	N	Navajo County Central Region Transportation Study (2010)

Figure 4: Corridor Recommendations from Previous Studies



2.0 CORRIDOR PERFORMANCE

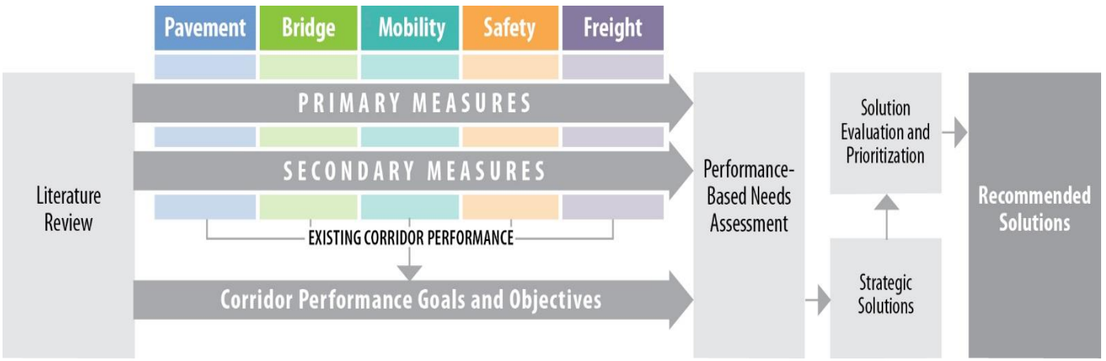
This chapter describes the evaluation of the existing performance of the SR 87/SR 260/SR 377 corridor. A series of performance measures is used to assess the corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

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

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

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

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

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

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

Table 4: Corridor Performance Measures

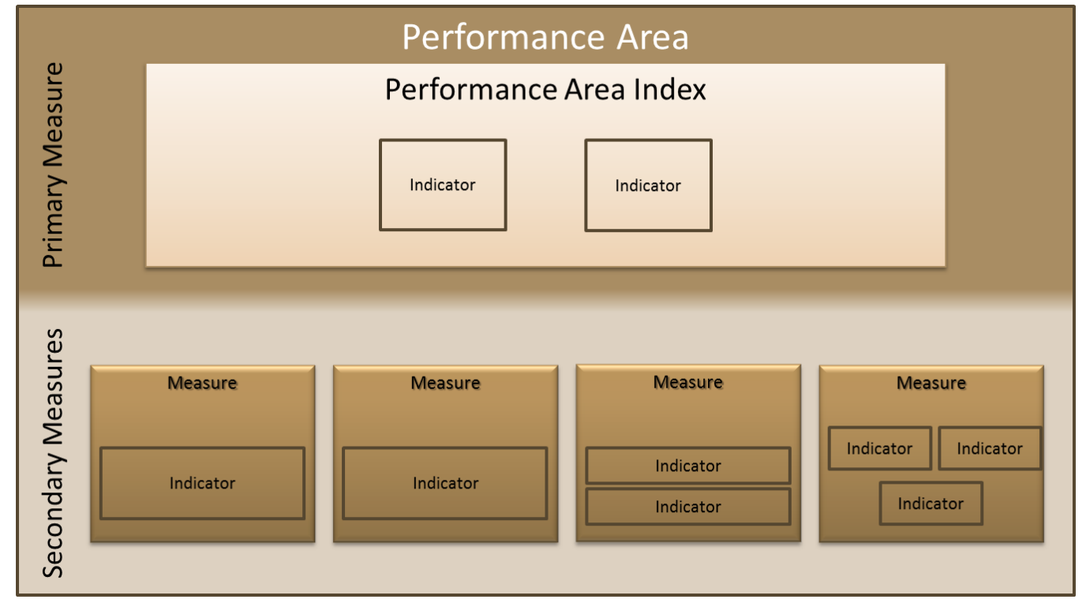
Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index and cracking	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure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

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

The guidelines for performance measure development are:

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

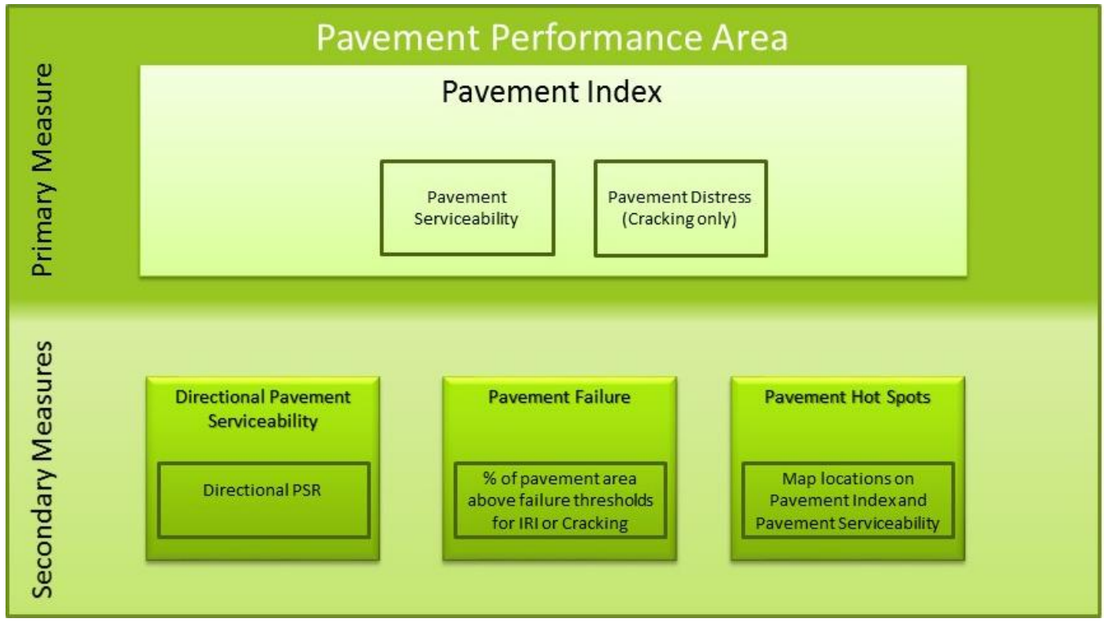
Figure 6: Performance Area Template



2.2 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 SR 87/SR 260/SR 377 corridor. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C**.

Figure 7: Pavement Performance Measures



Primary Pavement Index

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

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

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

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Pavement performance area, the relevant operating environments are designated as interstate and non-interstate segments. For the SR 87/SR 260/SR 377 corridor, the following operating environment was identified:

- Non-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 or Cracking

Pavement Hot Spots

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

Pavement Performance Results

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

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

- The weighted average of the Pavement Index shows "good" overall performance for the SR 87/SR 260/SR 377 corridor
- According to the Pavement Index, nearly all of the pavement is in "good" condition with the exception of Segments 260-13, 277-14, and 77-16
- No pavement condition data was available for MP 224-226 in Segment 87-4
- Segment 40B-17, the short 1-mile section of I-40B, did not have sufficient data to calculate ratings
- Segments 260-13, 277-14, and 77-16 have "poor" % Pavement Area Failure ratings
- Pavement hot spots along the corridor include:
    - Segment 87-1 northbound (NB) MP 177-178
    - Segment 87-3 southbound (SB) MP 195-199, 200-201
    - Segment 87-4 NB/SB MP 224-226

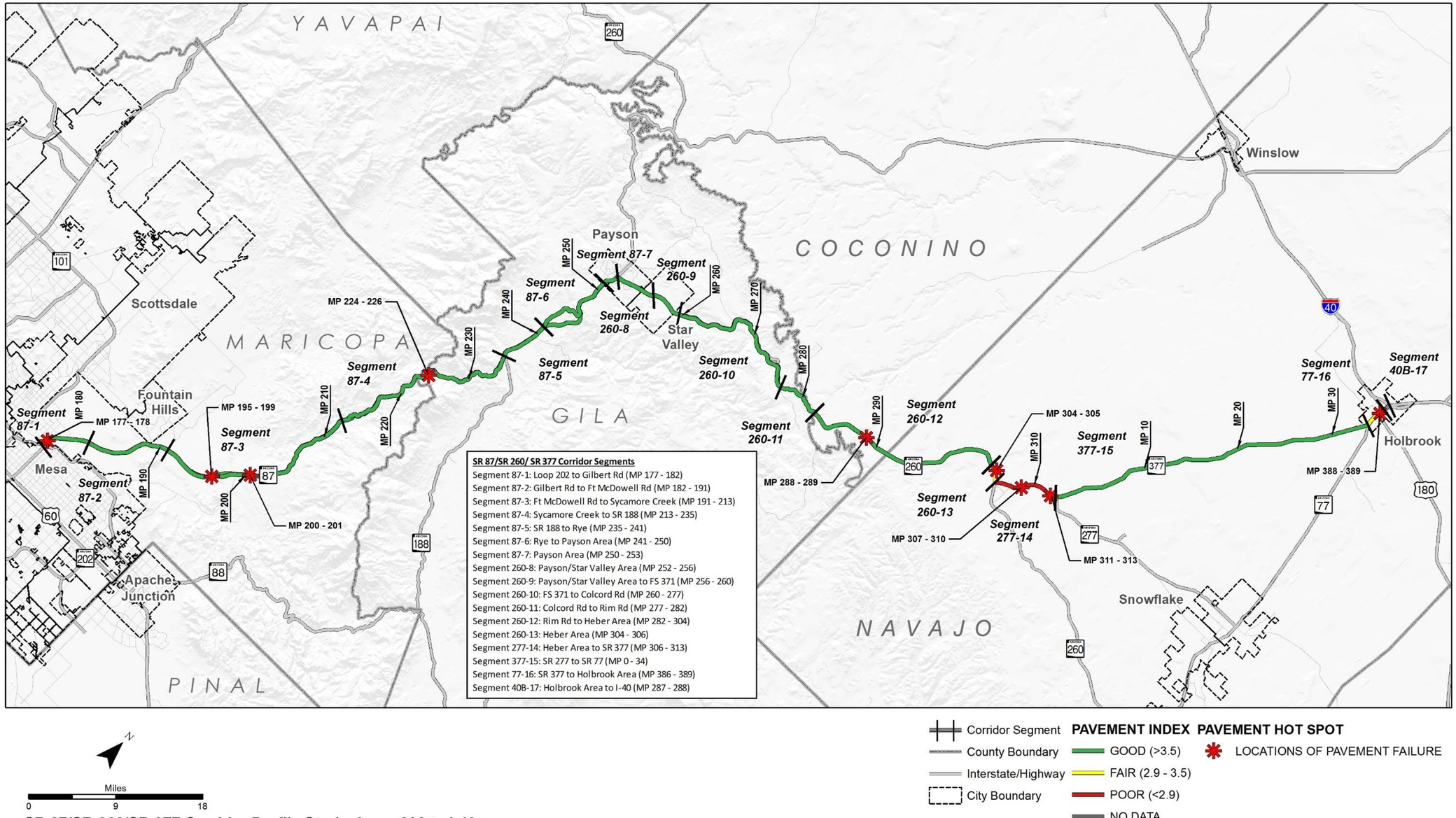
- Segment 260-12 eastbound (EB) MP 288-289
- Segment 260-13 EB MP 304-305
- Segment 277-14 EB MP 307-310, 311-313
- Segment 77-16 NB MP 388-389

Table 5 summarizes the Pavement performance results for the SR 87/SR 260/SR 377 corridor. **Figure 8** illustrates the primary Pavement Index performance and locations of Pavement hot spots along the SR 87/SR 260/SR 377 corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 5: Pavement Performance

Segment #	Segment Length (miles)	Pavement Index	Directional PSR		% Area Failure
			NB/EB	SB/WB	
87-1	5	4.19	4.03	4.11	10.0%
87-2	9	4.25	4.01	4.14	0.0%
87-3	22	3.80	3.80	3.88	11.4%
87-4	22	4.05	3.84	3.93	0.0%
87-5	5	4.55	4.35	4.36	0.0%
87-6	10	4.15	4.10	3.96	0.0%
87-7	2	3.54	3.36	3.48	0.0%
260-8	4	4.31	4.24		0.0%
260-9	3	4.27	4.12		0.0%
260-10	17	4.03	3.79	3.81	0.0%
260-11	5	4.13	3.98		0.0%
260-12	22	3.78	3.52		4.5%
260-13	2	3.11	2.87		50.0%
277-14	7	2.05	3.03		71.4%
377-15	34	4.12	4.03		0.0%
77-16	2	3.25	3.10		40.0%
40B-17	1	No Data			
Weighted Corridor Average		3.94	3.83	3.86	6.3%
SCALES					
Performance Level		**Non-Interstate**			
Good		> 3.50			< 5%
Fair		2.90 - 3.50			5% - 20%
Poor		< 2.90			> 20%

Figure 8: Pavement Performance

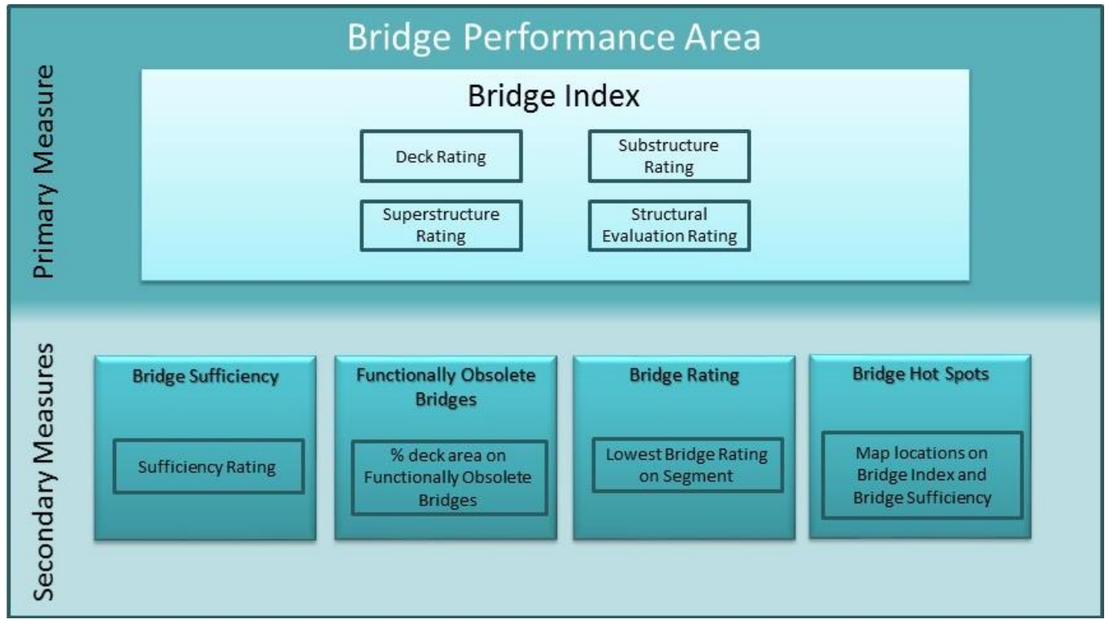


SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Pavement Index and Hot Spots
2014-2015 Data

2.3 Bridge Performance Area

The Bridge performance area consists of a primary measure (Bridge Index) and four secondary measures, as shown in **Figure 9**. These measures assess the condition of the existing bridges along the SR 87/SR 260/SR 377 corridor. Only bridges that carry mainline traffic or bridges that cross the mainline are included in the calculation. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C**.

Figure 9: Bridge Performance Measures



Primary Bridge Index

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

Secondary Bridge Measures

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

Bridge Sufficiency

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

Functionally Obsolete Bridges

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

Bridge Rating

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

Bridge Hot Spots

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

Bridge Performance Results

The Bridge Index provides a 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:

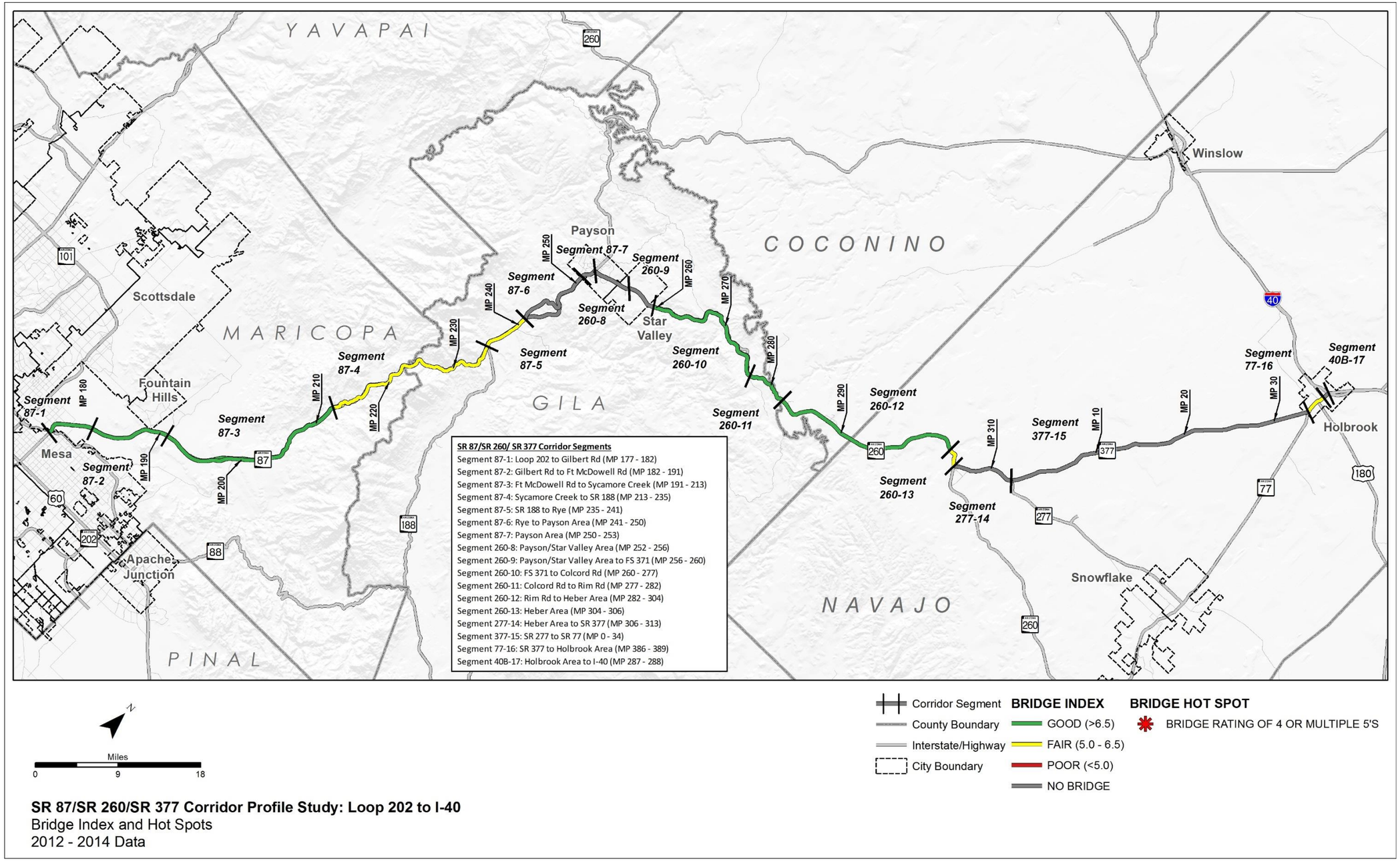
- The weighted average of the Bridge Index shows "good" overall performance for the SR 87/SR 260/SR 377 corridor
- All segments that contain bridges have a "fair" or "good" Bridge Index rating
- All segments that contain bridges have a "good" Sufficiency Rating except Segments 260-11 and 77-16, which have a "fair" Sufficiency Rating
- There is one functionally obsolete bridge in Segment 77-16 (Little Colorado River Bridge, #2030)
- All segments that contain bridges have a "fair" or "good" Lowest Bridge Rating
- There are no bridge hot spots along the corridor

Table 6 summarizes the Bridge performance results for the SR 87/SR 260/SR 377 corridor. **Figure 10** illustrates the primary Bridge Index performance and locations of Bridge hot spots along the SR 87/SR 260/SR 77 corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 6: Bridge Performance

Segment #	Segment Length (miles)	# of Bridges	Bridge Index	Sufficiency Rating	% of Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating
87-1	5	1	7.00	85.00	0.0%	7
87-2	9	2	7.00	96.50	0.0%	7
87-3	22	7	6.95	96.20	0.0%	6
87-4	22	10	6.31	89.18	0.0%	6
87-5	6	4	6.31	99.60	0.0%	6
87-6	9	0	No Bridges			
87-7	3	0	No Bridges			
260-8	4	0	No Bridges			
260-9	4	0	No Bridges			
260-10	17	33	6.81	99.52	0.0%	6
260-11	5	3	6.73	79.13	0.0%	6
260-12	22	1	7.00	98.40	0.0%	7
260-13	2	1	6.00	93.70	0.0%	6
277-14	7	0	No Bridges			
377-15	34	0	No Bridges			
77-16	3	1	6.00	59.00	100%	6
40B-17	1	0	No Bridges			
Weighted Corridor Average			6.70	95.46	1.6	6.06
SCALES						
Performance Level			**All**			
Good			> 6.5	> 80	< 12%	> 6
Fair			5.0 - 6.5	50 - 80	12% - 40%	5 - 6
Poor			< 5.0	< 50	> 40 %	< 5

Figure 10: Bridge Performance

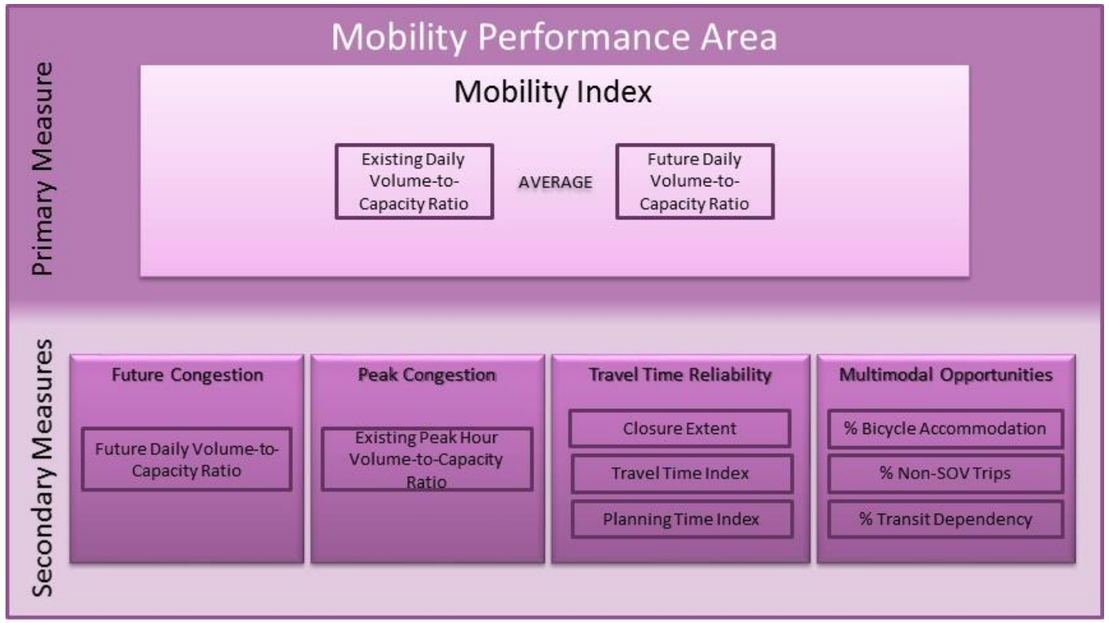


SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Bridge Index and Hot Spots
2012 - 2014 Data

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 SR 87/SR 260/SR 377 corridor. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C**.

Figure 11: Mobility Performance Measures



Primary Mobility Index

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

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Mobility performance area, the relevant operating environments are urban vs. rural setting and interrupted flow (e.g., signalized at-grade intersections are present) vs. interrupted flow (e.g., controlled access grade-separated conditions such as freeway or interstate highway). For the SR 87/SR 260/SR 377 corridor, the following operating environments were identified:

- Urban Interrupted Flow: Segments 87-1, 87-2, 87-7, 260-8, 77-16, and 40B-17
- Rural Uninterrupted Flow: Segments 87-3, 87-4, 87-5, 87-6, 260-9, 260-10, 260-11, 260-12, 260-13, 277-14, and 377-15

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

Peak Congestion – Existing Peak Hour V/C

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

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

- Closure Extent
  - The average number of instances a particular milepost is closed per year per mile on a given segment of the corridor in a specific direction of travel; a weighted average was applied to each closure that takes into account the distance over which the closure spans
  - Closures related to crashes, weather, or other incidents are a significant contributor to non-recurring delays; construction-related closures were excluded from the analysis
- Directional Travel Time Index (TTI):
  - The ratio of the average peak period travel time to the free-flow travel time (based on the posted speed limit) in a given direction
  - The TTI recognizes the delay potential from recurring congestion during peak periods; different thresholds are applied to uninterrupted flow (freeways) and interrupted flow (non-freeways) to account for flow characteristics
- Directional Planning Time Index (PTI):
  - The ratio of the 95th percentile travel time to the free-flow travel time (based on the posted speed limit) in a given direction

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

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

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

Mobility Performance Results

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

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

- The weighted average of the Mobility Index shows “good” overall performance for the SR 87/SR 260/SR 377 corridor, with Segments 87-2, 87-7, and 77-16 indicating “fair” performance and Segment 260-9 indicating “poor” performance
- During the existing peak hour, traffic operations are “good” for all segments except Segment 260-9
- Segments 87-2, 87-7, 260-9, and 77-16 are anticipated to have “poor” performance in the future, according to the Future Daily V/C performance indicator
- Segments 87-3 and 87-4 have “poor” performance in the Closure Extent performance indicator for NB travel; Segments 260-11 and 260-12 have “poor” performance in the Closure Extent performance indicator for westbound (WB) travel
- TTI and PTI data was not available for Segments 277-14 and 377-15
- The TTI performance indicator shows that all segments on the SR 87/SR 260/SR 377 corridor performance at “fair” or “good” performance level
- The PTI performance indicator shows many of the SR 87/SR 260/SR 377 segments, both NB/EB and SB/WB, have “fair” or “poor” performance in terms of reliability
- More than half of SR 87/SR 260/SR 377 segments show “poor” or “fair” performance for non-SOV trips, indicating single occupant trips are more common
- A majority of the corridor shows “poor” performance in % Bicycle Accommodation, indicating most of the corridor – particularly those segments not pertaining to SR 87 – has narrow shoulders

Table 7 summarizes the Mobility performance results for the SR 87/SR 260/SR 377 corridor. **Figure 12** illustrates the primary Mobility Index performance along the SR 87/SR 260/SR 377 corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 7: Mobility Performance

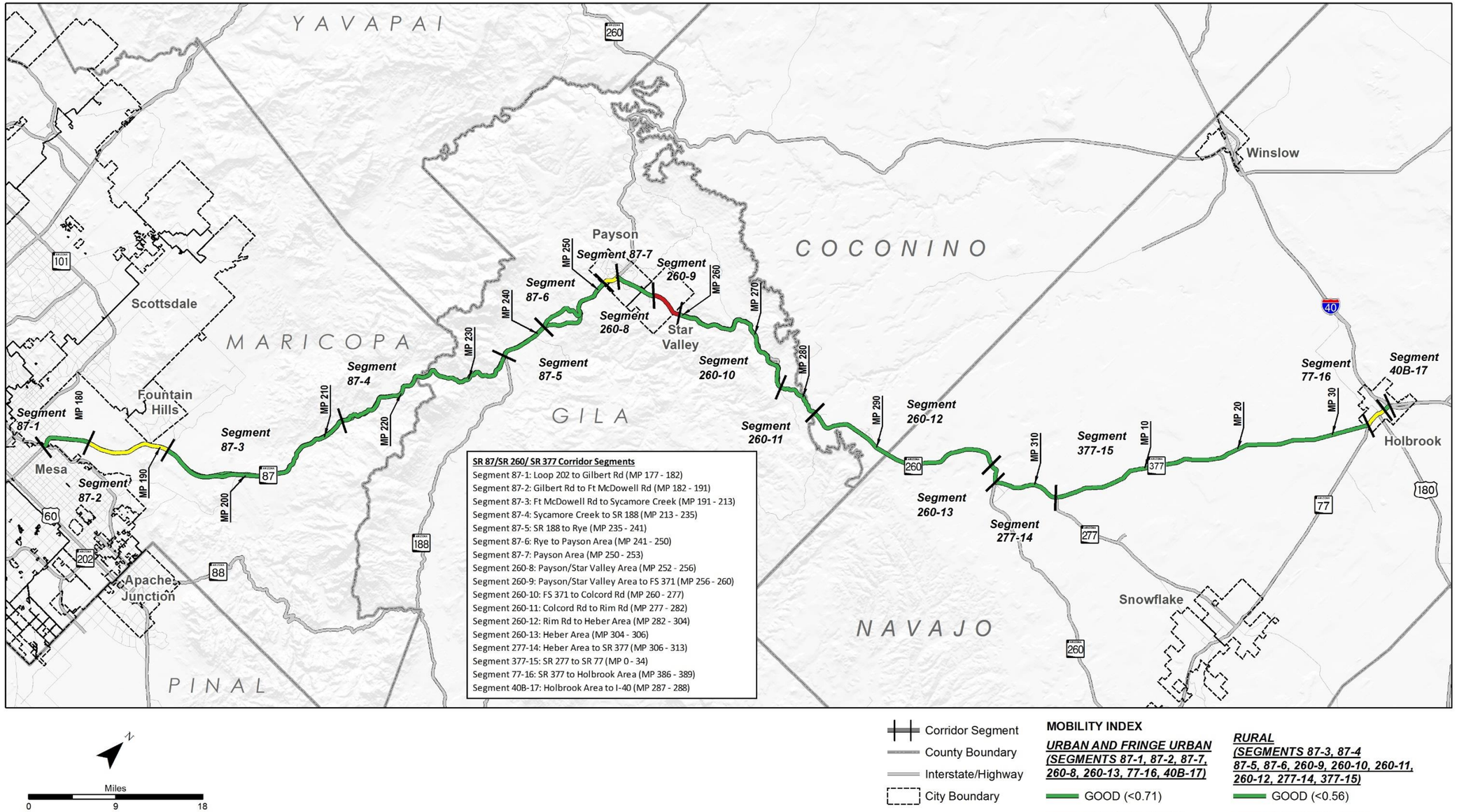
Segment #	Segment Length (miles)	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/milepost/year/mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
				NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB		
87-1[1]*	5	0.65	0.86	0.34	0.34	0.37	0.32	1.22	1.06	4.01	3.03	45%	13.6%
87-2[1]*	9	0.73	1.01	0.45	0.45	0.46	0.04	1.15	1.23	2.36	3.86	93%	14.4%
87-3[2]^	22	0.21	0.29	0.14	0.13	0.87	0.11	1.05	1.04	1.54	1.48	99%	16.7%
87-4[2]^	22	0.23	0.27	0.20	0.21	1.47	0.15	1.17	1.05	2.05	1.47	86%	5.2%
87-5[2]^	5	0.15	0.14	0.15	0.15	0.23	0.07	1.01	1.08	1.42	1.51	92%	12.9%
87-6[2]^	10	0.21	0.21	0.19	0.19	0.18	0.27	1.31	1.15	2.38	1.94	79%	12.4%
87-7[1]*	2	0.75	0.94	0.57	0.50	0.07	0.20	1.18	1.86	4.43	6.48	56%	18.4%
260-8[1]*	4	0.54	0.68	0.47	0.51	0.05	0.00	1.46	1.10	7.15	4.97	16%	18.5%
260-9[2]^	3	0.94	1.15	1.29	1.33	0.30	0.55	1.12	1.00	1.61	1.16	2%	15.1%
260-10[2]^	17	0.08	0.08	0.13	0.11	0.49	0.48	1.13	1.06	1.64	1.40	93%	16.2%
260-11[2]^	5	0.12	0.14	0.14	0.13	0.40	0.88	1.23	1.00	2.16	1.14	49%	12.5%
260-12[2]^	22	0.36	0.39	0.34	0.34	0.43	0.85	1.00	1.05	1.18	1.36	2%	10.8%
260-13[1]^	2	0.14	0.15	0.14	0.14	0.00	0.40	1.02	1.21	1.63	2.98	15%	6.7%
277-14[2]^	7	0.09	0.10	0.07	0.06	0.11	0.00	No Data				0%	17.5%
377-15[2]^	34	0.09	0.10	0.13	0.13	0.04	0.05	No Data				0%	18.2%
77-16[1]*	2	0.85	1.09	0.60	0.65	0.00	0.00	1.08	1.49	3.84	6.79	1%	18.7%
40B-17[1]*	1	0.45	0.57	0.32	0.32	No Data		1.80	1.31	12.93	10.56	27%	20.7%
Weighted Corridor Average		0.26	0.32	0.24	0.23	0.49	0.27	1.13	1.09	2.15	2.03	49%	14.0%

SCALES

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

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

Figure 12: Mobility Performance

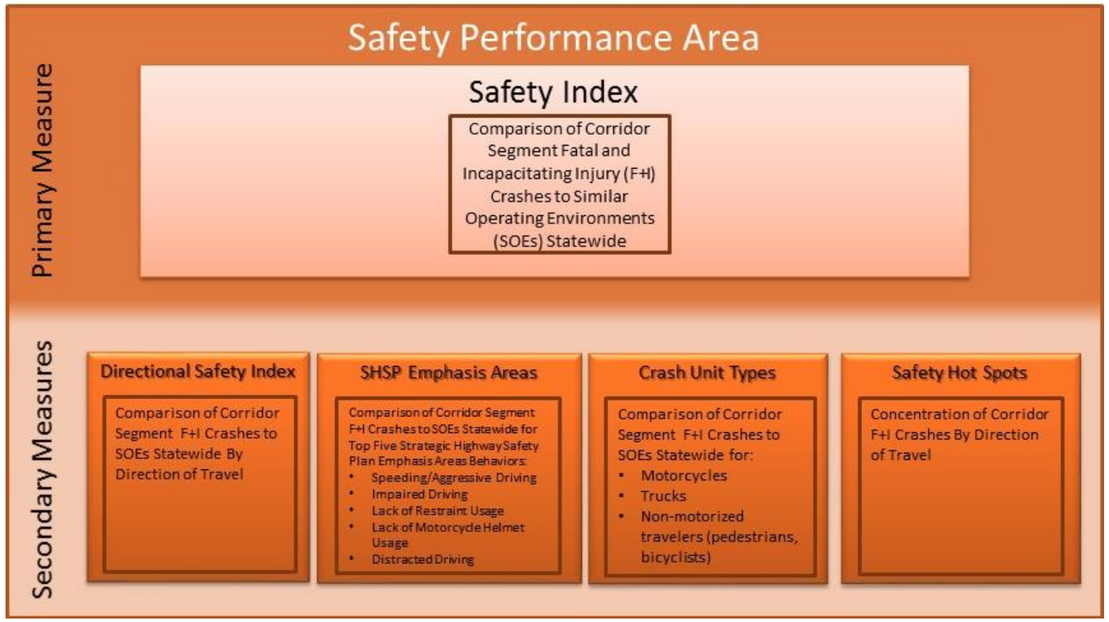


SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Mobility Index
2014 and 2035 Data

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 incapacitating injuries, as these types of crashes are the emphasis of the ADOT Strategic Highway Safety Plan (SHSP), FHWA, and MAP-21. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C**.

Figure 13: Safety Performance Measures



Primary Safety Index

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

Each corridor segment is rated on a scale by comparing the segment score with the average statewide score for similar operating environments. 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 SR 87/SR 260/SR 377 corridor, the following operating environments were identified:

- 2 or 3 or 4 Lane Divided Highway: Segments 87-1 to 87-6 and 260-10
- 4 or 5 Lane Undivided Highway: Segments 87-7, 260-8, 260-13, and 40B-17
- 2 or 3 lane Undivided Highway: Segments 260-9, 260-11, 260-12, 277-14, and 77-16

Secondary Safety Measures

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

Directional Safety Index

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

SHSP Emphasis Areas

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

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

Crash Unit Types

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

Safety Hot Spots

- The hot spot analysis identifies abnormally high concentrations of fatal and incapacitating injury crashes along the study corridor by direction of travel

For the Safety Index and the secondary safety measures, any segment that has too small of a sample size to generate statistically reliable performance ratings for a particular performance measure is considered to have "insufficient data" and is excluded from the safety performance evaluation for that particular performance measure.

Safety Performance Results

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

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

- The crash unit type performance measures for crashes involving trucks and non-motorized travelers had insufficient data to generate reliable performance ratings for the SR 87/SR 260/SR 377 corridor
- Several segments had insufficient data to generate reliable performance ratings for crashes involving motorcycles or behaviors associated with the SHSP Top 5 Emphasis Areas
- A total of 129 fatal and incapacitating injury crashes occurred along the SR 87/SR 260/SR 377 corridor in 2010 - 2014; of these crashes, 48 were fatal and 81 involved incapacitating injuries
- The weighted average of the Safety Index shows “below average” performance for the SR 87/SR 260/SR 377 corridor compared to other segments statewide that have similar operating environments, meaning the corridor generally does not perform well as it relates to safety
- The Safety Index value for Segments 87-1, 87-4, 87-6, 260-12, and 377-15 is “below average”, meaning these segments have more crashes than is typical statewide
- The Directional Safety Index value for many segments, usually in only one of the directions for the corridor, is “below average”
- The percentage of crashes related to the SHSP Top 5 Emphasis Areas is higher in Segments 87-6 and 377-15 than the statewide average for similar operating environments
- Safety hot spots include:
    - NB, MP 213-215
    - SB, MP 245-248
    - NB, MP 252-253

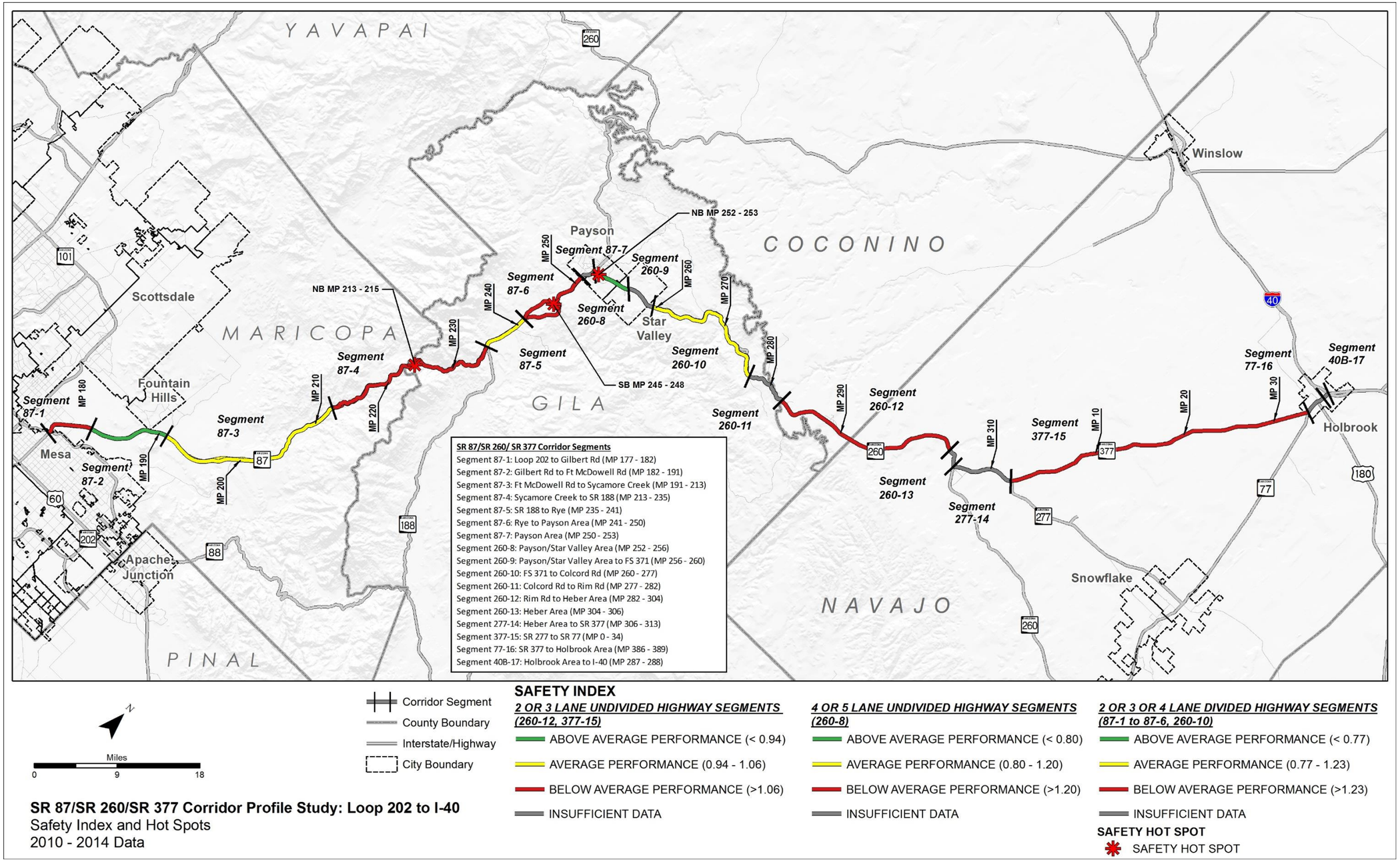
Table 8 summarizes the Safety performance results for the SR 87/SR 260/SR 377 corridor. **Figure 14** illustrates the primary Safety Index performance and locations of Safety hot spots along the SR 87/SR 260/SR 377 corridor. Maps for each secondary measure can be found in **Appendix A**.

Table 8: Safety Performance

Segment #	Segment Length (miles)	Total Fatal & Incapacitating Injury Crashes (F/I)	Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers
				NB/EB	SB/WB				
87-1[a]	5	6/1	3.01	4.05	1.98	29%	Insufficient Data	Insufficient Data	Insufficient Data
87-2[a]	9	2/2	0.62	1.21	0.04	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
87-3[a]	22	7/11	1.19	0.48	1.90	44%	Insufficient Data	39%	Insufficient Data
87-4[a]	22	9/21	1.62	1.48	1.76	30%	Insufficient Data	50%	Insufficient Data
87-5[a]	5	2/1	1.22	0.08	2.36	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
87-6[a]	10	6/8	2.11	0.09	4.13	71%	Insufficient Data	14%	Insufficient Data
87-7[b]	2	1/2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
260-8[b]	4	0/7	0.28	0.56	0.00	43%	Insufficient Data	Insufficient Data	Insufficient Data
260-9[c]	3	1/2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
260-10[a]	17	3/5	0.93	0.62	1.24	50%	Insufficient Data	13%	Insufficient Data
260-11[c]	5	0/4	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
260-12[c]	22	5/8	1.43	2.25	0.62	46%	Insufficient Data	15%	Insufficient Data
260-13[b]	2	0/1	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
277-14[c]	7	0/1	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
377-15[c]	34	4/7	1.18	1.21	1.16	82%	Insufficient Data	0%	Insufficient Data
77-16[c]	2	1/0	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
40B-17[b]	1	1/0	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Weighted Corridor Average			1.32	1.20	1.45	54%	Insufficient Data	21%	Insufficient Data
SCALES									
Performance Level			**2 or 3 or 4 Lane Divided Highway**						
Above Average			< 0.77			< 44%	< 4%	< 16%	< 2%
Average			0.77 – 1.23			44% - 54%	4% - 7%	16% - 26%	2% - 4%
Below Average			> 1.23			> 54%	> 7%	> 26%	> 4%
Performance Level			**4 or 5 Lane Undivided Highway**						
Above Average			< 0.80			< 42%	< 6%	< 6%	< 5%
Average			0.80 – 1.20			42% - 51%	6% - 10%	6% - 9%	5% - 8%
Below Average			> 1.20			> 51%	> 10%	> 9%	> 8%
Performance Level			**2 or 3 Lane Undivided Highway**						
Above Average			< 0.94			< 51%	< 6%	< 19%	< 5%
Average			0.94 – 1.06			51% - 58%	6% - 10%	19% - 27%	5% - 8%
Below Average			> 1.06			> 58%	> 10%	> 27%	> 8%

[a]2 or 3 or 4 Lane Divided Highway
[b]4 or 5 Lane Undivided Highway
[c]2 or 3 Lane Undivided Highway
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 five secondary measures, as illustrated in **Figure 15**. All measures related to the reliability of truck travel as measured by observed truck travel time speed and delays to truck travel from freeway closures or physical restrictions to truck travel. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C**.

Figure 15: Freight Performance Measures

Primary Freight Index

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

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

For the SR 87/SR 260/SR 377 corridor, the following operating environments were identified:

- Interrupted Flow: Segments 87-1, 87-2, 87-7, 260-8, 77-16, and 40B-17
- Uninterrupted Flow: Segments 87-3, 87-4, 87-5, 87-6, 260-9, 260-10, 260-11, 260-12, 260-13, 277-14, and 377-15

Secondary Freight Measures

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

Recurring Delay (Directional Truck Travel Time Index [TTTI])

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

Non-Recurring Delay (Directional TPTI)

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

Closure Duration

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

Bridge Vertical Clearance

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

Bridge Vertical Clearance Hot Spots

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

Freight Performance Results

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

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

- The weighted average of the Freight Index shows "poor" overall performance for the SR 87/SR 260/SR 377 corridor; each of the segments show either "poor" or "fair" performance
- A majority of the segments show either "poor" or "fair" performance for Directional TPTI measures, meaning the corridor has "poor" or "fair" travel time reliability in the NB/EB and SB/WB direction due to non-recurring congestion
- TTTI and TPTI data was not available for Segments 277-14 and 377-15
- A majority of the segments show either "poor" or "fair" performance in the Closure Duration performance indicator
- Segments 87-3 and 87-4 show abnormally high directional closure durations; a review of the data indicates these high closure durations were due to SR 87 being closed for several days due to a fire
- Closure Duration data was not available for Segment 40B-17
- No Bridge Vertical Clearance hot spots exist along the SR 87/SR 260/SR 377 corridor

Table 9 summarizes the Freight performance results for the SR 87/SR 260/SR 377 corridor. **Figure 16** illustrates the primary Freight Index performance and locations of Freight hot spots along the SR 87/SR 260/SR 377 corridor. Maps for each secondary measure can be found in **Appendix A.**

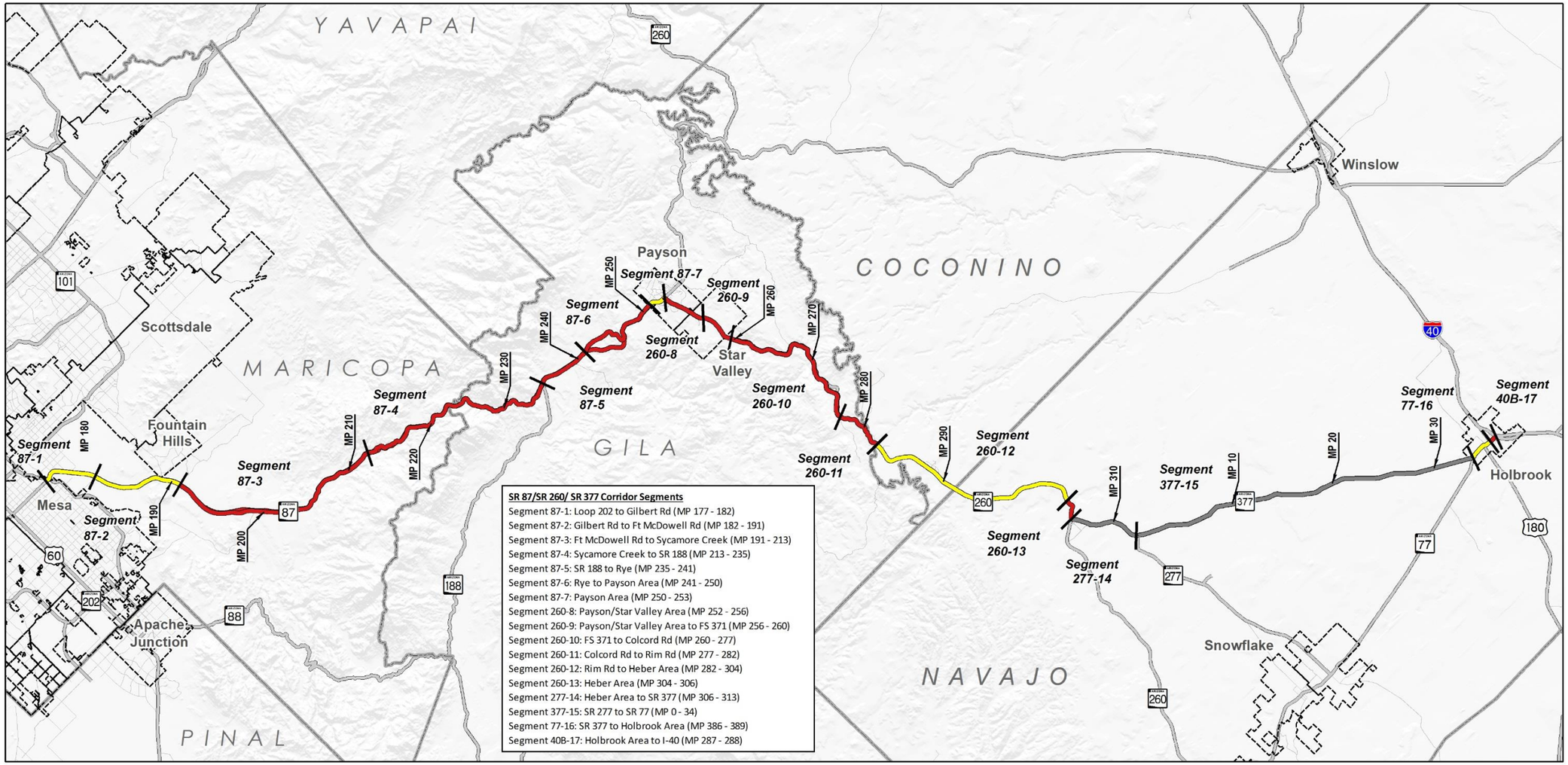
Table 9: Freight Performance

Segment #	Segment Length (miles)	Freight Index	Directional TTTI		Directional TPTI		Closure Duration (minutes/milepost /year/mile)		Bridge Vertical Clearance (feet)
			NB/ EB	SB/ WB	NB/ EB	SB/ WB	NB/ EB	SB/ WB	
87-1[1]*	5	0.28	1.29	1.10	3.88	3.38	129.19	61.92	No UP
87-2[1]*	9	0.29	1.19	1.32	2.72	4.06	119.84	147.44	No UP
87-3[2]^	22	0.53	1.11	1.23	1.38	2.38	2674.13	59.23	16.97
87-4[2]^	22	0.51	1.37	1.14	2.38	1.56	4359.89	34.01	18.75
87-5[2]^	5	0.56	1.12	1.21	1.45	2.13	49.20	21.67	No UP
87-6[2]^	10	0.44	1.55	1.22	2.52	2.01	37.16	287.98	No UP
87-7[1]*	2	0.28	1.20	1.91	3.29	3.88	21.33	693.60	No UP
260-8[1]*	4	0.15	1.66	1.17	9.64	4.11	11.45	0.00	No UP
260-9[2]^	3	0.47	1.20	1.00	3.09	1.21	71.85	726.90	No UP
260-10[2]^	17	0.58	1.23	1.12	1.82	1.61	157.49	797.71	No UP
260-11[2]^	5	0.54	1.45	1.00	2.53	1.18	144.40	922.04	No UP
260-12[2]^	22	0.69	1.00	1.10	1.19	1.69	117.01	901.62	No UP
260-13[1]^	2	0.36	1.09	1.35	2.75	2.82	0.00	739.30	No UP
277-14[2]^	7	No Data					20.03	0.00	No UP
377-15[2]^	34	No Data					10.14	9.29	No UP
77-16[1]*	2	0.22	1.12	1.54	3.52	5.65	0.00	0.00	No UP
40B-17[1]*	1	0.05	2.15	1.51	29.93	8.45	No Data		No UP
Weighted Corridor Average		0.50	1.24	1.18	2.46	2.25	957.0	289.9	17.87

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

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

Figure 16: Freight Performance



SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Freight Index and Hot Spots
2014 Data

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 SR 87/SR 260/SR 377 corridor:

- Overall Performance: The Pavement, Bridge, and Mobility performance areas show generally "good" or "fair" performance; Safety and Freight performance areas show generally "poor/below average" or "fair/average" performance
- Pavement Performance: The weighted average of the Pavement Index shows "good" overall performance; exceptions include Segments 260-13, 277-14, and 77-16, which show either "poor" or "fair" performance for the Pavement Index, Directional Pavement Serviceability Rating (PSR), and % Area Failure measures; no data was available for Segment 40B-17
- Bridge Performance: The weighted average of the Bridge Index shows "good" overall performance; all segments that include bridges have "good" or "fair" performance for Bridge Index, Sufficiency Rating, and Lowest Bridge Rating measures; Segment 77-16 shows "poor" performance for the % of Deck Area on Functionally Obsolete Bridges; Segments 87-6, 87-7, 260-8, 260-9, 277-14, 377-15, and 40B-17 contain no bridges
- Mobility Performance: The weighted average of the Mobility Index shows "good" overall performance; Closure Extent, Directional Planning Time Index (PTI), % Bicycle Accommodation, and % Non-Single Occupancy Vehicle (SOV) Trips show "poor" or "fair" performance for the corridor; Segments 87-2, 87-7, 260-9, and 77-16 show either "poor" or "fair" performance in the Mobility Index and Future Daily V/C measures
- Safety Performance: The weighted average of the Safety Index and Directional Safety Index show "below average" overall performance; in the 2010-2014 analysis period, there were 48 fatal crashes and 81 incapacitating crashes on the corridor; Segments 87-7, 260-9, 260-13, 277-14, 77-16, and 40B-17 have "insufficient data", meaning that there was not enough data available to generate reliable performance ratings so no values were calculated
- Freight Performance: The weighted average of the Freight Index shows "poor" performance; Closure Duration, Directional Truck Travel Time Index (TTTI), and Directional Truck PTI show "poor" or "fair" performance for the corridor; no TTTI or TPTI data was available for Segments 277-14 and 377-15; no Closure Duration data was available for Segment 40B-17
- Lowest Performing Segments: Segments 87-3, 87-4, 260-9, and 77-16 show "poor/below average" performance for many performance measures
- Highest Performing Segments: Segments 87-2 and 87-7 show "good/above average" performance for many performance measures

Figure 17 shows the percentage of the SR 87/SR 260/SR 377 corridor that rates either "good/above average performance", "fair/average performance", or "poor/below average performance" for each primary measure. On the SR 87/SR 260/SR 377 corridor, Freight is the lowest performing area with 69% of the corridor in "poor" condition as it relates to the primary measure. Pavement and Mobility are the highest performing areas along the SR 87/SR 260/SR 377 corridor with 93% and 91% of the corridor, respectively, in "good" condition as it relates to the primary measures.

Table 10 shows a summary of corridor performance for all primary measures and secondary measure indicators for the SR 87/SR 260/SR 377 corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure. The weighted average ratings are summarized in **Figure 18** which also provides a brief description of each performance measure. **Figure 18** represents the average for the entire corridor and any given segment or location could have a higher or lower rating than the corridor average.

Figure 17: Performance Summary by Primary Measure

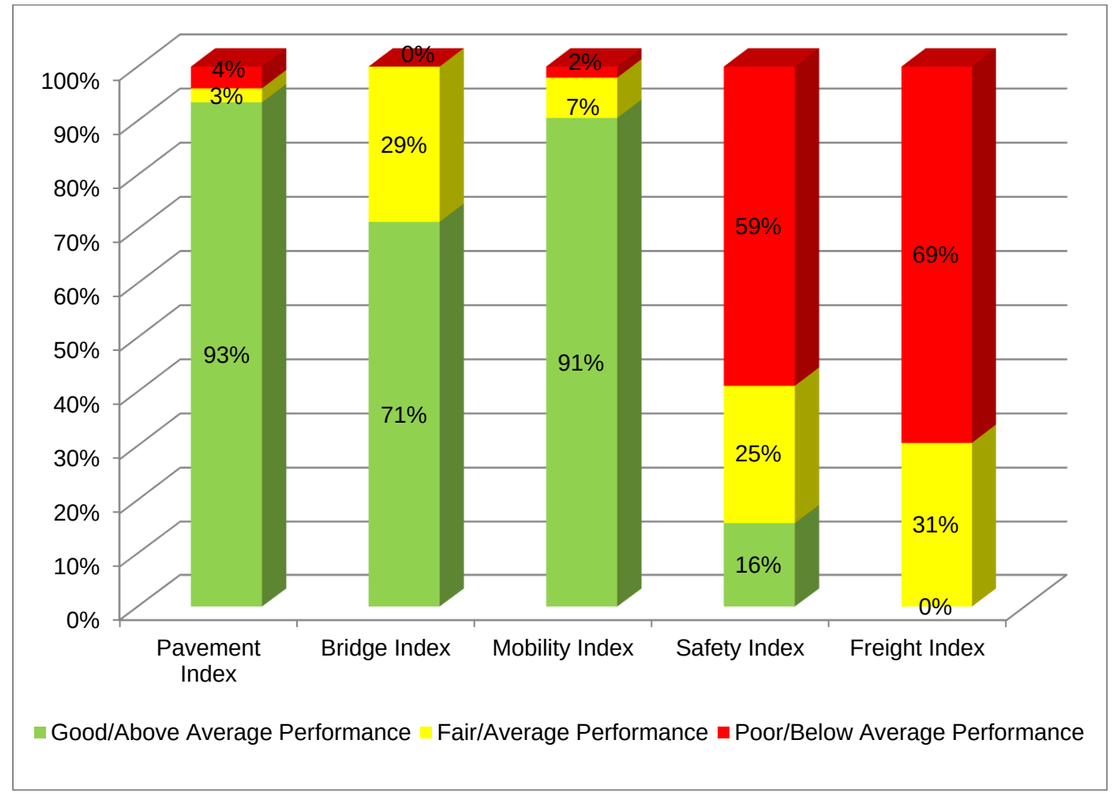


Figure 18: Corridor Performance Summary by Performance Measure

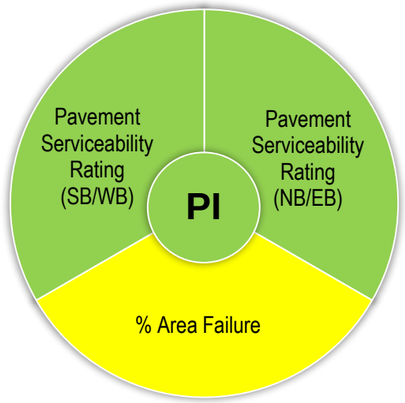
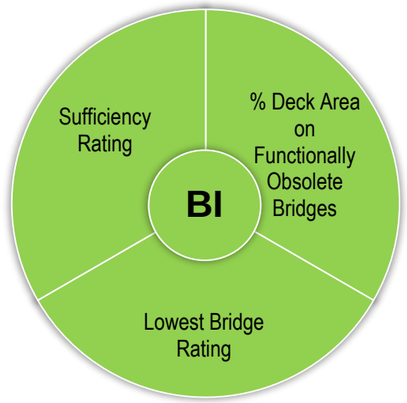
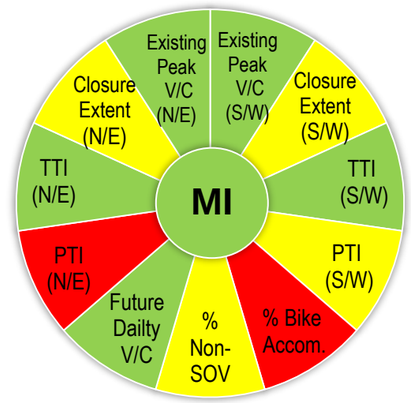
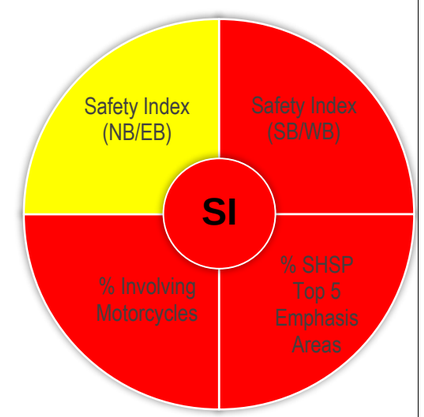
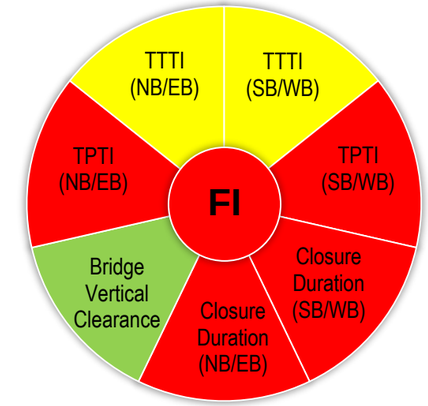
Pavement	Bridge	Mobility	Safety	Freight
				
Pavement Index (PI): based on two pavement condition ratings from the ADOT Pavement Database; the two ratings are the International Roughness Index (IRI) and the Cracking Rating	**Bridge Index (BI):** based on four bridge condition ratings from the ADOT Bridge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

Table 10: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area											
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	% of Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/ milepost/year/mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			NB/EB	SB/WB								NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB		
87-1[1*a]	5	4.19	4.03	4.11	10.0%	7.00	85.00	0.0%	7	0.65	0.86	0.34	0.34	0.37	0.32	1.22	1.06	4.01	3.03	45%	13.6%
87-2[1* a]	9	4.25	4.01	4.14	0.0%	7.00	96.50	0.0%	7	0.73	1.01	0.45	0.45	0.46	0.04	1.15	1.23	2.36	3.86	93%	14.4%
87-3[2^ a]	22	3.80	3.80	3.88	11.4%	6.95	96.20	0.0%	6	0.21	0.29	0.14	0.13	0.87	0.11	1.05	1.04	1.54	1.48	99%	16.7%
87-4[2^ a]	22	4.05	3.84	3.93	0.0%	6.31	89.18	0.0%	6	0.23	0.27	0.20	0.21	1.47	0.15	1.17	1.05	2.05	1.47	86%	5.2%
87-5[2^ a]	5	4.55	4.35	4.36	0.0%	6.31	99.60	0.0%	6	0.15	0.14	0.15	0.15	0.23	0.07	1.01	1.08	1.42	1.51	92%	12.9%
87-6[2^ a]	10	4.15	4.10	3.96	0.0%	No Bridges				0.21	0.21	0.19	0.19	0.18	0.27	1.31	1.15	2.38	1.94	79%	12.4%
87-7[1* b]	2	3.54	3.36	3.48	0.0%	No Bridges				0.75	0.94	0.57	0.50	0.07	0.20	1.18	1.86	4.43	6.48	56%	18.4%
260-8[1* b]	4	4.31	4.24		0.0%	No Bridges				0.54	0.68	0.47	0.51	0.05	0.00	1.46	1.10	7.15	4.97	16%	18.5%
260-9[2^ c]	3	4.27	4.12		0.0%	No Bridges				0.94	1.15	1.29	1.33	0.30	0.55	1.12	1.00	1.61	1.16	2%	15.1%
260-10[2^ a]	17	4.03	3.79	3.81	0.0%	6.81	99.52	0.0%	6	0.08	0.08	0.13	0.11	0.49	0.48	1.13	1.06	1.64	1.40	93%	16.2%
260-11[2^ c]	5	4.13	3.98		0.0%	6.73	79.13	0.0%	6	0.12	0.14	0.14	0.13	0.40	0.88	1.23	1.00	2.16	1.14	49%	12.5%
260-12[2^ c]	22	3.78	3.52		4.5%	7.00	98.40	0.0%	7	0.36	0.39	0.34	0.34	0.43	0.85	1.00	1.05	1.18	1.36	2%	10.8%
260-13[1^ b]	2	3.11	2.87		50.0%	6.00	93.70	0.0%	6	0.14	0.15	0.14	0.14	0.00	0.40	1.02	1.21	1.63	2.98	15%	6.7%
277-14[2^ c]	7	2.05	3.03		71.4%	No Bridges				0.09	0.10	0.07	0.06	0.11	0.00	No Data				0%	17.5%
377-15[2^ c]	34	4.12	4.03		0.0%	No Bridges				0.09	0.10	0.13	0.13	0.04	0.05	No Data				0%	18.2%
77-16[1* c]	2	3.25	3.10		40.0%	6.00	59.00	100.0%	6	0.85	1.09	0.60	0.65	0.00	0.00	1.08	1.49	3.84	6.79	1%	18.7%
40B-17[1* b]	1	No Data				No Bridges				0.45	0.57	0.32	0.32	No Data		1.80	1.31	12.93	10.56	27%	20.7%
Weighted Corridor Average		3.94	3.83	3.86	6.4%	6.70	95.46	1.6	6.06	0.26	0.32	0.24	0.23	0.49	0.27	1.13	1.09	2.15	2.03	49%	14.0%

SCALES

Performance Level	Non-Interstate		All				Urban and Fringe Urban	All	Uninterrupted		All	
Good/Above Average	> 3.50	< 5%	> 6.5	> 80	< 12%	> 6	< 0.71	< 0.22	< 1.15	< 1.3	> 90%	> 17%
Fair/Average	2.90 - 3.50	5% - 20%	5.0 - 6.5	50 - 80	12% - 40%	5 - 6	0.71 - 0.89	0.22 - 0.62	1.15 - 1.33	1.3 - 1.5	60% - 90%	11% - 17%
Poor/Below Average	< 2.90	> 20%	< 5.0	< 50	> 40%	< 5	> 0.89	> .62	> 1.33	> 1.5	< 60%	< 11%

Performance Level	Rural	Interrupted	
Good/Above Average	< 0.56	< 1.3	< 3.0
Fair/Average	0.56 - 0.76	1.3 – 2.0	3.0 – 6.0
Poor/Below Average	> 0.76	> 2.0	> 6.0

^Uninterrupted Flow Facility
*Interrupted Flow Facility

[a]2 or 3 or 4 Lane Divided Highway
[b]4 or 5 Lane Undivided Highway
[c]2 or 3 Lane Undivided Highway

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

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

Segment #	Segment Length (miles)	Safety Performance Area							Freight Performance Area							
		Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Freight Index	Directional TTTI		Directional TPTI		Closure Duration (minutes/milepost/ year/mile)		Bridge Vertical Clearance (feet)
			NB/EB	SB/WB						NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	
87-1[1]*	5	3.01	4.05	1.98	29%	Insufficient Data	Insufficient Data	Insufficient Data	0.28	1.29	1.10	3.88	3.38	129.19	61.92	No UP
87-2[1]*	9	0.62	1.21	0.04	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.29	1.19	1.32	2.72	4.06	119.84	147.44	No UP
87-3[2]^	22	1.19	0.48	1.90	44%	Insufficient Data	39%	Insufficient Data	0.53	1.11	1.23	1.38	2.38	2674.13	59.23	16.97
87-4[2]^	22	1.62	1.48	1.76	30%	Insufficient Data	50%	Insufficient Data	0.51	1.37	1.14	2.38	1.56	4359.89	34.01	18.75
87-5[2]^	5	1.22	0.08	2.36	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.56	1.12	1.21	1.45	2.13	49.20	21.67	No UP
87-6[2]^	10	2.11	0.09	4.13	71%	Insufficient Data	14%	Insufficient Data	0.44	1.55	1.22	2.52	2.01	37.16	287.98	No UP
87-7[1]*	2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.28	1.20	1.91	3.29	3.88	21.33	693.60	No UP
260-8[1]*	4	0.28	0.56	0.00	43%	Insufficient Data	Insufficient Data	Insufficient Data	0.15	1.66	1.17	9.64	4.11	11.45	0.00	No UP
260-9[2]^	3	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.47	1.20	1.00	3.09	1.21	71.85	726.90	No UP
260-10[2]^	17	0.93	0.62	1.24	50%	Insufficient Data	13%	Insufficient Data	0.58	1.23	1.12	1.82	1.61	157.49	797.71	No UP
260-11[2]^	5	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.54	1.45	1.00	2.53	1.18	144.40	922.04	No UP
260-12[2]^	22	1.43	2.25	0.62	46%	Insufficient Data	15%	Insufficient Data	0.69	1.00	1.10	1.19	1.69	117.01	901.62	No UP
260-13[1]^	2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.36	1.09	1.35	2.75	2.82	0.00	739.30	No UP
277-14[2]^	7	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	No Data					20.03	0.00	No UP
377-15[2]^	34	1.18	1.21	1.16	82%	Insufficient Data	0%	Insufficient Data	No Data					10.14	9.29	No UP
77-16[1]*	2	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.22	1.12	1.54	3.52	5.65	0.00	0.00	No UP
40B-17[1]*	1	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.05	2.15	1.51	29.93	8.45	No Data		No UP
Weighted Corridor Average		1.32	1.20	1.45	54%	Insufficient Data	21%	Insufficient Data	0.50	1.24	1.18	2.46	2.25	957.0	289.9	17.87

SCALES

Performance Level	2 or 3 or 4 Lane Divided Highway					Uninterrupted			All	
Good/Above Average	< 0.77	< 44%	< 4%	< 16%	< 2%	> 0.77	< 1.15	< 1.3	< 44.18	> 16.5
Fair/Average	0.77 - 1.23	44% - 54%	4% - 7%	16% - 26%	2% - 4%	0.67 - 0.77	1.15 - 1.33	1.3 - 1.5	44.18-124.86	16.0 - 16.5
Poor/Below Average	> 1.23	> 54%	> 7%	> 26%	> 4%	< 0.67	> 1.33	> 1.5	> 124.86	< 16.0
Performance Level	**2 or 3 Lane Undivided Highway**					**Interrupted**				
Good/Above Average	< 0.94	< 51%	< 6%	< 19%	< 5%	> 0.33	< 1.3	< 3.0		
Fair/Average	0.94 - 1.06	51% - 58%	6% - 10%	19% - 27%	5% - 8%	0.17 - 0.33	1.3 - 2.0	3.0 - 6.0		
Poor/Below Average	> 1.06	> 58%	> 10%	> 27%	> 8%	< 0.17	> 2.0	> 6.0		
Performance Level	**4 or 5 Undivided Highway**									
Good/Above Average	< 0.80	< 42%	< 6%	< 6%	< 5%					
Fair/Average	0.80 - 1.20	42% - 51%	6% - 10%	6% - 9%	5% - 8%					
Poor/Below Average	> 1.20	> 51%	> 10%	> 9%	> 8%					

^Uninterrupted Flow Facility
*Interrupted Flow Facility

[a]2 or 3 or 4 Lane Divided Highway
[b]4 or 5 Lane Undivided Highway
[c]2 or 3 Lane Undivided Highway

[1]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), 2010-2035. Statewide performance goals that are relevant to SR 87/SR 260/SR 377 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 SR 87/SR 260/SR 377 corridor: Mobility, Safety and Freight.

Taking into account the corridor goals and identified emphasis areas, performance objectives were developed for each quantifiable performance measure that identify the desired level of performance based on the performance scale levels for the overall corridor and for each segment of the corridor. For the performance emphasis areas, the corridor-wide weighted average performance objectives are identified with a higher standard than for the other performance areas. **Table 11** shows the SR 87/SR 260/SR 377 corridor goals, corridor objectives, and performance objectives, and how they align with the statewide goals.

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

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

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

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

Table 11: Corridor Performance Goals and Objectives

ADOT Statewide LRTP Goals	SR 87/SR 260/SR 377 Corridor Goals	SR 87/SR 260/SR 377 Corridor Objectives	Performance Area	Primary Measure	Performance Objective	
				Secondary Measure Indicators	Corridor Average	Segment
Improve Mobility and Accessibility	Improve mobility through additional capacity and improved roadway geometry Provide a safe and reliable route for recreational and tourist travel Provide a safe, reliable and efficient connection to all communities along the corridor to permit efficient regional travel	Reduce current congestion and plan to facilitate future congestion that accounts for anticipated growth and land use changes Reduce delays from recurring and non-recurring events to improve reliability, especially in Payson and Holbrook Improve bicycle and pedestrian accommodations	Mobility (*Emphasis Area*)	Mobility Index	Good	Fair or better
				Future Daily V/C		
				Existing Peak Hour V/C		
				Closure Extent		
				Directional Travel Time Index		
				Directional Planning Time Index		
				% Bicycle Accommodation		
				% Non-SOV Trips		
Support Economic Growth	Provide a safe, reliable and efficient freight route	Reduce delays and restrictions to freight movement to improve reliability Improve travel time reliability (including impacts to motorists due to freight traffic)	Freight *(Emphasis Area)*	Freight Index	Good	Fair or better
				Directional Truck Travel Time Index		
				Directional Truck Planning Time Index		
				Closure Duration		
				Bridge Vertical Clearance		
Preserve and Maintain the State Transportation System	Preserve and modernize highway infrastructure	Maintain structural integrity of bridges	Bridge	Bridge Index	Fair or better	Fair or better
				Sufficiency Rating		
				% of Deck Area on Functionally Obsolete Bridges		
				Lowest Bridge Rating		
		Improve pavement ride quality for all corridor users Reduce long-term pavement maintenance costs	Pavement	Pavement Index	Fair or better	Fair or better
				Directional Pavement Serviceability Rating		
				% Area Failure		
Enhance Safety and Security	Provide a safe, reliable, and efficient connection for the communities along the corridor Promote safety by implementing appropriate countermeasures	Reduce fatal and incapacitating injury crashes for all roadway users	Safety *(Emphasis Area)*	Safety Index	Above Average	Average or better
				Directional Safety Index		
				% of Crashes Involving SHSP Top 5 Emphasis Areas Behaviors		
				% of Crashes Involving Crash Unit Types		

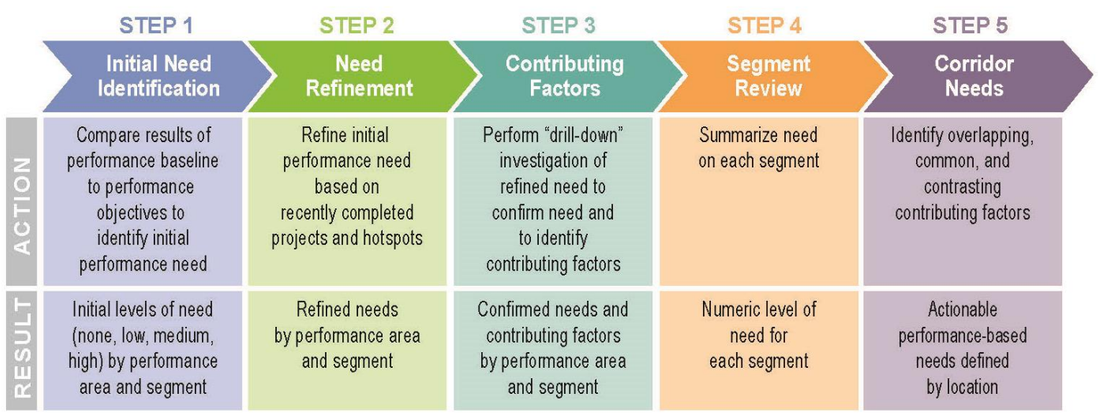
3.2 Needs Assessment Process

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

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

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

Figure 19: Needs Assessment Process



Step 1: Initial Needs Identification

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

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

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

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

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

Step 2: Need Refinement

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

- For segments with an initial level of need of None that contain hot spots, the level of need should be increased from None to Low
- For segments with an initial level of need where recently completed projects or projects under construction are anticipated to partially or fully address the identified need, the level of need should be reduced or eliminated as appropriate
- Programmed projects that are expected to partially or fully address an identified need are not justification to lower the initial need because the programmed projects may not be

implemented as planned; in addition, further investigations may suggest that changes in the scope of a programmed project may be warranted

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

Step 3: Contributing Factors

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

Pavement Performance Area

- Pavement Rating Database

Bridge Performance Area

- ABISS

Mobility Performance Area

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

Safety Performance Area

- Crash Database

Freight Performance Area

- HERE Database
- HCRS Database

In addition, other sources were considered to help identify the contributing factors such as:

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

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

Step 4: Segment Review

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

Step 5: Corridor Needs

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

3.3 Corridor Needs Assessment

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

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

Pavement Needs Refinement and Contributing Factors

- The level of need in Segment 87-1 was increased from None to Low due to the presence of a hot spot
- The level of need in Segment 87-4 was increased from None to Low due to the presence of a hot spot
- With pavement rating data not available in Segment 40B-17, a field review was conducted to provide an estimated level of need of Low based on visual observation of pavement condition
- See **Appendix D** for detailed information on contributing factors

Table 12: Final Pavement Needs

Segment #	Performance Score and Level of Need				Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Pavement Index	Directional PSR		% Area Failure				
		NB	SB					
87-1	4.19	4.03	4.11	10.00%	0.0	NB MP 177-178	None	Low
87-2	4.25	4.01	4.14	0.00%	0.0	None	None	None
87-3	3.80	3.80	3.88	11.36%	0.2	SB MP 195-199, SB MP 200-201	None	Low
87-4	4.05	3.84	3.93	0.00%	0.0	MP 224-226	None	Low
87-5	4.55	4.35	4.36	0.00%	0.0	None	None	None
87-6	4.15	4.10	3.96	0.00%	0.0	None	None	None
87-7	3.54	3.36	3.48	0.00%	0.0	None	None	None
260-8	4.31	4.24	4.24	0.00%	0.0	None	None	None
260-9	4.27	4.12	4.12	0.00%	0.0	None	None	None
260-10	4.03	3.79	3.81	0.00%	0.0	None	None	None
260-11	4.13	3.98	3.98	0.00%	0.0	None	None	None
260-12	3.78	3.52	3.52	4.55%	0.0	NB MP 288-289	Spot repair pavement preservation project for MP 282-290 is currently underway that will address the identified hot spot	None
260-13	3.11	2.87	2.87	50.00%	2.0	NB MP 304-305	None	Medium
277-14	2.05	3.03	3.03	71.43%	4.0	NB MP 307-310, NB MP 311-313	None	High
377-15	4.12	4.03	4.03	0.00%	0.0	None	None	None
77-16	3.25	3.10	3.10	40.00%	1.8	NB MP 388-389	None	Medium
40B-17	No Data				N/A	None	None	Low

Level of Need (Score)	Performance Score Need Scale		Segment Level Need Scale
None* (0)	> 3.30	< 10%	0
Low (1)	3.10 - 3.30	10% - 15%	< 1.5
Medium (2)	2.70 - 3.10	15% - 25%	1.5 - 2.5
High (3)	< 2.70	> 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

- There are no bridges along the corridor with potential historical investment issues
- There were no recently completed bridge projects or hot spots along the corridor
- See **Appendix D** for detailed information on contributing factors

Table 13: Final Bridge Needs

Segment #	Performance Score and Level of Need				Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Bridge Index	Sufficiency Rating	% of Deck on Functionally Obsolete Bridges	Lowest Bridge Rating				
87-1	7.00	85.0	0.0%	7	0.0	None	None	None
87-2	7.00	96.5	0.0%	7	0.0	None	None	None
87-3	6.95	96.2	0.0%	6	0.0	None	None	None
87-4	6.31	89.2	0.0%	6	0.0	None	None	None
87-5	6.31	99.6	0.0%	6	0.0	None	None	None
87-6	No Bridges				None	None	None	None
87-7	No Bridges				None	None	None	None
260-8	No Bridges				None	None	None	None
260-9	No Bridges				None	None	None	None
260-10	6.81	99.5	0.0%	6	0.0	None	None	None
260-11	6.73	79.1	0.0%	6	0.0	None	None	None
260-12	7.00	98.4	0.0%	7	0.0	None	None	None
260-13	6.00	93.7	0.0%	6	0.0	None	None	None
277-14	No Bridges				None	None	None	None
377-15	No Bridges				None	None	None	None
77-16	6.00	59.0	100%	6	0.7	None	None	Low
40B-17	No Bridges				None	None	None	None

Level of Need (Score)	Performance Score Need Scale				Segment Level Need Scale
None (0)	> 6.0	> 70	> 5.0	< 21.0%	0
Low (1)	5.5 - 6.0	60 - 70	5.0	21.0% - 31.0%	< 1.5
Medium (2)	4.5 - 5.5	40 - 60	4.0	31.0% - 49.0%	1.5 - 2.5
High (3)	< 4.5	< 40	< 4.0	> 49.0%	> 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

- There were no recently completed mobility projects along the corridor
- See **Appendix D** for detailed information on contributing factors

Table 14: Final Mobility Needs

Segment #	Performance Score and Level of Need											Initial Segment Need	Recently Completed Projects	Final Segment Need
	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent		Directional TTI		Directional PTI		% Bicycle Accommodation			
			NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB				
87-1[b]	0.65	0.86	0.34	0.34	0.37	0.32	1.22	1.06	4.01	3.03	45%	1.2	None	Low
87-2[b]	0.73	1.01	0.45	0.45	0.46	0.04	1.15	1.23	2.36	3.86	93%	0.7	None	Low
87-3[a]	0.21	0.29	0.14	0.13	0.87	0.11	1.05	1.04	1.54	1.48	99%	0.7	None	Low
87-4[a]	0.23	0.27	0.20	0.21	1.47	0.15	1.17	1.05	2.05	1.47	86%	0.8	None	Low
87-5[a]	0.15	0.14	0.15	0.15	0.23	0.07	1.01	1.08	1.42	1.51	92%	0.3	None	Low
87-6[a]	0.21	0.21	0.19	0.19	0.18	0.27	1.31	1.15	2.38	1.94	79%	1	None	Low
87-7[b]	0.75	0.94	0.57	0.50	0.07	0.20	1.18	1.86	4.43	6.48	56%	1.3	None	Low
260-8[b]	0.54	0.68	0.47	0.51	0.05	0.00	1.46	1.10	7.15	4.97	16%	1	None	Low
260-9[a]	0.94	1.15	1.29	1.33	0.30	0.55	1.12	1.00	1.61	1.16	2%	5.3	None	High
260-10[a]	0.08	0.08	0.13	0.11	0.49	0.48	1.13	1.06	1.64	1.40	93%	0.7	None	Low
260-11[a]	0.12	0.14	0.14	0.13	0.40	0.88	1.23	1.00	2.16	1.14	49%	1.4	None	Low
260-12[a]	0.36	0.39	0.34	0.34	0.43	0.85	1.00	1.05	1.18	1.36	2%	1	None	Low
260-13[a]	0.14	0.15	0.14	0.14	0.00	0.40	1.02	1.21	1.63	2.98	15%	1.3	None	Low
277-14[a]	0.09	0.10	0.07	0.06	0.11	0.00	*No Data*				0%	0.6	None	Low
377-15[a]	0.09	0.10	0.13	0.13	0.04	0.05	*No Data*				0%	0.6	None	Low
77-16[b]	0.85	1.09	0.60	0.65	0.00	0.00	1.08	1.49	3.84	6.79	1%	3.4	None	High
40B-17[b]	0.45	0.57	0.32	0.32	*No Data*		1.80	1.31	12.93	10.56	27%	1.4	None	Low

Level of Need (Score)	Performance Score Need Scale					Segment Level Need Scale
None* (0)	≤ 0.77 (Urban) ≤ 0.63 (Rural)	< 0.35	< 1.21[a] < 1.53[b]	< 1.37[a] < 4.00[b]	> 80%	0
Low (1)	0.77 - 0.83 (Urban) 0.63 - 0.69 (Rural)	0.35 - 0.49	1.21 - 1.27[a] 1.53 - 1.77[b]	1.37 - 1.43[a] 4.00 - 5.00[b]	70% - 80%	< 1.5
Medium (2)	0.83 - 0.95 (Urban) 0.69 - 0.83 (Rural)	0.49 - 0.75	1.27 - 1.39[a] 1.77 - 2.23[b]	1.43 - 1.57[a] 5.00 - 7.00[b]	50% - 70%	1.5 - 2.5
High (3)	≥ 0.95 (Urban) ≥ 0.83 (Rural)	> 0.75	> 1.39[a] > 2.23[b]	> 1.57[a] > 7.00[b]	< 50%	> 2.5

a: Uninterrupted
b: Interrupted

**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 260-8 includes a hot spot so the final segment need was raised from None to Low
- Safety hot spots are also present in Segments 87-4 and 87-6, which already have a High Safety segment need

See **Appendix D** for detailed information on contributing factors

Table 15: Final Safety Needs

Segment #	Performance Score and Level of Need							Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Area Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers				
		NB/EB	SB/WB								
87-1[a]	3.01	4.05	1.98	29%	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	3.6	None	None	High
87-2[a]	0.62	1.21	0.04	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	0.2	None	None	Low
87-3[a]	1.19	0.48	1.90	44%	*Insufficient Data*	39%	*Insufficient Data*	2.9	None	None	High
87-4[a]	1.62	1.48	1.76	30%	*Insufficient Data*	50%	*Insufficient Data*	4.2	NB, MP 213-215	None	High
87-5[a]	1.22	0.08	2.36	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	2.3	None	Signage, rumble strips, and turn lanes added in 2016 at SR 87/SR 188 intersection	Medium
87-6[a]	2.11	0.09	4.13	71%	*Insufficient Data*	14%	*Insufficient Data*	3.9	SB, MP 245-248	None	High
87-7[b]	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	N/A	None	None	N/A
260-8[b]	0.28	0.56	0.00	43%	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	0.0	EB, MP 252-253	None	Low
260-9[c]	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	N/A	None	None	N/A
260-10[a]	0.93	0.62	1.24	50%	*Insufficient Data*	13%	*Insufficient Data*	1.4	None	None	Low
260-11[c]	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	N/A	None	None	N/A
260-12[c]	1.43	2.25	0.62	46%	*Insufficient Data*	15%	*Insufficient Data*	3.3	None	Spot repair pavement preservation project, 2016, MP 282-291	High
260-13[b]	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	N/A	None	None	N/A
277-14[c]	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	N/A	None	None	N/A
377-15[c]	1.18	1.21	1.16	82%	*Insufficient Data*	0%	*Insufficient Data*	4.2	None	None	High
77-16[c]	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	N/A	None	None	N/A
40B-17[b]	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	N/A	None	None	N/A

Level of Need (Score)		Performance Score Needs Scale					Segment Level Need Scale
None* (0)	a	≤ 0.92	≤ 47%	≤ 5%	≤ 19%	≤ 3%	0
	b	≤ 0.93	≤ 45%	≤ 7%	≤ 7%	≤ 6%	
	c	≤ 0.98	≤ 53%	≤ 6%	≤ 22%	≤ 3%	
Low (1)	a	0.92 - 1.07	47% - 50%	5% - 6%	19% - 22%	3% - 4%	≤ 1.5
	b	0.93 - 1.06	45% - 48%	7% - 8%	7% - 8%	6% - 7%	
	c	0.98 - 1.02	53% - 55%	6% - 7%	22% - 25%	3% - 4%	
Medium (2)	a	1.07 - 1.38	50% - 57%	6% - 8%	22% - 29%	4% - 5%	1.5 - 2.5
	b	1.06 - 1.33	48% - 54%	8% - 11%	8% - 10%	7% - 9%	
	c	1.02 - 1.10	55% - 59%	7% - 8%	25% - 30%	4% - 5%	
High (3)	a	≥ 1.38	≥ 57%	≥ 8%	≥ 29%	≥ 5%	≥ 2.5
	b	≥ 1.33	≥ 54%	≥ 11%	≥ 10%	≥ 9%	
	c	≥ 1.10	≥ 59%	≥ 8%	≥ 30%	≥ 5%	

a: 2 or 3 or 4 Lane Divided Highway
b: 4 or 5 Lane Undivided Highway
c: 2 or 3 Lane Undivided Highway

**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

- There are no bridge vertical clearance hot spots on the corridor
- See **Appendix D** for detailed information on contributing factors

Table 16: Final Freight Needs

Segment #	Performance Score and Level of Need								Initial Segment Need	Hot Spots	Recently Completed Projects	Final Segment Need
	Freight Index	Directional TTTI		Directional TPTI		Closure Duration		Bridge Vertical Clearance				
		NB	SB	NB	SB	NB	SB					
87-1[b]	0.28	1.29	1.10	3.88	3.38	129.19	61.92	No UP	1.2	None	None	Low
87-2[b]	0.29	1.19	1.32	2.72	4.06	119.84	147.44	No UP	0.5	None	None	Low
87-3[a]	0.53	1.11	1.23	1.38	2.38	2674.13	59.23	16.97	3.8	None	None	High
87-4[a]	0.51	1.37	1.14	2.38	1.56	4359.89	34.01	18.75	4.0	None	MP 227 Construction of NB truck escape ramp (FY 2014), in progress	High
87-5[a]	0.56	1.12	1.21	1.45	2.13	49.20	21.67	No UP	3.6	None	None	High
87-6[a]	0.44	1.55	1.22	2.52	2.01	37.16	287.98	No UP	4.3	None	None	High
87-7[b]	0.28	1.20	1.91	3.29	3.88	21.33	693.60	No UP	0.5	None	None	Low
260-8[b]	0.15	1.66	1.17	9.64	4.11	11.45	0.00	No UP	2.5	None	None	High
260-9[a]	0.47	1.20	1.00	3.09	1.21	71.85	726.90	No UP	3.7	None	None	High
260-10[a]	0.58	1.23	1.12	1.82	1.61	157.49	797.71	No UP	4.3	None	None	High
260-11[a]	0.54	1.45	1.00	2.53	1.18	144.40	922.04	No UP	4.1	None	None	High
260-12[a]	0.69	1.00	1.10	1.19	1.69	117.01	901.62	No UP	2.8	None	None	High
260-13[a]	0.36	1.09	1.35	2.75	2.82	0.00	739.30	No UP	4.1	None	None	High
277-14[a]	*No Data*	*No Data*	*No Data*	*No Data*	*No Data*	20.03	0.00	No UP	N/A	None	None	N/A
377-15[a]	*No Data*	*No Data*	*No Data*	*No Data*	*No Data*	10.14	9.29	No UP	N/A	None	None	N/A
77-16[b]	0.22	1.12	1.54	3.52	5.65	0.00	0.00	No UP	2.3	None	None	Medium
40B-17[b]	0.05	2.15	1.51	29.93	8.45	*No Data*	*No Data*	No UP	3.8	None	None	High

Level of Need (Score)		Performance Score Need Scale					Segment Level Need Scale
None* (0)	a b	≥ 0.74 ≥ 0.28	≤ 1.21 ≤ 1.53	≤ 1.37 ≤ 4.00	≤ 71.07	≥ 16.33	0
Low (1)	a b	0.70 - 0.74 0.22 - 0.28	1.21 - 1.27 1.53 - 1.77	1.37 - 1.43 4.00 - 5.00	71.07 - 97.97	16.17 - 16.33	≤ 1.5
Medium (2)	a b	0.64 - 0.70 0.12 - 0.22	1.27 - 1.39 1.77 - 2.23	1.43 - 1.57 5.00 - 7.00	97.97 - 151.75	15.83 - 16.17	1.5 - 2.5
High (3)	a b	≤ 0.64 ≤ 0.12	≥ 1.39 ≥ 2.23	≥ 1.57 ≥ 7.00	≥ 151.75	≤ 15.83	≥ 2.5

a: Uninterrupted Flow
b: Interrupted Flow

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

Segment Review

The needs for each segment were combined to numerically estimate the average level of need for each segment of the corridor. **Table 17** provides a summary of needs for each segment across all performance areas, with the 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 (Mobility, Safety, and Freight for the SR 87/SR 260/SR 377 corridor). There is one segment with a High average need, fourteen segments with a Medium average need, and two segments with a Low average need.

Table 17: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)																
	87-1	87-2	87-3	87-4	87-5	87-6	87-7	260-8	260-9	260-10	260-11	260-12	260-13	277-14	377-15	77-16	40B-17^
	MP 177-182	MP 182-191	MP 191-213	MP 213-235	MP 235-241	MP 241-250	MP 250-253	MP 252-256	MP 256-260	MP 260-277	MP 277-282	MP 282-304	MP 304-306	MP 306-313	MP 0-34	MP 386-389	MP 287-288
Pavement	Low	None	Low	Low	None	None	None	None	None	None	None	None	Medium	High	None	Medium	Low
Bridge	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	Low	None
Mobility+	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low
Safety+	High	Low	High	High	Medium	High	N/A#	Low	N/A	Low	N/A	High	N/A	N/A	High	N/A	N/A
Freight+	Low	Low	High	High	High	High	Low	High	High	High	High	High	High	N/A	N/A	Medium	High
Average Need	**1.31**	**0.69**	**1.77**	**1.77**	**1.38**	**1.62**	**0.60**	**1.15**	**1.80**	**1.15**	**1.20**	**1.62**	**1.60**	**1.29**	**1.20**	**2.10**	**1.40**

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

+ Identified as an emphasis area for the SR 87/SR 260/SR 377 corridor.

 # N/A indicates insufficient or no data available to determine level of need

^ Segment 40B-17 Pavement Need estimated based on field review

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

Summary of Corridor

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

Pavement Needs

- Seven segments (87-1, 87-3, 87-4, 260-12, 260-13, 277-14, and 77-16) contain Pavement hot spots, but one of these segments had recent paving projects that addressed the need
- Segments 87-1, 87-3, 87-4, and 40B-17 have final needs of Low and Segments 260-13 and 77-16 have final needs of Medium. Segment 277-14 was the only High need segment along the corridor; all other segments on the corridor have a final need of None

Bridge Needs

- Seven segments (87-6, 87-7, 260-8, 260-9, 277-14, 377-15, and 40B-17) do not include any bridges
- Segment 77-16 includes one bridge, the Little Colorado River Bridge, which is functionally obsolete
- There are no final Bridge needs along the corridor

Mobility Needs

- Low Mobility needs exist on fifteen of the seventeen segments of the corridor.
- Two segments (260-9 and 77-16) have High final needs
- Segment 260-9 has high existing, directional, and future V/C needs
- Many segments contain Medium or High directional PTI needs
- Bicycle accommodation needs are High on ten of the seventeen segments of the corridor

Safety Needs

- High Safety needs exist on six of the seventeen segments of the corridor
- Safety hot spots exist in Segments 87-4, 87-6, and 260-8
- Many of the segments of the corridor (87-7, 260-9, 260-11, 260-13, 277-14, 77-16, 40B-17) contain insufficient data to determine levels of need, so a need value is not available (N/A)

Freight Needs

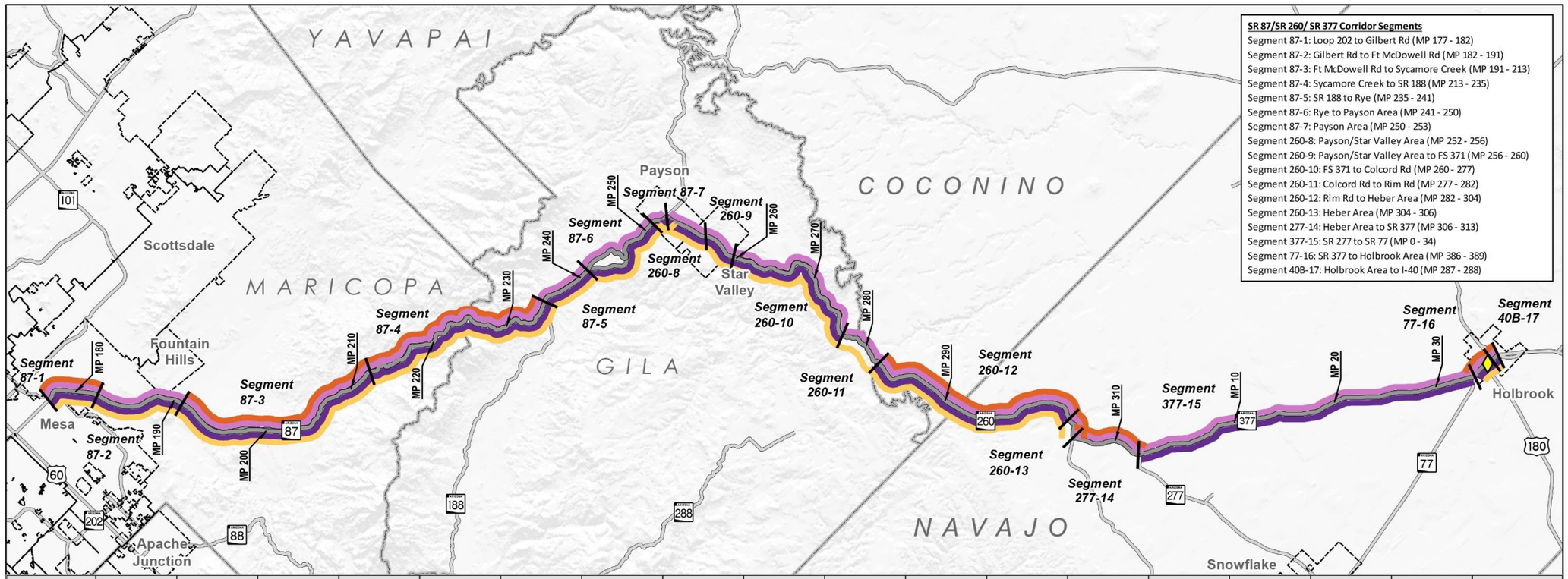
- High Freight needs exist on eleven of the seventeen segments
- Many segments along the corridor contain High directional PTI and closure duration needs
- No freight hotspots exist along the corridor
- Segments 277-14 and 377-15 have no data to determine a level of need

Overlapping Needs

This section identifies overlapping performance needs on the SR 87/SR 260/SR 377 corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need. Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided below.

- Segments 87-3, 87-4, 87-5, 87-6 and 260-12 all contain elevated Needs in the Safety and Freight performance areas
- Segment 77-16, which has the highest average need score of all the segments of the corridor, has elevated needs in Pavement, Mobility, and Freight
- Segment 260-9 contains elevated Needs in the Mobility and Freight performance areas

Figure 21 Corridor Needs Summary



SR 87/SR 260/ SR 377 Corridor Segments

Segment 87-1: Loop 202 to Gilbert Rd (MP 177 - 182)
Segment 87-2: Gilbert Rd to Ft McDowell Rd (MP 182 - 191)
Segment 87-3: Ft McDowell Rd to Sycamore Creek (MP 191 - 213)
Segment 87-4: Sycamore Creek to SR 188 (MP 213 - 235)
Segment 87-5: SR 188 to Rye (MP 235 - 241)
Segment 87-6: Rye to Payson Area (MP 241 - 250)
Segment 87-7: Payson Area (MP 250 - 253)
Segment 260-8: Payson/Star Valley Area (MP 252 - 256)
Segment 260-9: Payson/Star Valley Area to FS 371 (MP 256 - 260)
Segment 260-10: FS 371 to Colcord Rd (MP 260 - 277)
Segment 260-11: Colcord Rd to Rim Rd (MP 277 - 282)
Segment 260-12: Rim Rd to Heber Area (MP 282 - 304)
Segment 260-13: Heber Area (MP 304 - 306)
Segment 277-14: Heber Area to SR 377 (MP 306 - 313)
Segment 377-15: SR 277 to SR 77 (MP 0 - 34)
Segment 77-16: SR 377 to Holbrook Area (MP 386 - 389)
Segment 40B-17: Holbrook Area to I-40 (MP 287 - 288)

Performance Area	87-1	87-2	87-3	87-4	87-5	87-6	87-7	260-8	260-9	260-10	260-11	260-12	260-13	277-14	377-15	77-16	40B-17^	Performance Area
	MP 177-182	MP 182-191	MP 191-213	MP 213-235	MP 235-241	MP 241-250	MP 250-253	MP 252-256	MP 256-260	MP 260-277	MP 277-282	MP 282-304	MP 304-306	MP 306-313	MP 0-34	MP 386-389	MP 287-288	
Pavement	Low	None	Low	Low	None	None	None	None	None	None	None	None	Medium	High	None	Medium	Low	Pavement
Bridge	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	Low	None	Bridge
Mobility*	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low	Mobility*
Safety*	High	Low	High	High	Medium	High	N/A#	Low	N/A	Low	N/A	High	N/A	N/A	High	N/A	N/A	Safety*
Freight*	Low	Low	High	High	High	High	Low	High	High	High	High	High	High	N/A	N/A	Medium	High	Freight*
Average Need (0-3)	1.31	0.69	1.77	1.77	1.38	1.62	0.60	1.15	1.80	1.15	1.20	1.62	1.60	1.29	1.20	2.10	1.40	Average Need (0-3)

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

Miles
0 9 18

Corridor Segment
County Boundary
Interstate/Highway
City Boundary

Performance Area Needs
Pavement
Mobility
Safety
Freight
Bridge

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

SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Needs Summary

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 SR 87/SR 260/SR 377 strategic investment areas (resulting from the elevated needs) are shown in **Figure 22**.

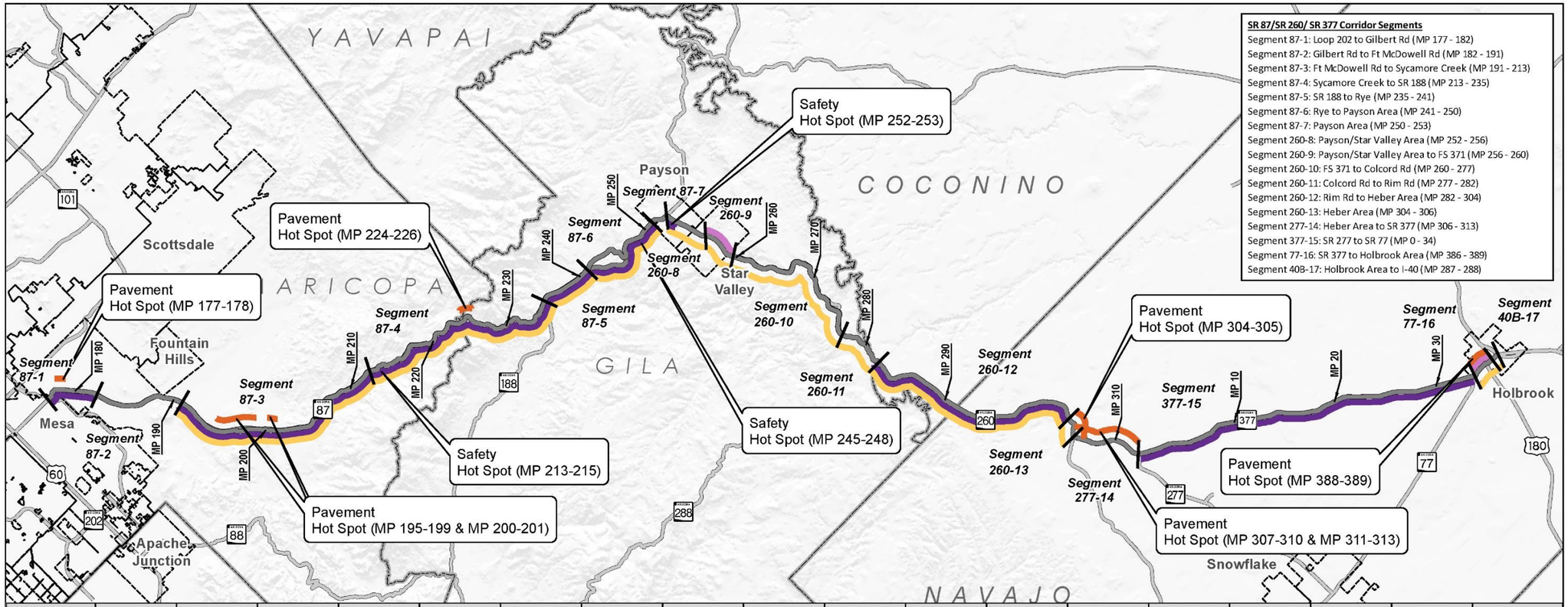
4.1 Screening Process

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

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

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

Figure 22: Strategic Investment Areas



Performance Area	87-1	87-2	87-3	87-4	87-5	87-6	87-7	260-8	260-9	260-10	260-11	260-12	260-13	277-14	377-15	77-16	40B-17^	Performance Area
	MP 177-182	MP 182-191	MP 191-213	MP 213-235	MP 235-241	MP 241-250	MP 250-253	MP 252-256	MP 256-260	MP 260-277	MP 277-282	MP 282-304	MP 304-306	MP 306-313	MP 0-34	MP 386-389	MP 287-288	
Pavement	Hot Spot	-	Hot Spot	Hot Spot	-	-	-	-	-	-	-	-	Medium	High	-	Medium	-	Pavement
Bridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Bridge
Mobility*	-	-	-	-	-	-	-	-	High	-	-	-	-	-	-	High	-	Mobility*
Safety*	High	-	High	High	Medium	High	N/A#	Hot Spot	N/A	-	N/A	High	N/A	N/A	High	N/A	N/A	Safety*
Freight*	-	-	High	High	High	High	-	High	High	High	High	High	High	N/A	N/A	Medium	High	Freight*

* Identified as emphasis area for SR 87/SR 260/SR 377 Corridor

^40B-17 Pavement Need estimated bases on field review

N/A indicate insufficient or no data available to determine level of need

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

Miles 0 9 18

Corridor Segment
County Boundary
Interstate/Highway
City Boundary

Performance Area Needs
Pavement
Mobility
Safety
Freight
Bridge

Level of Need
Low
Medium
High

SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Strategic Investment Areas

Table 18: 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					
87-1 (MP 177-182)	Hot Spot			High		L1	Safety	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 % 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	Y	No programmed project to address Safety need
						L2	Pavement	Hot spot NB at MP 177-178	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
87-2 (MP 182-191)						No Strategic Needs Identified				
87-3 (MP 191-213)	Hot Spot			High	High	L3	Safety	MP 191-213 has a High level of need based on the Safety Index in the SB direction and motorcycle crashes Crash data analysis indicates % 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	Y	No programmed project to address Safety need
						L4	Freight	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	Y	No programmed project to address Freight need
						L5	Pavement	Hot spot SB at MP 195-199 and 200-201	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
87-4 (MP 213-235)	Hot Spot			High	High	L6	Safety	MP 213-235 has a High level of need based on the Safety Index and 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 too fast for conditions, and 80% run off road (left or right), and 80% single vehicle; 9 fatal crashes, 21 incapacitating injury crashes, and 15 crashes involving motorcycles	Y	No programmed project to address Safety need

Legend: Strategic investment area screened out from further consideration

Table 18: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
87-4 (MP 213-235)	Hot Spot			High	High	L7	Safety	Hot spot NB at MP 213-215	Y	No programmed project to address Safety need
						L8	Freight	MP 213-215 has a High level of need based on the overall Freight Index, NB directional (TTI), and both directional PTI scores, and closure duration in the NB direction	Y	No programmed project to address Freight need
						L9	Pavement	Hot spot NB/SB at MP 224-226	Y	No programmed project to address Pavement need; high historical investment
87-5 (MP 235-241)				Medium	High	L10	Freight	MP 235-241 has a High level of need based on the overall Freight Index, SB directional PTI scores	Y	No programmed project to address Freight need
						L11	Safety	MP 235-241 has a High level of need based on the SB directional Safety Index	Y	No programmed project to address Safety need
87-6 (MP 241-250)				High	High	L12	Freight	MP 241-250 has a High level of need based on the overall Freight Index, NB directional TTI, both directional PTI scores, and closure duration in the SB direction	Y	No programmed project to address Freight need
						L13	Safety	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 % 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	Y	No programmed project to address Safety need
						L14	Safety	Hot spot SB at MP 245-248	Y	No programmed project to address Safety need
87-7 (MP 250-253)				N/A		No Strategic Needs Identified				

Legend: Strategic investment area screened out from further consideration

Table 18: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
260-8 (MP 252-256)				Hot spot	High	L15	Freight	High level of need based on the overall Freight Index and EB directional PTI scores	Y	No programmed project to address Freight need
						L16	Safety	Hot spot EB at MP 252-253	Y	No programmed project to address Safety need
260-9 (MP 256-260)			High	N/A	High	L17	Mobility	MP 256-260 has a High level of need based on the existing and future V/C 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	Y	No programmed project to address mobility need in first three years of five-year program, but reconstruction of segment to a 4-lane divided highway facility is programmed for design in FY 2021 with tentative construction in FY 2024
						L18	Freight	MP 256-260 has a High level of need based on the overall Freight Index, EB directional PTI scores, and closure duration in the WB direction	Y	No programmed project to address Freight need
260-10 (MP 260-277)					High	L19	Freight	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	Y	No programmed project to address Freight need
260-11 (MP 277-282)				N/A	High	L20	Freight	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	Y	No programmed project to address Freight need
260-12 (MP 282-304)				High	High	L21	Safety	MP 282-304 has a High level of need based on the EB directional Safety Index with significant directional split	Y	No programmed project to address Safety need
						L22	Freight	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	Y	No programmed project to address Freight need
260-13 (MP 304-306)	Medium			N/A	High	L23	Freight	MP 304-306 has a High level of need based on the overall Freight Index, WB directional TTTI, both directional TPTI scores, and closure duration in the WB direction	N	Freight needs considered non-actionable because high TTTI and TPTI scores are likely a result of travel times being skewed due to vehicles parking at businesses adjacent to the roadway

Legend: Strategic investment area screened out from further consideration

Table 18: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
260-13 (MP 304-306)	Medium			N/A	High	L24	Pavement	MP 304-306 has 50% Area Failure	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L25	Pavement	Hot spot EB at MP 304-305	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
277-14 (MP 306-313)	High			N/A	N/A	L26	Pavement	MP 306-313 has a High level of need based on the Pavement Index with over 71% Area Failure	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
						L27	Pavement	Hot spot NB at MP 307-310 and 311-313	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes
377-15 (MP 0-34)				High	N/A	L28	Safety	MP 0-34 has a High level of need based on the Safety Index in both directions and high rate of fatal and incapacitating injury crashes involving SHSP Top 5 Emphasis Areas Crash data analysis indicates % of crashes above statewide average including 73% for each overturning and involve single vehicle, 36% under the influence, 27% for each failure to keep in proper lane, and speed too fast for conditions, 64% ran off road (right), and 18% for sideswipe; 4 fatal crashes, 7 incapacitating injury crashes, and 3 involving trucks	N	Programmed project in FY 2018 to reconstruct horizontal curves and widen shoulders to 8 feet in both directions (10 locations, MP 3-34)
77-16 (MP 386-389)	Medium		High	N/A	Medium	L29	Mobility	MP 386-389 has a High level of need based on the future V/C and bicycle accommodation; the segment also has an at-grade railroad crossing	Y	No programmed project to address Mobility need
						L30	Freight	MP 386-389 has a Medium level of need based on the overall Freight Index	Y	No programmed project to address Freight need
						L31	Pavement	MP 386-389 has a Medium level need based on the Pavement Index and % Area Failure	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes.
						L32	Pavement	Hot spot NB at MP 388-389	N	No high historical investment so not considered a strategic investment; will likely be addressed by current ADOT processes.

Legend: Strategic investment area screened out from further consideration

Table 18: Strategic Investment Area Screening (continued)

Segment # and MP	Level of Strategic Need					Location #	Type	Need Description	Advance (Y/N)	Screening Description
	Pavement	Bridge	Mobility	Safety	Freight					
40B-17 (MP 287-288)				N/A	High	L33	Freight	MP 287-288 has a High level of need based on the overall Freight Index and NB/SB directional TTTI and TPTI scores	N	Need will be partially addressed through the solutions developed for Segment 77-16; remaining need considered non-actionable because high TTTI and TPTI scores are likely a result of travel times being skewed due to vehicles parking at businesses adjacent to the roadway

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 SR 87/SR 260/SR 377 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 16 candidate solutions are proposed to address the identified needs on the SR 87/SR 260/SR 377 corridor.

Table 19 identifies each strategic location that has been assigned a candidate solution, with a number (e.g., CS87.1, CS87.2, etc.). Each candidate solution is comprised of one or more components to address the identified needs. The assigned candidate solution numbers are linked to the location number and provide tracking capability through the rest of the process. The locations of proposed solutions are shown on the map in **Figure 23**.

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

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

Table 19: Candidate Solutions

Candidate Solution #	Segment #	Location #	Beginning Milepost	Ending Milepost	Candidate Solution Name	Option*	Scope	Investment Category (Preservation [P], Modernization [M], Expansion [E])
CS87.1	87-1	L1	177	182	Salt River Area Safety Improvements	-	-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 178.4), Center St (MP 179.1), Mesa Dr (MP 179.7), and Camelback Rd (MP 181.0) -Install raised concrete barrier in median on Salt River bridge and approaches (MP 177.0-177.5)	M
CS87.2	87-3	L3/L4	191	213	Bush Highway Area Safety and Freight Improvements	-	-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 211-209)	M
CS87.3	87-4	L6/L7	213	235	Sunflower Area Safety Improvements	-	-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)	M
CS87.4	87-4	L8	213	223	Sunflower Area Freight Improvements	-	-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	M
CS87.5	87-4	L9	224	226	Slate Creek Pavement Improvements	A	-Rehabilitate pavement	P
						B	-Replace pavement	M
CS87.6	87-5	L10/L11	235	241	Rye Area Safety and Freight Improvements	-	-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 240.9]) -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	M
CS87.7	87-6	L13	241	250	Ox Bow Estates Area Safety Improvements	-	-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	M
CS87.8	87-6	L12	243	247	Ox Bow Estates Area Freight Improvements	-	-Construct NB climbing lane	M
CS87.9	87-6	L14	246	251	Mazatzal Area Safety Improvements	-	-Widen shoulders SB MP 246.2-250.9	M

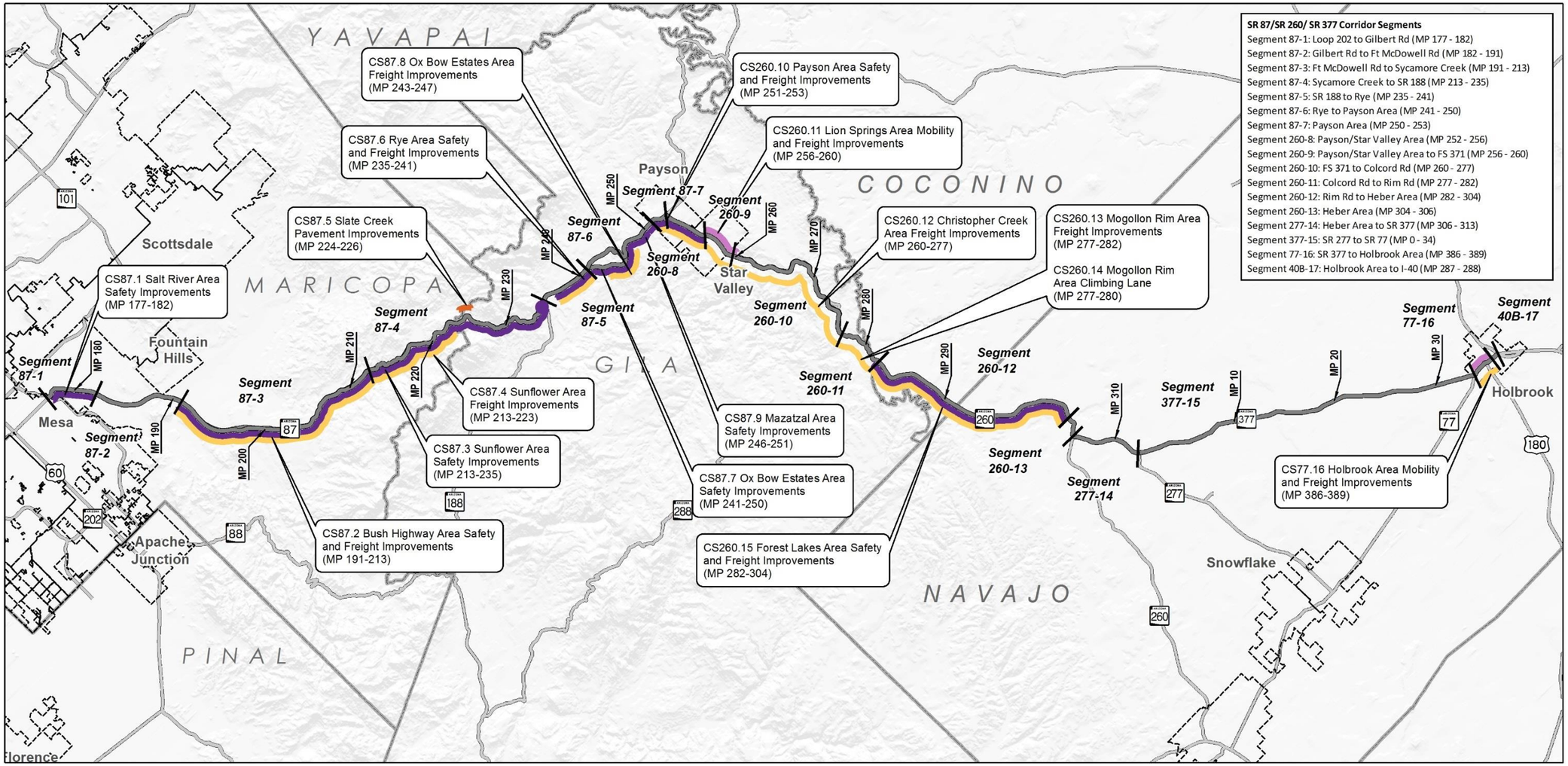
* '-' indicates only one solution is being proposed and no options are being considered

Table 19: Candidate Solutions (continued)

Candidate Solution #	Segment #	Location #	Beginning Milepost	Ending Milepost	Candidate Solution Name	Option*	Scope	Investment Category (Preservation [P], Modernization [M], Expansion [E])
CS260.10	87-7 & 260-8	L15/L16	251 (SR 87)	253 (SR 260)	Payson Area Safety and Freight Improvements	A	-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 Parkway [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	M
						B	-Reconstruct three signalized intersections as double-lane roundabouts (SR 87/Bonita St, SR 87/SR 260 intersection, and SR 260/Manzanita Dr) -Implement signal coordination/adaptive control for three signals in Payson urban area (SR 87/Green Valley Parkway [BIA 101], SR 87/Main St, and SR 260/Payson Village Center)	M
CS260.11	260-9	L17/L18	256	260	Lion Springs Area Mobility and Freight Improvements	-	-Reconstruct to 4-lane divided highway (using the existing 2-lane road for one direction)	E
CS260.12	260-10	L19	260	277	Christopher Creek Area Freight Improvements	-	-Install rock-fall mitigation (WB MP 262.2-262.6, 261.6-261.9, 269.0-269.1, 269.7-269.8, 271.3-271.5; EB MP 269.8-269.9, 272.6-272.7) -Implement variable speed limits at MP 272-277 and new DMS and CCTV at MP 272 EB	M
CS260.13	260-11	L20	277	282	Mogollon Rim Area Freight Improvements	-	-Install centerline rumble strips -Install rock-fall mitigation (WB MP 278.4-278.6, 279.8-280.9, 281.4-282.0) -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	M
CS260.14	260-11	L20	277	280	Mogollon Rim Area Climbing Lane	-	-Construct EB climbing lane	M
CS260.15	260-12	L21/L22	282	304	Forest Lakes Area Safety and Freight Improvements	-	-Widen shoulders -Construct alternating passing lanes (varying locations for 11 miles of the segment)	M
CS77.16	77-16	L29/L30	386	389	Holbrook Area Mobility and Freight Improvements	A	-Construct new roadway connection between SR 377/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook; includes new bridge over the Little Colorado River and overpass at railroad crossing	E
						B	-Construct new roadway connection between US 180/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook; includes new bridge over the Little Colorado River and overpass at railroad crossing	E
						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	E

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

Figure 23: Candidate Solutions



SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
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.

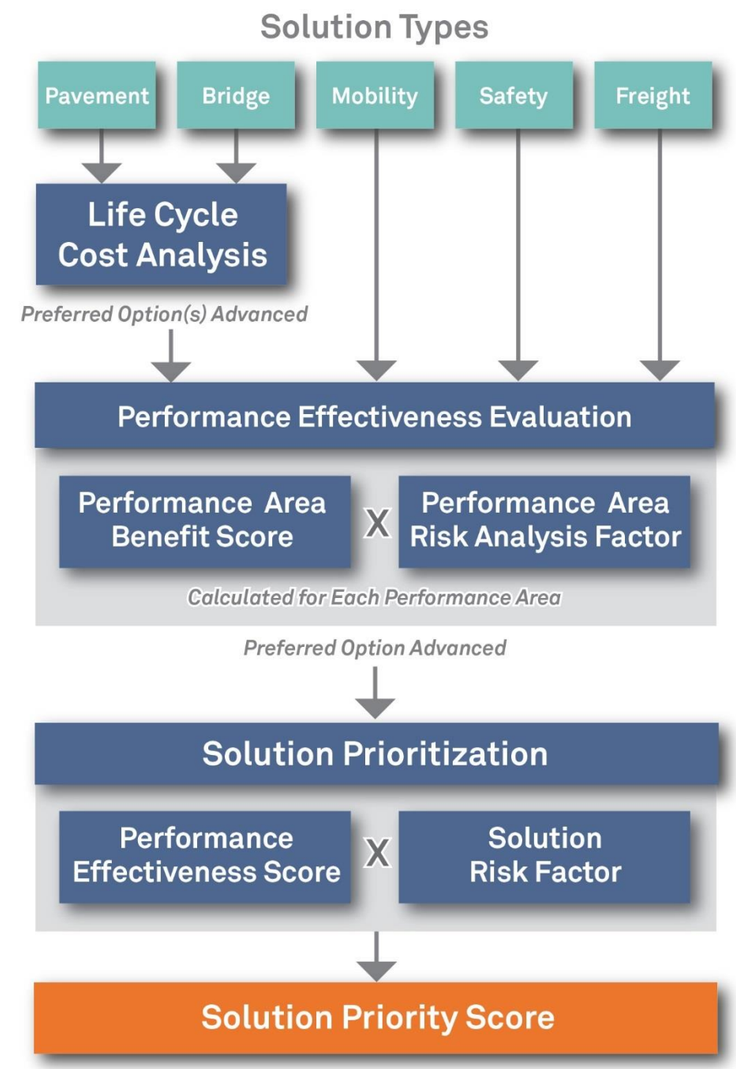
Solution Risk Analysis

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

Based on the candidate solutions presented in **Table 19**, LCCA was not conducted for any bridges on the SR 87/SR 260/SR 377 corridor, as noted in **Table 20**.

Pavement LCCA

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

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

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

- The pavement LCCA only addresses the condition of the pavement and does not address other issues or costs
- The historical pavement rehabilitation frequencies at each location are used to estimate future rehabilitation frequencies
- Different pavement replacement and rehabilitation strategies have different costs and expected service life

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

Based on the candidate solutions presented in **Table 19**, LCCA was conducted for one pavement section on the SR 87/SR 260/SR 377 corridor. A summary of this analysis is shown in **Table 21**. Additional information regarding the pavement LCCA is included in **Appendix E**.

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

- Reconstruction was determined to be the most effective approach for the Pavement candidate solution CS87.5; the replace pavement option of this solution was carried forward to the Performance Effectiveness Evaluation

Table 20: Bridge Life-Cycle Cost Analysis Results

Candidate Solution	Present Value at 3% Discount Rate ($)			Ratio of Present Value Compared to Lowest Present Value			Other Needs	Results
	Replace	Rehab	Repair	Replace	Rehab	Repair		
No LCCA conducted for any bridge candidate solution on the SR 87/SR 260/SR 377 corridor								

Table 21: Pavement Life-Cycle Cost Analysis Results

Candidate Solution	Present Value at 3% Discount Rate ($)				Ratio of Present Value Compared to Lowest Present Value				Other Needs	Results
	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehabilitation	Asphalt Light Rehabilitation	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehabilitation	Asphalt Light Rehabilitation		
Slate Creek Pavement Improvements (CS87.5, MP 224-226)	**$9,046,928**	$9,478,848	$9,224,966	$9,478,766	**1.00**	1.05	1.02	1.05	-	Concrete reconstruction is the lowest option and asphalt reconstruction is within 15% of the lowest rehabilitation 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) would have a direct effect on the TTI secondary measure
  - Changes in the Mobility Index (due to increased capacity) and Safety Index (due to crash reductions) would have a direct effect on the PTI secondary measure
  - Changes in the Safety Index (due to crash reductions) would have a direct effect on the Closure Extent secondary measure
- Safety:
  - Crash modification factors were developed that would be applied to estimate the reduction in crashes (for additional information see **Appendix F**)
- Freight:
  - Changes in the Mobility Index (due to increased capacity) and Safety Index (due to crash reductions) would have a direct effect on the Freight Index and the TPTI secondary measure
  - Changes in the Mobility Index (due to increased capacity) would have a direct effect on the TTTI secondary measure
  - Changes in the Safety Index (due to crash reductions) would have a direct effect on the Closure Duration secondary measure

Performance Area Risk Analysis

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

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

Net Present Value Factor

The benefit (reduction in need) is measured as a one-time benefit. However, different types of solutions will have varying service lives during which the benefits will be obtained. For example, a preservation solution would likely have a shorter stream of benefits over time when compared to a modernization or expansion solution. To address the varying lengths of benefit streams, each solution is classified as a 10-year, 20-year, 30-year, or 75-year benefit stream, or the 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 (2014) daily volume and length of solution

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

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

For candidate solutions with multiple options to address Mobility, Safety, or Freight needs, the PES should be compared to help identify the best performing option. If one option clearly performs better than the other options (e.g., more than twice the PES value and a difference in magnitude of at least 20 points), the other options can be eliminated from further consideration. If multiple options have similar PES values, or there are other factors not accounted for in the performance system that could significantly influence the ultimate selection of an option (e.g., potential environmental concerns, potential adverse economic impacts), those options should all be advanced to the prioritization process. On the SR 87/SR 260/SR 377 corridor, the following candidate solutions have options to address Mobility, Safety, or Freight needs:

- CS260.10 (Options A and B) – Payson Area Safety and Freight Improvements
- CS77.16 (Options A, B, and C) – Holbrook Area Mobility and Freight Improvements

Based on a review of the PES values for solution CS260.10, Option B did not advance to the solution prioritization process because the Option A PES is more than twice that of the Option B PES and the difference is greater than 20 points. Based on a review of the PES values for solution CS77.16, and due to other factors not accounted for in the performance system (environmental concerns and potential economic impacts to the City of Holbrook), all of the CS77.16 options (Options A, B, and C) advanced to the candidate solution prioritization process and received a prioritization score.

As was previously mentioned, pavement reconstruction (Option B) was determined to be the most effective approach for the candidate solution listed below that was subject to LCCA:

- Slate Creek Pavement Improvements (CS87.5, MP 224-226)

Pavement rehabilitation or repair (Option A) for CS87.5 was eliminated from further consideration per the LCCA; no PES value was calculated for Option A of solution CS87.5 and it does not appear in **Table 22**.

Table 22: Performance Effectiveness Scores

Candidate Solution #	Segment #	Option	Candidate Solution Name	Milepost Location	Estimated Cost* (in millions)	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	Mobility	Safety	Freight				
CS87.1	87-1	-	Salt River Area Safety Improvements	177-182	$4.7	-	-	0.08	18.38	0.25	0.00	0.81	0.00	19.52	1.43	15.3	91.3
CS87.2	87-3	-	Bush Highway Area Safety and Freight Improvements	191-213	$6.8	-	-	1.85	2.23	3.84	0.00	0.30	0.05	8.26	4.21	15.3	79.7
CS87.3	87-4	-	Sunflower Area Safety Improvements	213-235	$18.3	-	-	2.74	5.71	8.08	0.00	1.04	0.06	17.62	4.78	15.3	70.4
CS87.4	87-4	-	Sunflower Area Freight Improvements	213-219	$43.4	-	-	0.56	1.50	2.01	0.01	0.28	0.01	4.38	1.81	20.2	3.7
CS87.5	87-4	-	Slate Creek Pavement Improvements (Replacement)	224-226	$7.2	0.00	-	0.19	0.63	0.84	0.00	0.12	0.01	1.79	0.70	20.2	3.5
CS87.6	87-5	-	Rye Area Safety and Freight Improvements	235-241	$0.2	-	-	0.73	0.61	0.51	0.00	0.02	0.01	1.89	1.56	8.8	125.7
CS87.7	87-6	-	Ox Bow Estates Area Safety Improvements	241-250	$2.6	-	-	1.03	1.18	0.67	0.01	0.11	0.01	3.01	2.79	15.3	49.3
CS87.8	87-6	-	Ox Bow Estates Area Freight Improvements	243-247	$22.4	-	-	0.55	0.06	0.24	0.01	0.01	0.00	0.87	1.39	20.2	1.1
CS87.9	87-6	-	Mazatzal Area Safety Improvements	246-251	$2.3	-	-	0.96	5.44	0.46	0.00	0.52	0.01	7.39	1.59	15.3	78.9
CS260.10	87-7 and 260-8	A	Payson Area Safety and Freight Improvements (Signals)	251-253	$0.4	-	-	0.12	2.96	0.09	0.00	0.29	0.00	3.44	1.98	8.8	137.3
		B	Payson Area Safety and Freight Improvements (Roundabouts)	251-253	$13.9	-	-	0.67	3.92	1.35	0.00	0.73	0.01	6.66	1.98	20.2	19.2
CS260.11	260-9	-	Lion Springs Area Mobility and Freight Improvements	256-260	$50.0	0.00	-	45.72	7.43	4.63	0.16	0.19	0.03	61.99	2.68	20.2	62.9
CS260.12	260-10	-	Christopher Creek Area Freight Improvements	260-277	$6.5	-	-	0.36	0.33	0.53	0.01	0.05	0.02	1.29	2.09	15.3	6.4
CS260.13	260-11	-	Mogollon Rim Area Freight Improvements	277-282	$8.7	-	-	1.12	0.21	0.95	0.00	0.04	0.01	2.33	1.73	15.3	7.1
CS260.14	260-11	-	Mogollon Rim Area Climbing Lane	277-280	$16.8	-	-	0.46	0.00	0.18	0.00	0.00	0.00	0.64	0.60	20.2	0.5
CS260.15	260-12	-	Forest Lakes Area Safety and Freight Improvements	282-304	$56.5	-	-	7.09	13.21	12.43	0.06	1.78	0.19	34.76	4.19	20.2	52.1
CS77.16	77-16	A	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	386-389	$92.1	3.30	5.30	12.23	11.57	12.09	0.02	0.20	0.22	44.93	1.45	30.6	21.6
		B	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	386-389	$75.8	3.16	5.30	14.43	11.57	12.09	0.04	0.20	0.24	47.03	0.79	30.6	14.9
		C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)	386-389	$43.8	4.34	5.54	11.33	117.08	12.10	0.01	2.01	0.24	152.65	0.36	30.6	38.4

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

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

5.4 Candidate Solution Prioritization

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

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

Where:

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

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

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

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

Table 23: Prioritization Scores

Candidate Solution #	Segment #	Option*	Candidate Solution Name	Milepost Location	Estimated Cost (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
CS87.1	87-1	-	Salt River Area Safety Improvements	177-182	$4.7	91.3	1.77	1.31	**212**	0%	0%	3%	49%	19%
CS87.2	87-3	-	Bush Highway Area Safety and Freight Improvements	191-213	$6.8	79.7	1.49	1.77	**210**	0%	0%	26%	56%	8%
CS87.3	87-4	-	Sunflower Area Safety Improvements	213-235	$18.3	70.4	1.52	1.77	**189**	0%	0%	21%	47%	12%
CS87.4	87-4	-	Sunflower Area Freight Improvements	213-219	$43.4	3.7	1.53	1.77	**10**	0%	0%	5%	11%	3%
CS87.5	87-4	-	Slate Creek Pavement Improvements (Replacement)	224-226	$7.2	3.5	1.54	1.77	**9**	0%	0%	2%	5%	1%
CS87.6	87-5	-	Rye Area Safety and Freight Improvements	235-241	$0.2	125.7	1.50	1.38	**261**	0%	0%	20%	31%	2%
CS87.7	87-6	-	Ox Bow Estates Area Safety Improvements	241-250	$4.1	49.3	1.54	1.62	**123**	0%	0%	8%	5%	2%
CS87.8	87-6	-	Ox Bow Estates Area Freight Improvements	243-247	$22.4	1.1	1.39	1.62	**2**	0%	0%	4%	0%	1%
CS87.9	87-6	-	Mazatzal Area Safety Improvements	246-251	$2.3	78.9	1.70	1.62	**216**	0%	0%	7%	28%	2%
CS260.10	87-7 and 260-8	-	Payson Area Safety and Freight Improvements (Signals)	251-253	$0.4	137.3	1.75	0.71	**171**	0%	0%	1%	18%	1%
CS260.11	260-9	-	Lion Springs Area Mobility and Freight Improvements	256-260	$50.0	62.9	1.41	1.80	**160**	0%	0%	83%	41%	11%
CS260.12	260-10	-	Christopher Creek Area Freight Improvements	260-277	$7.2	6.4	1.48	1.15	**11**	0%	0%	7%	11%	2%
CS260.13	260-11	-	Mogollon Rim Area Freight Improvements	277-282	$9.5	7.1	1.40	1.20	**12**	0%	0%	10%	18%	3%
CS260.14	260-11	-	Mogollon Rim Area Climbing Lane	277-280	$16.8	0.5	1.36	1.20	**1**	0%	0%	4%	0%	1%
CS260.15	260-12	-	Forest Lakes Area Safety and Freight Improvements	282-304	$56.5	52.1	1.54	1.62	**130**	0%	0%	51%	84%	43%
CS77.16	77-16	A	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	386-389	$92.1	21.6	1.48	2.10	**67**	76%	96%	47%	10%	95%
		B	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	386-389	$75.8	14.9	1.47	2.10	**46**	73%	96%	59%	10%	95%
		C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)	386-389	$43.8	38.4	1.69	2.10	**136**	100%	100%	47%	99%	95%

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

6.0 SUMMARY OF CORRIDOR RECOMMENDATIONS

6.1 Prioritized Candidate Solution Recommendations

Table 24 and **Figure 27** show the prioritized candidate solutions recommended for the SR 87/SR 260/SR 377 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 SR 87/SR 260/SR 377 corridor. The following observations were noted about the prioritized solutions:

- Most of the anticipated improvements in performance are in the Mobility, Safety, and Freight performance areas
- The highest-ranking solutions tend to have overlapping benefits in the Mobility, Safety, and Freight performance areas
- The highest priority solutions address needs in the Rye area (SR 87 MP 235-241), Salt River area (SR 87 MP 177-182), and near the Payson area (SR 87 MP 246-251)

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 SR 87/SR 260/SR 377 corridor:

- Implement a driving impaired and speeding safety education campaign along the corridor
- Coordinate with AGFD to conduct a study on vehicle/wildlife conflicts on SR 87 between MP 233 and MP 241
- Conduct an access management study on SR 87 and SR 260 through the Town of Payson

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 SR 87/SR 260/SR 377, but across the entire state highway system where the conditions are applicable. The following list, which is in no particular order of priority, was derived from the Round 1, Round 2, and Round 3 CPS:

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

Table 24: Prioritized Recommended Solutions

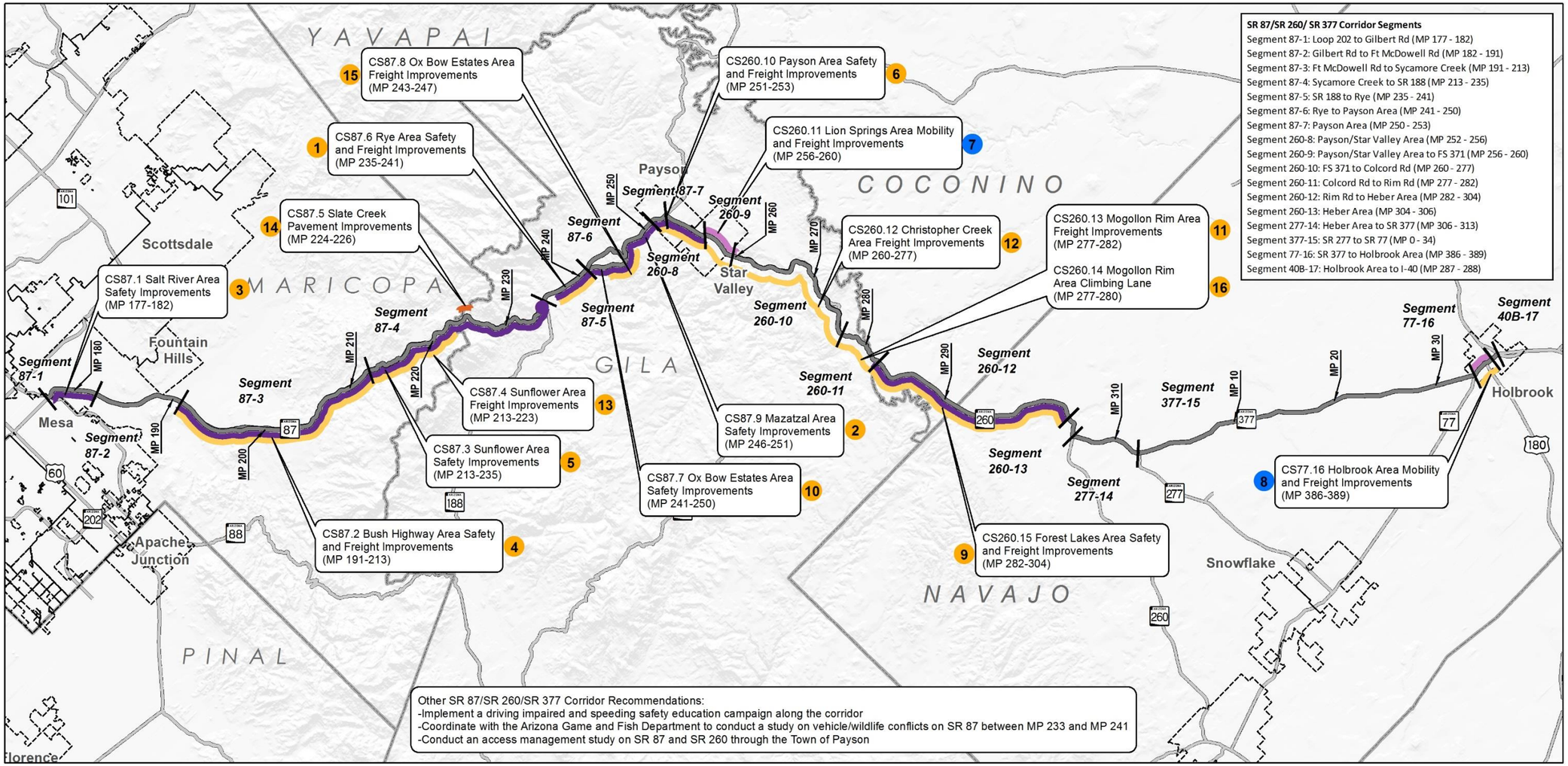
Rank	Candidate Solution #	Option*	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Prioritization Score
1	CS87.6	-	Rye Area Safety and Freight Improvements (SR 87 MP 235-241)	-Install advisory sign about approaching area with intersections (Deer Creek Drive [MP 237.6], Gisela Road [MP 239.5], two intersections in Rye [MP 240.5 and MP 240.9]) -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	$0.2	M	261
2	CS87.9	-	Mazatzal Area Safety Improvements (SR 87 MP 246-251)	-Widen shoulders SB MP 246.2-250.9	$2.3	M	216
3	CS87.1	-	Salt River Area Safety Improvements (SR 87 MP 177-182)	-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 177-177.5)	$4.7	M	212
4	CS87.2	-	Bush Highway Area Safety and Freight Improvements (SR 87 MP 191-213)	-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 211-209)	$6.8	M	210
5	CS87.3	-	Sunflower Area Safety Improvements (SR 87 MP 213-235)	-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)	$18.3	M	189
6	CS260.10	-	Payson Area Safety and Freight Improvements (SR 87 MP 251-SR 260 MP 253)	-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 Parkway [BIA101]) -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	$0.4	M	171
7	CS260.11	-	Lion Springs Area Mobility and Freight Improvements (SR 260 MP 256-260)	-Reconstruct to 4-lane divided highway (using the existing 2-lane road for one direction) [Design already programmed for FY 2021 in ADOT 5-year program]	$50.0	E	160
8	CS77.16	C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77) (SR 77 MP 386-389)	-Construct new roadway connection between SR 377/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook; includes new bridge over the Little Colorado River and overpass at railroad crossing	$43.8	E	136
		A	*Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)* (SR 77 MP 386-389)	*-Construct new roadway connection between US 180/SR 77 and I-40/40B West TI (Exit 285) west of Holbrook; includes new bridge over the Little Colorado River and overpass at railroad crossing*	*$92.1*	*E*	*67*
		B	*Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)* (SR 77 MP 386-389)	*-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*	*$75.8*	*E*	*46*
9	CS260.15	-	Forest Lakes Area Safety and Freight Improvements (SR 260 MP 282-304)	-Widen shoulders -Construct alternating passing lanes (varying locations for 11 miles of the segment)	$56.5	M	130
10	CS87.7	-	Ox Bow Estates Area Safety Improvements (SR 87 MP 241-250)	-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	$4.1	M	123
11	CS260.13	-	Mogollon Rim Area Freight Improvements (SR 260 MP 277-282)	-Install centerline rumble strips -Install rock-fall mitigation (WB MP 278.4-278.6, 279.8-280.9, 281.4-282.0) -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	$9.5	M	12

Table 24: Prioritized Recommended Solutions (continued)

Rank	Candidate Solution #	Option*	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Prioritization Score
12	CS260.12	-	Christopher Creek Area Freight Improvements (SR 260 MP 260-277)	-Install rock-fall mitigation (WB MP 262.2-262.6, 261.6-261.9, 269.0-269.1, 269.7-269.8, 271.3-271.5; EB MP 269.8-269.9, 272.6-272.7) -Implement variable speed limits at MP 272-277 and new DMS and CCTV at MP 272 EB	$7.2	M	11
13	CS87.4	-	Sunflower Area Freight Improvements (SR 87 MP 213-223)	-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	$43.4	M	10
14	CS87.5	-	Slate Creek Pavement Improvements (SR 87 MP 224-226)	-Replace Pavement	$7.2	M	9
15	CS87.8	-	Ox Bow Estates Area Freight Improvements (SR 87 MP 243-247)	-Construct NB climbing lane	$22.4	M	2
16	CS260.14	-	Mogollon Rim Area Climbing Lane (SR 260 MP 277-280)	-Construct EB climbing lane	$16.8	M	1

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

Figure 27: Prioritized Recommended Solutions

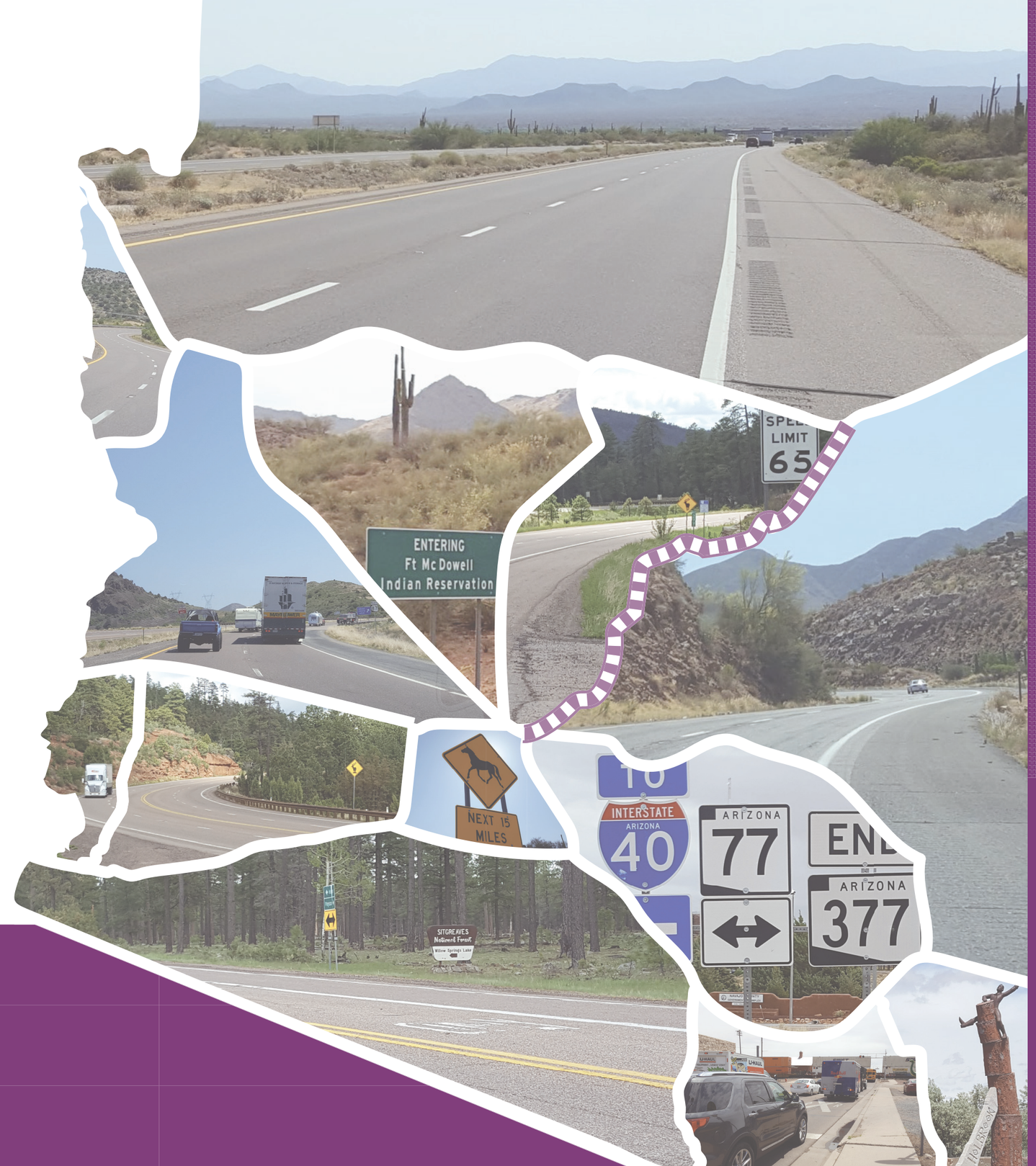


6.4 Next Steps

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 SR 87/SR 260/SR 377 corridor will be considered along with other candidate projects in the ADOT statewide programming process.

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

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



Appendices

Appendices

Appendix A: Corridor Performance Maps

This appendix contains maps of each primary and secondary measure associated with the five performance areas for the SR 87/SR 260/SR 377 corridor. The following are the areas and maps included:

Pavement Performance Area:

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

Bridge Performance Area:

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

Mobility Performance Area:

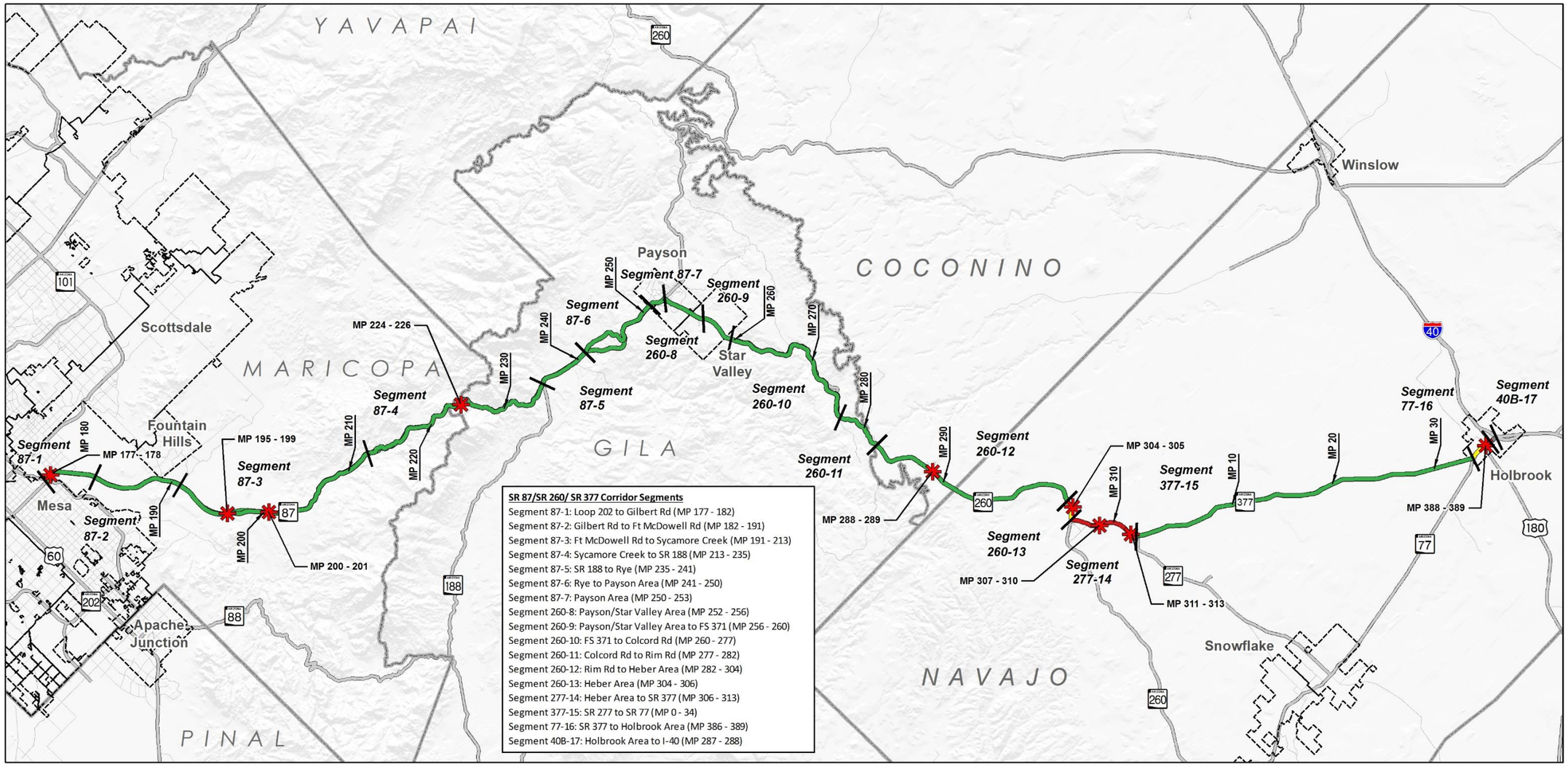
- Mobility Index
- Future Daily V/C
- Existing Peak V/C (directional)
- Average Instances Per Year a Given Milepost is Closed Per Segment Mile
- All Vehicles Travel Time Index
- All Vehicles Planning Time Index
- Multimodal Opportunities
- Percentage of Bicycle Accommodation

Safety Performance Area:

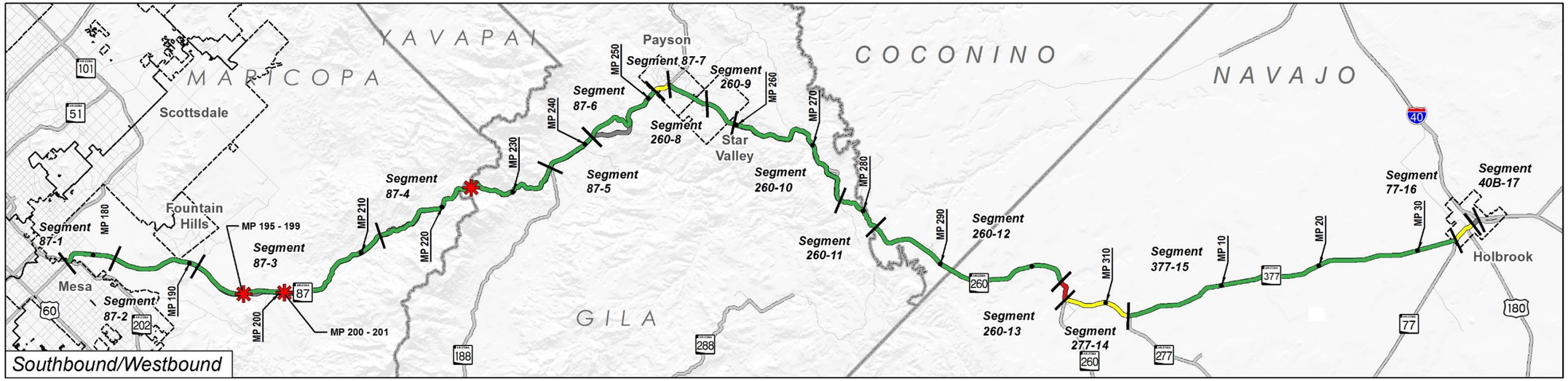
- Safety Index and Hot Spots
- Safety Index and Hot Spots (directional)
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors Compared to the Statewide Average for Similar Segments
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving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

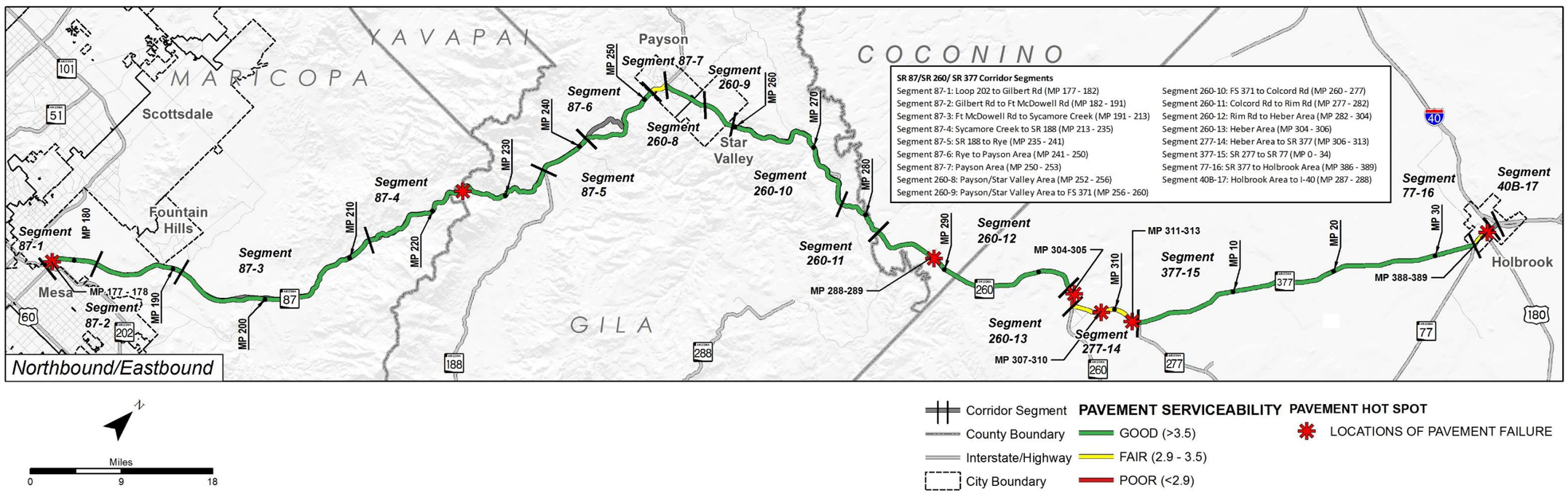
Freight Performance Area:

- Freight Index and Hot Spots
- Truck Travel Time Index
- Truck Planning Time Index
- Average Minutes Per Year Given Milepost is Closed Per Segment Mile
- Bridge Vertical Clearance



SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Pavement Index and Hot Spots
2014-2015 Data





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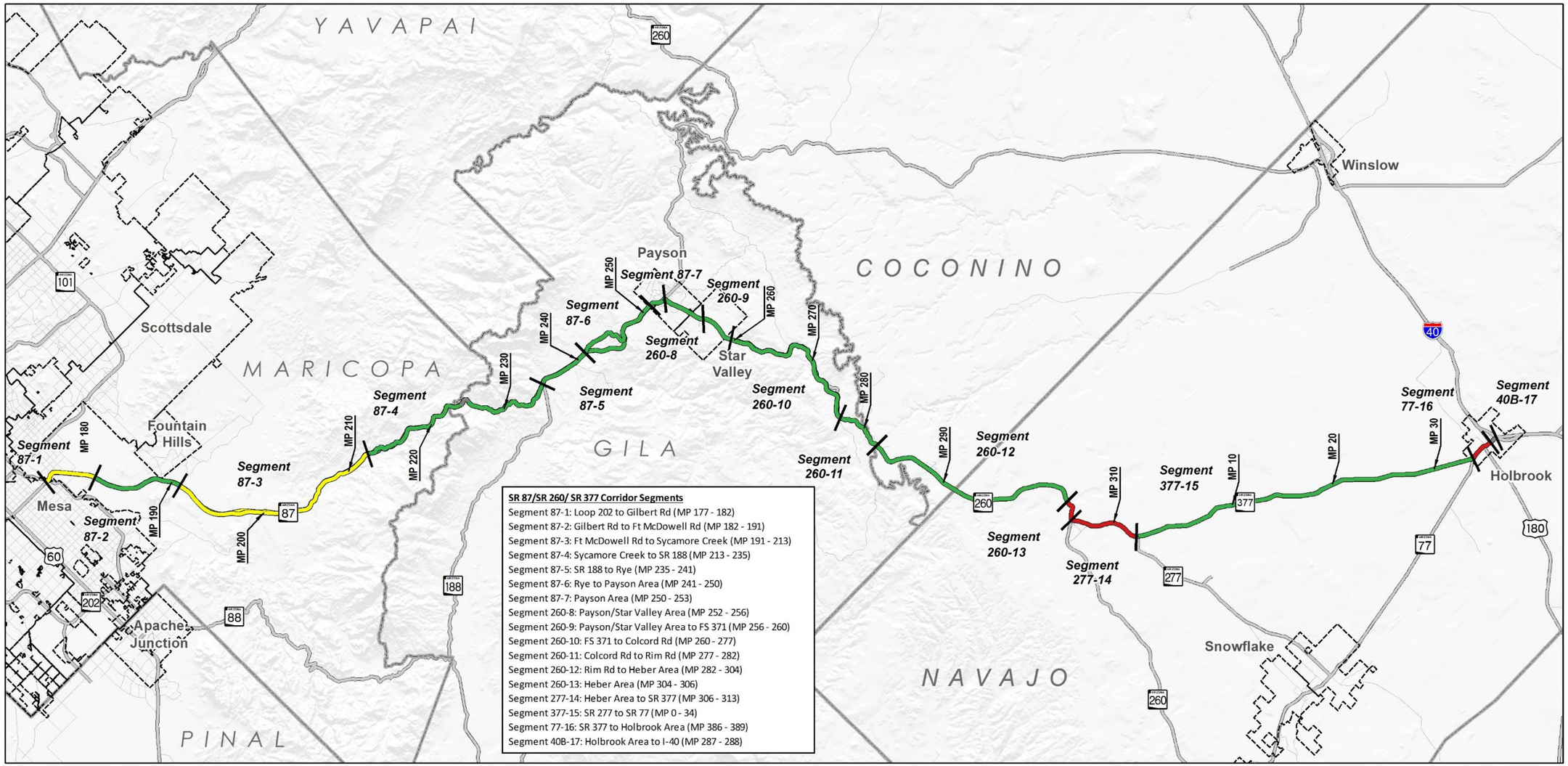
Corridor Segment
County Boundary
Interstate/Highway
City Boundary

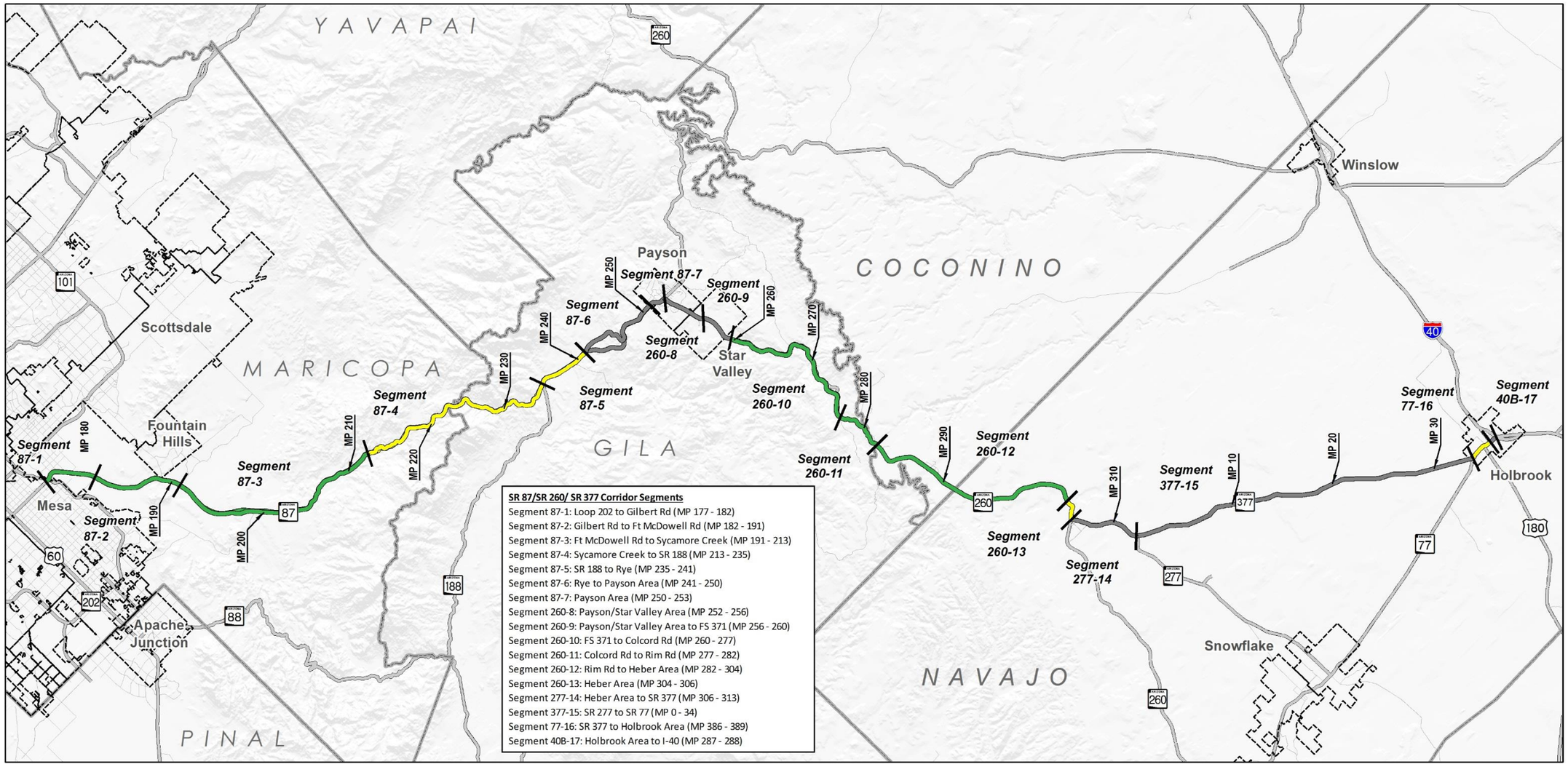
PAVEMENT SERVICEABILITY
GOOD (>3.5)
FAIR (2.9 - 3.5)
POOR (<2.9)
NO DATA

PAVEMENT HOT SPOT
LOCATIONS OF PAVEMENT FAILURE

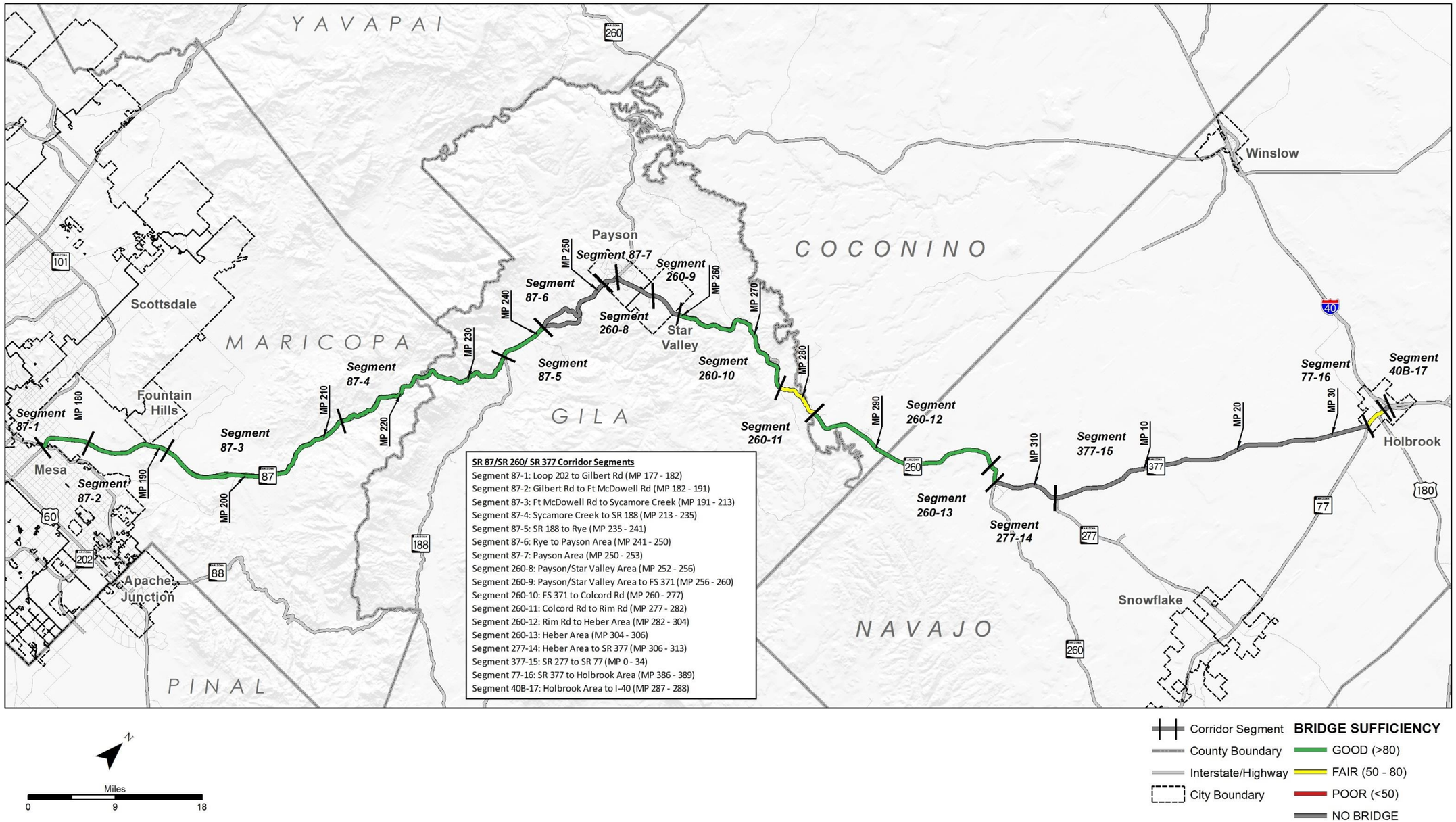
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Pavement Serviceability and Hot Spots
2014-2015 Data



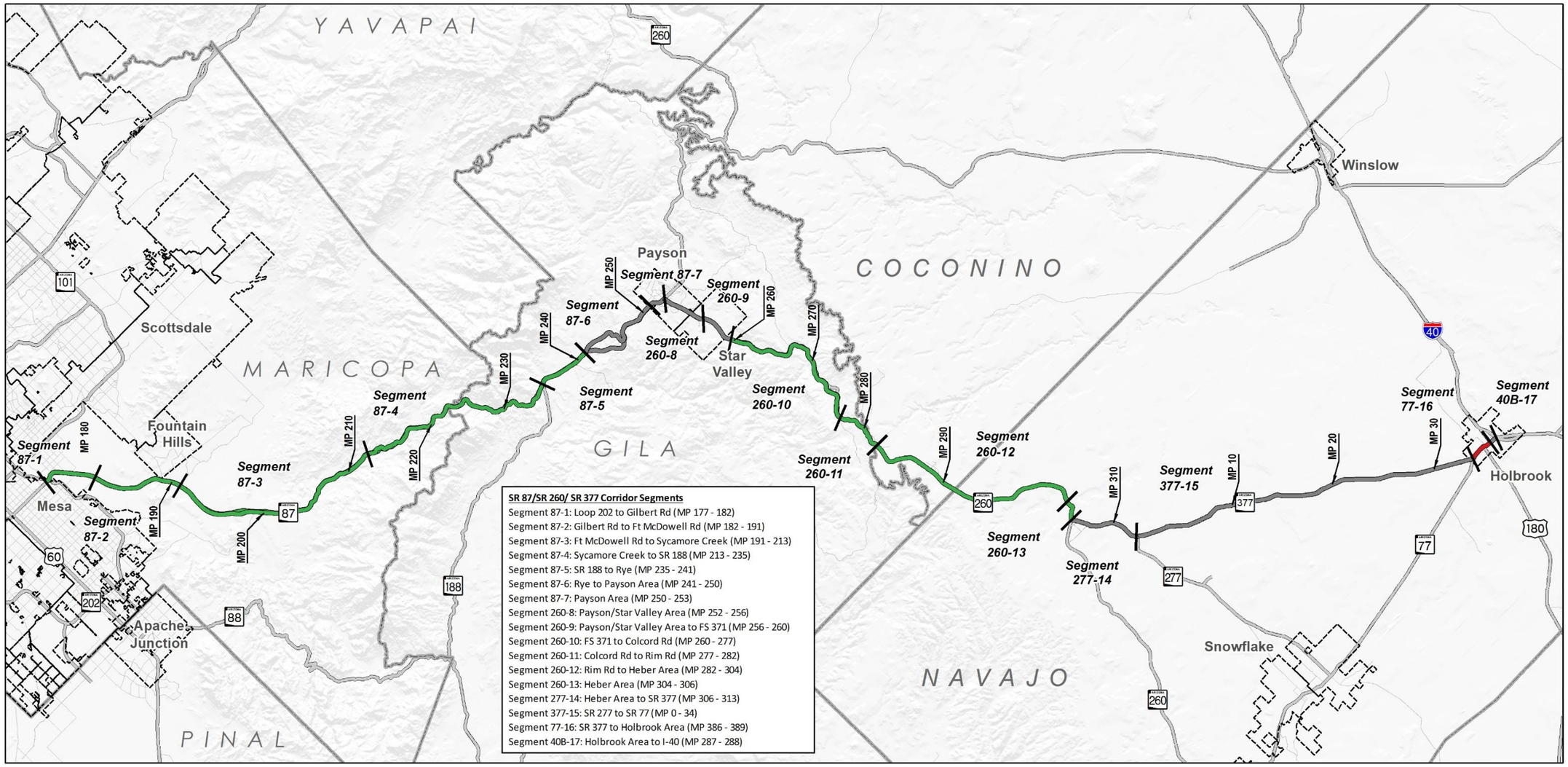
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Percentage of Pavement Area Failure
2014-2015 Data



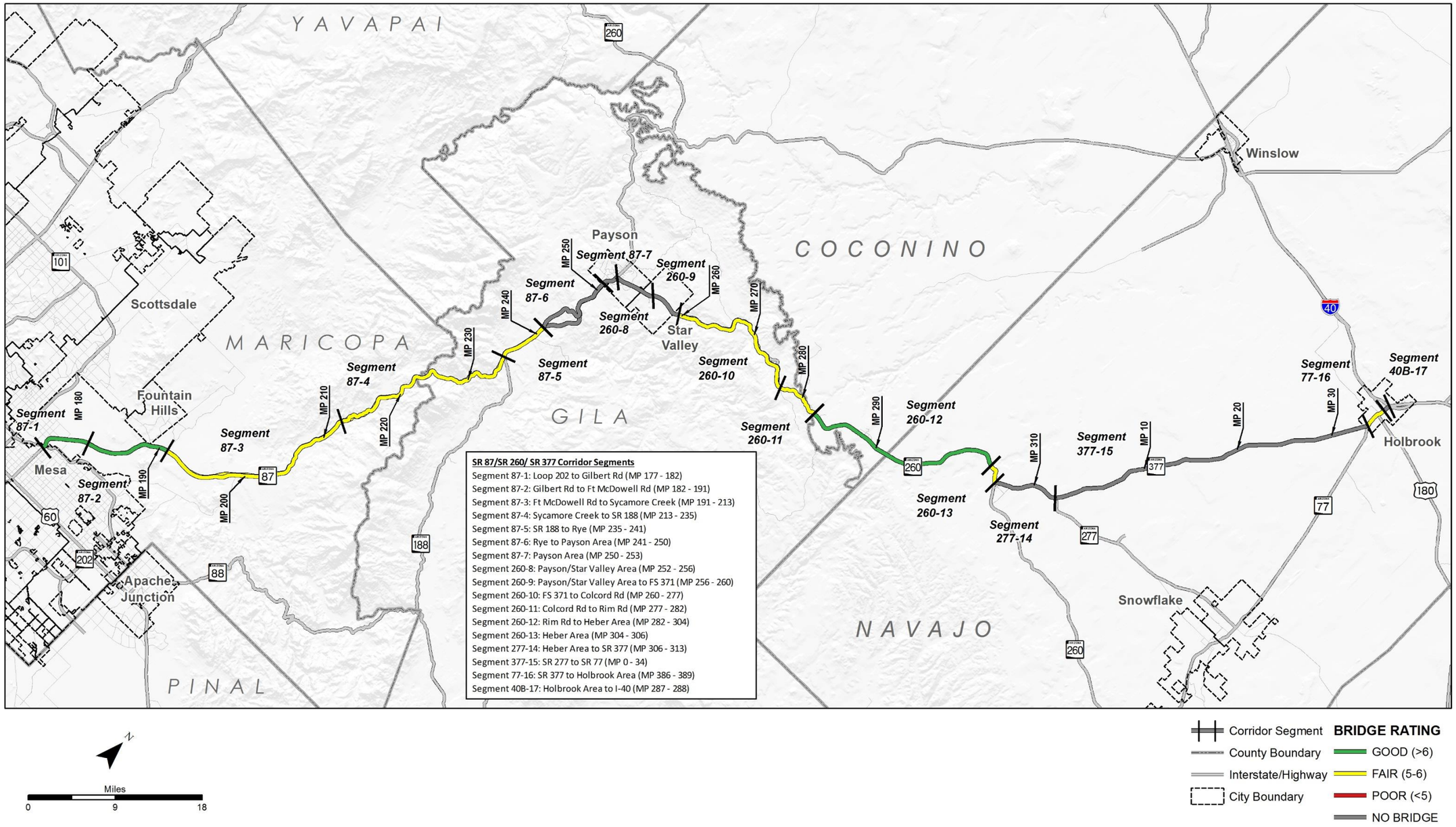
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Bridge Index and Hot Spots
2012 - 2014 Data



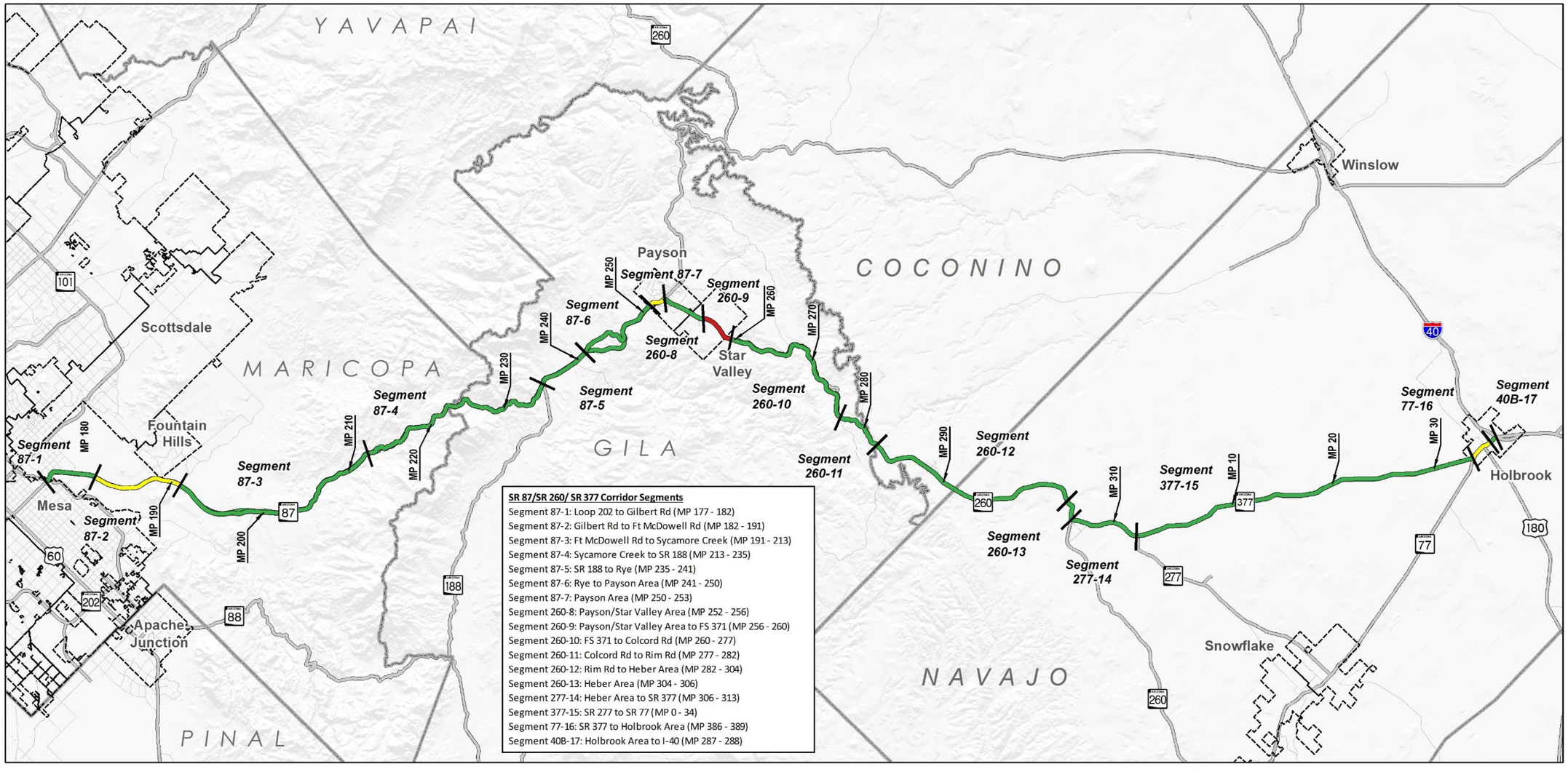
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Bridge Sufficiency
2012 - 2014 Data



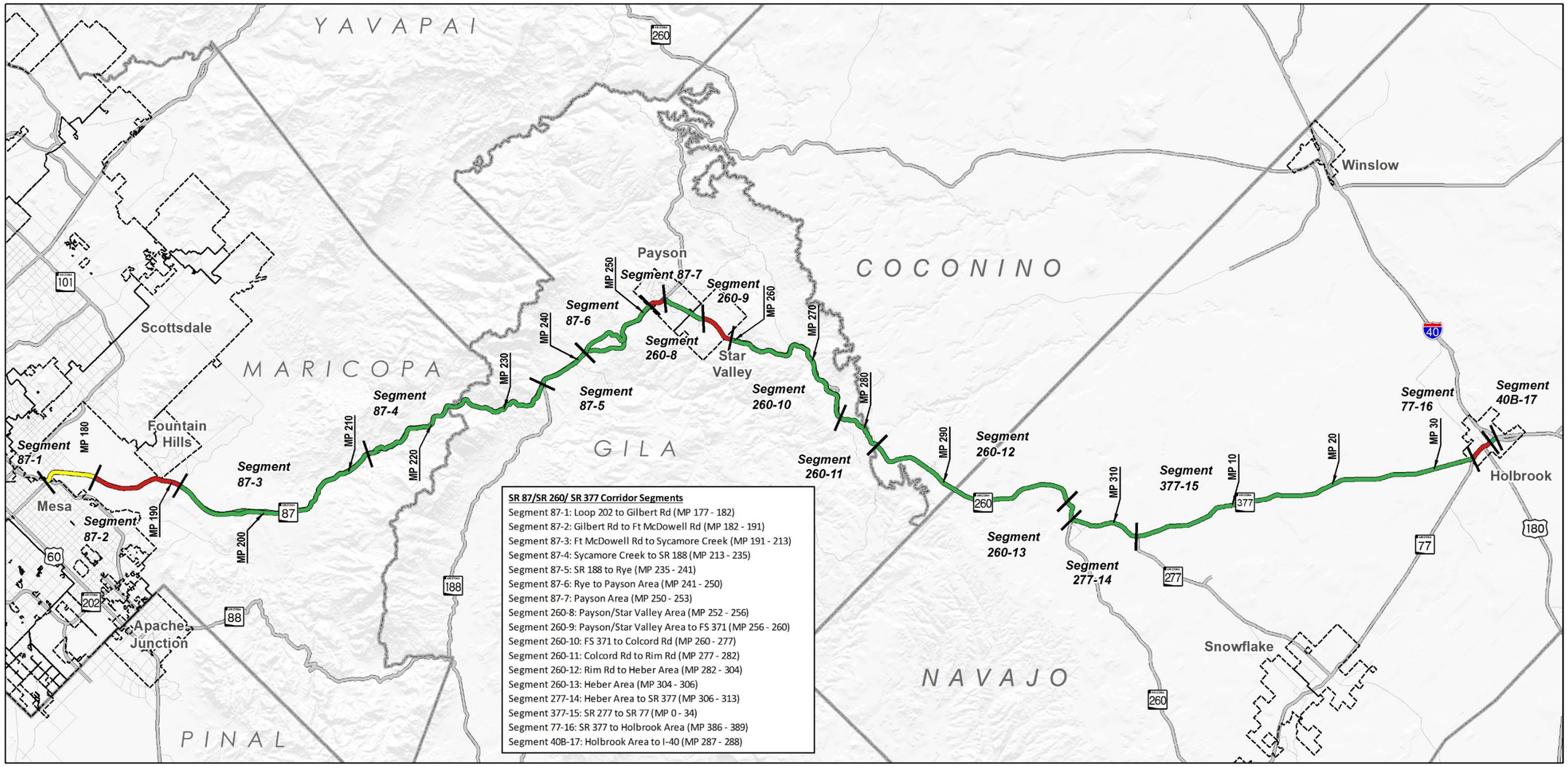
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Percentage of Deck Area on Functionally Obsolete Bridges
2012 - 2014 Data



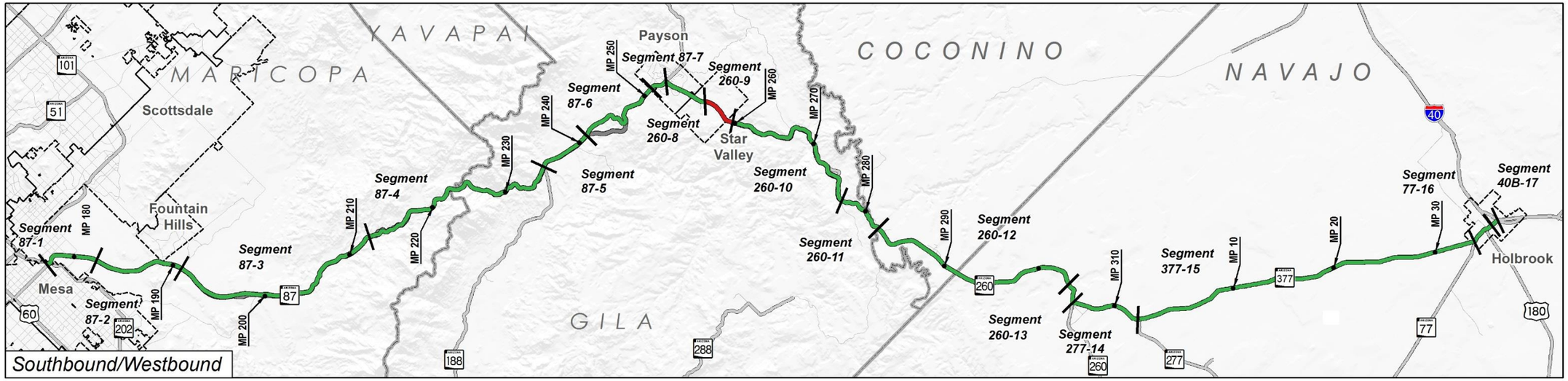
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Lowest Bridge Rating
2012 - 2014 Data



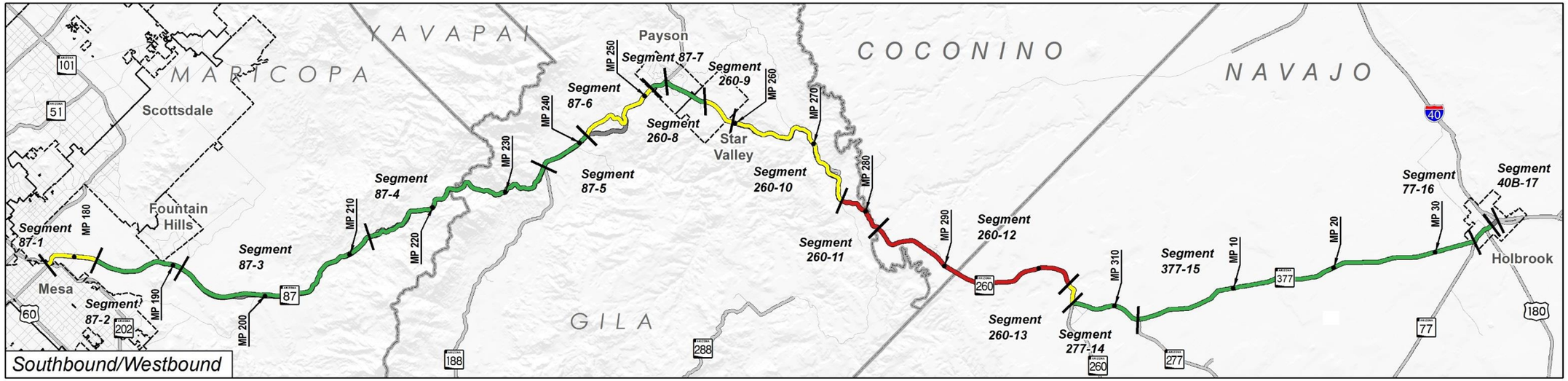
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Mobility Index
2014 and 2035 Data

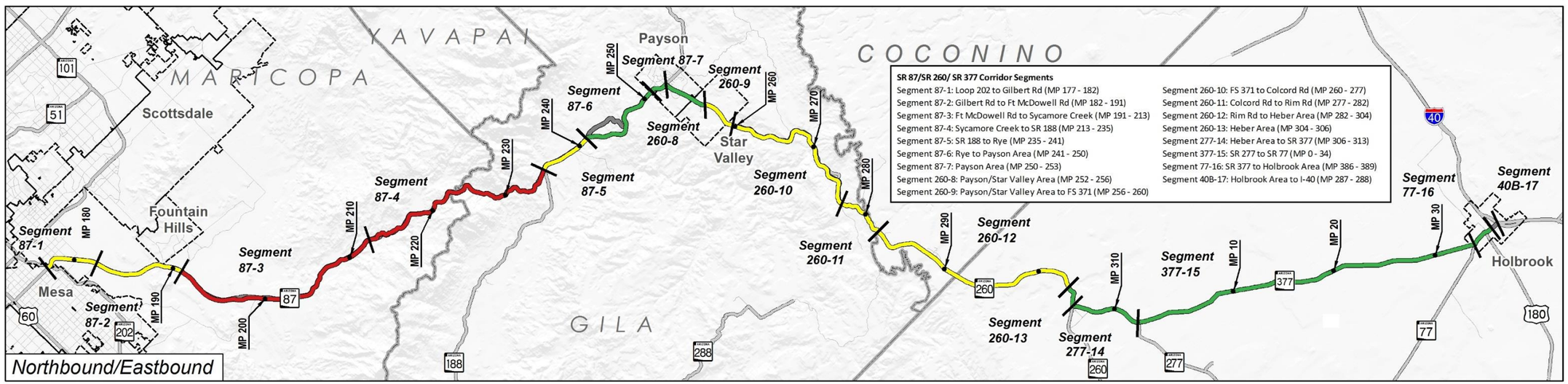


SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Future Daily Volume/Capacity (V/C) Ratio
2035 Data

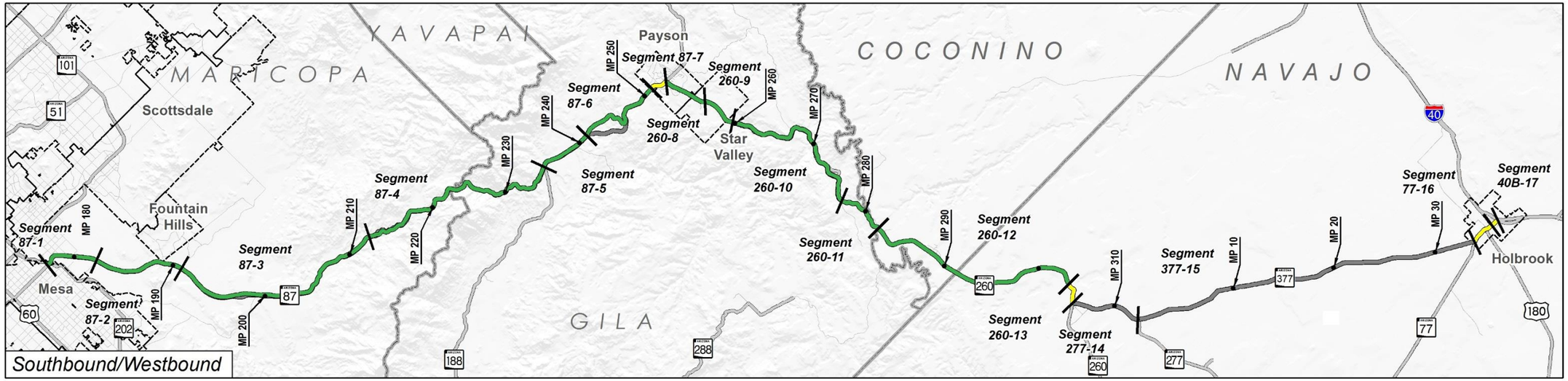


SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Existing Peak Hour V/C
2014 Data

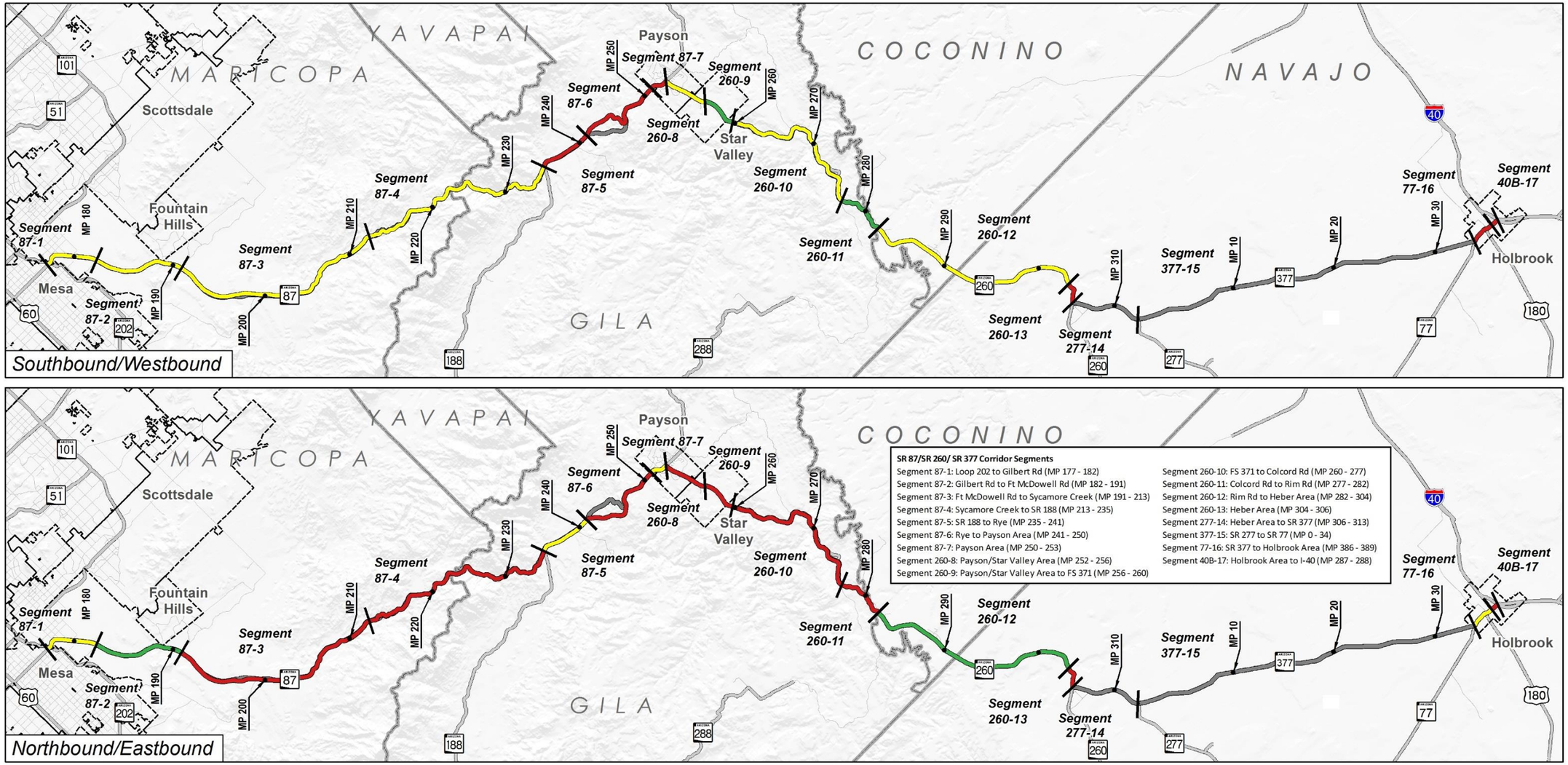




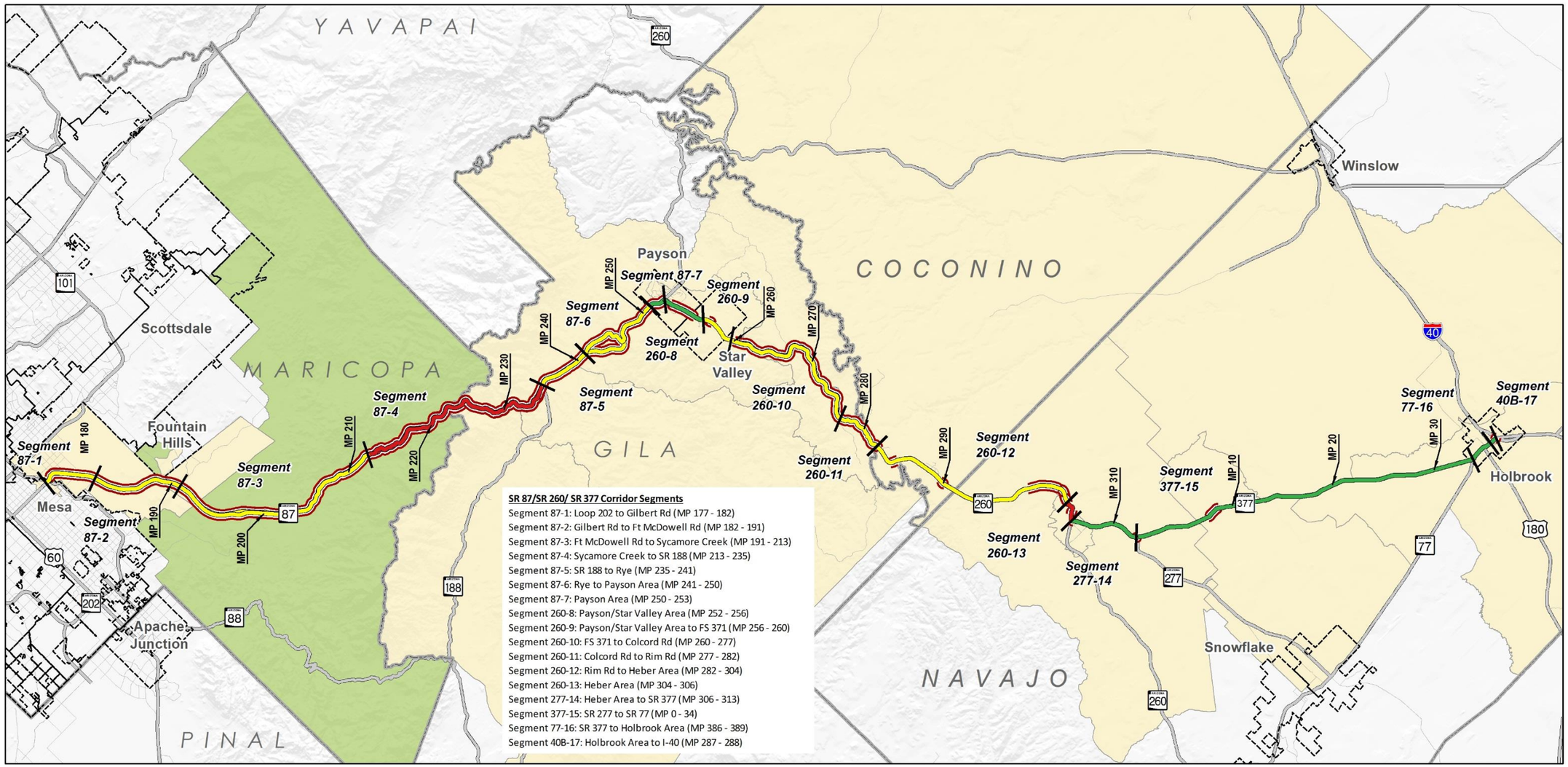
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Average Instances Per Year A
Given Milepost Is Closed Per Segment Mile
2010 - 2014 Data



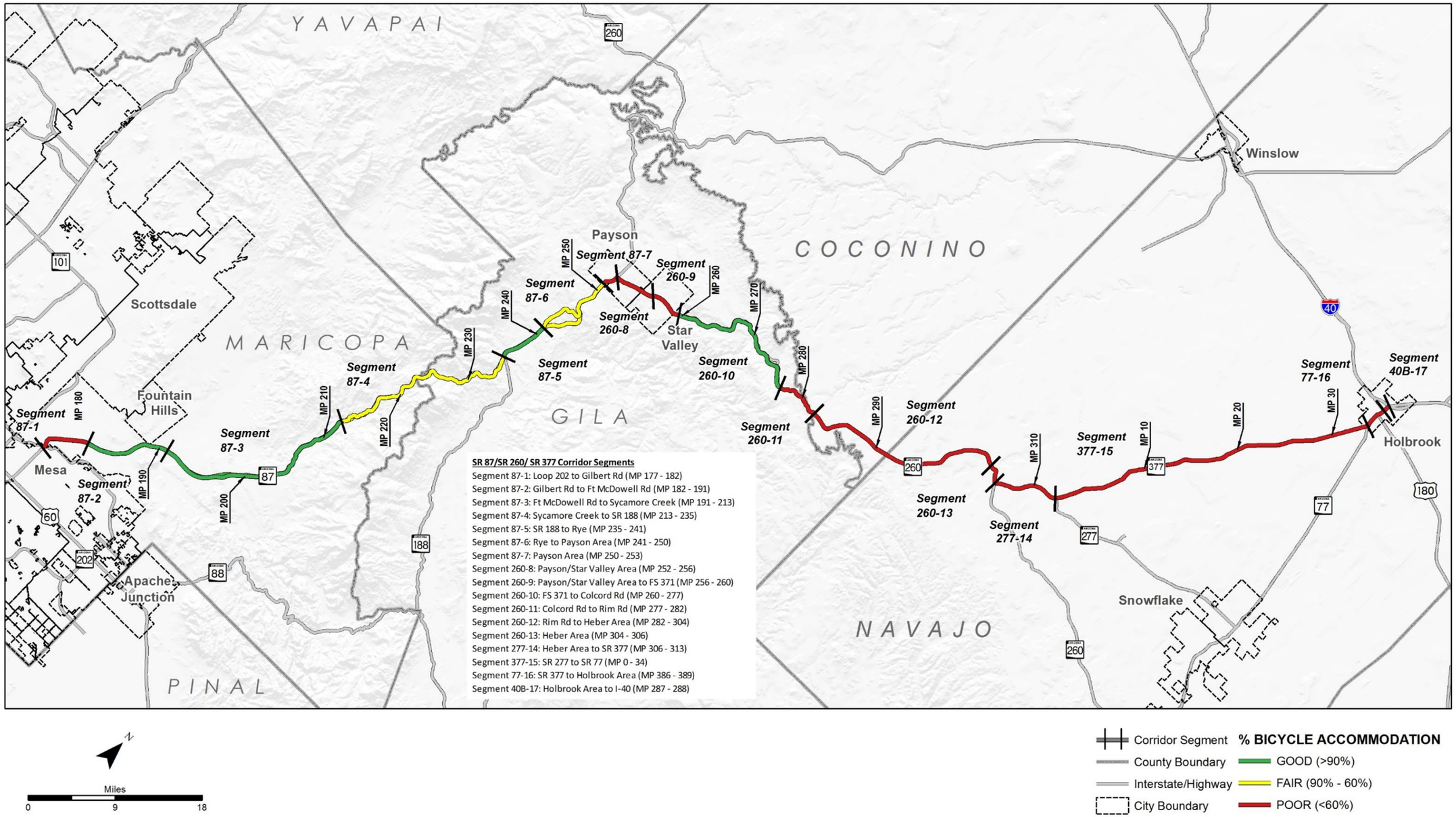
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
All Vehicles Travel Time Index
2014 Data



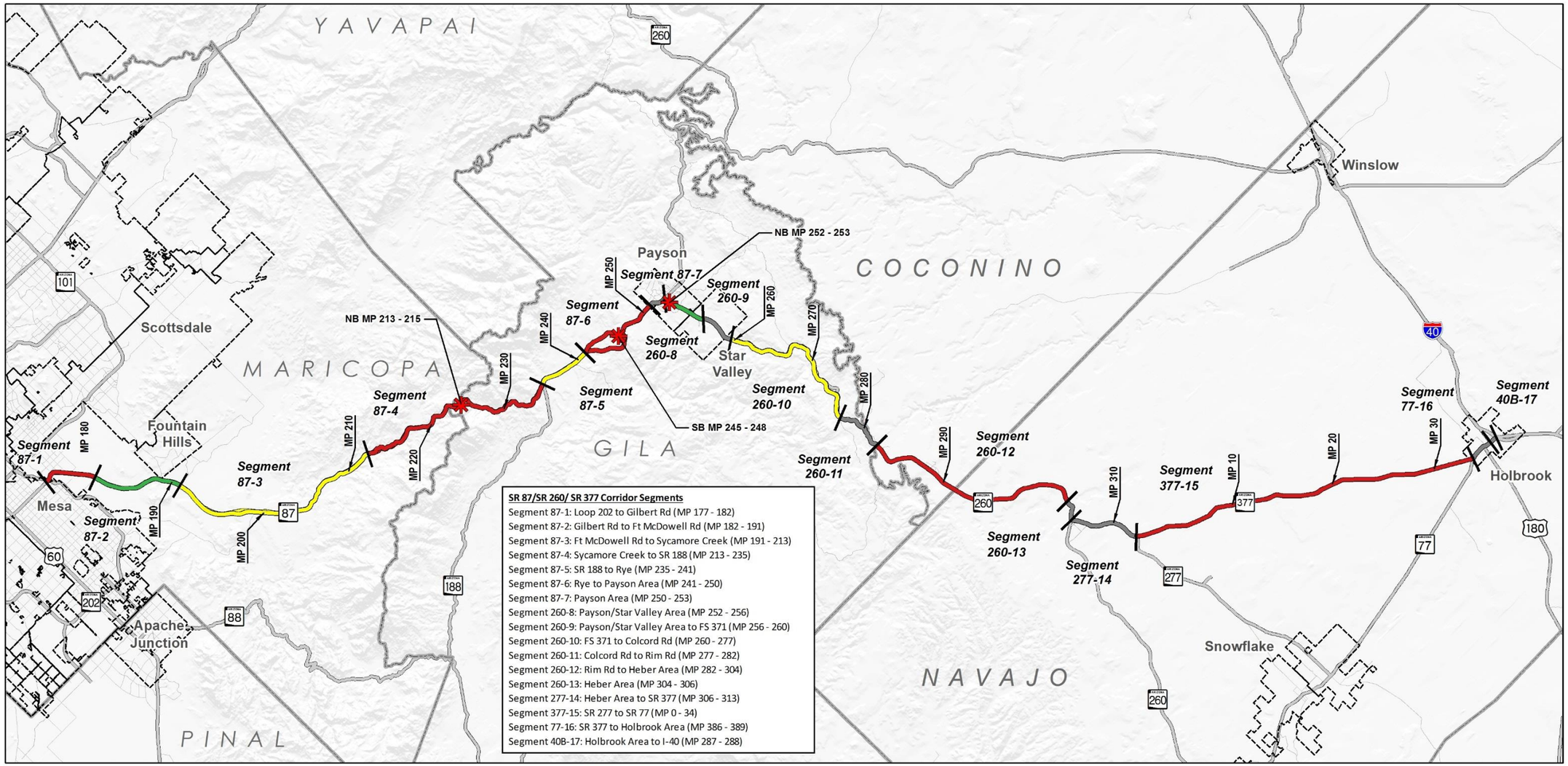
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
All Vehicles Planning Time Index
2014 Data



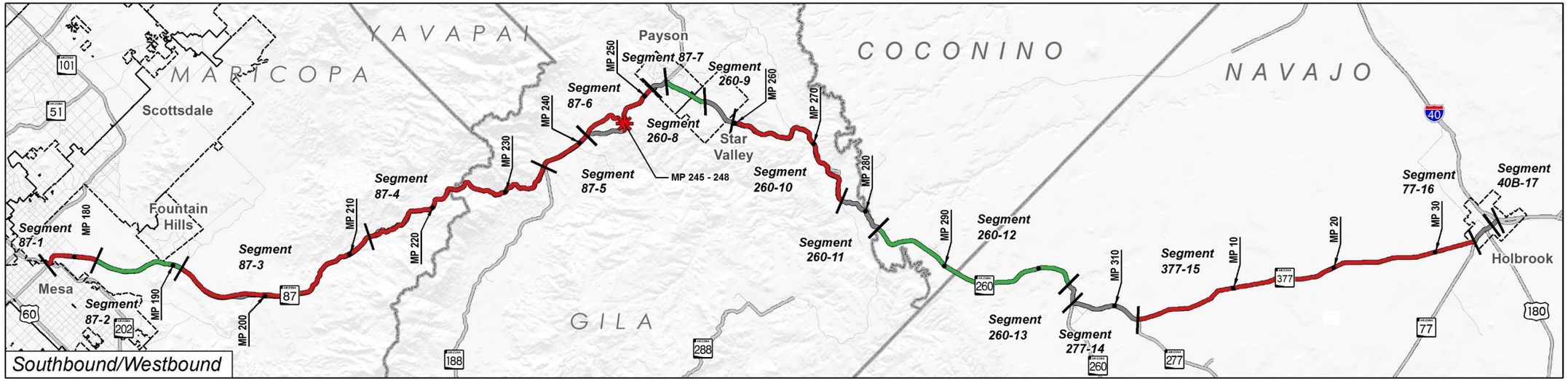
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Multimodal Opportunities
2014 Data



SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Percentage of Bicycle Accommodation
2014 Data



SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Safety Index and Hot Spots
2010 - 2014 Data



SR 87/SR 260/ SR 377 Corridor Segments

Segment 87-1: Loop 202 to Gilbert Rd (MP 177 - 182)
Segment 87-2: Gilbert Rd to Ft McDowell Rd (MP 182 - 191)
Segment 87-3: Ft McDowell Rd to Sycamore Creek (MP 191 - 213)
Segment 87-4: Sycamore Creek to SR 188 (MP 213 - 235)
Segment 87-5: SR 188 to Rye (MP 235 - 241)
Segment 87-6: Rye to Payson Area (MP 241 - 250)
Segment 87-7: Payson Area (MP 250 - 253)
Segment 260-8: Payson/Star Valley Area (MP 252 - 256)
Segment 260-9: Payson/Star Valley Area to FS 371 (MP 256 - 260)
Segment 260-10: FS 371 to Colcord Rd (MP 260 - 277)
Segment 260-11: Colcord Rd to Rim Rd (MP 277 - 282)
Segment 260-12: Rim Rd to Heber Area (MP 282 - 304)
Segment 260-13: Heber Area (MP 304 - 306)
Segment 277-14: Heber Area to SR 377 (MP 306 - 313)
Segment 377-15: SR 277 to SR 77 (MP 0 - 34)
Segment 77-16: SR 377 to Holbrook Area (MP 386 - 389)
Segment 40B-17: Holbrook Area to I-40 (MP 287 - 288)

Miles 0 9 18

Corridor Segment
County Boundary
Interstate/Highway
City Boundary

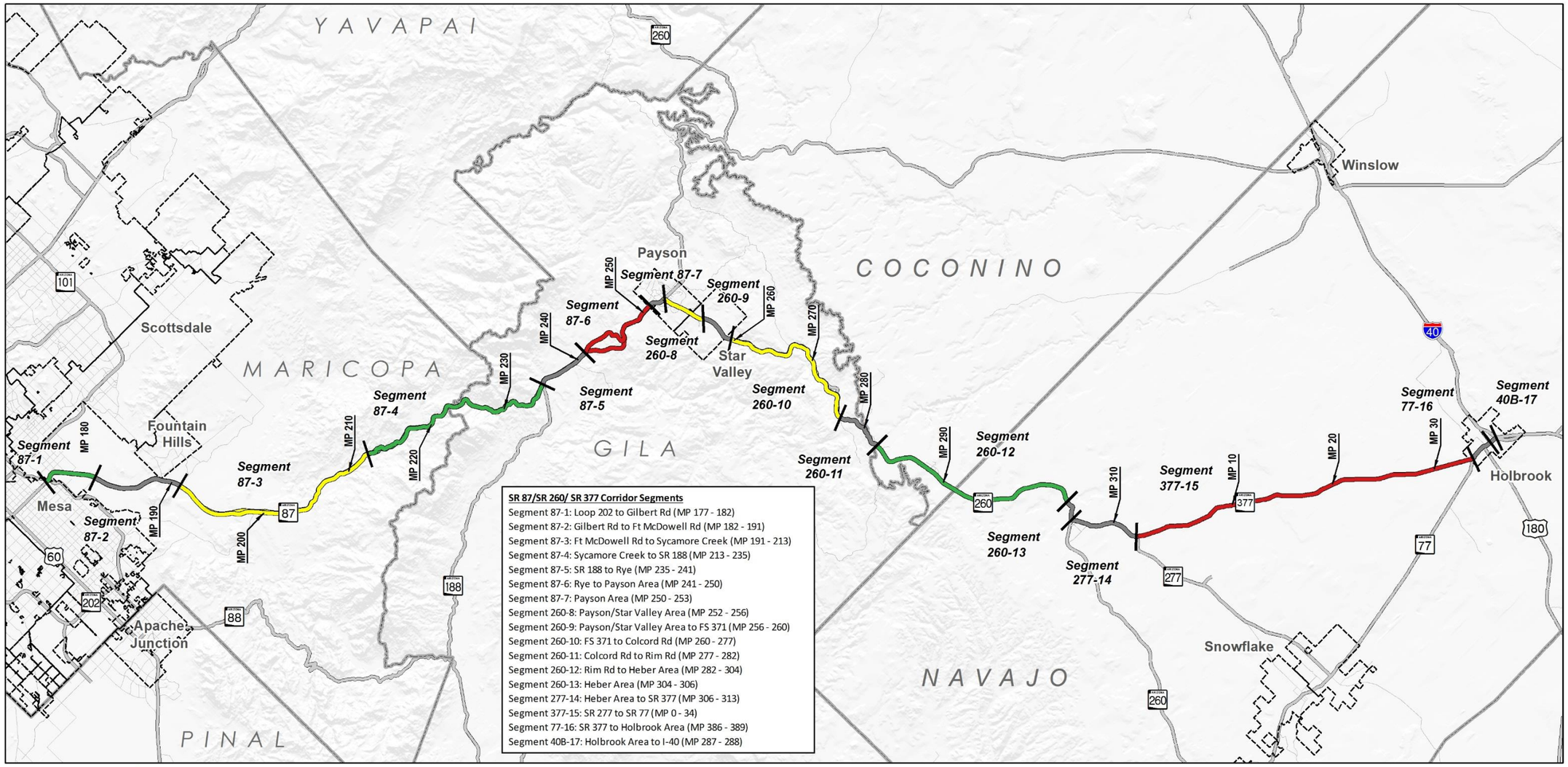
SAFETY INDEX

2 OR 3 LANE UNDIVIDED HIGHWAY SEGMENTS (260-12, 377-15)
- ABOVE AVERAGE PERFORMANCE (< 0.94)
- AVERAGE PERFORMANCE (0.94 - 1.06)
- BELOW AVERAGE PERFORMANCE (>1.06)
- INSUFFICIENT DATA

4 OR 5 LANE UNDIVIDED HIGHWAY SEGMENTS (260-8)
- ABOVE AVERAGE PERFORMANCE (< 0.80)
- AVERAGE PERFORMANCE (0.80 - 1.20)
- BELOW AVERAGE PERFORMANCE (>1.20)
- INSUFFICIENT DATA

2 OR 3 OR 4 LANE DIVIDED HIGHWAY SEGMENTS (87-1 to 87-6, 260-10)
- ABOVE AVERAGE PERFORMANCE (< 0.77)
- AVERAGE PERFORMANCE (0.77 - 1.23)
- BELOW AVERAGE PERFORMANCE (>1.23)
- INSUFFICIENT DATA
- SAFETY HOT SPOT

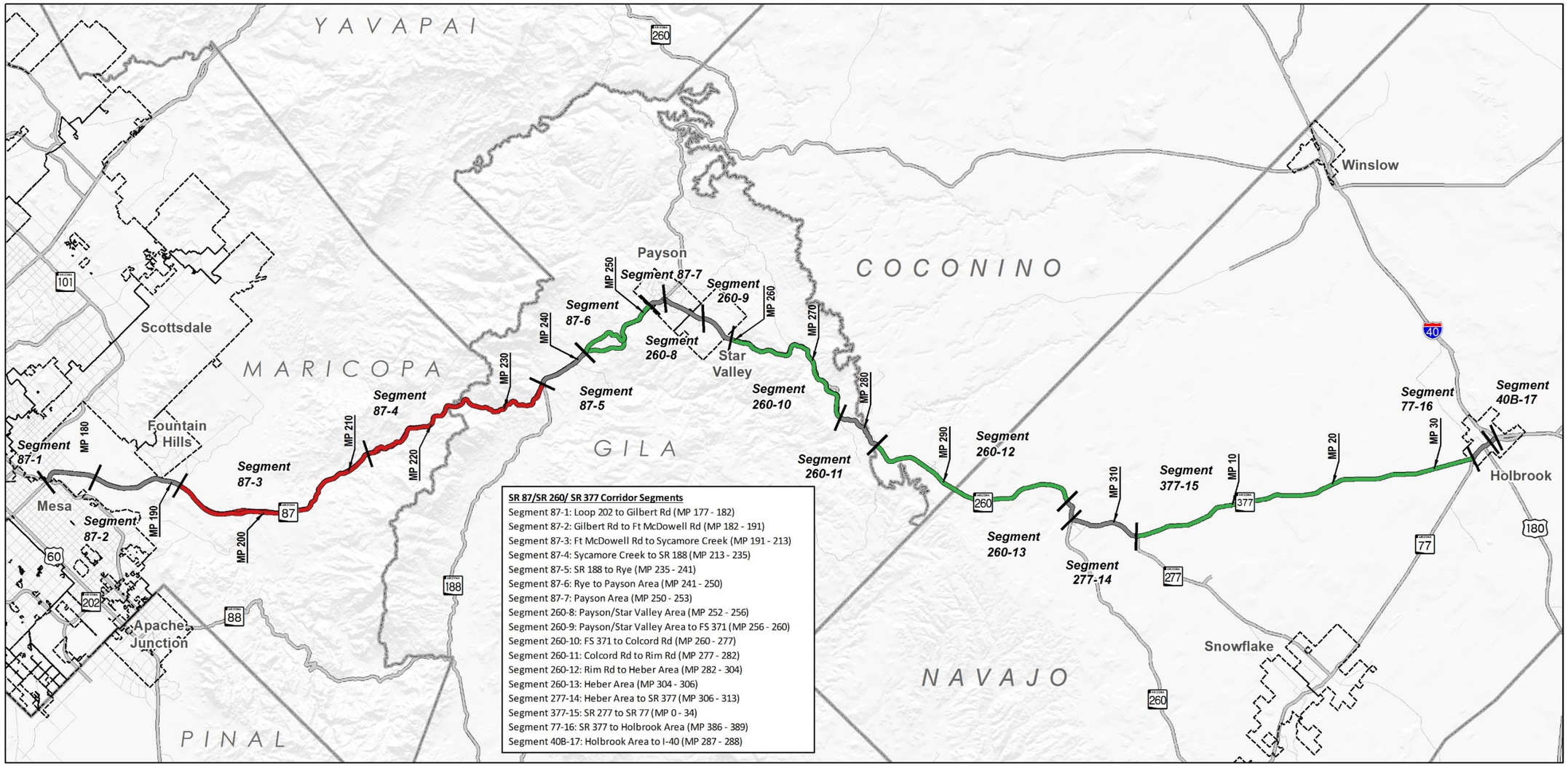
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Directional Safety Index and Hot Spots
2010 - 2014 Data



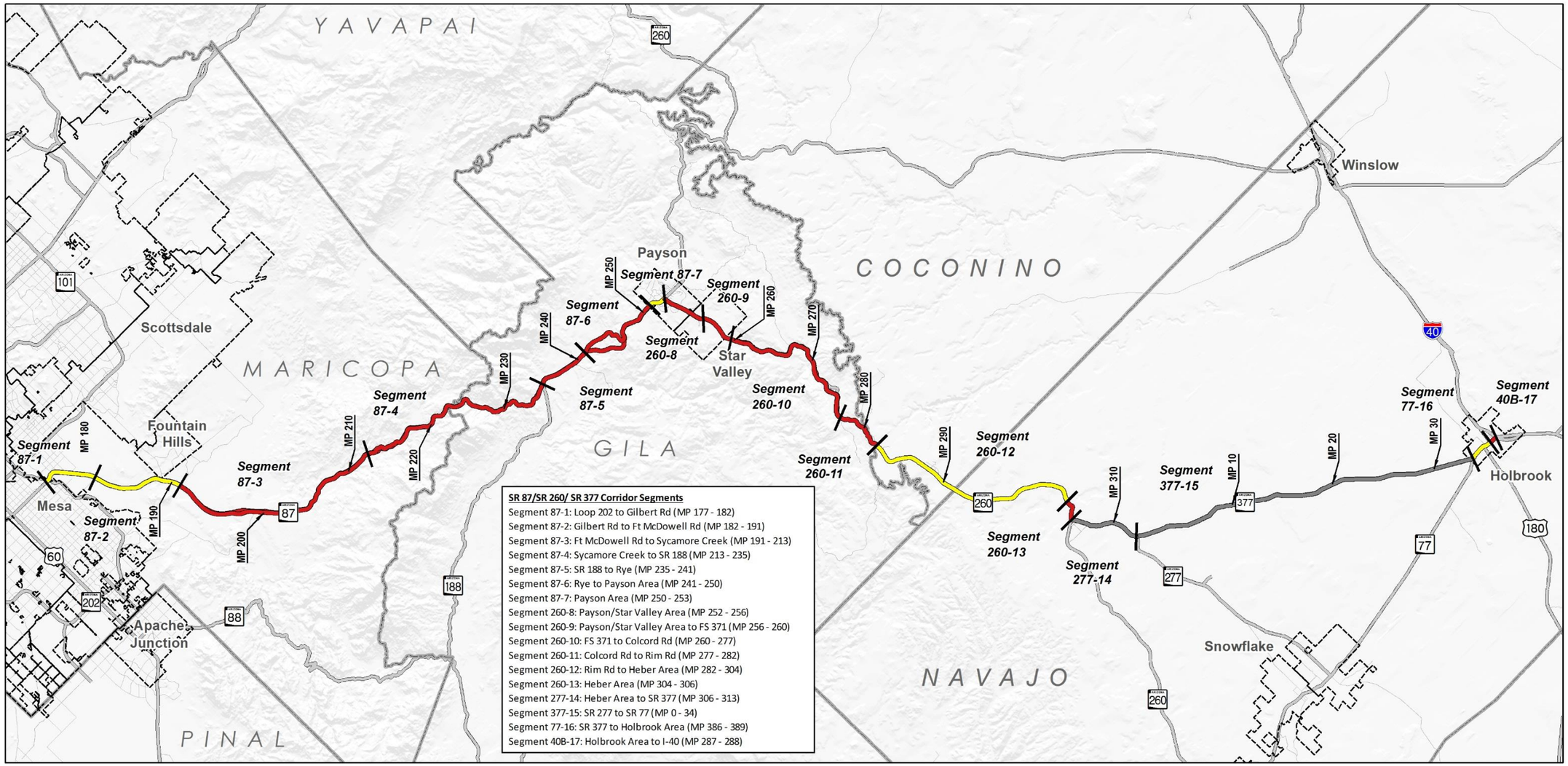
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Relative Frequency of Fatal + Incapacitating
Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors
Compared to the Statewide Average for Similar Segments
2010 - 2014 Data

CRASHES INVOLVING SHSP TOP 5 EMPHASIS AREAS BEHAVIORS

2 OR 3 LANE UNDIVIDED HIGHWAY SEGMENTS (260-9, 260-11, 260-12, 277-14, 377-15, 77-16)	*4 OR 5 LANE UNDIVIDED HIGHWAY SEGMENTS (87-7, 260-8, 260-13, 40B-17)*	*2 OR 3 OR 4 LANE DIVIDED HIGHWAY SEGMENTS (87-1 to 87-6, 260-10)*
ABOVE AVERAGE PERFORMANCE (< 51%)	ABOVE AVERAGE PERFORMANCE (< 42%)	ABOVE AVERAGE PERFORMANCE (< 44%)
AVERAGE PERFORMANCE (51% - 58%)	AVERAGE PERFORMANCE (42% - 51%)	AVERAGE PERFORMANCE (44% - 54%)
BELOW AVERAGE PERFORMANCE (>58%)	BELOW AVERAGE PERFORMANCE (> 51%)	BELOW AVERAGE PERFORMANCE (> 54%)
NO DATA	NO DATA	NO DATA



SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Relative Frequency of Fatal + Incapacitating Injury Crashes Involving Motorcycles Compared to the Statewide Average for Similar Segments
2010 - 2014 Data



SR 87/SR 260/ SR 377 Corridor Segments

Segment 87-1: Loop 202 to Gilbert Rd (MP 177 - 182)
Segment 87-2: Gilbert Rd to Ft McDowell Rd (MP 182 - 191)
Segment 87-3: Ft McDowell Rd to Sycamore Creek (MP 191 - 213)
Segment 87-4: Sycamore Creek to SR 188 (MP 213 - 235)
Segment 87-5: SR 188 to Rye (MP 235 - 241)
Segment 87-6: Rye to Payson Area (MP 241 - 250)
Segment 87-7: Payson Area (MP 250 - 253)
Segment 260-8: Payson/Star Valley Area (MP 252 - 256)
Segment 260-9: Payson/Star Valley Area to FS 371 (MP 256 - 260)
Segment 260-10: FS 371 to Colcord Rd (MP 260 - 277)
Segment 260-11: Colcord Rd to Rim Rd (MP 277 - 282)
Segment 260-12: Rim Rd to Heber Area (MP 282 - 304)
Segment 260-13: Heber Area (MP 304 - 306)
Segment 277-14: Heber Area to SR 377 (MP 306 - 313)
Segment 377-15: SR 277 to SR 77 (MP 0 - 34)
Segment 77-16: SR 377 to Holbrook Area (MP 386 - 389)
Segment 40B-17: Holbrook Area to I-40 (MP 287 - 288)

N

Miles
0 9 18

Corridor Segment
County Boundary
Interstate/Highway
City Boundary

FREIGHT INDEX

UNINTERRUPTED (SEGMENTS 87-3, 87-4, 87.5, 87-6, 260-9, 260-10, 260-11, 260-12, 260-13, 277-14, 377-15)

- GOOD (>0.77)
- FAIR (0.67 - 0.77)
- POOR (<0.67)
- NO DATA

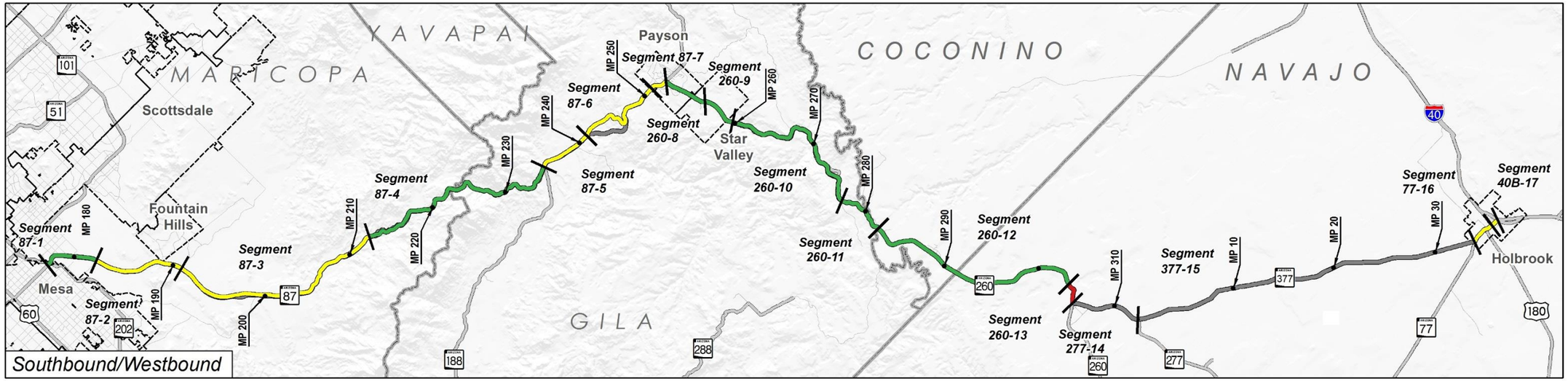
INTERRUPTED (SEGMENTS 87-1, 87-2, 87-7, 260-8, 77-16 & 40B-17)

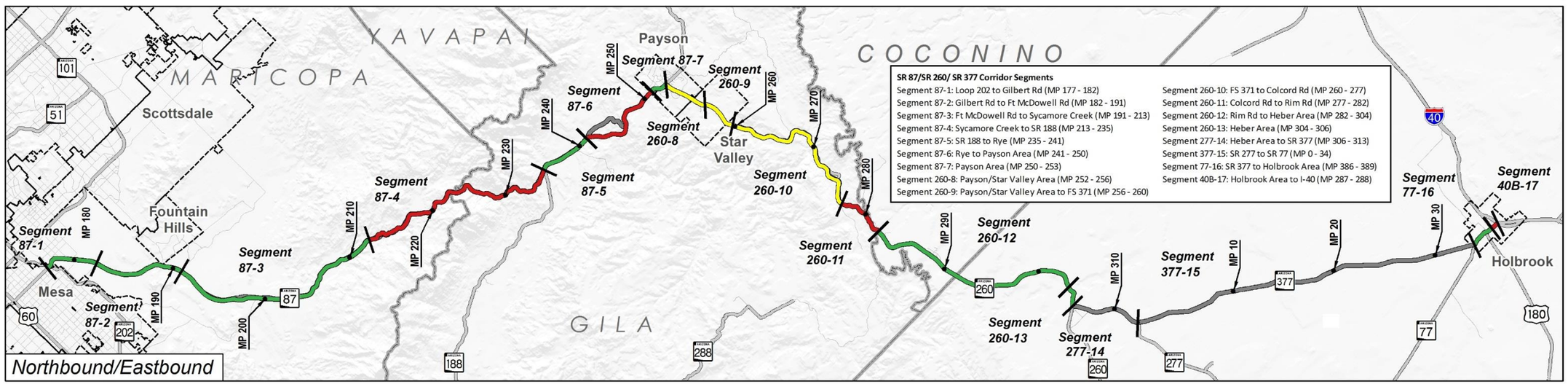
- GOOD (>0.33)
- FAIR (0.17 - 0.33)
- POOR (<0.17)
- NO DATA

FREIGHT HOT SPOT

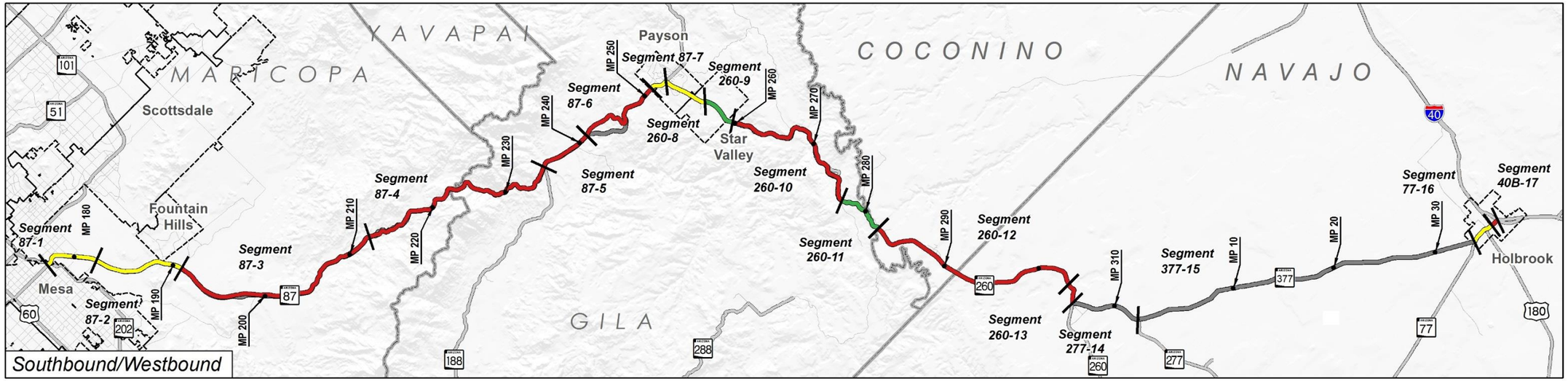
BRIDGE VERTICAL CLEARANCE LESS THAN 16.25 FEET AND NO RAMP AROUND

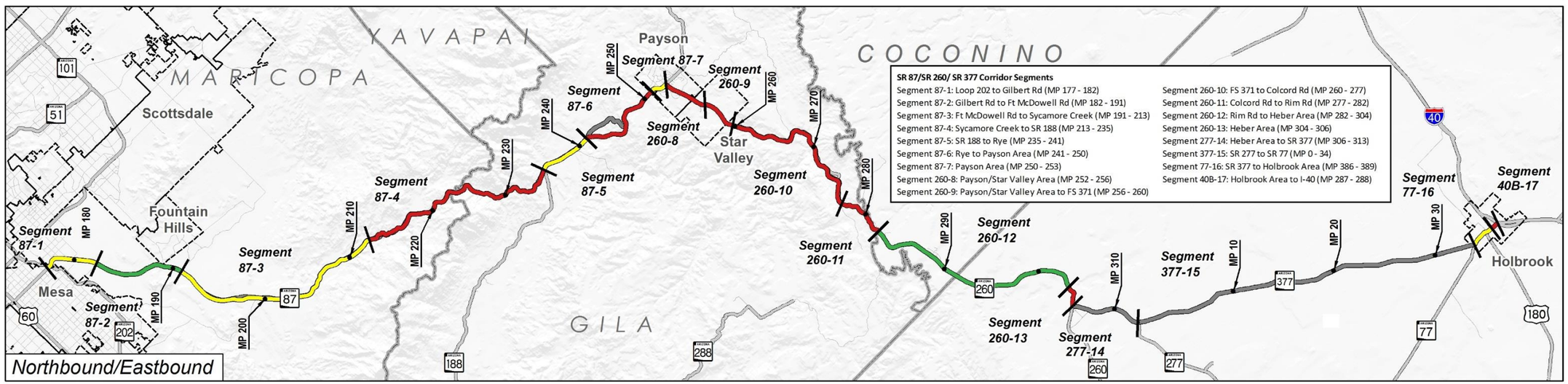
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Freight Index and Hot Spots
2014 Data



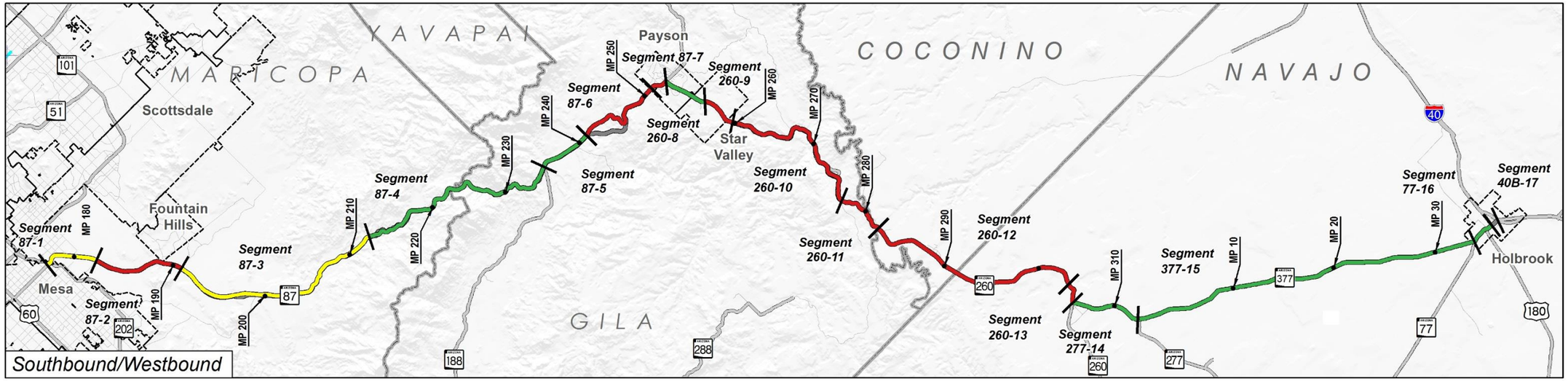


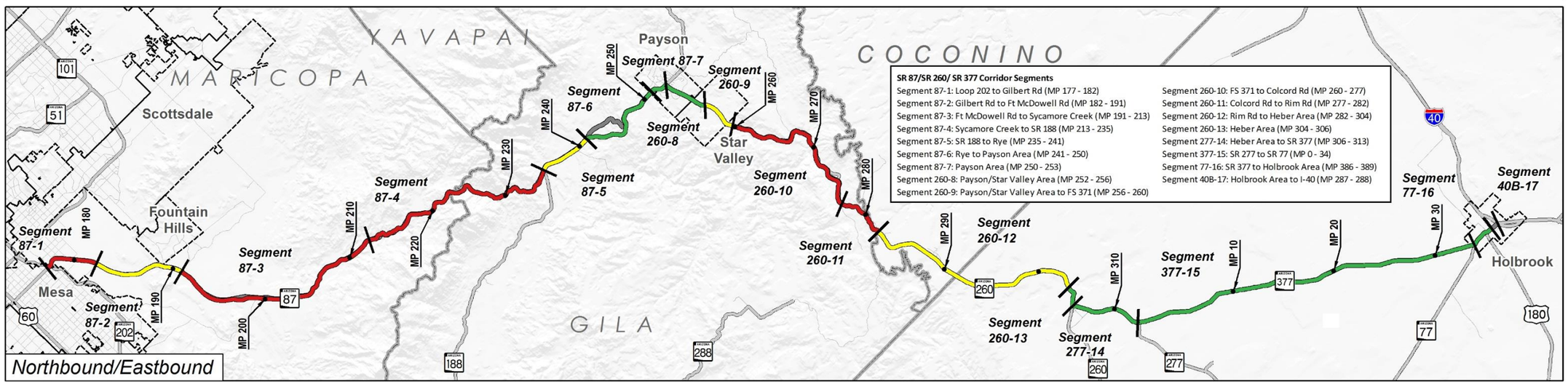
SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Truck Travel Time Index
2014 Data





SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Truck Planning Time Index
2014 Data





SR 87/SR 260/ SR 377 Corridor Segments

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Segment 277-14: Heber Area to SR 377 (MP 306 - 313)
Segment 377-15: SR 277 to SR 77 (MP 0 - 34)
Segment 77-16: SR 377 to Holbrook Area (MP 386 - 389)
Segment 40B-17: Holbrook Area to I-40 (MP 287 - 288)

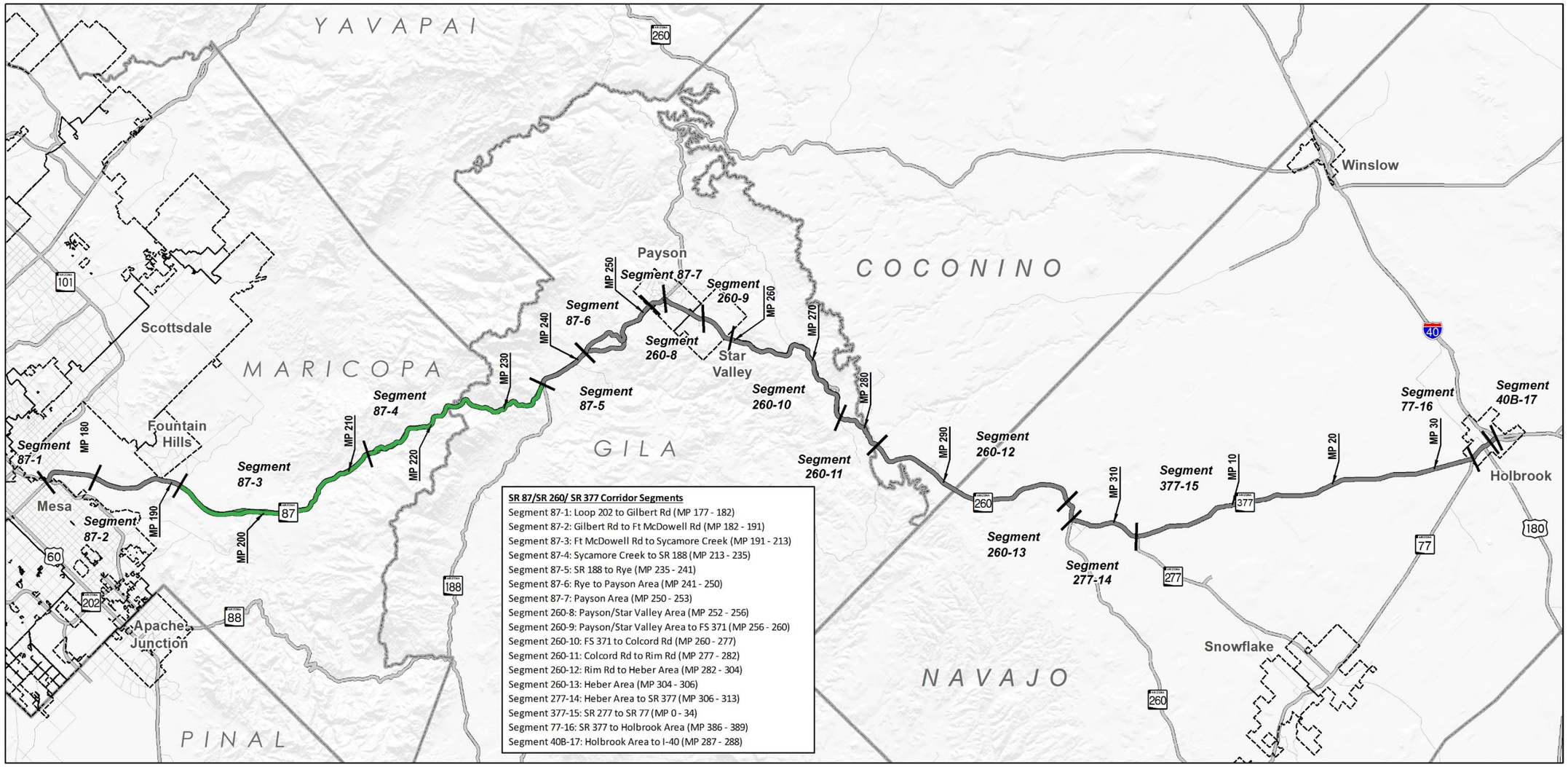
N

Miles
0 9 18

Corridor Segment
County Boundary
Interstate/Highway
City Boundary

MINUTES OF CLOSURE DURATION
GOOD (< 44.18)
FAIR (44.18 - 124.86)
POOR (> 124.86)
NO DATA

SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Average Minutes Per Year Given Milepost Is Closed Per Segment Mile
2010 - 2014 Data

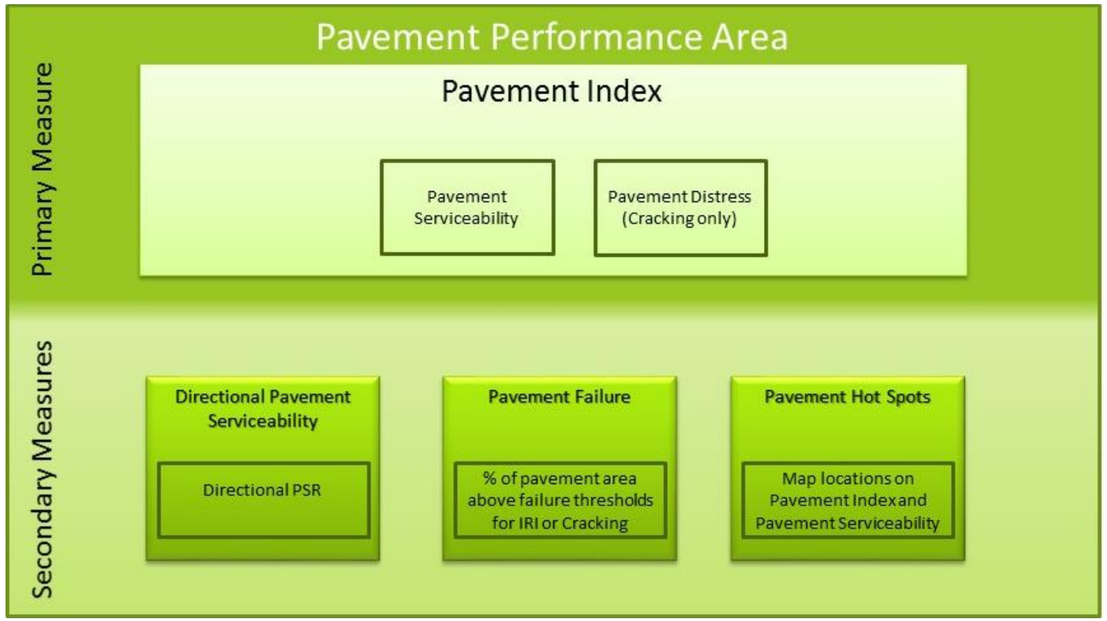


SR 87/SR 260/SR 377 Corridor Profile Study: Loop 202 to I-40
Bridge Vertical Clearance
2014 Data

Appendix B: Performance Area Detailed Calculation Methodologies

Pavement Performance Area Calculation Methodologies

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



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

Primary Pavement Index

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

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

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

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

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

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

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

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

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

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

Secondary Pavement Measures

Three secondary measures are evaluated:

- Directional Pavement Serviceability
- Pavement Failure
- Pavement Hot Spots

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

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

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

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

Scoring

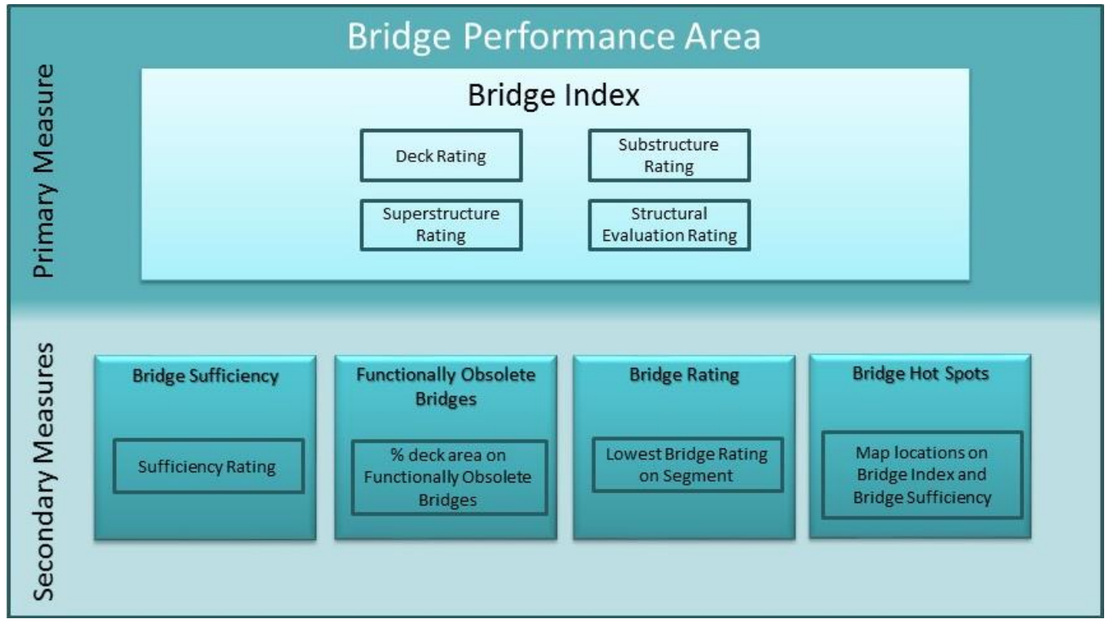
Performance Level	Pavement Index	
	Interstates	Non-Interstates
Good	>3.75	>3.5
Fair	3.2 - 3.75	2.9 - 3.5
Poor	<3.2	<2.9

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

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

Bridge Performance Area Calculation Methodologies

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



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

Primary Bridge Index

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

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

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

Secondary Bridge Measures

Four secondary measures will be evaluated:

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

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

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

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

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

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

Scoring:

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

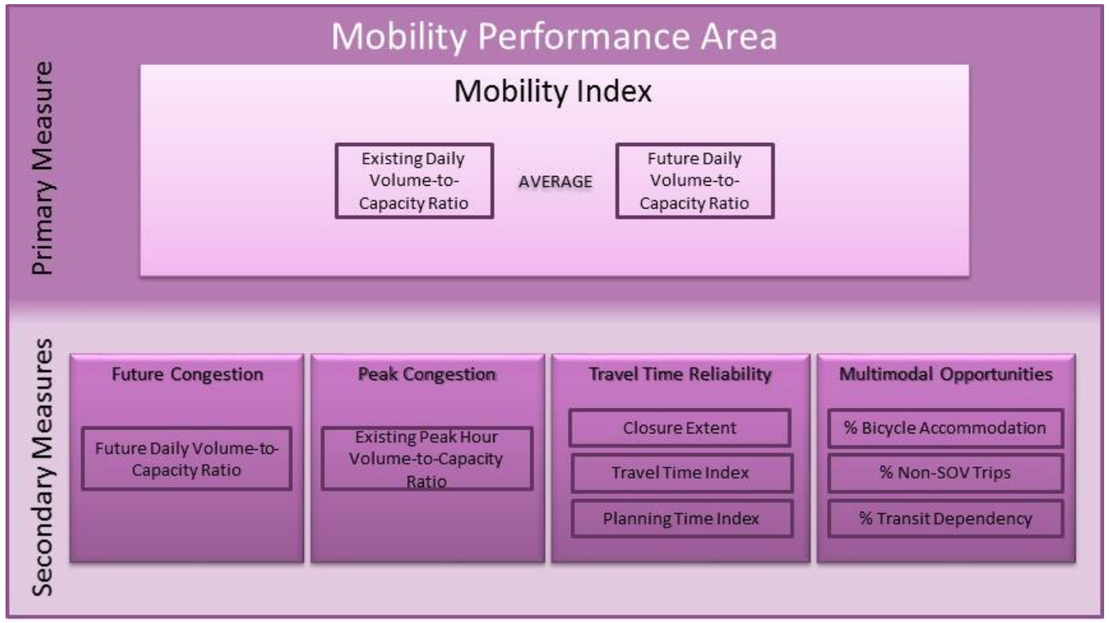
Performance Level	Sufficiency Rating
Good	>80
Fair	50-80
Poor	<50

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

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

Mobility Performance Area Calculation Methodologies

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



Primary Mobility Index

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

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

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

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

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

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

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

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

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

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

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

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

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

Secondary Mobility Measures

Four secondary measures are evaluated:

- Future Congestion
- Peak Congestion
- Travel Time Reliability

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

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

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

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

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

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

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

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

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

TTI = Posted Speed Limit/Mean Peak Hour Speed

PTI = Posted Speed Limit/5th Percentile Lowest Speed

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Scoring:

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

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

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

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

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

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

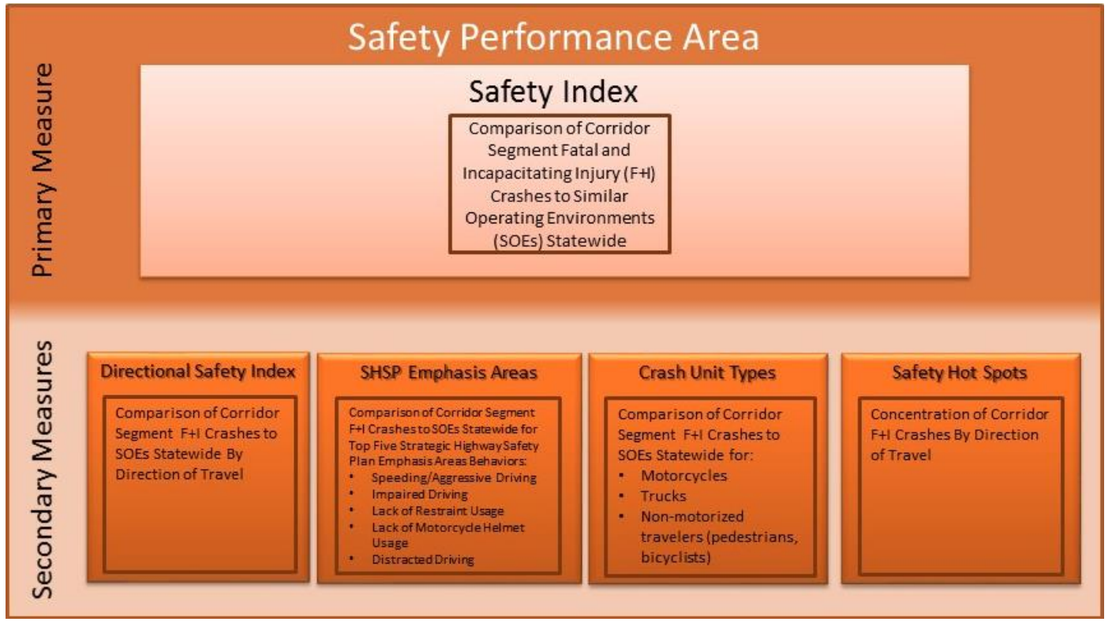
Performance Level	Percent Bicycle Accommodation
Good	≥ 90%
Fair	> 60% & ≤ 90%
Poor	< 60%

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

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

Safety Performance Area Calculation Methodologies

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



Primary Safety Index

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

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

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

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

The Safety Index is calculated using the following formula:

Safety Index = Segment CSS / Statewide Similar Operating Environment CSS

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

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

Scoring:

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

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

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

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

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

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

Secondary Safety Measures

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

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

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

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

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

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

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

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

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

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

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

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

Scoring:

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

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

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

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

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

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

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

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

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

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

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

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

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

Scoring:

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

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

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

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

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

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

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

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

Freight Performance Area Calculation Methodologies

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

Primary Freight Index

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

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

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

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

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

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

Freight Index = 1 / Bi-directional TPTI

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

Secondary Freight Measures

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Scoring:

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

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

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

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

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

Appendix C: Performance Area Data

Pavement Performance Area Data

				NB			SB			NB		SB		Composite			% Pavement Failure	
				# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB	Pavement Index	NB	SB
Segment 1		***Interstate?***		**No**	**SR-87 MP 177-182**													
Mile 1	177	to	178	2	181.31	0.1	2	108.22	0.1	2.51	-	3.31	-	2.51	3.31		2	0
Mile 2	178	to	179	2	36.85	1	2	38.28	0	4.35	4.7	4.32	5.0	4.44	4.53		0	0
Mile 3	179	to	180	2	31.58	0	2	41.83	0	4.43	5.0	4.27	5.0	4.60	4.49		0	0
Mile 4	180	to	181	2	31.42	1	2	39.31	0	4.44	4.7	4.31	5.0	4.50	4.51		0	0
Mile 5	181	to	182	2	32.40	0	2	37.38	1	4.42	5.0	4.34	4.7	4.59	4.43		0	0
		Total		10			10											2
		Weighted Average								4.03	3.86	4.11	3.93	4.13	4.25			
		Factor								1.00		1.00						
		Indicator Score								**4.03**		**4.11**						**10.0%**
		Pavement Index														**4.19**		
Segment 2		***Interstate?***		**No**	**SR-87 MP 182-191**													
Mile 1	182	to	183	2	61.60	0	2	63.48	1	3.96	5.0	3.93	4.7	4.27	4.15		0	0
Mile 2	183	to	184	2	70.16	2	2	58.40	2	3.83	4.5	4.00	4.5	4.02	4.14		0	0
Mile 3	184	to	185	2	50.58	0	2	51.83	6	4.13	5.0	4.11	3.9	4.39	3.94		0	0
Mile 4	185	to	186	2	47.44	1	2	37.92	1	4.18	4.7	4.33	4.7	4.32	4.43		0	0
Mile 5	186	to	187	2	58.62	1	2	39.85	1	4.00	4.7	4.30	4.7	4.20	4.40		0	0
Mile 6	187	to	188	2	53.51	2	2	46.21	1	4.08	4.5	4.19	4.7	4.19	4.33		0	0
Mile 7	188	to	189	2	47.49	1	2	52.26	1	4.17	4.7	4.10	4.7	4.32	4.27		0	0
Mile 8	189	to	190	2	52.60	0	2	45.49	0	4.09	5.0	4.21	5.0	4.37	4.44		0	0
Mile 9	190	to	191	2	82.52	0	2	54.11	0	3.65	5.0	4.07	5.0	4.06	4.35		0	0
		Total		18			18											0
		Weighted Average								4.01	4.76	4.14	4.62	4.24	4.27			
		Factor								1.00		1.00						
		Indicator Score								**4.01**		**4.14**						**0.0%**
		Pavement Index														**4.25**		
Segment 3		***Interstate?***		**No**	**SR-87 MP 191-213**													
Mile 1	191	to	192	2	71.42	1	2	68.94	0	3.81	4.7	3.85	5.0	4.06	4.19		0	0
Mile 2	192	to	193	2	82.32	0	2	76.85	1	3.66	5.0	3.73	4.7	4.06	4.01		0	0
Mile 3	193	to	194	2	58.42	0	2	95.26	2	4.00	5.0	3.48	4.5	4.30	3.77		0	0
Mile 4	194	to	195	2	53.75	1	2	93.94	7	4.08	4.7	3.50	3.8	4.25	3.58		0	0
Mile 5	195	to	196	2	59.11	1	2	89.38	45	3.99	4.7	3.56	0.7	4.19	0.74		0	2
Mile 6	196	to	197	2	50.67	1	2	97.66	40	4.12	4.7	3.45	1.1	4.28	1.06		0	2

	NB			SB			NB		SB		Composite		Pavement Index	% Pavement Failure	
	# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB		NB	SB
Mile 7 197 to 198	2	68.21	3	2	91.79	30	3.86	4.3	3.53	1.7	3.99	1.74		0	2
Mile 8 198 to 199	2	60.62	5	2	77.16	25	3.97	4.0	3.73	2.1	3.98	2.11		0	2
Mile 9 199 to 200	2	51.40	3	2	71.31	12	4.11	4.3	3.81	3.2	4.17	3.40		0	0
Mile 10 200 to 201	2	117.48	2	2	70.31	20	3.20	4.5	3.83	2.5	3.58	2.51		0	2
Mile 11 201 to 202	2	90.29	0	2	47.24	3	3.55	5.0	4.18	4.3	3.98	4.21		0	0
Mile 12 202 to 203	2	61.53	3	2	52.83	0	3.96	4.3	4.09	5.0	4.06	4.36		0	0
Mile 13 203 to 204	2	49.51	3	2	43.45	2	4.14	4.3	4.24	4.5	4.19	4.30		0	0
Mile 14 204 to 205	2	66.09	3	2	41.79	1	3.89	4.3	4.27	4.7	4.01	4.38		0	0
Mile 15 205 to 206	2	68.01	0	2	37.20	0	3.86	5.0	4.34	5.0	4.20	4.54		0	0
Mile 16 206 to 207	2	80.71	0	2	40.84	0	3.68	5.0	4.28	5.0	4.08	4.50		0	0
Mile 17 207 to 208	2	79.54	0	2	38.71	0	3.70	5.0	4.32	5.0	4.09	4.52		0	0
Mile 18 208 to 209	2	69.10	1	2	38.34	0	3.85	4.7	4.32	5.0	4.09	4.53		0	0
Mile 19 209 to 210	2	84.85	0	2	80.14	0	3.62	5.0	3.69	5.0	4.04	4.08		0	0
Mile 20 210 to 211	2	71.71	3	2	102.53	3	3.81	4.3	3.39	4.3	3.95	3.66		0	0
Mile 21 211 to 212	2	119.96	3	2	58.05	3	3.17	4.3	4.01	4.3	3.50	4.09		0	0
Mile 22 212 to 213	2	93.45	1	2	70.95	0	3.51	4.7	3.82	5.0	3.85	4.17		0	0
Total	44			44											10
Weighted Average							3.80	4.61	3.88	3.92	4.04	3.57			
Factor							1.00		1.00						
Indicator Score							**3.80**		**3.88**						**11.4%**
Pavement Index													**3.80**		
Segment 4	***Interstate?***	**No**	**SR-87 MP 213-235**												
Mile 1 213 to 214	2	85.53	10	2	85.27	4	3.61	3.4	3.62	4.1	3.48	3.77		0	0
Mile 2 214 to 215	2	99.63	3	2	90.83	4	3.42	4.3	3.54	4.1	3.68	3.72		0	0
Mile 3 215 to 216	2	106.92	6	2	88.62	1	3.33	3.9	3.57	4.7	3.49	3.90		0	0
Mile 4 216 to 217	2	124.17	4	2	72.98	2	3.12	4.1	3.79	4.5	3.43	3.99		0	0
Mile 5 217 to 218	2	43.86	10	2	61.70	0	4.23	3.4	3.95	5.0	3.67	4.27		0	0
Mile 6 218 to 219	2	50.39	7	2	45.04	0	4.13	3.8	4.21	5.0	3.87	4.45		0	0
Mile 7 219 to 220	2	47.04	0	2	47.23	0	4.18	5.0	4.18	5.0	4.43	4.43		0	0
Mile 8 220 to 221	2	48.73	0	2	47.83	0	4.15	5.0	4.17	5.0	4.41	4.42		0	0
Mile 9 221 to 222	2	31.85	0	2	44.14	0	4.43	5.0	4.23	5.0	4.60	4.46		0	0
Mile 10 222 to 223	2	38.12	0	2	30.85	0	4.33	5.0	4.45	5.0	4.53	4.61		0	0
Mile 11 223 to 224	2	50.48	0	2	40.87	0	4.13	5.0	4.28	5.0	4.39	4.50		0	0
Mile 12 224 to 226			0			0	5.00	5.0	5.00	5.0	5.00	5.00		0	0
Mile 14 226 to 227	2	100.58	1	2	98.49	3	3.41	4.7	3.44	4.3	3.78	3.69		0	0
Mile 15 227 to 228	2	98.29	7	2	88.46	7	3.44	3.8	3.57	3.8	3.54	3.63		0	0

	NB			SB			NB		SB		Composite			% Pavement Failure	
	# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB	Pavement Index	NB	SB
Mile 16 228 to 229	2	100.22	4	2	93.54	3	3.42	4.1	3.50	4.3	3.63	3.74		0	0
Mile 17 229 to 230	2	83.40	3	2	69.87	3	3.64	4.3	3.83	4.3	3.84	3.97		0	0
Mile 18 230 to 231	2	93.15	3	2	85.74	5	3.51	4.3	3.61	4.0	3.74	3.73		0	0
Mile 19 231 to 232	2	78.70	4	2	73.74	4	3.71	4.1	3.78	4.1	3.84	3.89		0	0
Mile 20 232 to 233	2	42.24	0	2	44.36	0	4.26	5.0	4.22	5.0	4.48	4.46		0	0
Mile 21 233 to 234	2	48.13	1	2	41.88	0	4.16	4.7	4.26	5.0	4.31	4.49		0	0
Mile 22 234 to 235	2	44.01	0	2	39.81	0	4.23	5.0	4.30	5.0	4.46	4.51		0	0
Total	40			40											0
Weighted Average							3.84	4.39	3.93	4.61	3.98	4.13			
Factor							1.00		1.00						
Indicator Score							**3.84**		**3.93**						**0.0%**
Pavement Index													**4.05**		
Segment 5	***Interstate?***	**No**	**SR-87 MP 235-241**												
Mile 1 235 to 236	2	51.55	0	2	41.48	0	4.11	5.0	4.27	5.0	4.38	4.49		0	0
Mile 2 236 to 237	2	29.30	0	2	29.14	0	4.47	5.0	4.48	5.0	4.63	4.63		0	0
Mile 3 237 to 238	2	38.86	0	2	40.29	0	4.31	5.0	4.29	5.0	4.52	4.50		0	0
Mile 4 238 to 239	2	25.67	0	2	35.50	0	4.54	5.0	4.37	5.0	4.67	4.56		0	0
Mile 5 239 to 240	2	41.48	0	2	41.91	0	4.27	5.0	4.26	5.0	4.49	4.48		0	0
Mile 6 240 to 241	2	34.73	0	2	28.21	0	4.38	5.0	4.49	5.0	4.57	4.64		0	0
Total	12			12											0
Weighted Average							4.35	5.00	4.36	5.00	4.54	4.55			
Factor							1.00		1.00						
Indicator Score							**4.35**		**4.36**						**0.0%**
Pavement Index													**4.55**		
Segment 6	***Interstate?***	**No**	**SR-87 MP 241-250**												
Mile 1 241 to 242	2	60.00	0	2	48.96	0	3.98	5.0	4.15	5.0	4.29	4.41		0	0
Mile 2 242 to 243	2	46.95	1	2	41.94	0	4.18	4.7	4.26	5.0	4.32	4.48		0	0
Mile 3 243 to 244	2	42.93	4	2	43.03	4	4.25	4.1	4.25	4.1	4.17	4.17		0	0
Mile 4 244 to 245	2	47.90	1	2	63.65	5	4.17	4.7	3.93	4.0	4.31	3.95		0	0
Mile 5 245 to 246	2	58.09	2	2	69.41	4	4.01	4.5	3.84	4.1	4.14	3.93		0	0
Mile 6 246 to 247	2	41.35	1	2	77.28	4	4.27	4.7	3.73	4.1	4.39	3.85		0	0
Mile 7 247 to 248	2	58.89	1	2	87.34	4	4.00	4.7	3.59	4.1	4.19	3.75		0	0
Mile 8 248 to 249	2	61.41	3	2	62.27	1	3.96	4.3	3.95	4.7	4.06	4.16		0	0
Mile 9 249 to 250	2	55.15	6	2	62.97	1	4.05	3.9	3.94	4.7	3.93	4.15		0	0
Total	18			18											0
Weighted Average							4.10	4.49	3.96	4.43	4.20	4.09			

				NB			SB			NB		SB		Composite			% Pavement Failure	
				# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB	Pavement Index	NB	SB
			Factor							1.00		1.00						
			Indicator Score							**4.10**		**3.96**						**0.0%**
			Pavement Index													**4.15**		
Segment 7		***Interstate?***		**No**	**SR-87 MP 250-253**													
Mile 1	250	to	251	2	65.49	12	2	80.78	0	3.90	3.2	3.68	5.0	3.42	4.07		0	0
Mile 2	251	to	252	2	122.03	4	2	111.25	4	3.14	4.1	3.28	4.1	3.44	3.53		0	0
Mile 3	252	to	253	2	130.49	8				3.05	3.6	5.00	5.0	3.22	5.00		0	0
			Total	6			4											0
			Weighted Average							3.36	3.67	3.48	4.57	3.36	3.80			
			Factor							1.00		1.00						
			Indicator Score							**3.36**		**3.48**						**0.0%**
			Pavement Index													**3.54**		
Segment 8		***Interstate?***		**No**	**SR-260 MP 252-256**													
Mile 1	252	to	253	2	48.68	1		-	-	4.16	4.7	#VALUE!	#VALUE!	4.31	#VALUE!		0	0
Mile 2	253	to	254	2	47.37	1		-	-	4.18	4.7	#VALUE!	#VALUE!	4.32	#VALUE!		0	0
Mile 3	254	to	255	2	39.83	0		-	-	4.30	5.0	#VALUE!	#VALUE!	4.51	#VALUE!		0	0
Mile 4	255	to	256	2	38.92	5		-	-	4.31	4.0	#VALUE!	#VALUE!	4.10	#VALUE!		0	0
			Total	8			0											0
			Weighted Average							4.24	4.58	#VALUE!	#VALUE!	4.31	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**4.24**		**#VALUE!**						**0.0%**
			Pavement Index													**4.31**		
Segment 9		***Interstate?***		**No**	**SR-260 MP 256-260**													
Mile 1	256	to	257	1	47.74	0		-	-	4.17	5.0	#VALUE!	#VALUE!	4.42	#VALUE!		0	0
Mile 2	257	to	258	1	48.78	4		-	-	4.15	4.1	#VALUE!	#VALUE!	4.14	#VALUE!		0	0
Mile 3	258	to	259	1	54.16	3		-	-	4.07	4.3	#VALUE!	#VALUE!	4.14	#VALUE!		0	0
Mile 4	259	to	260	1	52.21	0		-	-	4.10	5.0	#VALUE!	#VALUE!	4.37	#VALUE!		0	0
			Total	4			0											0
			Weighted Average							4.12	4.61	#VALUE!	#VALUE!	4.27	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**4.12**		**#VALUE!**						**0.0%**
			Pavement Index													**4.27**		
Segment 10		***Interstate?***		**No**	**SR-260 MP 260-277**													
Mile 1	260	to	261	2	73.62	0	2	106.20	0	3.78	5.0	3.34	5.0	4.15	3.84		0	0

	NB			SB			NB		SB		Composite		Pavement Index	% Pavement Failure	
	# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB		NB	SB
Mile 2 261 to 262	2	77.39	2	2	88.83	6	3.73	4.5	3.57	3.9	3.94	3.66		0	0
Mile 3 262 to 263	2	72.76	2	2	83.54	7	3.79	4.5	3.64	3.8	3.99	3.67		0	0
Mile 4 263 to 264	2	48.34	7	2	42.38	8	4.16	3.8	4.26	3.6	3.88	3.82		0	0
Mile 5 264 to 265	2	36.17	0	2	32.82	0	4.36	5.0	4.41	5.0	4.55	4.59		0	0
Mile 6 265 to 266	2	35.13	0	2	38.12	0	4.38	5.0	4.33	5.0	4.56	4.53		0	0
Mile 7 266 to 267	2	90.22	0	2	53.49	0	3.55	5.0	4.08	5.0	3.98	4.36		0	0
Mile 8 267 to 268	2	104.69	1	2	78.38	0	3.36	4.7	3.71	5.0	3.75	4.10		0	0
Mile 9 268 to 269	2	103.95	1	2	85.18	4	3.37	4.7	3.62	4.1	3.75	3.77		0	0
Mile 10 269 to 270	2	50.41	0	2	44.31	0	4.13	5.0	4.23	5.0	4.39	4.46		0	0
Mile 11 270 to 271	2	49.62	0	2	46.53	0	4.14	5.0	4.19	5.0	4.40	4.43		0	0
Mile 12 271 to 272	2	60.33	0	2	49.42	0	3.98	5.0	4.14	5.0	4.28	4.40		0	0
Mile 13 272 to 273	2	98.12	0	2	85.38	0	3.44	5.0	3.61	5.0	3.91	4.03		0	0
Mile 14 273 to 274	2	102.46	0	2	113.42	4	3.39	5.0	3.25	4.1	3.87	3.52		0	0
Mile 15 274 to 275	2	115.60	1	2	136.99	4	3.22	4.7	2.97	4.1	3.65	3.32		0	0
Mile 16 275 to 276	2	71.89	1	2	78.64	8	3.80	4.7	3.71	3.6	4.06	3.66		0	0
Mile 17 276 to 277	2	70.92	2	2	82.36	4	3.82	4.5	3.66	4.1	4.01	3.80		0	0
Total	34			34											0
Weighted Average							3.79	4.75	3.81	4.50	4.07	4.00			
Factor							1.00		1.00						
Indicator Score							**3.79**		**3.81**						**0.0%**
Pavement Index													**4.03**		
Segment 11	***Interstate?***	**No**	**SR-260 MP 277-282**												
Mile 1 277 to 278	2	67.20	8	2	74.39	2	3.87	3.6	3.77	4.5	3.71	3.97		0	0
Mile 2 278 to 279	2	47.71	1		-	-	4.17	4.7	#VALUE!	#VALUE!	4.32	#VALUE!		0	0
Mile 3 279 to 280	2	55.53	2		-	-	4.05	4.5	#VALUE!	#VALUE!	4.17	#VALUE!		0	0
Mile 4 280 to 281	2	64.46	0		-	-	3.91	5.0	#VALUE!	#VALUE!	4.24	#VALUE!		0	0
Mile 5 281 to 282	2	64.94	0		-	-	3.91	5.0	#VALUE!	#VALUE!	4.23	#VALUE!		0	0
Total	10			2											0
Weighted Average							3.98	4.55	#VALUE!	#VALUE!	4.13	#VALUE!			
Factor							1.00		1.00						
Indicator Score							**3.98**		**#VALUE!**						**0.0%**
Pavement Index													**4.13**		
Segment 12	***Interstate?***	**No**	**SR-260 MP 282-304**												
Mile 1 282 to 283	1	89.12	0		-	-	3.56	5.0	#VALUE!	#VALUE!	3.99	#VALUE!		0	0
Mile 2 283 to 284	1	125.73	0		-	-	3.10	5.0	#VALUE!	#VALUE!	3.67	#VALUE!		0	0
Mile 3 284 to 285	1	111.04	7		-	-	3.28	3.8	#VALUE!	#VALUE!	3.42	#VALUE!		0	0

				NB			SB			NB		SB		Composite			% Pavement Failure	
				# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB	Pavement Index	NB	SB
Mile 4	285	to	286	1	53.79	0		-	-	4.08	5.0	#VALUE!	#VALUE!	4.35	#VALUE!		0	0
Mile 5	286	to	287	1	56.15	0		-	-	4.04	5.0	#VALUE!	#VALUE!	4.33	#VALUE!		0	0
Mile 6	287	to	288	1	61.48	0		-	-	3.96	5.0	#VALUE!	#VALUE!	4.27	#VALUE!		0	0
Mile 7	288	to	289	1	164.74	12		-	-	2.67	3.2	#VALUE!	#VALUE!	2.67	#VALUE!		1	0
Mile 8	289	to	290	1	139.62	12		-	-	2.94	3.2	#VALUE!	#VALUE!	3.03	#VALUE!		0	0
Mile 9	290	to	291	1	84.95	5		-	-	3.62	4.0	#VALUE!	#VALUE!	3.73	#VALUE!		0	0
Mile 10	291	to	292	1	93.49	4		-	-	3.51	4.1	#VALUE!	#VALUE!	3.70	#VALUE!		0	0
Mile 11	292	to	293	1	65.22	9		-	-	3.90	3.5	#VALUE!	#VALUE!	3.64	#VALUE!		0	0
Mile 12	293	to	294	1	71.49	0		-	-	3.81	5.0	#VALUE!	#VALUE!	4.17	#VALUE!		0	0
Mile 13	294	to	295	1	81.49	0		-	-	3.67	5.0	#VALUE!	#VALUE!	4.07	#VALUE!		0	0
Mile 14	295	to	296	1	77.14	0		-	-	3.73	5.0	#VALUE!	#VALUE!	4.11	#VALUE!		0	0
Mile 15	296	to	297	1	96.56	5		-	-	3.46	4.0	#VALUE!	#VALUE!	3.63	#VALUE!		0	0
Mile 16	297	to	298	1	78.55	1		-	-	3.71	4.7	#VALUE!	#VALUE!	3.99	#VALUE!		0	0
Mile 17	298	to	299	1	68.70	0		-	-	3.85	5.0	#VALUE!	#VALUE!	4.20	#VALUE!		0	0
Mile 18	299	to	300	1	74.96	0		-	-	3.76	5.0	#VALUE!	#VALUE!	4.13	#VALUE!		0	0
Mile 19	300	to	301	1	102.73	5		-	-	3.38	4.0	#VALUE!	#VALUE!	3.57	#VALUE!		0	0
Mile 20	301	to	302	1	110.91	6		-	-	3.28	3.9	#VALUE!	#VALUE!	3.46	#VALUE!		0	0
Mile 21	302	to	303	1	120.82	3		-	-	3.16	4.3	#VALUE!	#VALUE!	3.50	#VALUE!		0	0
Mile 22	303	to	304	1	130.48	2		-	-	3.05	4.5	#VALUE!	#VALUE!	3.47	#VALUE!		0	0
			Total	22			0											1
			Weighted Average							3.52	4.42	#VALUE!	#VALUE!	3.78	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**3.52**		**#VALUE!**						**4.5%**
			Pavement Index													**3.78**		
Segment 13		***Interstate?***		**No**	**SR-260 MP 304-306**													
Mile 1	304	to	305	2	163.00	15		-	-	2.69	2.9	#VALUE!	#VALUE!	2.69	#VALUE!		2	0
Mile 2	305	to	306	2	130.32	1		-	-	3.05	4.7	#VALUE!	#VALUE!	3.53	#VALUE!		0	0
			Total	4			0											2
			Weighted Average							2.87	3.80	#VALUE!	#VALUE!	3.11	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**2.87**		**#VALUE!**						**50.0%**
			Pavement Index													**3.11**		
Segment 14		***Interstate?***		**No**	**SR-277 MP 306-313**													
Mile 1	306	to	307	1	122.12	6		-	-	3.14	3.9	#VALUE!	#VALUE!	3.36	#VALUE!		0	0
Mile 2	307	to	308	1	131.87	25		-	-	3.03	2.1	#VALUE!	#VALUE!	2.11	#VALUE!		1	0
Mile 3	308	to	309	1	133.44	40		-	-	3.01	1.1	#VALUE!	#VALUE!	1.06	#VALUE!		1	0

				NB			SB			NB		SB		Composite			% Pavement Failure	
				# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB	Pavement Index	NB	SB
Mile 4	309	to	310	1	134.30	40		-	-	3.00	1.1	#VALUE!	#VALUE!	1.06	#VALUE!		1	0
Mile 5	310	to	311	1	120.37	12		-	-	3.16	3.2	#VALUE!	#VALUE!	3.18	#VALUE!		0	0
Mile 6	311	to	312	1	148.88	20		-	-	2.84	2.5	#VALUE!	#VALUE!	2.51	#VALUE!		1	0
Mile 7	312	to	313	1	130.04	40		-	-	3.05	1.1	#VALUE!	#VALUE!	1.06	#VALUE!		1	0
			Total	7	110.63	7	0											5
			Weighted Average							3.03	2.13	#VALUE!	#VALUE!	2.05	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**3.03**		**#VALUE!**						**71.4%**
			Pavement Index													**2.05**		
Segment 15		***Interstate?***		**No**	**SR-377 MP 0-34**													
Mile 1	0	to	1	1	68.55	3		-	-	3.85	4.3	#VALUE!	#VALUE!	3.98	#VALUE!		0	0
Mile 2	1	to	2	1	55.89	4		-	-	4.04	4.1	#VALUE!	#VALUE!	4.07	#VALUE!		0	0
Mile 3	2	to	3	1	75.45	6		-	-	3.75	3.9	#VALUE!	#VALUE!	3.79	#VALUE!		0	0
Mile 4	3	to	4	1	69.07	2		-	-	3.85	4.5	#VALUE!	#VALUE!	4.03	#VALUE!		0	0
Mile 5	4	to	5	1	61.36	1		-	-	3.96	4.7	#VALUE!	#VALUE!	4.17	#VALUE!		0	0
Mile 6	5	to	6	1	62.73	1		-	-	3.94	4.7	#VALUE!	#VALUE!	4.15	#VALUE!		0	0
Mile 7	6	to	7	1	62.43	2		-	-	3.94	4.5	#VALUE!	#VALUE!	4.10	#VALUE!		0	0
Mile 8	7	to	8	1	53.34	1		-	-	4.08	4.7	#VALUE!	#VALUE!	4.25	#VALUE!		0	0
Mile 9	8	to	9	1	46.93	1		-	-	4.18	4.7	#VALUE!	#VALUE!	4.32	#VALUE!		0	0
Mile 10	9	to	10	1	45.50	2		-	-	4.21	4.5	#VALUE!	#VALUE!	4.28	#VALUE!		0	0
Mile 11	10	to	11	1	44.88	1		-	-	4.22	4.7	#VALUE!	#VALUE!	4.35	#VALUE!		0	0
Mile 12	11	to	12	1	74.58	4		-	-	3.77	4.1	#VALUE!	#VALUE!	3.88	#VALUE!		0	0
Mile 13	12	to	13	1	88.27	5		-	-	3.58	4.0	#VALUE!	#VALUE!	3.70	#VALUE!		0	0
Mile 14	13	to	14	1	67.59	0		-	-	3.87	5.0	#VALUE!	#VALUE!	4.21	#VALUE!		0	0
Mile 15	14	to	15	1	47.58	9		-	-	4.17	3.5	#VALUE!	#VALUE!	3.72	#VALUE!		0	0
Mile 16	15	to	16	1	47.94	2		-	-	4.17	4.5	#VALUE!	#VALUE!	4.25	#VALUE!		0	0
Mile 17	16	to	17	1	36.22	4		-	-	4.36	4.1	#VALUE!	#VALUE!	4.20	#VALUE!		0	0
Mile 18	17	to	18	1	39.85	1		-	-	4.30	4.7	#VALUE!	#VALUE!	4.40	#VALUE!		0	0
Mile 19	18	to	19	1	37.80	1		-	-	4.33	4.7	#VALUE!	#VALUE!	4.43	#VALUE!		0	0
Mile 20	19	to	20	1	48.62	4		-	-	4.16	4.1	#VALUE!	#VALUE!	4.14	#VALUE!		0	0
Mile 21	20	to	21	1	43.76	4		-	-	4.23	4.1	#VALUE!	#VALUE!	4.17	#VALUE!		0	0
Mile 22	21	to	22	1	43.77	1		-	-	4.23	4.7	#VALUE!	#VALUE!	4.36	#VALUE!		0	0
Mile 23	22	to	23	1	41.71	10		-	-	4.27	3.4	#VALUE!	#VALUE!	3.68	#VALUE!		0	0
Mile 24	23	to	24	1	52.87	3		-	-	4.09	4.3	#VALUE!	#VALUE!	4.15	#VALUE!		0	0
Mile 25	24	to	25	1	54.93	1		-	-	4.06	4.7	#VALUE!	#VALUE!	4.24	#VALUE!		0	0
Mile 26	25	to	26	1	56.10	3		-	-	4.04	4.3	#VALUE!	#VALUE!	4.11	#VALUE!		0	0
Mile 27	26	to	27	1	58.01	3		-	-	4.01	4.3	#VALUE!	#VALUE!	4.09	#VALUE!		0	0

				NB			SB			NB		SB		Composite			% Pavement Failure	
				# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	NB	SB	Pavement Index	NB	SB
Mile 28	27	to	28	1	49.90	1		-	-	4.14	4.7	#VALUE!	#VALUE!	4.29	#VALUE!		0	0
Mile 29	28	to	29	1	52.74	1		-	-	4.09	4.7	#VALUE!	#VALUE!	4.26	#VALUE!		0	0
Mile 30	29	to	30	1	54.18	3		-	-	4.07	4.3	#VALUE!	#VALUE!	4.14	#VALUE!		0	0
Mile 31	30	to	31	1	63.26	4		-	-	3.93	4.1	#VALUE!	#VALUE!	3.99	#VALUE!		0	0
Mile 32	31	to	32	1	59.83	2		-	-	3.98	4.5	#VALUE!	#VALUE!	4.12	#VALUE!		0	0
Mile 33	32	to	33	1	64.84	2		-	-	3.91	4.5	#VALUE!	#VALUE!	4.07	#VALUE!		0	0
Mile 34	33	to	34	1	105.82	0		-	-	3.34	5.0	#VALUE!	#VALUE!	3.84	#VALUE!		0	0
			Total	34			0											0
			Weighted Average							4.03	4.38	#VALUE!	#VALUE!	4.12	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**4.03**		**#VALUE!**						**0.0%**
			Pavement Index													**4.12**		
Segment 16		***Interstate?***		**No**	**SR-77 MP 386-389**													
Mile 1	386	to	387	1	119.37	3		-	-	3.18	4.3	#VALUE!	#VALUE!	3.51	#VALUE!		0	0
Mile 2	387	to	388	2	98.93	4		-	-	3.43	4.1	#VALUE!	#VALUE!	3.64	#VALUE!		0	0
Mile 3	388	to	389	2	159.73	0		-	-	2.72	5.0	#VALUE!	#VALUE!	2.72	#VALUE!		2	0
			Total	5			0											2
			Weighted Average							3.10	4.51	#VALUE!	#VALUE!	3.25	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**3.10**		**#VALUE!**						**40.0%**
			Pavement Index													**3.25**		
Segment 17		***Interstate?***		**No**	**I-40B MP 287-288**													
Mile 1	287	to	288			15		-	-	5.00	2.9	#VALUE!	#VALUE!	3.56	#VALUE!		0	0
			Total	0			0											0
			Weighted Average							#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!			
			Factor							1.00		1.00						
			Indicator Score							**#VALUE!**		**#VALUE!**						**#DIV/0!**
			Pavement Index													**#VALUE!**		

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												
Salt River Bridge	1812	177.22	9,793	85.00	7	7	7	7	7.0	0		
Total			9,793									
Weighted Average				85.00					7.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				85.00						0.00%	7	
Bridge Index									7.00			
Segment 2												
Arizona Canal Bridge	2406	184.23	1,530	96.50	7	8	8	8	7.0	0		
CAP Canal Bridge	1408	187.47	1,115	96.50	7	8	8	8	7.0	0		
Total			2,645									
Weighted Average				96.50					7.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				96.50						0.00%	7	
Bridge Index									7.00			
Segment 3												
Bush Highway TI UP	2862	199.12	1,628	96.70	7	7	7	7	7.0	0		
Verde River Br NB	2266	191.16	6,719	94.60	7	8	7	7	7.0	0		
Verde River Br SB	2267	191.16	6,719	95.40	7	8	7	7	7.0	0		
Mesquite Wash Bridge NB	2291	207.54	1,155	99.70	7	8	7	7	7.0	0		
Pine Creek Bridge NB	2292	210.75	1,029	99.70	7	8	7	7	7.0	0		
Sycamore Creek Br NB	1562	212.48	1,017	98.60	7	7	6	6	6.0	0		
Sycamore Creek Bridge SB	2293	212.48	1,533	99.60	7	8	7	7	7.0	0		
Total			19,799									
Weighted Average				96.20					6.95	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				96.20						0.00%	6	
Bridge Index									6.95			
Segment 4												
S Crossover SB Over NB UP	2294	213.53	546	99.60	7	7	7	7	7.0	0		
Lower Screwtail Bridge SB	2295	214.2	4,545	96.30	6	7	7	7	6.0	0		
Upper Screwtail Br SB	2296	215.67	2,881	99.30	7	7	7	7	7.0	0		
N Crossover SB Over NB UP	2297	216.0	659	99.70	8	7	7	7	7.0	0		
Sycamore Creek Br NB	2462	218.29	3,049	99.70	7	8	7	7	7.0	0		

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		
Sycamore Creek Br SB	2463	218.29	3,049	99.70	7	8	7	7	7.0	0		
Lower Kitty Joe Canyon Bridge	2458	219.27	6,935	80.00	6	8	7	7	6.0	0		
Whiskey Springs Br	2515	220.32	3,947	82.40	6	7	6	6	6.0	0		
Upper Kitty Joe Br	2497	221.39	4,922	82.40	6	7	7	7	6.0	0		
Cottonwood Basin Br	2298	223.17	2,160	82.40	6	7	7	7	6.0	0		
Total			32,691									
Weighted Average				89.18					6.31	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				89.18						0.00%	6	
Bridge Index									6.31			
Segment 5												
Deer Creek Bridge SB	2148	237.38	609	99.6	7	8	7	7	7.0	0		
Deer Creek Bridge NB	2149	237.38	609	99.6	7	8	7	7	7.0	0		
Rye Creek Bridge SB	2150	239.38	1369	99.6	6	8	7	7	6.0	0		
Rye Creek Bridge NB	2151	239.38	1369	99.6	6	8	7	7	6.0	0		
Total			3,956									
Weighted Average				99.60					6.31	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				99.60						0.00%	6	
Bridge Index									6.31			
Segment 6												
N/A - no bridges									#NUM!	0		
Total			0									
Weighted Average				#VALUE!					#NUM!	#DIV/0!		
Factor				1.00					1.00	1.00		
Indicator Score				#VALUE!						#DIV/0!	#NUM!	
Bridge Index									#NUM!			
Segment 7												
N/A - no bridges									#NUM!	0		
Total			0									
Weighted Average				#VALUE!					#NUM!	#DIV/0!		
Factor				1.00					1.00	1.00		
Indicator Score				#VALUE!						#DIV/0!	#NUM!	
Bridge Index									#NUM!			

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 8												
N/A - no bridges									#NUM!	0		
Total			0									
Weighted Average				#VALUE!					#NUM!	#DIV/0!		
Factor				1.00					1.00	1.00		
Indicator Score				#VALUE!						#DIV/0!	#NUM!	
Bridge Index									#NUM!			
Segment 9												
N/A - no bridges									#NUM!	0		
Total			0									
Weighted Average				#VALUE!					#NUM!	#DIV/0!		
Factor				1.00					1.00	1.00		
Indicator Score				#VALUE!						#DIV/0!	#NUM!	
Bridge Index									#NUM!			
Segment 10												
Preacher Canyon Bridge EB	2526	261.5	3548	99.7	6	7	7	7	6.0	0		
Preacher Canyon Br WB	2527	261.5	2496	99.7	6	8	7	7	6.0	0		
Wildlife Crossing No 1 WB	1691	262.7	522	99.7	7	8	7	7	7.0	0		
Wildlife Crossing No 1 EB	1692	262.7	522	99.7	7	8	7	7	7.0	0		
Wildlife Crossing No 2 WB	1693	262.8	518	99.7	7	8	7	7	7.0	0		
Wildlife Crossing No 2 EB	1694	262.8	522	99.7	7	8	7	7	7.0	0		
LGV Wildlife Crossing 1 EB	1480	263.5	518	99.7	7	8	8	8	7.0	0		
LGV Wildlife Crossing 1 WB	1481	263.5	518	99.7	7	8	8	8	7.0	0		
Thompson Draw Bridge EB	2636	266.24	1603	99.7	7	8	7	7	7.0	0		
Thompson Draw Bridge WB	2637	266.24	1359	99.7	6	8	8	8	6.0	0		
Wildlife Crossing BR EB	2638	267.72	547	99.8	7	8	7	7	7.0	0		
Wildlife Crossing BR WB	2639	267.72	547	99.8	7	8	7	7	7.0	0		
Tonto Creek Bridge EB	2634	268.29	3889	98.8	7	7	7	7	7.0	0		
Tonto Creek Bridge WB	2635	268.29	3174	99.8	7	8	7	7	7.0	0		
Tonto Creek Bridge	699	268.53	284	86.1	6	6	7	6	6.0	0		
Doubtful Canyon Bridge EB	1494	269.87	2709	99.8	7	8	8	8	7.0	0		
Doubtful Canyon Bridge WB	1495	269.88	2258	99.8	7	8	8	8	7.0	0		
Wildlife Crossing Bridge EB	1496	270.5	523	99.8	7	8	8	8	7.0	0		
Wildlife Crossing Bridge WB	1497	270.5	518	99.8	7	8	8	8	7.0	0		
Wildlife Crossing Bridge EB	1498	271.73	523	99.8	7	8	8	8	7.0	0		

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		
Wildlife Crossing Bridge WB	1499	271.73	657	99.8	7	8	8	8	7.0	0		
Wildlife OP No 1 EB	1446	272.8	1477	99.8	7	7	7	7	7.0	0		
Wildlife OP No 1 WB	1447	272.8	1288	99.8	7	7	7	7	7.0	0		
Christopher Creek BR EB	1470	273.1	2125	99.8	7	7	7	7	7.0	0		
Christopher Creek BR WB	1471	273.1	2125	99.8	7	7	7	7	7.0	0		
Pedestrian OP EB	1472	273.7	476	99.8	7	7	7	7	7.0	0		
Pedestrian OP WB	1473	273.7	446	99.8	7	7	7	7	7.0	0		
Hunter Creek Drive OP EB	1474	274.38	602	97.8	7	7	7	7	7.0	0		
Hunter Creek Drive OP WB	1475	274.4	602	97.8	7	7	7	7	7.0	0		
Wildlife OP No 2 EB	1448	275.32	556	99.8	7	7	7	7	7.0	0		
Wildlife OP No 2 WB	1449	275.32	556	99.8	7	7	7	7	7.0	0		
Sharp Creek Bridge WB	1477	276	564	99.8	7	8	7	7	7.0	0		
Sharp Creek Bridge EB	1476	276.01	2294	99.8	7	7	7	7	7.0	0		
Total			40,863									
Weighted Average				99.52					6.81	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				99.52						0.00%	6	
Bridge Index									6.81			
Segment 11												
Wildlife OP No 3	1450	277.1	1131	80	7	8	7	7	7.0	0		
Gordon Canyon Bridge	2088	280	2388	79	7	7	6	6	6.0	0		
Mogollon Rim Viaduct	2089	281.01	5174	79	7	7	7	7	7.0	0		
Total			8,693									
Weighted Average				79.13					6.73	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				79.13						0.00%	6	
Bridge Index									6.73			
Segment 12												
Black Canyon Bridge	2399	303.83	918	98.4	7	7	7	7	7.0	0		
Total			918									
Weighted Average				98.40					7.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				98.40						0.00%	7	
Bridge Index									7.00			

Structure Name (A209)	Structure # (N8)	Milepost (A232)	Area (A225)	Bridge Sufficiency: Sufficiency Rating	Bridge Index: Deck (N58)	Bridge Index: Sub (N59)	Bridge Index: Super (N60)	Bridge Index: Eval (N67)	Bridge Index: Lowest	Functionally Obsolete Bridges: Deck Area on Func Obsolete	Bridge Rating	Hot Spots on Bridge Index map
Segment 13												
Buckskin Canyon Br.	2400	304.13	474	93.7	6	7	6	6	6.0	0		
Total			474									
Weighted Average				93.70					6.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				93.70						0.00%	6	
Bridge Index									6.00			
Segment 14												
N/A - no bridges									#NUM!	0		
Total			0									
Weighted Average				#VALUE!					#NUM!	#DIV/0!		
Factor				1.00					1.00	1.00		
Indicator Score				#VALUE!						#DIV/0!	#NUM!	
Bridge Index									#NUM!			
Segment 15												
N/A - no bridges									#NUM!	0		
Total			0									
Weighted Average				#DIV/0!					#NUM!	#DIV/0!		
Factor				1.00					1.00	1.00		
Indicator Score				#DIV/0!						#DIV/0!	#NUM!	
Bridge Index									#NUM!			
Segment 16												
Little Colo River Br	2030	388.1	9959	59	6	7	6	6	6.0	9,959		
Total			9,959									
Weighted Average				59.00					6.00	100.00%		
Factor				1.00					1.00	1.00		
Indicator Score				59.00						100.00%	6	
Bridge Index									6.00			
Segment 17												
N/A - no bridges									#NUM!	0		
Total			0									
Weighted Average				#VALUE!					#NUM!	#DIV/0!		
Factor				1.00					1.00	1.00		
Indicator Score				#VALUE!						#DIV/0!	#NUM!	
Bridge Index									#NUM!			

Mobility Performance Area Data

Segment	Begin MP	End MP	Length (mi)	Facility Type	Flow Type	Terrain	No. of Lanes	Capacity Environment Type	Lane Width (feet)	Posted Speed Limit (mph)	Divided or Undivided	Access Points (per mile)	% No-Passing Zone	Street Parking
87-1	177	182	5	Urban	Interrupted	Level	4	Urban/Rural Single or Multilane Signalized	12.00	59	Divided	N/A	0%	N/A
87-2	182	191	9	Fringe Urban	Interrupted	Level	4	Urban/Rural Single or Multilane Signalized	12.00	65	Divided	N/A	0%	N/A
87-3	191	213	22	Rural	Uninterrupted	Level	4	Multilane Highway	12.00	65	Divided	0.74	0%	N/A
87-4	213	235	22	Rural	Uninterrupted	Mountainous	4	Multilane Highway	12.00	63	Divided	0.54	0%	N/A
87-5	235	241	6	Rural	Uninterrupted	Level	4	Multilane Highway	12.00	65	Divided	1.72	0%	N/A
87-6	241	250	9	Rural	Uninterrupted	Mountainous	4	Multilane Highway	12.00	65	Divided	0.63	0%	N/A
87-7	250	253	3	Urban	Interrupted	Level	4	Urban/Rural Single or Multilane Signalized	12.00	39	Undivided	N/A	0%	N/A
260-8	252	256	4	Urban	Interrupted	Level	4	Urban/Rural Single or Multilane Signalized	12.00	51	Undivided	N/A	0%	N/A
260-9	256	260	4	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	53	Undivided	2.59	0%	N/A
260-10	260	277	17	Rural	Uninterrupted	Level	4	Multilane Highway	12.00	60	Divided	0.97	0%	N/A
260-11	277	282	5	Rural	Uninterrupted	Mountainous	4	Multilane Highway	12.00	55	Undivided	0.41	0%	N/A
260-12	282	304	22	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	54	Undivided	1.89	73%	N/A
260-13	304	306	2	Fringe Urban	Uninterrupted	Level	4	Urban 1/2/3 Lane Highway	12.00	45	Undivided	21.46	0%	Street Parking Prohibited
277-14	306	313	7	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	52	Undivided	6.00	54%	N/A
377-15	0	34	34	Rural	Uninterrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	64	Undivided	0.71	30%	N/A
77-16	386	389	3	Fringe Urban	Interrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	49	Undivided	4.66	40%	N/A
40B-17	287	288	1	Urban	Interrupted	Level	4	Urban/Rural Single or Multilane Signalized	11.00	35	Undivided	N/A	0%	N/A

Car TTI and PTI/Truck TTTI and TPTI – Northbound/Eastbound

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
87-1	115P04411	1 AM Peak	Weekday	AZ-87	Northbound	35.6	33.9	8.7	12.4	45	45	45	1.26	1.33	5.17	3.63	1.26	1.42	8.04	6.58
87-1	115P04411	2 Mid Day	Weekday	AZ-87	Northbound	36.6	34.0	5.6	9.9	45	45	45	1.23	1.32	8.04	4.53				
87-1	115P04411	3 PM Peak	Weekday	AZ-87	Northbound	35.9	31.6	5.6	6.8	45	45	45	1.25	1.42	8.04	6.58				
87-1	115P04411	4 Evening	Weekday	AZ-87	Northbound	36.7	34.0	5.6	9.9	45	45	45	1.23	1.32	8.04	4.53				
87-1	115P04412	1 AM Peak	Weekday	AZ-87	Northbound	47.3	46.8	19.9	19.9	65	65	65	1.37	1.39	3.27	3.27	1.37	1.47	3.98	3.88
87-1	115P04412	2 Mid Day	Weekday	AZ-87	Northbound	48.2	46.5	18.7	20.5	65	65	65	1.35	1.40	3.48	3.18				
87-1	115P04412	3 PM Peak	Weekday	AZ-87	Northbound	49.8	44.2	16.3	16.8	65	65	65	1.30	1.47	3.98	3.88				
87-1	115P04412	4 Evening	Weekday	AZ-87	Northbound	49.8	46.8	21.7	20.5	65	65	65	1.30	1.39	2.99	3.18				
87-1	115P04413	1 AM Peak	Weekday	AZ-87	Northbound	59.0	61.2	38.1	55.3	65	65	65	1.10	1.06	1.71	1.18	1.10	1.08	1.74	1.18
87-1	115P04413	2 Mid Day	Weekday	AZ-87	Northbound	60.2	60.7	37.4	55.3	65	65	65	1.08	1.07	1.74	1.18				
87-1	115P04413	3 PM Peak	Weekday	AZ-87	Northbound	63.0	60.4	46.4	55.3	65	65	65	1.03	1.08	1.40	1.18				
87-1	115P04413	4 Evening	Weekday	AZ-87	Northbound	62.7	60.8	47.4	55.3	65	65	65	1.04	1.07	1.37	1.18				
87-1	115P04414	1 AM Peak	Weekday	AZ-87	Northbound	57.3	56.5	29.8	23.6	65	65	65	1.13	1.15	2.18	2.75	1.13	1.18	2.30	3.88
87-1	115P04414	2 Mid Day	Weekday	AZ-87	Northbound	58.3	55.9	32.0	25.3	65	65	65	1.11	1.16	2.03	2.57				
87-1	115P04414	3 PM Peak	Weekday	AZ-87	Northbound	59.6	55.1	30.8	16.8	65	65	65	1.09	1.18	2.11	3.88				
87-1	115P04414	4 Evening	Weekday	AZ-87	Northbound	59.2	56.0	28.3	19.9	65	65	65	1.10	1.16	2.30	3.27				
87-2	115P04415	1 AM Peak	Weekday	AZ-87	Northbound	58.9	56.8	37.3	28.6	65	65	65	1.10	1.14	1.74	2.28	1.10	1.15	1.97	2.28
87-2	115P04415	2 Mid Day	Weekday	AZ-87	Northbound	59.8	56.9	33.6	33.6	65	65	65	1.09	1.14	1.94	1.94				
87-2	115P04415	3 PM Peak	Weekday	AZ-87	Northbound	60.8	56.7	33.0	30.9	65	65	65	1.07	1.15	1.97	2.11				
87-2	115P04415	4 Evening	Weekday	AZ-87	Northbound	60.3	57.6	35.4	34.8	65	65	65	1.08	1.13	1.84	1.87				
87-2	115P06123	1 AM Peak	Weekday	AZ-87	Northbound	54.6	55.7	24.9	25.5	65	65	65	1.19	1.17	2.61	2.55	1.19	1.23	2.76	3.17
87-2	115P06123	2 Mid Day	Weekday	AZ-87	Northbound	55.0	54.1	23.6	26.7	65	65	65	1.18	1.20	2.76	2.43				
87-2	115P06123	3 PM Peak	Weekday	AZ-87	Northbound	56.2	52.7	25.5	20.5	65	65	65	1.16	1.23	2.55	3.17				
87-2	115P06123	4 Evening	Weekday	AZ-87	Northbound	57.5	55.8	28.5	29.7	65	65	65	1.13	1.16	2.28	2.19				
87-3	115P05704	1 AM Peak	Weekday	AZ-87	Northbound	62.0	59.4	44.7	48.5	65	65	65	1.05	1.09	1.45	1.34	1.05	1.11	1.54	1.38
87-3	115P05704	2 Mid Day	Weekday	AZ-87	Northbound	62.7	59.1	42.3	50.3	65	65	65	1.04	1.10	1.54	1.29				
87-3	115P05704	3 PM Peak	Weekday	AZ-87	Northbound	63.9	58.8	49.1	47.2	65	65	65	1.02	1.11	1.32	1.38				
87-3	115P05704	4 Evening	Weekday	AZ-87	Northbound	62.4	58.4	49.7	49.4	65	65	65	1.04	1.11	1.31	1.32				
87-4	115P05705	1 AM Peak	Weekday	AZ-87	Northbound	61.0	49.0	43.7	29.1	65	65	65	1.07	1.33	1.49	2.24	1.17	1.37	2.05	2.38
87-4	115P05705	2 Mid Day	Weekday	AZ-87	Northbound	61.1	49.2	40.4	31.1	65	65	65	1.06	1.32	1.61	2.09				
87-4	115P05705	3 PM Peak	Weekday	AZ-87	Northbound	59.4	48.0	35.4	28.2	65	65	65	1.09	1.35	1.83	2.30				
87-4	115P05705	4 Evening	Weekday	AZ-87	Northbound	55.6	47.3	31.7	27.3	65	65	65	1.17	1.37	2.05	2.38				
87-5	115P07387	1 AM Peak	Weekday	AZ-87	Northbound	64.6	58.6	47.9	45.3	65	65	65	1.01	1.11	1.36	1.43	1.01	1.12	1.42	1.45
87-5	115P07387	2 Mid Day	Weekday	AZ-87	Northbound	64.5	58.4	45.7	44.7	65	65	65	1.01	1.11	1.42	1.45				
87-5	115P07387	3 PM Peak	Weekday	AZ-87	Northbound	65.2	58.3	50.4	45.3	65	65	65	1.00	1.12	1.29	1.43				

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
87-5	115P07387	4 Evening	Weekday	AZ-87	Northbound	64.5	58.9	53.4	47.4	65	65	65	1.01	1.10	1.22	1.37				
87-6	115P07820	1 AM Peak	Weekday	AZ-87	Northbound	58.9	42.7	33.5	26.7	65	65	65	1.10	1.52	1.94	2.43	1.31	1.55	2.38	2.52
87-6	115P07820	2 Mid Day	Weekday	AZ-87	Northbound	59.5	44.0	31.8	27.3	65	65	65	1.09	1.48	2.04	2.38				
87-6	115P07820	3 PM Peak	Weekday	AZ-87	Northbound	56.3	41.9	28.7	26.7	65	65	65	1.16	1.55	2.26	2.43				
87-6	115P07820	4 Evening	Weekday	AZ-87	Northbound	49.8	42.1	27.3	25.8	65	65	65	1.31	1.54	2.38	2.52				
87-7	115P07388	1 AM Peak	Weekday	AZ-87	Northbound	55.5	47.2	29.9	28.6	45	45	45	1.00	1.00	1.51	1.57	1.00	1.00	1.81	2.56
87-7	115P07388	2 Mid Day	Weekday	AZ-87	Northbound	54.4	47.1	26.7	23.6	45	45	45	1.00	1.00	1.68	1.91				
87-7	115P07388	3 PM Peak	Weekday	AZ-87	Northbound	53.2	45.1	24.8	17.6	45	45	45	1.00	1.00	1.81	2.56				
87-7	115P07388	4 Evening	Weekday	AZ-87	Northbound	51.6	46.7	26.6	26.7	45	45	45	1.00	1.00	1.69	1.68				
87-7	115P07389	1 AM Peak	Weekday	AZ-87	Northbound	29.3	27.7	7.5	10.6	35	35	35	1.19	1.26	4.69	3.31	1.36	1.40	7.04	4.02
87-7	115P07389	2 Mid Day	Weekday	AZ-87	Northbound	25.7	25.1	5.6	9.9	35	35	35	1.36	1.40	6.26	3.52				
87-7	115P07389	3 PM Peak	Weekday	AZ-87	Northbound	26.4	25.0	5.0	8.7	35	35	35	1.32	1.40	7.04	4.02				
87-7	115P07389	4 Evening	Weekday	AZ-87	Northbound	29.8	28.3	11.8	11.8	35	35	35	1.18	1.24	2.97	2.97				
260-8	115N05999	1 AM Peak	Weekday	AZ-260	Eastbound	27.5	23.7	5.6	3.7	35	35	35	1.27	1.48	6.26	9.39	1.35	1.67	6.26	14.08
260-8	115N05999	2 Mid Day	Weekday	AZ-260	Eastbound	25.9	21.0	5.6	2.5	35	35	35	1.35	1.66	6.26	14.08				
260-8	115N05999	3 PM Peak	Weekday	AZ-260	Eastbound	27.1	21.0	5.6	2.9	35	35	35	1.29	1.67	6.26	11.94				
260-8	115N05999	4 Evening	Weekday	AZ-260	Eastbound	27.6	22.0	5.6	3.1	35	35	35	1.27	1.59	6.26	11.26				
260-8	115N06331	1 AM Peak	Weekday	AZ-260	Eastbound	37.0	35.4	12.4	12.4	55	55	55	1.49	1.55	4.43	4.43	1.56	1.66	8.05	5.21
260-8	115N06331	2 Mid Day	Weekday	AZ-260	Eastbound	35.4	34.2	8.9	12.4	55	55	55	1.55	1.61	6.17	4.43				
260-8	115N06331	3 PM Peak	Weekday	AZ-260	Eastbound	35.2	33.2	6.8	10.6	55	55	55	1.56	1.66	8.05	5.21				
260-8	115N06331	4 Evening	Weekday	AZ-260	Eastbound	39.4	37.4	16.8	16.8	55	55	55	1.40	1.47	3.28	3.28				
260-9	115N06330	1 AM Peak	Weekday	AZ-260	Eastbound	50.1	45.8	36.1	17.8	55	55	55	1.10	1.20	1.52	3.09	1.12	1.20	1.61	3.09
260-9	115N06330	2 Mid Day	Weekday	AZ-260	Eastbound	49.7	48.4	34.2	32.9	55	55	55	1.11	1.14	1.61	1.67				
260-9	115N06330	3 PM Peak	Weekday	AZ-260	Eastbound	50.2	46.7	37.6	19.7	55	55	55	1.10	1.18	1.46	2.79				
260-9	115N06330	4 Evening	Weekday	AZ-260	Eastbound	49.1	46.6	35.1	18.0	55	55	55	1.12	1.18	1.57	3.06				
260-10	115N06328	1 AM Peak	Weekday	AZ-260	Eastbound	60.2	51.4	39.9	36.6	65	65	65	1.08	1.26	1.63	1.78	1.20	1.28	1.66	1.78
260-10	115N06328	2 Mid Day	Weekday	AZ-260	Eastbound	59.4	52.4	39.9	40.1	65	65	65	1.09	1.24	1.63	1.62				
260-10	115N06328	3 PM Peak	Weekday	AZ-260	Eastbound	58.5	51.0	39.9	38.6	65	65	65	1.11	1.27	1.63	1.68				
260-10	115N06328	4 Evening	Weekday	AZ-260	Eastbound	54.2	50.7	39.1	37.2	65	65	65	1.20	1.28	1.66	1.75				
260-10	115N06329	1 AM Peak	Weekday	AZ-260	Eastbound	59.1	49.9	42.9	33.5	65	65	65	1.10	1.30	1.52	1.94	1.19	1.32	1.73	2.05
260-10	115N06329	2 Mid Day	Weekday	AZ-260	Eastbound	58.3	51.5	39.8	37.2	65	65	65	1.12	1.26	1.63	1.75				
260-10	115N06329	3 PM Peak	Weekday	AZ-260	Eastbound	57.8	49.9	38.9	35.8	65	65	65	1.12	1.30	1.67	1.82				
260-10	115N06329	4 Evening	Weekday	AZ-260	Eastbound	54.5	49.4	37.7	31.7	65	65	65	1.19	1.32	1.73	2.05				
260-10	115N11107	1 AM Peak	Weekday	AZ-260	Eastbound	58.6	51.7	39.8	33.6	55	55	55	1.00	1.06	1.38	1.64	1.00	1.08	1.53	1.64
260-10	115N11107	2 Mid Day	Weekday	AZ-260	Eastbound	56.8	52.3	36.7	34.8	55	55	55	1.00	1.05	1.50	1.58				
260-10	115N11107	3 PM Peak	Weekday	AZ-260	Eastbound	56.8	52.3	37.9	34.5	55	55	55	1.00	1.05	1.45	1.59				
260-10	115N11107	4 Evening	Weekday	AZ-260	Eastbound	55.1	50.8	36.0	33.6	55	55	55	1.00	1.08	1.53	1.64				

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
260-11	115N06669	1 AM Peak	Weekday	AZ-260	Eastbound	54.4	38.1	29.0	22.4	55	55	55	1.01	1.44	1.90	2.46	1.23	1.45	2.16	2.53
260-11	115N06669	2 Mid Day	Weekday	AZ-260	Eastbound	52.6	40.5	27.1	25.5	55	55	55	1.05	1.36	2.03	2.16				
260-11	115N06669	3 PM Peak	Weekday	AZ-260	Eastbound	49.5	39.3	25.5	25.5	55	55	55	1.11	1.40	2.16	2.16				
260-11	115N06669	4 Evening	Weekday	AZ-260	Eastbound	44.6	38.0	25.5	21.8	55	55	55	1.23	1.45	2.16	2.53				
260-12	115N06325	1 AM Peak	Weekday	AZ-260	Eastbound	60.2	57.0	53.4	51.6	55	55	55	1.00	1.00	1.03	1.07	1.00	1.00	1.08	1.09
260-12	115N06325	2 Mid Day	Weekday	AZ-260	Eastbound	59.7	57.4	53.3	52.2	55	55	55	1.00	1.00	1.03	1.05				
260-12	115N06325	3 PM Peak	Weekday	AZ-260	Eastbound	59.1	57.5	52.7	51.9	55	55	55	1.00	1.00	1.04	1.06				
260-12	115N06325	4 Evening	Weekday	AZ-260	Eastbound	58.1	57.2	51.0	50.3	55	55	55	1.00	1.00	1.08	1.09				
260-12	115N06326	1 AM Peak	Weekday	AZ-260	Eastbound	59.5	55.2	52.0	45.6	55	55	55	1.00	1.00	1.06	1.21	1.00	1.00	1.13	1.21
260-12	115N06326	2 Mid Day	Weekday	AZ-260	Eastbound	58.9	56.4	51.3	49.7	55	55	55	1.00	1.00	1.07	1.11				
260-12	115N06326	3 PM Peak	Weekday	AZ-260	Eastbound	58.3	56.6	50.3	49.2	55	55	55	1.00	1.00	1.09	1.12				
260-12	115N06326	4 Evening	Weekday	AZ-260	Eastbound	56.9	55.9	48.5	46.6	55	55	55	1.00	1.00	1.13	1.18				
260-12	115N06327	1 AM Peak	Weekday	AZ-260	Eastbound	58.0	54.5	43.5	44.2	55	55	55	1.00	1.01	1.26	1.24	1.00	1.01	1.32	1.28
260-12	115N06327	2 Mid Day	Weekday	AZ-260	Eastbound	56.9	55.6	41.6	47.1	55	55	55	1.00	1.00	1.32	1.17				
260-12	115N06327	3 PM Peak	Weekday	AZ-260	Eastbound	57.2	55.1	41.6	46.4	55	55	55	1.00	1.00	1.32	1.19				
260-12	115N06327	4 Evening	Weekday	AZ-260	Eastbound	56.2	54.9	45.9	42.9	55	55	55	1.00	1.00	1.20	1.28				
260-13	115N06323	1 AM Peak	Weekday	AZ-260	Eastbound	43.7	42.2	27.9	20.5	45	45	45	1.03	1.07	1.61	2.20	1.04	1.07	1.87	2.20
260-13	115N06323	2 Mid Day	Weekday	AZ-260	Eastbound	43.5	44.3	24.1	38.0	45	45	45	1.03	1.02	1.87	1.19				
260-13	115N06323	3 PM Peak	Weekday	AZ-260	Eastbound	43.8	44.1	24.9	38.0	45	45	45	1.03	1.02	1.81	1.19				
260-13	115N06323	4 Evening	Weekday	AZ-260	Eastbound	43.1	42.9	28.3	34.8	45	45	45	1.04	1.05	1.59	1.29				
260-13	115N06324	1 AM Peak	Weekday	AZ-260	Eastbound	50.1	40.2	36.7	13.7	45	45	45	1.00	1.12	1.23	3.29	1.00	1.12	1.39	3.29
260-13	115N06324	2 Mid Day	Weekday	AZ-260	Eastbound	49.1	45.6	32.5	20.5	45	45	45	1.00	1.00	1.39	2.20				
260-13	115N06324	3 PM Peak	Weekday	AZ-260	Eastbound	49.6	44.9	40.0	16.8	45	45	45	1.00	1.00	1.12	2.68				
260-13	115N06324	4 Evening	Weekday	AZ-260	Eastbound	49.2	46.3	41.3	24.9	45	45	45	1.00	1.00	1.09	1.81				
77-16	115P05961	1 AM Peak	Weekday	AZ-77	Northbound	32.3	28.8	8.7	7.4	35	35	35	1.08	1.21	4.02	4.70	1.15	1.24	7.04	6.25
77-16	115P05961	2 Mid Day	Weekday	AZ-77	Northbound	32.7	29.2	6.8	6.8	35	35	35	1.07	1.20	5.12	5.12				
77-16	115P05961	3 PM Peak	Weekday	AZ-77	Northbound	30.6	28.3	5.0	5.6	35	35	35	1.15	1.24	7.04	6.25				
77-16	115P05961	4 Evening	Weekday	AZ-77	Northbound	31.0	29.4	6.8	8.7	35	35	35	1.13	1.19	5.12	4.02				
77-16	115P06390	1 AM Peak	Weekday	US-180	Northbound	42.2	40.6	16.9	25.1	45	45	45	1.07	1.11	2.66	1.79	1.08	1.15	2.66	2.25
77-16	115P06390	2 Mid Day	Weekday	US-180	Northbound	44.1	40.9	28.9	25.1	45	45	45	1.02	1.10	1.56	1.79				
77-16	115P06390	3 PM Peak	Weekday	US-180	Northbound	43.9	40.4	30.0	20.0	45	45	45	1.02	1.11	1.50	2.25				
77-16	115P06390	4 Evening	Weekday	US-180	Northbound	41.8	39.2	30.0	25.1	45	45	45	1.08	1.15	1.50	1.79				
77-16	115P06391	1 AM Peak	Weekday	US-180	Northbound	33.0	30.5	8.7	7.5	35	35	35	1.06	1.15	4.02	4.68	1.12	1.20	5.12	5.12
77-16	115P06391	2 Mid Day	Weekday	US-180	Northbound	34.5	30.6	9.9	6.8	35	35	35	1.02	1.14	3.52	5.12				
77-16	115P06391	3 PM Peak	Weekday	US-180	Northbound	33.4	30.4	8.7	8.7	35	35	35	1.05	1.15	4.02	4.02				
77-16	115P06391	4 Evening	Weekday	US-180	Northbound	31.2	29.2	6.8	8.7	35	35	35	1.12	1.20	5.12	4.02				
77-16	115P07001	1 AM Peak	Weekday	AZ-77	Northbound	62.4	59.0	47.6	27.3	55	55	55	1.00	1.00	1.16	2.01	1.00	1.00	1.35	2.01

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
77-16	115P07001	2 Mid Day	Weekday	AZ-77	Northbound	60.0	59.4	40.7	50.0	55	55	55	1.00	1.00	1.35	1.10				
77-16	115P07001	3 PM Peak	Weekday	AZ-77	Northbound	61.6	60.0	48.2	51.5	55	55	55	1.00	1.00	1.14	1.07				
77-16	115P07001	4 Evening	Weekday	AZ-77	Northbound	63.5	59.9	52.3	50.3	55	55	55	1.00	1.00	1.05	1.09				
77-16	115P07002	1 AM Peak	Weekday	AZ-77	Northbound	45.9	47.3	18.6	22.7	45	45	45	1.00	1.00	2.42	1.98	1.03	1.00	3.02	1.98
77-16	115P07002	2 Mid Day	Weekday	AZ-77	Northbound	43.5	46.3	17.4	27.3	45	45	45	1.03	1.00	2.58	1.65				
77-16	115P07002	3 PM Peak	Weekday	AZ-77	Northbound	45.9	46.2	20.5	24.9	45	45	45	1.00	1.00	2.19	1.81				
77-16	115P07002	4 Evening	Weekday	AZ-77	Northbound	46.2	45.7	14.9	23.7	45	45	45	1.00	1.00	3.02	1.90				
40B-17	115P05962	1 AM Peak	Weekday	AZ-77	Northbound	28.4	25.7	9.9	12.4	35	35	35	1.23	1.36	3.52	2.81	1.35	1.45	7.04	3.52
40B-17	115P05962	2 Mid Day	Weekday	AZ-77	Northbound	26.5	25.0	6.2	9.9	35	35	35	1.32	1.40	5.64	3.52				
40B-17	115P05962	3 PM Peak	Weekday	AZ-77	Northbound	25.9	24.1	5.0	11.8	35	35	35	1.35	1.45	7.04	2.97				
40B-17	115P05962	4 Evening	Weekday	AZ-77	Northbound	26.7	25.1	7.5	10.6	35	35	35	1.31	1.40	4.69	3.31				
40B-17	115P06392	1 AM Peak	Weekday	US-180	Northbound	20.9	14.0	2.5	0.6	35	35	35	1.67	2.50	14.08	56.33	2.25	2.85	18.82	56.33
40B-17	115P06392	2 Mid Day	Weekday	US-180	Northbound	19.0	13.3	2.5	1.9	35	35	35	1.84	2.63	14.08	18.82				
40B-17	115P06392	3 PM Peak	Weekday	US-180	Northbound	15.5	12.3	1.9	1.9	35	35	35	2.25	2.85	18.82	18.82				
40B-17	115P06392	4 Evening	Weekday	US-180	Northbound	20.3	17.2	5.0	2.5	35	35	35	1.72	2.04	6.98	14.08				

Car TTI and PTI/Truck TTTI and TPTI – Southbound/Westbound

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
87-1	115N04411	1 AM Peak	Weekday	AZ-87	Southbound	45.2	42.7	6.8	5.6	45	45	45	1.00	1.05	6.58	8.05	1.00	1.06	6.58	8.05
87-1	115N04411	2 Mid Day	Weekday	AZ-87	Southbound	46.8	43.4	10.6	7.5	45	45	45	1.00	1.04	4.26	6.04				
87-1	115N04411	3 PM Peak	Weekday	AZ-87	Southbound	46.2	43.1	6.8	10.0	45	45	45	1.00	1.04	6.58	4.52				
87-1	115N04411	4 Evening	Weekday	AZ-87	Southbound	46.0	42.6	6.8	7.5	45	45	45	1.00	1.06	6.58	6.04				
87-1	115N04412	1 AM Peak	Weekday	AZ-87	Southbound	62.5	61.2	40.1	55.4	65	65	65	1.04	1.06	1.62	1.17	1.05	1.08	1.62	1.23
87-1	115N04412	2 Mid Day	Weekday	AZ-87	Southbound	61.7	61.1	41.5	55.4	65	65	65	1.05	1.06	1.57	1.17				
87-1	115N04412	3 PM Peak	Weekday	AZ-87	Southbound	64.3	60.7	52.8	54.1	65	65	65	1.01	1.07	1.23	1.20				
87-1	115N04412	4 Evening	Weekday	AZ-87	Southbound	62.9	60.4	49.5	52.8	65	65	65	1.03	1.08	1.31	1.23				
87-1	115N04413	1 AM Peak	Weekday	AZ-87	Southbound	61.1	58.0	38.2	39.4	65	65	65	1.06	1.12	1.70	1.65	1.08	1.12	1.70	1.65
87-1	115N04413	2 Mid Day	Weekday	AZ-87	Southbound	60.1	58.4	41.7	40.0	65	65	65	1.08	1.11	1.56	1.63				
87-1	115N04413	3 PM Peak	Weekday	AZ-87	Southbound	62.3	58.7	46.9	44.5	65	65	65	1.04	1.11	1.38	1.46				
87-1	115N04413	4 Evening	Weekday	AZ-87	Southbound	61.0	58.3	41.7	43.6	65	65	65	1.07	1.12	1.56	1.49				
87-1	115N04414	1 AM Peak	Weekday	AZ-87	Southbound	60.0	55.8	29.2	24.9	65	65	65	1.08	1.16	2.23	2.61	1.09	1.16	2.23	2.61
87-1	115N04414	2 Mid Day	Weekday	AZ-87	Southbound	59.6	56.0	35.4	26.7	65	65	65	1.09	1.16	1.84	2.43				
87-1	115N04414	3 PM Peak	Weekday	AZ-87	Southbound	61.0	56.3	39.4	32.3	65	65	65	1.07	1.15	1.65	2.01				
87-1	115N04414	4 Evening	Weekday	AZ-87	Southbound	59.8	56.6	31.7	31.4	65	65	65	1.09	1.15	2.05	2.07				
87-2	115N04415	1 AM Peak	Weekday	AZ-87	Southbound	46.4	44.2	12.4	11.2	65	65	65	1.40	1.47	5.23	5.81	1.40	1.53	5.23	6.54
87-2	115N04415	2 Mid Day	Weekday	AZ-87	Southbound	47.0	43.6	14.9	9.9	65	65	65	1.38	1.49	4.36	6.54				
87-2	115N04415	3 PM Peak	Weekday	AZ-87	Southbound	47.3	42.5	14.9	10.2	65	65	65	1.37	1.53	4.36	6.34				
87-2	115N04415	4 Evening	Weekday	AZ-87	Southbound	50.6	48.1	17.1	15.5	65	65	65	1.28	1.35	3.80	4.18				
87-2	115N06123	1 AM Peak	Weekday	AZ-87	Southbound	61.7	59.6	26.1	42.0	65	65	65	1.05	1.09	2.49	1.55	1.05	1.10	2.49	1.58
87-2	115N06123	2 Mid Day	Weekday	AZ-87	Southbound	62.4	59.8	37.9	41.0	65	65	65	1.04	1.09	1.71	1.58				
87-2	115N06123	3 PM Peak	Weekday	AZ-87	Southbound	62.8	59.1	36.3	41.6	65	65	65	1.03	1.10	1.79	1.56				
87-2	115N06123	4 Evening	Weekday	AZ-87	Southbound	62.5	59.7	39.8	45.3	65	65	65	1.04	1.09	1.63	1.43				
87-3	115N05704	1 AM Peak	Weekday	AZ-87	Southbound	64.1	53.2	45.2	27.3	65	65	65	1.01	1.22	1.44	2.38	1.04	1.23	1.48	2.38
87-3	115N05704	2 Mid Day	Weekday	AZ-87	Southbound	63.3	53.9	46.5	28.9	65	65	65	1.03	1.21	1.40	2.25				
87-3	115N05704	3 PM Peak	Weekday	AZ-87	Southbound	63.2	53.7	47.2	32.5	65	65	65	1.03	1.21	1.38	2.00				
87-3	115N05704	4 Evening	Weekday	AZ-87	Southbound	62.4	52.6	43.9	28.6	65	65	65	1.04	1.23	1.48	2.27				
87-4	115N05705	1 AM Peak	Weekday	AZ-87	Southbound	64.4	57.8	47.9	43.5	65	65	65	1.01	1.12	1.36	1.50	1.05	1.14	1.47	1.56
87-4	115N05705	2 Mid Day	Weekday	AZ-87	Southbound	62.1	57.0	44.2	41.6	65	65	65	1.05	1.14	1.47	1.56				
87-4	115N05705	3 PM Peak	Weekday	AZ-87	Southbound	62.9	57.0	46.3	43.9	65	65	65	1.03	1.14	1.40	1.48				
87-4	115N05705	4 Evening	Weekday	AZ-87	Southbound	64.1	57.8	51.5	45.5	65	65	65	1.01	1.12	1.26	1.43				
87-5	115N07387	1 AM Peak	Weekday	AZ-87	Southbound	62.7	54.2	47.0	30.5	65	65	65	1.04	1.20	1.38	2.13	1.08	1.21	1.51	2.13
87-5	115N07387	2 Mid Day	Weekday	AZ-87	Southbound	61.4	54.4	47.8	31.1	65	65	65	1.06	1.20	1.36	2.09				
87-5	115N07387	3 PM Peak	Weekday	AZ-87	Southbound	61.3	53.7	48.1	33.0	65	65	65	1.06	1.21	1.35	1.97				
87-5	115N07387	4 Evening	Weekday	AZ-87	Southbound	60.3	53.7	43.2	31.9	65	65	65	1.08	1.21	1.51	2.04				

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
87-6	115N07820	1 AM Peak	Weekday	AZ-87	Southbound	60.1	56.2	41.6	40.5	65	65	65	1.08	1.16	1.56	1.61	1.15	1.22	1.94	2.01
87-6	115N07820	2 Mid Day	Weekday	AZ-87	Southbound	56.6	54.3	33.6	32.5	65	65	65	1.15	1.20	1.94	2.00				
87-6	115N07820	3 PM Peak	Weekday	AZ-87	Southbound	57.8	53.3	38.0	32.3	65	65	65	1.12	1.22	1.71	2.01				
87-6	115N07820	4 Evening	Weekday	AZ-87	Southbound	58.5	55.2	41.6	40.5	65	65	65	1.11	1.18	1.56	1.61				
87-7	115N07388	1 AM Peak	Weekday	AZ-87	Southbound	31.1	30.1	8.7	13.7	45	45	45	1.45	1.50	5.17	3.29	1.64	1.60	6.59	3.66
87-7	115N07388	2 Mid Day	Weekday	AZ-87	Southbound	27.4	28.1	6.8	12.4	45	45	45	1.64	1.60	6.59	3.62				
87-7	115N07388	3 PM Peak	Weekday	AZ-87	Southbound	29.1	28.4	6.8	12.3	45	45	45	1.55	1.59	6.59	3.66				
87-7	115N07388	4 Evening	Weekday	AZ-87	Southbound	32.1	30.4	13.0	14.9	45	45	45	1.40	1.48	3.45	3.02				
87-7	115N07389	1 AM Peak	Weekday	AZ-87	Southbound	17.3	17.5	5.5	8.5	35	35	35	2.02	2.00	6.37	4.09	2.08	2.22	6.37	4.09
87-7	115N07389	2 Mid Day	Weekday	AZ-87	Southbound	17.5	16.2	5.5	9.6	35	35	35	2.00	2.16	6.37	3.64				
87-7	115N07389	3 PM Peak	Weekday	AZ-87	Southbound	20.6	15.8	11.0	8.5	35	35	35	1.70	2.22	3.18	4.09				
87-7	115N07389	4 Evening	Weekday	AZ-87	Southbound	16.8	15.8	5.5	11.0	35	35	35	2.08	2.22	6.37	3.18				
260-8	115P05999	1 AM Peak	Weekday	AZ-260	Westbound	35.7	33.2	5.6	6.5	35	35	35	1.00	1.05	6.26	5.36	1.07	1.15	6.26	5.45
260-8	115P05999	2 Mid Day	Weekday	AZ-260	Westbound	32.7	30.4	5.6	6.4	35	35	35	1.07	1.15	6.26	5.45				
260-8	115P05999	3 PM Peak	Weekday	AZ-260	Westbound	33.3	30.3	6.2	6.8	35	35	35	1.05	1.15	5.63	5.12				
260-8	115P05999	4 Evening	Weekday	AZ-260	Westbound	35.8	34.1	7.2	7.5	35	35	35	1.00	1.03	4.89	4.69				
260-8	115P06331	1 AM Peak	Weekday	AZ-260	Westbound	49.0	47.5	14.9	21.7	55	55	55	1.12	1.16	3.69	2.53	1.12	1.18	3.69	2.76
260-8	115P06331	2 Mid Day	Weekday	AZ-260	Westbound	49.2	47.6	29.8	22.4	55	55	55	1.12	1.15	1.84	2.46				
260-8	115P06331	3 PM Peak	Weekday	AZ-260	Westbound	50.0	47.5	35.3	28.6	55	55	55	1.10	1.16	1.56	1.92				
260-8	115P06331	4 Evening	Weekday	AZ-260	Westbound	50.0	46.5	34.6	19.9	55	55	55	1.10	1.18	1.59	2.76				
260-9	115P06330	1 AM Peak	Weekday	AZ-260	Westbound	64.6	59.1	52.9	46.6	55	55	55	1.00	1.00	1.04	1.18	1.00	1.00	1.16	1.21
260-9	115P06330	2 Mid Day	Weekday	AZ-260	Westbound	62.0	58.8	47.2	48.3	55	55	55	1.00	1.00	1.16	1.14				
260-9	115P06330	3 PM Peak	Weekday	AZ-260	Westbound	63.2	57.5	51.5	46.1	55	55	55	1.00	1.00	1.07	1.19				
260-9	115P06330	4 Evening	Weekday	AZ-260	Westbound	61.8	57.7	48.3	45.4	55	55	55	1.00	1.00	1.14	1.21				
260-10	115P06328	1 AM Peak	Weekday	AZ-260	Westbound	57.2	50.8	42.9	32.0	65	65	65	1.14	1.28	1.51	2.03	1.17	1.29	1.56	2.03
260-10	115P06328	2 Mid Day	Weekday	AZ-260	Westbound	56.3	50.9	43.5	32.9	65	65	65	1.15	1.28	1.50	1.97				
260-10	115P06328	3 PM Peak	Weekday	AZ-260	Westbound	56.8	50.6	43.2	34.8	65	65	65	1.14	1.28	1.50	1.87				
260-10	115P06328	4 Evening	Weekday	AZ-260	Westbound	55.8	50.6	41.6	34.2	65	65	65	1.17	1.29	1.56	1.90				
260-10	115P06329	1 AM Peak	Weekday	AZ-260	Westbound	59.6	54.2	44.8	36.7	55	55	55	1.00	1.01	1.23	1.50	1.00	1.04	1.36	1.53
260-10	115P06329	2 Mid Day	Weekday	AZ-260	Westbound	57.2	53.3	40.6	35.9	55	55	55	1.00	1.03	1.36	1.53				
260-10	115P06329	3 PM Peak	Weekday	AZ-260	Westbound	58.0	52.8	42.3	36.5	55	55	55	1.00	1.04	1.30	1.51				
260-10	115P06329	4 Evening	Weekday	AZ-260	Westbound	57.6	52.7	41.6	36.3	55	55	55	1.00	1.04	1.32	1.51				
260-10	115P11107	1 AM Peak	Weekday	AZ-260	Westbound	58.9	54.8	45.9	43.2	55	55	55	1.00	1.00	1.20	1.27	1.00	1.02	1.28	1.27
260-10	115P11107	2 Mid Day	Weekday	AZ-260	Westbound	56.6	54.1	44.0	43.5	55	55	55	1.00	1.02	1.25	1.27				
260-10	115P11107	3 PM Peak	Weekday	AZ-260	Westbound	58.3	53.9	44.6	43.5	55	55	55	1.00	1.02	1.23	1.27				
260-10	115P11107	4 Evening	Weekday	AZ-260	Westbound	56.9	54.0	42.9	43.5	55	55	55	1.00	1.02	1.28	1.27				
260-11	115P06669	1 AM Peak	Weekday	AZ-260	Westbound	58.0	56.2	48.5	48.5	55	55	55	1.00	1.00	1.13	1.13	1.00	1.00	1.14	1.18

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
260-11	115P06669	2 Mid Day	Weekday	AZ-260	Westbound	56.8	55.5	48.2	49.0	55	55	55	1.00	1.00	1.14	1.12				
260-11	115P06669	3 PM Peak	Weekday	AZ-260	Westbound	57.8	55.8	51.1	49.9	55	55	55	1.00	1.00	1.08	1.10				
260-11	115P06669	4 Evening	Weekday	AZ-260	Westbound	57.8	55.7	48.2	46.6	55	55	55	1.00	1.00	1.14	1.18				
260-12	115P06325	1 AM Peak	Weekday	AZ-260	Westbound	48.7	43.2	35.5	23.6	55	55	55	1.13	1.27	1.55	2.33	1.16	1.27	1.73	2.46
260-12	115P06325	2 Mid Day	Weekday	AZ-260	Westbound	47.5	43.9	31.7	22.4	55	55	55	1.16	1.25	1.73	2.46				
260-12	115P06325	3 PM Peak	Weekday	AZ-260	Westbound	48.4	43.4	33.5	25.5	55	55	55	1.14	1.27	1.64	2.16				
260-12	115P06325	4 Evening	Weekday	AZ-260	Westbound	48.1	43.5	34.1	30.4	55	55	55	1.14	1.26	1.61	1.81				
260-12	115P06326	1 AM Peak	Weekday	AZ-260	Westbound	57.6	54.0	49.7	40.4	55	55	55	1.00	1.02	1.11	1.36	1.00	1.02	1.18	1.36
260-12	115P06326	2 Mid Day	Weekday	AZ-260	Westbound	56.5	54.2	48.5	42.6	55	55	55	1.00	1.01	1.13	1.29				
260-12	115P06326	3 PM Peak	Weekday	AZ-260	Westbound	56.9	53.8	48.6	41.0	55	55	55	1.00	1.02	1.13	1.34				
260-12	115P06326	4 Evening	Weekday	AZ-260	Westbound	56.9	54.6	46.6	44.6	55	55	55	1.00	1.01	1.18	1.23				
260-12	115P06327	1 AM Peak	Weekday	AZ-260	Westbound	58.5	54.6	51.0	43.8	55	55	55	1.00	1.01	1.08	1.25	1.00	1.01	1.15	1.25
260-12	115P06327	2 Mid Day	Weekday	AZ-260	Westbound	57.3	55.1	50.3	48.4	55	55	55	1.00	1.00	1.09	1.14				
260-12	115P06327	3 PM Peak	Weekday	AZ-260	Westbound	57.5	55.2	49.7	47.9	55	55	55	1.00	1.00	1.11	1.15				
260-12	115P06327	4 Evening	Weekday	AZ-260	Westbound	57.3	54.9	47.7	45.3	55	55	55	1.00	1.00	1.15	1.21				
260-13	115P06323	1 AM Peak	Weekday	AZ-260	Westbound	34.0	28.4	10.5	11.8	45	45	45	1.32	1.58	4.27	3.82	1.39	1.67	4.27	4.27
260-13	115P06323	2 Mid Day	Weekday	AZ-260	Westbound	34.9	30.0	13.6	12.4	45	45	45	1.29	1.50	3.30	3.62				
260-13	115P06323	3 PM Peak	Weekday	AZ-260	Westbound	35.4	29.6	14.8	12.4	45	45	45	1.27	1.52	3.04	3.62				
260-13	115P06323	4 Evening	Weekday	AZ-260	Westbound	32.4	27.0	11.8	10.5	45	45	45	1.39	1.67	3.82	4.27				
260-13	115P06324	1 AM Peak	Weekday	AZ-260	Westbound	43.9	44.2	26.7	37.3	45	45	45	1.03	1.02	1.69	1.21	1.03	1.04	1.69	1.37
260-13	115P06324	2 Mid Day	Weekday	AZ-260	Westbound	43.7	43.3	27.9	33.7	45	45	45	1.03	1.04	1.61	1.34				
260-13	115P06324	3 PM Peak	Weekday	AZ-260	Westbound	45.1	43.4	31.8	34.8	45	45	45	1.00	1.04	1.41	1.29				
260-13	115P06324	4 Evening	Weekday	AZ-260	Westbound	44.6	43.5	33.7	32.9	45	45	45	1.01	1.04	1.34	1.37				
77-16	115N05961	1 AM Peak	Weekday	AZ-77	Southbound	28.6	28.2	5.9	13.0	35	35	35	1.22	1.24	5.93	2.68	1.30	1.35	7.04	4.02
77-16	115N05961	2 Mid Day	Weekday	AZ-77	Southbound	26.9	26.2	5.0	8.7	35	35	35	1.30	1.34	7.04	4.02				
77-16	115N05961	3 PM Peak	Weekday	AZ-77	Southbound	27.4	26.0	5.0	8.7	35	35	35	1.28	1.35	7.04	4.02				
77-16	115N05961	4 Evening	Weekday	AZ-77	Southbound	28.0	28.4	6.8	14.3	35	35	35	1.25	1.23	5.12	2.45				
77-16	115N06390	1 AM Peak	Weekday	US-180	Southbound	32.4	30.9	10.5	14.3	45	45	45	1.39	1.46	4.27	3.14	1.45	1.50	4.27	3.62
77-16	115N06390	2 Mid Day	Weekday	US-180	Southbound	31.0	30.9	11.8	12.4	45	45	45	1.45	1.46	3.82	3.62				
77-16	115N06390	3 PM Peak	Weekday	US-180	Southbound	34.7	29.9	15.6	14.9	45	45	45	1.30	1.50	2.88	3.03				
77-16	115N06390	4 Evening	Weekday	US-180	Southbound	33.6	30.0	14.9	12.6	45	45	45	1.34	1.50	3.03	3.56				
77-16	115N06391	1 AM Peak	Weekday	US-180	Southbound	18.8	18.4	2.5	2.5	35	35	35	1.86	1.90	14.08	14.08	1.86	2.09	14.08	14.08
77-16	115N06391	2 Mid Day	Weekday	US-180	Southbound	18.9	16.8	3.4	3.7	35	35	35	1.85	2.09	10.27	9.35				
77-16	115N06391	3 PM Peak	Weekday	US-180	Southbound	19.2	16.9	2.5	3.7	35	35	35	1.82	2.07	14.08	9.35				
77-16	115N06391	4 Evening	Weekday	US-180	Southbound	21.2	19.0	5.0	3.7	35	35	35	1.65	1.84	6.98	9.35				
77-16	115N07001	1 AM Peak	Weekday	AZ-77	Southbound	42.6	45.3	21.7	28.5	55	55	55	1.29	1.21	2.53	1.93	1.29	1.23	2.53	2.25
77-16	115N07001	2 Mid Day	Weekday	AZ-77	Southbound	44.4	45.7	23.6	29.4	55	55	55	1.24	1.20	2.33	1.87				

Segment	TMC	timeperiod	week type	road number	road direction	cars mean	trucks mean	cars P05	trucks P05	Posted Speed limit	Assumed car free-flow speed	Assumed truck free-flow speed	cars TTI	Trucks TTI	cars PTI	Trucks PTI	Cars PeakTTI	Trucks PeakTTI	Cars PeakPTI	Trucks PeakPTI
77-16	115N07001	3 PM Peak	Weekday	AZ-77	Southbound	49.4	44.8	31.6	24.5	55	55	55	1.11	1.23	1.74	2.25				
77-16	115N07001	4 Evening	Weekday	AZ-77	Southbound	47.8	44.8	30.2	27.6	55	55	55	1.15	1.23	1.82	1.99				
77-16	115N07002	1 AM Peak	Weekday	AZ-77	Southbound	31.1	31.4	8.7	13.7	45	45	45	1.45	1.43	5.17	3.29	1.53	1.52	6.04	4.27
77-16	115N07002	2 Mid Day	Weekday	AZ-77	Southbound	29.5	31.0	7.4	11.8	45	45	45	1.53	1.45	6.04	3.81				
77-16	115N07002	3 PM Peak	Weekday	AZ-77	Southbound	32.7	29.6	9.0	10.5	45	45	45	1.38	1.52	5.00	4.27				
77-16	115N07002	4 Evening	Weekday	AZ-77	Southbound	32.5	30.8	10.5	12.9	45	45	45	1.39	1.46	4.27	3.50				
40B-17	115N05962	1 AM Peak	Weekday	AZ-77	Southbound	34.3	28.7	18.3	13.7	35	35	35	1.02	1.22	1.91	2.56	1.12	1.28	2.33	2.83
40B-17	115N05962	2 Mid Day	Weekday	AZ-77	Southbound	33.2	28.5	15.5	15.0	35	35	35	1.05	1.23	2.25	2.33				
40B-17	115N05962	3 PM Peak	Weekday	AZ-77	Southbound	33.6	27.7	16.7	12.4	35	35	35	1.04	1.26	2.10	2.83				
40B-17	115N05962	4 Evening	Weekday	AZ-77	Southbound	31.3	27.4	15.0	13.7	35	35	35	1.12	1.28	2.33	2.56				
40B-17	115N06392	1 AM Peak	Weekday	US-180	Southbound	23.4	22.3	5.0	3.7	35	35	35	1.49	1.57	7.02	9.38	1.49	1.75	18.79	14.08
40B-17	115N06392	2 Mid Day	Weekday	US-180	Southbound	23.9	22.2	3.7	5.0	35	35	35	1.46	1.58	9.38	7.02				
40B-17	115N06392	3 PM Peak	Weekday	US-180	Southbound	24.2	20.0	2.5	2.5	35	35	35	1.45	1.75	14.08	14.08				
40B-17	115N06392	4 Evening	Weekday	US-180	Southbound	23.4	20.5	1.9	2.5	35	35	35	1.49	1.71	18.79	14.08				

Closure Data

			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	12	9.3	8.0	0.37	0.32
87-2	9	17	20.6	2.0	0.46	0.04
87-3	22	27	95.9	12.0	0.87	0.11
87-4	22	36	161.2	16.0	1.47	0.15
87-5	6	9	7.0	2.0	0.23	0.07
87-6	9	18	8.0	12.0	0.18	0.27
87-7	3	2	1.0	3.0	0.07	0.20
260-8	4	1	1.0	0.0	0.05	0.00
260-9	4	13	6.0	11.0	0.30	0.55
260-10	17	19	42.0	41.0	0.49	0.48
260-11	5	11	10.0	22.0	0.40	0.88
260-12	22	27	47.7	93.0	0.43	0.85
260-13	2	3	0.0	4.0	0.00	0.40
277-14	7	4	4.0	0.0	0.11	0.00
377-15	34	14	7.0	9.0	0.04	0.05
77-16	3	0	0.0	0.0	0.00	0.00
40B-17	1	No Data				

	ITIS Category Description										
	Closures		Incidents/Accidents	Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
Segment	NB (or EB)	SB (or WB)	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)
87-1	0	0	6	0	0	0	0	0	0	0	0
87-2	0	0	1	0	0	0	1	0	0	0	0
87-3	0	0	8	0	0	5	1	0	0	0	0
87-4	0	0	14	0	0	4	1	0	0	0	0
87-5	0	0	2	0	0	1	0	0	0	0	0
87-6	0	0	9	0	0	0	0	0	0	0	1
87-7	0	0	0	0	0	0	0	0	0	0	1
260-8	0	0	0	0	0	0	0	0	0	0	0
260-9	0	0	7	0	0	0	0	0	0	1	1
260-10	0	0	3	0	0	0	2	0	0	1	2
260-11	0	0	6	0	0	0	0	0	0	1	3
260-12	0	0	8	0	0	0	0	0	0	2	4
260-13	0	0	2	0	0	0	0	0	0	0	1
277-14	0	0	0	0	0	1	0	0	0	0	0
377-15	0	0	7	0	0	0	0	0	0	0	0
77-16	0	0	0	0	0	0	0	0	0	0	0
40B-17	No Data										

HPMS Data

SEGMENT	MP_FROM	MP_TO	WEIGHTED AVERAGE NB/EB AADT	WEIGHTED AVERAGE SB/WB AADT	WEIGHTED AVERAGE AADT	NB/EB AADT	SB/WB AADT	2014 AADT	K Factor	D-Factor	T-Factor
87-1	177	182	7765	7816	15580	7550	7566	15116	8	53	5
87-2	182	191	8372	8469	16841	7703	7747	15450	10	51	5
87-3	191	213	4790	4785	9576	4981	4846	9827	10	51	10
87-4	213	235	4488	4551	9039	5342	5436	10778	11	50	10
87-5	235	241	5531	5452	10983	5933	5784	11717	9	51	10
87-6	241	250	5531	5452	10983	5933	5784	11717	9	51	10
87-7	250	253	9777	9433	19210	10224	8961	19185	10	53	8
260-8	252	256	5728	5749	11477	6871	7363	14233	13	52	2
260-9	256	260	4605	4581	9186	6793	7001	13796	19	51	2
260-10	260	277	2861	2744	5604	3356	2914	6270	14	54	4
260-11	277	282	2884	2842	5726	3166	2945	6112	13	52	6
260-12	282	304	2907	2940	5848	2977	2977	5954	11	50	9
260-13	304	306	3529	3587	7117	3814	3814	7627	12	50	12
277-14	306	313	584	608	1193	558	523	1082	9	52	10
377-15	0	34	974	1006	1981	1032	1058	2091	18	51	10
77-16	386	389	3907	3987	7893	3693	4001	7694	11	52	13
40B-17	287	288	5265	5404	10669	5498	5498	10996	10	50	9

SEGMENT	Loc ID	BMP	EMP	Length	Pos Dir AADT	Neg Dir AADT	Corrected Pos Dir AADT	Corrected Neg Dir AADT	2014 AADT	K Factor	D-Factor	D-Factor Adjusted	T-Factor
87-1	100974	177.04	177.98	0.94	10581	9830	10581	9830	20410	8	65	52	5
	100976	177.98	179.00	1.02	7813	8110	7813	8110	15923	5	56	51	5
	100977	179.00	179.80	0.80	5141	7396	5141	7396	12537	9	58	59	5
	100978	179.80	182.10	2.30	7033	6458	7033	6458	13491	9	61	52	5
87-2	100979	182.10	188.83	6.73	11510	12030	11510	12030	23540	10	51	51	5
	100980	188.83	190.84	2.01	7570	7094	7570	7094	14664	10	60	52	5
	100981	190.84	199.14	8.30	4648	4432	4648	4432	9080	11	70	51	6
87-3	100982	199.14	217.92	18.78	4981	4846	4981	4846	9827	10	75	51	10
87-4	100983	217.92	235.69	17.77	5342	5436	5342	5436	10778	11	80	50	10
87-5	100984	235.69	239.45	3.76	4810	4191	4810	4191	9001	10	65	53	11
	100985	239.45	251.28	11.83	0	0	6290	6290	12580	9	59	50	10
87-7	100986	251.28	251.85	0.57	8334	7931	8334	7931	16265	9	59	51	8
	100988	251.85	252.58	0.73	12363	11010	12363	11010	23372	10	52	53	7
	100990	252.58	254.58	2.00	9982	8507	9982	8507	18489	10	53	54	9
260-8	101501	252.29	252.88	0.59	8107	7105	8107	7105	15212	10	64	53	2
	101503	252.88	255.86	2.98	6599	7836	6599	7836	14435	12	69	54	2
	101505	255.86	258.58	2.72	0	0	6900	6900	13800	14	80	50	2
260-9	101506	258.58	263.19	4.61	6793	7001	6793	7001	13796	19	80	51	2
260-10	101507	263.19	266.87	3.68	0	0	5498	5498	10996	16	72	50	2
	101508	266.87	282.24	15.37	2843	2295	2843	2295	5138	14	66	55	4
260-12	101510	282.24	290.00	7.76	2598	0	2600	2600	5200	11	65	50	5
	101511	290.00	303.72	13.72	0	0	2982	2982	5964	11	68	50	11
	101512	303.72	305.75	2.03	4383	0	4383	4383	8766	11	68	50	11
260-13	101512	303.72	305.75	2.03	4383	0	4383	4383	8766	11	68	50	11
	101514	305.75	307.98	2.23	3070	3371	3296	3296	6591	12	70	50	12
277-14	101563	312.62	321.21	8.59	558	523	558	523	1082	9	54	52	10
377-15	101637	0.00	33.83	33.83	1032	1058	1032	1058	2091	18	51	51	10
77-16	100826	386.21	387.80	1.59	0	0	3300	3300	6600	11	53	50	13
	100827	387.80	388.67	0.87	4411	5283	4411	5283	9694	10	52	54	13
40B-17	101796	287.04	287.41	0.37	0	0	6210	6210	12420	10	53	50	8
	101798	287.41	288.37	0.96	4541	5705	5224	5224	10447	10	53	50	10

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	Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors
87-1	2 or 3 or 4 Lane Divided Highway	5.28	4	2	1	0	2
87-2	2 or 3 or 4 Lane Divided Highway	8.73	2	0	1	1	1
87-3	2 or 3 or 4 Lane Divided Highway	21.61	1	6	8	3	8
87-4	2 or 3 or 4 Lane Divided Highway	22.02	4	5	11	10	9
87-5	2 or 3 or 4 Lane Divided Highway	5.24	0	2	1	0	1
87-6	2 or 3 or 4 Lane Divided Highway	9.6	0	6	2	6	10
87-7	4 or 5 Lane Undivided Highway	1.64	1	0	1	1	0
260-8	4 or 5 Lane Undivided Highway	4.28	0	0	7	0	3
260-9	2 or 3 Lane Undivided Highway	3.48	0	1	1	1	1
260-10	2 or 3 or 4 Lane Divided Highway	16.53	1	2	2	3	4
260-11	2 or 3 Lane Undivided Highway	4.89	0	0	1	3	0
260-12	2 or 3 Lane Undivided Highway	21.74	4	1	5	3	6
260-13	4 or 5 Lane Undivided Highway	2.05	0	0	0	1	1
277-14	2 or 3 Lane Undivided Highway	6.83	0	0	1	0	1
377-15	2 or 3 Lane Undivided Highway	33.83	2	2	4	3	9
77-16	2 or 3 Lane Undivided Highway	2.36	0	1	0	0	1
40B-17	4 or 5 Lane Undivided Highway	0.75	1	0	0	0	0

Segment	Operating Environment	Fatal + Incapacitating Injury Crashes Involving Trucks	Fatal + Incapacitating Injury Crashes Involving Motorcycles	Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Weighted 5-Year (2010-2014) Average NB/EB AADT	Weighted 5-Year (2010-2014) Average SB/WB AADT	Weighted 5-Year (2010-2014) Average Total AADT
87-1	2 or 3 or 4 Lane Divided Highway	0	1	1	7765	7816	15580
87-2	2 or 3 or 4 Lane Divided Highway	0	1	1	8372	8469	16841
87-3	2 or 3 or 4 Lane Divided Highway	0	7	0	4790	4785	9576
87-4	2 or 3 or 4 Lane Divided Highway	1	15	1	4488	4551	9039
87-5	2 or 3 or 4 Lane Divided Highway	0	1	0	5531	5452	10983
87-6	2 or 3 or 4 Lane Divided Highway	0	2	0	5531	5452	10983
87-7	4 or 5 Lane Undivided Highway	0	0	1	9777	9433	19210
260-8	4 or 5 Lane Undivided Highway	1	1	0	5728	5749	11477
260-9	2 or 3 Lane Undivided Highway	0	0	1	4605	4581	9186
260-10	2 or 3 or 4 Lane Divided Highway	1	1	0	2861	2744	5604
260-11	2 or 3 Lane Undivided Highway	0	1	0	2884	2842	5726
260-12	2 or 3 Lane Undivided Highway	0	2	0	2907	2940	5848
260-13	4 or 5 Lane Undivided Highway	0	0	0	3529	3587	7117
277-14	2 or 3 Lane Undivided Highway	0	0	0	584	608	1193
377-15	2 or 3 Lane Undivided Highway	3	0	0	974	1006	1981
77-16	2 or 3 Lane Undivided Highway	0	0	0	3907	3987	7893
40B-17	4 or 5 Lane Undivided Highway	0	0	1	5265	5404	10669

HPMS Data

SEGMENT	MP_FROM	MP_TO	2010-2014 Weighted Average			2014			2013			2012			2011			2010		
			WEIGHTED AVERAGE NB/EB AADT	WEIGHTED AVERAGE SB/WB AADT	WEIGHTED AVERAGE AADT	NB/EB AADT	SB/WB AADT	2014 AADT	NB/EB AADT	SB/WB AADT	2014 AADT	NB/EB AADT	SB/WB AADT	2014 AADT	NB/EB AADT	SB/WB AADT	2014 AADT	NB/EB AADT	SB/WB AADT	2014 AADT
87-1	177	182	7765	7816	15580	7550	7566	15116	7108	7158	14264	6799	6753	13551	6570	6807	13377	10797	10797	21595
87-2	182	191	8372	8469	16841	7703	7747	15450	8214	8306	16521	8128	8287	16415	8824	9017	17841	8989	8989	17978
87-3	191	213	4790	4785	9576	4981	4846	9827	4314	4314	8627	4225	4071	8298	5932	6195	12128	4500	4500	9000
87-4	213	235	4488	4551	9039	5342	5436	10778	4152	4374	8526	4197	4197	8393	4350	4350	8700	4400	4400	8800
87-5	235	241	5531	5452	10983	5933	5784	11717	5370	5370	10740	5309	5257	10566	5432	5465	10897	5611	5383	10994
87-6	241	250	5531	5452	10983	5933	5784	11717												
87-7	250	253	9777	9433	19210	10224	8961	19185	10092	9815	19907	10147	9966	20112	8466	8466	16932	9958	9958	19915
260-8	252	256	5728	5749	11477	6871	7363	14233	5765	6169	11933	5108	4920	10027	5121	4516	9638	5776	5776	11552
260-9	256	260	4605	4581	9186	6793	7001	13796	4967	4967	9933	3344	3404	6746	3623	3733	7356	4300	3800	8100
260-10	260	277	2861	2744	5604	3356	2914	6270	2731	3076	5806	2292	2046	4340	2850	2850	5700	3074	2832	5906
260-11	277	282	2884	2842	5726	3166	2945	6112												
260-12	282	304	2907	2940	5848	2977	2977	5954	3089	3226	6315	2699	2708	5407	2762	2783	5545	3009	3009	6018
260-13	304	306	3529	3587	7117	3814	3814	7627	3720	3801	7521	3539	3749	7288	2873	2873	5746	3700	3700	7401
277-14	306	313	584	608	1193	558	523	1082	540	507	1047	443	631	1075	681	681	1362	700	700	1400
377-15	0	34	974	1006	1981	1032	1058	2091	954	1006	1961	941	993	1936	943	973	1917	1000	1000	2000
77-16	386	389	3907	3987	7893	3693	4001	7694	4340	4341	8681	3939	4171	8109	3848	3848	7696	3713	3572	7285
40B-17	287	288	5265	5404	10669	5498	5498	10996	5231	5927	11156	4902	4902	9804	5208	5208	10416	5487	5487	10974

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)
87-1	5	12	3229.7	1548.0	129.19	61.92
87-2	9	17	5392.8	6635.0	119.84	147.44
87-3	22	27	294154.2	6515.0	2674.13	59.23
87-4	22	36	479587.6	3741.0	4359.89	34.01
87-5	6	9	1476.0	650.0	49.20	21.67
87-6	9	18	1672.0	12959.0	37.16	287.98
87-7	3	2	320.0	10404.0	21.33	693.60
260-8	4	1	229.0	0.0	11.45	0.00
260-9	4	13	1437.0	14538.0	71.85	726.90
260-10	17	19	13387.0	67805.0	157.49	797.71
260-11	5	11	3610.0	23051.0	144.40	922.04
260-12	22	27	12871.3	99178.0	117.01	901.62
260-13	2	3	0.0	7393.0	0.00	739.30
277-14	7	4	701.0	0.0	20.03	0.00
377-15	34	14	1724.0	1579.5	10.14	9.29
77-16	3	0	0.0	0.0	0.00	0.00
40B-17	No Data					

	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)
87-1	0	0	6	6	0	0	0	0	0	0	0	0
87-2	0	0	15	1	0	0	0	1	0	0	0	0
87-3	0	0	13	8	0	0	5	1	0	0	0	0
87-4	0	0	17	14	0	0	4	1	0	0	0	0
87-5	0	0	6	2	0	0	1	0	0	0	0	0
87-6	0	0	8	9	0	0	0	0	0	0	0	1
87-7	0	0	1	0	0	0	0	0	0	0	0	1
260-8	0	0	1	0	0	0	0	0	0	0	0	0
260-9	0	0	4	7	0	0	0	0	0	0	1	1
260-10	0	0	11	3	0	0	0	2	0	0	1	2
260-11	0	0	1	6	0	0	0	0	0	0	1	3
260-12	0	0	13	8	0	0	0	0	0	0	2	4
260-13	0	0	0	2	0	0	0	0	0	0	0	1
277-14	0	0	3	0	0	0	1	0	0	0	0	0
377-15	0	0	7	7	0	0	0	0	0	0	0	0
77-16	0	0	0	0	0	0	0	0	0	0	0	0
40B-17	No Data											

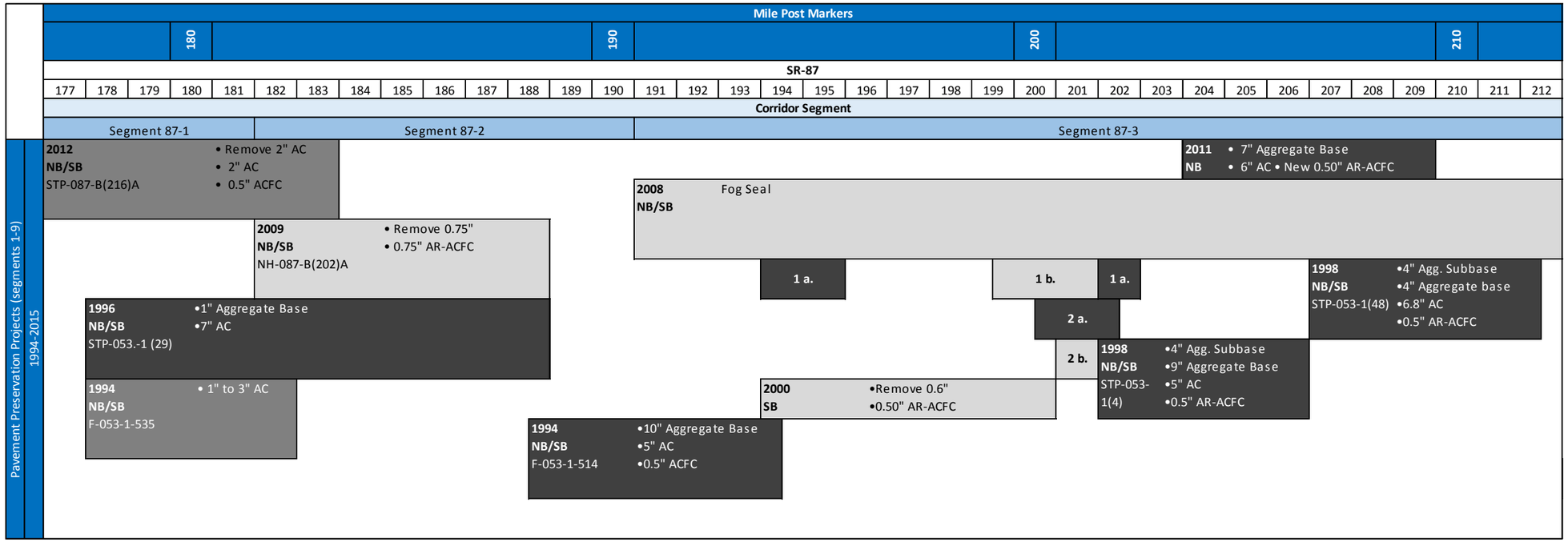
See the **Mobility Performance Area Data** section for other Freight Performance Area related data.

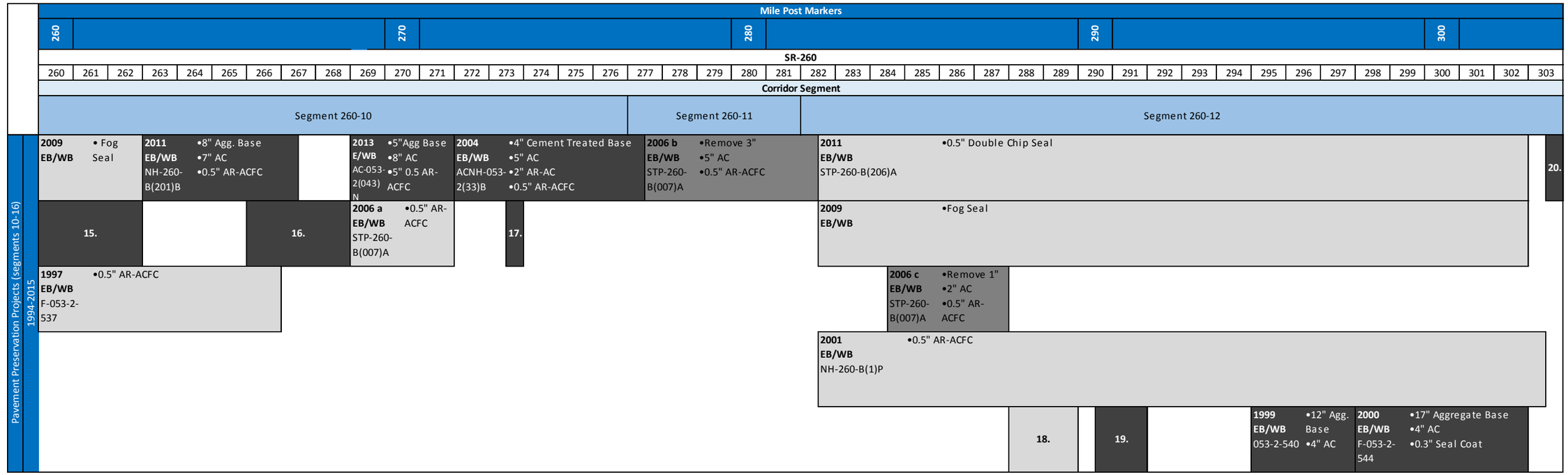
Appendix D: Needs Analysis Contributing Factors and Scores

Pavement Performance Needs Analysis

Segment	Segment Length (miles)	Segment Mileposts (MP)	Final Need	Bid History Investment	PeCos History Investment	Resulting Historical Investment	Contributing Factors and Comments
87-1	5.28	177-182	Low	Low	Medium	Low	Hot spot 1 mile NB MP 177-178
87-2	8.73	182-191	None	Low	High	Medium	
87-3	21.61	191-213	Low	Low	High	Medium	Hot spot 5 miles SB MP 195-199, SB MP 200-201
87-4	22.02	213-235	Low	Medium	High	High	Hot spot 1 mile NB/SB MP 224-226
87-5	5.24	235-241	None	Low	Low	Low	
87-6	9.6	241-250	None	High	High	High	
87-7	1.64	250-253	None	Medium	Medium	Medium	
260-8	4.28	252-256	None	Low	Low	Low	
260-9	3.48	256-260	None	Medium	Low	Medium	
260-10	16.53	260-277	None	Low	Medium	Low	
260-11	4.89	277-282	None	Low	Low	Low	
260-12	21.74	282-304	None	Low	Medium	Low	Hot spot 1 mile EB, MP 288-289
260-13	2.05	304-306	Medium	Low	Low	Low	Hot spot 1 mile EB MP 304-305
277-14	6.83	306-313	High	Low	Low	Low	Hot spot 5 miles NB MP 307-310, NB MP 311-313
377-15	33.83	0-34	None	Low	Low	Low	
77-16	2.36	386-389	Medium	Low	Medium	Low	Hot spot 1 mile NB MP 388-389
40B-17	0.75	287-288	Low	Low	High	Medium	

Pavement History




Mile Post Markers
260
270
280
290
300
SR-260
260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303
Corridor Segment
Segment 260-10
Segment 260-11
Segment 260-12
Pavement Preservation Projects (segments 10-16)
1994-2015
2009 EB/WB • Fog Seal
2011 EB/WB NH-260-B(201)B •8" Agg. Base •7" AC •0.5" AR-ACFC
2013 E/WB AC-053-2(043) N •5"Agg Base •8" AC •5" 0.5 AR-ACFC
2004 EB/WB ACNH-053-2(33)B •4" Cement Treated Base •5" AC •2" AR-AC •0.5" AR-ACFC
2006 b EB/WB STP-260-B(007)A •Remove 3" •5" AC •0.5" AR-ACFC
2011 EB/WB STP-260-B(206)A •0.5" Double Chip Seal
20.
15.
16.
2006 a EB/WB STP-260-B(007)A •0.5" AR-ACFC
17.
2009 EB/WB •Fog Seal
1997 EB/WB F-053-2-537 •0.5" AR-ACFC
2006 c EB/WB STP-260-B(007)A •Remove 1" •2" AC •0.5" AR-ACFC
2001 EB/WB NH-260-B(1)P •0.5" AR-ACFC
18.
19.
1999 EB/WB 053-2-540 •12" Agg. Base •4" AC
2000 EB/WB F-053-2-544 •17" Aggregate Base •4" AC •0.3" Seal Coat
310
10
20
30
386
287
SR-260
SR-277
SR-377
SR-77
I-40 B
304 305 306 307 308 309 310 311 312 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 386 387 388 287
Corridor Segment
Segment 260-13
Segment 277-14
Segment 377-15
Segment 77-16
Seg 40B-17
Pavement Preservation Projects (segments 10-16)
1994-2015
20.
2009 NB/SB ARRA-277A(201)A •0.3" Slurry Seal
2004 NB/SB STP-377-A(002)A •2.5" AC •0.5" AR-ACFC
2003 NB/SB S-377-A-500 •0.5" AR-ACFC
21.
22.
2002 NB/SB STP-069-1(1)P •3" AC •Fog Seal

Pavement Treatment Reference Numbers	
1 a. 2006 (NB): 8" Aggregate Base, 5" AC, 0.5" AR-ACFC	**11. 2001 (SB)**: 12" Aggregate Base, 3" AC
1 b. 2006 (NB): 2" AC, 0.5" AR-ACFC	**12. 2002 (NB/SB)**: 0.5" AR-ACFC
2 a. 2004 (SB): 4" Aggregate Subbase, 10" Aggregate Base, 6" AC, 0.5" AR-ACFC	**13. 2001 (SB)**: Remove 3.5", 3.5" AC, Fog Seal
2 b. 2004 (NB): Remove 0.5", 0.5" AR-ACFC	**14. 1995 (EB/WB)**: 6" Aggregate Base, 4" AC, 0.3" Seal Coat
3. 2004 (NB/SB): Remove 3.5", 3" AC, 0.5" ACFC	**15. 2004 (EB/WB)**: 6" Cement Treated Subgrade, 3" AC, 2" AR-AC, 0.5" AR-ACFC
4. 2012 (NB): Remove 3.5", 3" AC, 0.50" AR-ACFC	**16. 2006 (EB/WB)**: 6" Aggregate Base, 5" AC, 2" AR-AC, 0.5" AR-ACFC
5. 2012 (SB): Outside Lane: Remove 3.5", 3" AC, 0.50" AR-ACFC	**17. 1995 (EB/WB)**: 12" Aggregate Base, 5" AC, 0.3" Seal Coat
6 a. 2004 (NB): 1" Seal Coat, 0.5" ACFC	**18. 1994 (EB/WB)**: 0.5" Double Chip Seal
6 b. 2004 (NB): Remove 3.5", 3" AC, 1" Seal Coat, 0.5" ACFC	**19. 2000 (EB/WB)**: 12" Aggregate Base, 4" AC, 0.3" Seal Coat
7. 2006 (SB): Remove 3.5", 3" AC, 0.3" Bituminous Membrane, 0.5" ACFC	**20. 1996 (EB/WB)**: 12" Aggregate Base, 4" AC, 0.3" Seal Coat
8. 2003 (NB): Remove 4", 3.5" AC, 0.5" AR-ACFC	**21. 2008 (NB/SB)**: Remove 3", 3" AC, Fog Seal
9. 2010 (SB): 0.5" ACFC, 6.5" AC, 10" Aggregate Base	**22. 2009 (NB/SB)**: 0.5" AR-ACFC
10. 2009 (SB): Remove 5", 4.5" AC, 0.5" AR-ACFC	

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	

Value	Level	Segment Number															
		87-1		87-2		87-3		87-4		87-5		87-6		87-7		260-8	
		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				78%	11%	100%	10%	24%		92%		100%		50%		
1					6%	5%									33%		
1						32%											
1																	
3	L2							33%	2%		8%	28%			50%		100%
3								26%	14%		92%						
3								5%	17%								
3								2%	17%								
3																	
3																	
4	L3		100%		22%	2%		17%	21%			100%	100%	50%	50%		
4									19%								
4																	
4																	
6	L4					27%		2%									
6						14%											
6						9%											
6																	
6																	
6																	
Sub-Total		0.0	4.0	0.0	1.7	3.6	1.0	2.9	3.4	0.0	3.9	4.8	5.0	2.0	4.3	0.0	3.0
Total		**4.0**		**1.7**		**2.8**		**4.8**		**3.9**		**7.4**		**5.3**		**3.0**	

Value	Level	Segment Number																	
		260-9		260-10		260-11		260-12		260-13		277-14		377-15		77-16		40B-17	
		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		100%		18%				93%				100%		84%				100%
1									93%						84%				
1					18%				95%										
1									9%										
3	L2		100%														33%		
3																			
3																			
3																			
3																			
3																			
4	L3						90%		2%						16%				
4									16%										
4																			
4																			
6	L4		25%																
6																			
6																			
6																			
6																			
6																			
Sub-Total		0.0	5.5	0.0	0.4	0.0	3.6	0.0	3.6	0.0	0.0	0.0	1.0	0.0	2.3	0.0	1.0	0.0	1.0
Total		**5.5**		**0.4**		**3.6**		**3.6**		**0.0**		**1.0**		**2.3**		**1.0**		**1.0**	

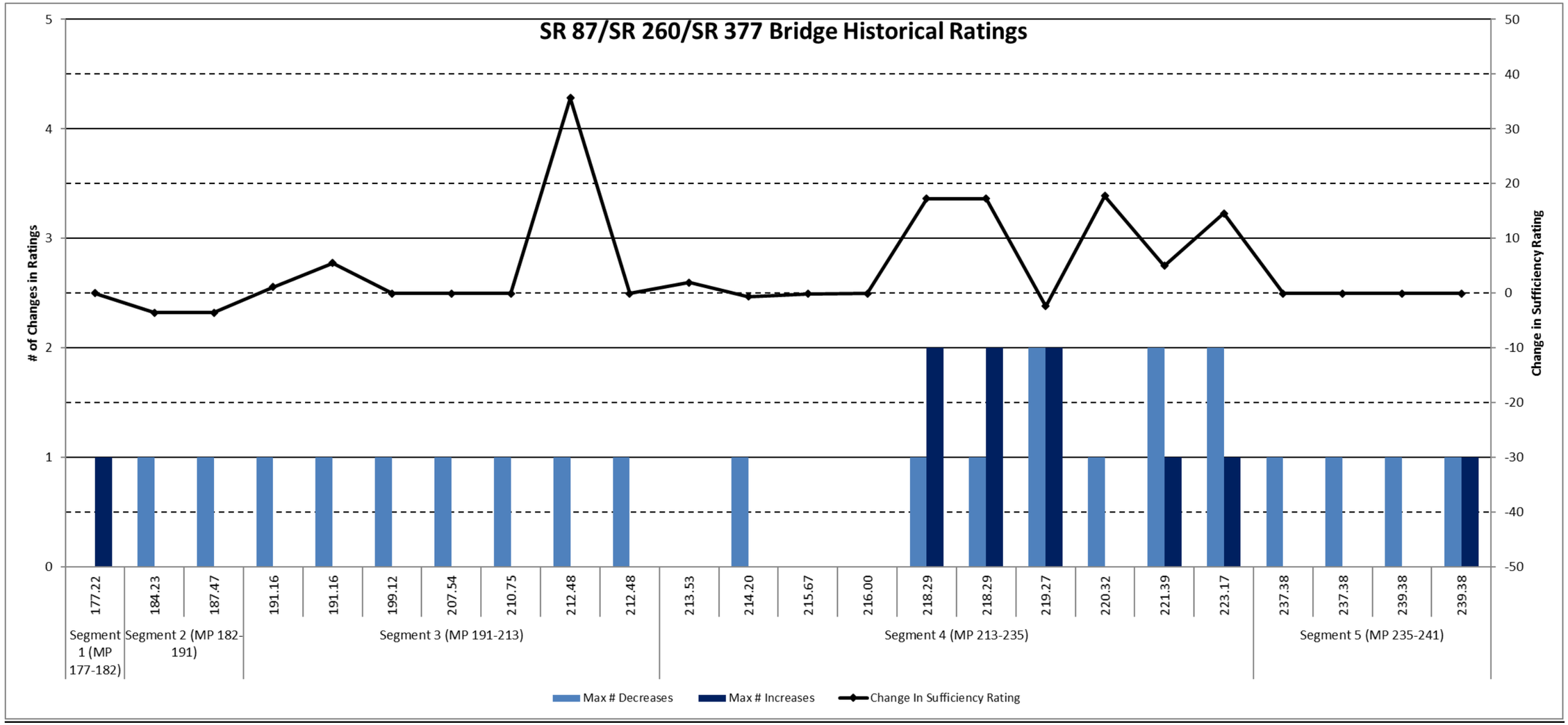
Pavement Historical Investment

Segment	Pavement History Value (bid projects)	Pavement History Score (bid projects)	Pavement History (bid projects)	PeCos ($/mile/yr)	PeCos Score	PeCos	Resulting Historical Investment
87-1	4.00	-0.56	Low	$1,974.68	-0.21	Medium	Low
87-2	1.72	-1.59	Low	$71,187.31	10.04	High	Medium
87-3	2.78	-1.11	Low	$14,503.66	1.64	High	Medium
87-4	4.81	-0.20	Medium	$4,124.55	0.11	High	High
87-5	3.92	-0.60	Low	$387.59	-0.45	Low	Low
87-6	7.42	0.97	High	$4,272.35	0.13	High	High
87-7	5.33	0.03	Medium	$3,741.76	0.05	Medium	Medium
260-8	3.00	-1.01	Low	$839.32	-0.38	Low	Low
260-9	5.50	0.11	Medium	$340.88	-0.45	Low	Medium
260-10	0.35	-2.20	Low	$2,879.04	-0.08	Medium	Low
260-11	3.60	-0.74	Low	$174.96	-0.48	Low	Low
260-12	3.64	-0.73	Low	$2,412.33	-0.15	Medium	Low
260-13	0.00	-2.35	Low	$350.01	-0.45	Low	Low
277-14	1.00	-1.91	Low	$329.98	-0.45	Low	Low
377-15	2.32	-1.32	Low	$546.02	-0.42	Low	Low
77-16	1.00	-1.91	Low	$3,837.01	0.07	Medium	Low
40B-17	1.00	-1.91	Low	$5,913.33	0.37	High	Medium

Bridge Performance Needs Analysis

Segment	Segment Length (Miles)	Segment Mileposts (MP)	Number of Bridges in Segment	# Functionally Obsolete Bridges	Final Need	Contributing Factors			Comments
						Bridge	Current Ratings	Historical Review	
87-1	5.28	177-182	1	0	None	No bridges with current ratings less than 6 and no historical issues			
87-2	8.73	182-191	2	0	None	No bridges with current ratings less than 6 and no historical issues			
87-3	21.61	191-213	7	0	None	No bridges with current ratings less than 6 and no historical issues			
87-4	22.02	213-235	10	0	None	No bridges with current ratings less than 6 and no historical issues			
87-5	5.24	235-241	4	0	None	No bridges with current ratings less than 6 and no historical issues			
87-6	9.6	241-250	0	0	None	No bridges with current ratings less than 6 and no historical issues			
87-7	1.64	250-253	0	0	None	No bridges with current ratings less than 6 and no historical issues			
260-8	4.28	252-256	0	0	None	No bridges with current ratings less than 6 and no historical issues			
260-9	3.48	256-260	0	0	None	No bridges with current ratings less than 6 and no historical issues			
260-10	16.53	260-277	33	0	None	No bridges with current ratings less than 6 and no historical issues			
260-11	4.89	277-282	3	0	None	No bridges with current ratings less than 6 and no historical issues			
260-12	21.74	282-304	1	0	None	No bridges with current ratings less than 6 and no historical issues			
260-13	2.05	304-306	1	0	None	No bridges with current ratings less than 6 and no historical issues			
277-14	6.83	306-313	0	0	None	No bridges with current ratings less than 6 and no historical issues			
377-15	33.83	0-34	0	0	None	No bridges with current ratings less than 6 and no historical issues			
77-16	2.36	386-389	1	1 (Little Colorado River Bridge #2030)	Low	No bridges with current ratings less than 6 and no historical issues			Little Colorado River Bridge is considered functionally obsolete
40B-17	0.75	287-288	0	0	None	No bridges with current ratings less than 6 and no historical issues			

Bridge Ratings History

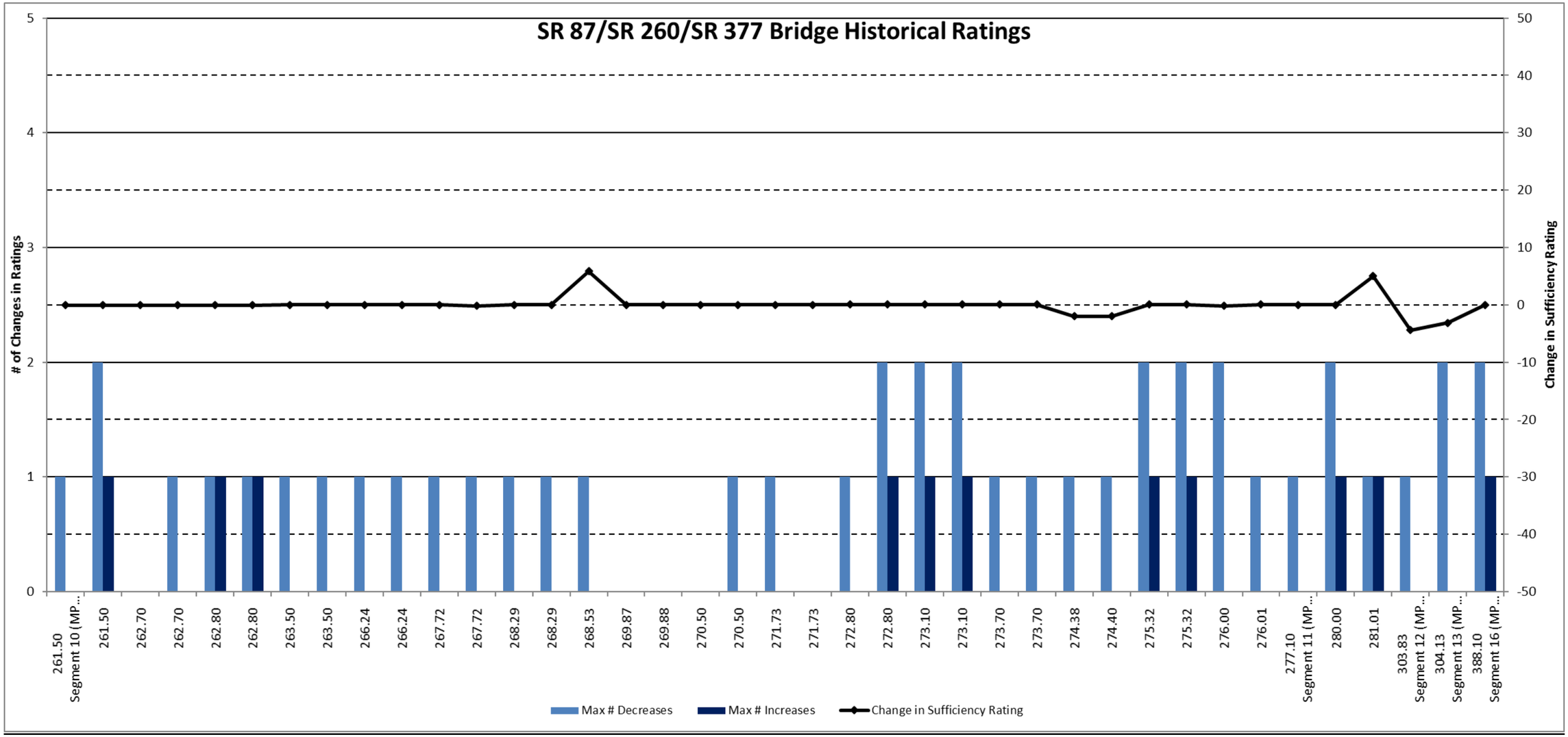


O identifies the bridge indicated is of concern from a historical ratings perspective

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

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

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



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

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

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

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

Mobility Performance Needs Analysis

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Roadway Variables								Traffic Variables					Relevant Mobility Related Existing Infrastructure
				Functional Classification	Environmental Type (Urban/Rural)	Terrain	# of Lanes/ Direction	Weighted Average Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2035 LOS	% Trucks	NB Buffer Index (PTI-TTI)	SB Buffer Index (PTI-TTI)	
87-1	177-182	5.28	Low	State Highway	Urban	Level	2	59	No	Divided	-	A-C	D	5%	2.80	1.98	
87-2	182-191	8.73	Low	State Highway	Fringe Urban	Level	2	65	No	Divided	-	D	E/F	5%	1.22	2.63	
87-3	191-213	21.61	Low	State Highway	Rural	Level	2	65	No	Divided	-	A/B	A/B	10%	0.49	0.44	DMS NB, MP 191.2; Climbing/Passing Lane SB, MP 205.4-207.0
87-4	213-235	22.02	Low	State Highway	Rural	Mountainous	2	63	No	Divided	-	A/B	A/B	10%	0.88	0.42	Safety pullout area SB, MP 223 and MP 217 Brake check area NB, MP 223
87-5	235-241	5.24	Low	State Highway	Rural	Level	2	65	No	Divided	-	A/B	A/B	10%	0.41	0.43	Mazatzal Rest Area EB, MP 235 (currently closed)
87-6	241-250	9.6	Low	State Highway	Rural	Mountainous	2	65	No	Divided	-	A/B	A/B	10%	1.07	0.79	Safety pullout area SB MP 248
87-7	250-253	1.64	Low	State Highway	Urban	Level	2	39	Yes	Non-Divided	-	D	E/F	8%	3.25	4.62	
260-8	252-256	4.28	Low	State Highway	Urban	Level	2	51	Yes	Non-Divided	-	A-C	A-C	2%	5.70	3.87	DMS EB, MP 255.0 Speed cameras EB/WB, MP 255.5 and 255.9
260-9	256-260	3.48	High	State Highway	Rural	Level	1	53	No	Non-Divided	-	D-F	D-F	2%	0.49	0.16	Elk crossing EB/WB MP 259.5
260-10	260-277	16.53	Low	State Highway	Rural	Level	2	60	No	Divided	-	A/B	A/B	4%	0.51	0.34	
260-11	277-282	4.89	Low	State Highway	Rural	Mountainous	2	55	No	Non-Divided	-	A/B	A/B	6%	0.92	0.14	
260-12	282-304	21.74	Low	State Highway	Rural	Level	1	54	No	Non-Divided	73%	A/B	A/B	9%	0.18	0.30	DMS EB/WB, MP 302.4; CCTV EB/WB, MP 302.4; Safety pullout area EB/WB, MP 282 Passing Lane: NB, MP 284.8 - 285.4; SB, MP 288.5 - 287.9; SB, MP 291.0 - 291.8; NB, MP 290.4 - 291.3; NB, MP 295.0 - 295.8; SB, MP 296.6 - 297.8; NB, MP 297.8 - 299.4; SB, MP 301.0 - 302.1
260-13	304-306	2.05	Low	State Highway	Fringe Urban	Level	2	45	Yes	Non-Divided	-	A-C	A-C	12%	0.61	1.77	
277-14	306-313	6.83	Low	State Highway	Rural	Level	1	52	No	Non-Divided	54%	A/B	A/B	10%	-	-	
377-15	0-34	33.83	Low	State Highway	Rural	Level	1	64	No	Non-Divided	30%	A/B	A/B	10%	-	-	RWIS NB, MP 0.1 Flash flood warning sign NB/SB MP 12.5

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 2035 LOS	% Trucks	NB Buffer Index (PTI-TTI)	SB Buffer Index (PTI-TTI)	
77-16	386-389	2.36	High	State Highway	Fringe Urban	Level	1	49	No	Non-Divided	40%	D	E/F	13%	2.76	5.31	DMS SB, MP 387.5; CCTV NB/SB, MP 387.5; Speed feedback sign, NB/SB MP 388
40B-17	287-288	0.75	Low	State Highway	Urban	Level	2	35	Yes	Non-Divided	-	A-C	A-C	9%	11.13	9.25	

Mobility Performance Needs Analysis (continued)

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent							Non-Actionable Conditions	Programmed and Planned Projects or Issues from Previous Documents Relevant to Final Need	Contributing Factors
				Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related			
87-1	177-182	5.28	Low	12	12	100%	0	0%	0	0%		Planned: DMS SR 87, SB MP 180	Percentage of closures due to incidents above the statewide average (100% to 96%)
87-2	182-191	8.73	Low	17	16	94%	1	6%	0	0%			Percentage of closures due to obstructions/hazards above the statewide average (6% to 3%)
87-3	191-213	21.61	Low	27	21	78%	6	22%	0	0%			Percentage of closures due to obstructions/hazards above the statewide average (22% to 3%)
87-4	213-235	22.02	Low	36	31	86%	5	14%	0	0%			Percentage of closures due to obstructions/hazards above the statewide average (14% to 3%)
87-5	235-241	5.24	Low	9	8	89%	1	11%	0	0%			Percentage of closures due to obstructions/hazards above the statewide average (11% to 3%)
87-6	241-250	9.6	Low	18	17	94%	0	0%	1	6%			Percentage of closures due to weather above the statewide average (6% to 1%)
87-7	250-253	1.64	Low	2	1	50%	0	0%	1	50%			Percentage of closures due to weather above the statewide average (50% to 1%)
260-8	252-256	4.28	Low	1	1	100%	0	0%	0	0%			Percentage of closures due to incidents above the statewide average (100% to 96%)
260-9	256-260	3.48	High	13	11	85%	0	0%	2	15%		Programmed: SR 260, Lion Springs Section (MP 258-260) - reconstruct to 4-lane divided highway - FY 2021 for design (ADOT Five Year Facility Construction Program 2017-2021)	Percentage of closures due to weather above the statewide average (6% to 1%)
260-10	260-277	16.53	Low	19	14	74%	2	11%	3	16%			Percentage of closures due to obstructions/hazards above the statewide average (11% to 3%) Percentage of closures due to weather above the statewide average (16% to 1%)

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			
260-11	277-282	4.89	Low	11	7	64%	0	0%	4	36%			Percentage of closures due to weather above the statewide average (36% to 1%)
260-12	282-304	21.74	Low	27	21	78%	0	0%	6	22%		Planned: Shoulder widening, MP 282-304 (Project Assessment, 2014)	Percentage of closures due to weather above the statewide average (22% to 1%)
260-13	304-306	2.05	Low	3	2	67%	0	0%	1	33%			Percentage of closures due to weather above the statewide average (33% to 1%)
277-14	306-313	6.83	Low	4	3	75%	1	25%	0	0%			Percentage of closures due to obstructions/hazards above the statewide average (25% to 3%)
377-15	0-34	33.83	Low	14	14	100%	0	0%	0	0%		Programmed: Reconstruct horizontal curves and widen shoulders to 8 ft in both directions (MP 3-34) FY 2018 (ADOT Five Year Facility Construction Program 2017-2021); Widen/upgrade road to four lanes (BQAZ)	Percentage of closures due to incidents above the statewide average (100% to 96%)
77-16	386-389	2.36	High	0	0	0%	0	0%	0	0%		Planned: Widen SR 77, Holbrook to Tucson (BQAZ); Construct an alternate route to SR 77/40B-17 in Holbrook (ADOT, unpublished)	At-grade railroad crossing
40B-17	287-288	0.75	Low	No Data									At-grade railroad crossing

Safety Performance Needs Analysis

Segment Number	87-1	87-2	87-3	87-4	87-5	87-6	87-7	260-8	260-9
Segment Length (miles)	5.28	8.73	21.61	22.02	5.24	9.6	1.64	4.28	3.48
Segment Milepost (MP)	177-182	182-191	191-213	213-235	235-241	241-250	250-253	252-256	256-260
Final Need	High	Low	High	High	Medium	High	N/A	Low	N/A
Segment Crash Overview	6 Crashes were fatal 1 Crashes had incapacitating injuries 0 Crashes involve trucks 1 Crashes involve Motorcycles	2 Crashes were fatal 2 Crashes had incapacitating injuries 0 Crashes involve trucks 1 Crashes involve Motorcycles	7 Crashes were fatal 11 Crashes had incapacitating injuries 0 Crashes involve trucks 7 Crashes involve Motorcycles	9 Crashes were fatal 21 Crashes had incapacitating injuries 1 Crashes involve trucks 15 Crashes involve Motorcycles	2 Crashes were fatal 1 Crashes had incapacitating injuries 0 Crashes involve trucks 1 Crashes involve Motorcycles	6 Crashes were fatal 8 Crashes had incapacitating injuries 0 Crashes involve trucks 2 Crashes involve Motorcycles	1 Crashes were fatal 2 Crashes had incapacitating injuries 0 Crashes involve trucks 0 Crashes involve Motorcycles	0 Crashes were fatal 7 Crashes had incapacitating injuries 1 Crashes involve trucks 1 Crashes involve Motorcycles	1 Crashes were fatal 2 Crashes had incapacitating injuries 0 Crashes involve trucks 0 Crashes involve Motorcycles
Segment Crash Summaries (Fatal and Serious Injury Crashes): First Harmful Event Type	29% Involve Collision with Pedestrian 29% Involve Collision with Fixed Object 29% Involve Collision with Motor Vehicle	N/A - Sample size too small	39% Involve Overturning 28% Involve Other Non-Collision 22% Involve Collision with Motor Vehicle	30% Involve Collision with Fixed Object 27% Involve Other Non-Collision 23% Involve Overturning	N/A - Sample size too small	36% Involve Overturning 29% Involve Collision with Fixed Object 21% Involve Other Non-Collision	N/A - Sample size too small	57% Involve Collision with Motor Vehicle 29% Involve Collision With Animal 14% Involve Other Non-Collision	N/A - Sample size too small
Segment Crash Summaries (Fatal and Serious Injury Crashes): Collision Type	43% Involve Other 29% Involve Single Vehicle 14% Involve Angle	N/A - Sample size too small	72% Involve Single Vehicle 11% Involve Sideswipe (same) 6% Involve Rear End	80% Involve Single Vehicle 13% Involve Other 3% Involve Angle	N/A - Sample size too small	86% Involve Single Vehicle 7% Involve Sideswipe (same) 7% Involve Rear End	N/A - Sample size too small	43% Involve Single Vehicle 14% Involve Head On 14% Involve Angle	N/A - Sample size too small
Segment Crash Summaries (Fatal and Serious Injury Crashes): Violation or Behavior	43% Involve Unknown 29% Involve Failure to Yield Right-of- 14% Involve Speed too Fast for Conditions	N/A - Sample size too small	28% Involve Speed too Fast for Conditions 22% Involve No Improper Action 11% Involve Failure to Keep in Proper Lane	53% Involve Speed too Fast for Conditions 20% Involve No Improper Action 10% Involve Inattention/Distraction	N/A - Sample size too small	29% Involve Speed too Fast for Conditions 21% Involve Inattention/Distraction 14% Involve Unknown	N/A - Sample size too small	29% Involve No Improper Action 29% Involve Unknown 14% Involve Speed too Fast for Conditions	N/A - Sample size too small
Segment Crash Summaries (Fatal and Serious Injury Crashes): Lighting Conditions	29% Occur in Dark-Lighted Conditions 29% Occur in Dark-Unlighted Conditions 29% Occur in Dark-Unknown Lighting Conditions	N/A - Sample size too small	72% Occur in Daylight Conditions 22% Occur in Dark-Unlighted Conditions 6% Occur in Dawn Conditions	73% Occur in Daylight Conditions 20% Occur in Dark-Unlighted Conditions 7% Occur in Dawn Conditions	N/A - Sample size too small	86% Occur in Daylight Conditions 14% Occur in Dark-Unlighted Conditions	N/A - Sample size too small	71% Occur in Daylight Conditions 14% Occur in Dawn Conditions 14% Occur in Dark-Unlighted Conditions	N/A - Sample size too small
Segment Crash Summaries (Fatal and Serious Injury Crashes): Surface Conditions	71% Involve Dry Conditions 29% Involve Unknown Conditions	N/A - Sample size too small	78% Involve Dry Conditions 17% Involve Wet Conditions 6% Involve Mud, Dirt, Gravel	80% Involve Dry Conditions 13% Involve Wet Conditions 7% Involve Ice/Frost Conditions	N/A - Sample size too small	79% Involve Dry Conditions 21% Involve Wet Conditions	N/A - Sample size too small	83% Involve Dry Conditions 17% Involve Wet Conditions	N/A - Sample size too small
Segment Crash Summaries (Fatal and Serious Injury Crashes): First Unit Event	43% Involve a first unit event of Motor Vehicle in Transport 14% Involve a first unit event of Collision with Pedestrian 14% Involve a first unit event of Ran Off the Road (Right)	N/A - Sample size too small	28% Involve a first unit event of Ran Off the Road (Left) 28% Involve a first unit event of Motor Vehicle in Transport 22% Involve a first unit event of Ran Off the Road (Right)	57% Involve a first unit event of Ran Off the Road (Right) 23% Involve a first unit event of Ran Off the Road (Left) 7% Involve a first unit event of Other Non-Collision	N/A - Sample size too small	57% Involve a first unit event of Ran Off the Road (Right) 29% Involve a first unit event of Ran Off the Road (Left) 7% Involve a first unit event of Crossed Centerline	N/A - Sample size too small	57% Involve a first unit event of Motor Vehicle in Transport 29% Involve a first unit event of Collision with Animal 14% Involve a first unit event of Other Non-Collision	N/A - Sample size too small
Segment Crash Summaries (Fatal and Serious Injury Crashes): Driver Physical Condition	57% Unknown 29% Under the Influence of Drugs or Alcohol 14% No Apparent Influence	N/A - Sample size too small	44% No Apparent Influence 33% Unknown 11% Under the Influence of Drugs or Alcohol	63% No Apparent Influence 33% Unknown 3% Fatigued/Fell Asleep	N/A - Sample size too small	50% Under the Influence of Drugs or Alcohol 21% No Apparent Influence 21% Unknown	N/A - Sample size too small	71% No Apparent Influence 14% Under the Influence of Drugs or Alcohol 14% Unknown	N/A - Sample size too small
Segment Crash Summaries (Fatal and Serious Injury Crashes): Safety Device Usage	43% Air Bag Deployed/Shoulder-Lap 29% Shoulder And Lap Belt Used 14% Unknown	N/A - Sample size too small	22% Helmet Used 22% Shoulder And Lap Belt Used 17% None Used	40% Helmet Used 27% Shoulder And Lap Belt Used 17% None Used	N/A - Sample size too small	50% Shoulder And Lap Belt Used 36% None Used 7% Helmet Used	N/A - Sample size too small	57% Shoulder And Lap Belt Used 29% None Used 14% Helmet Used	N/A - Sample size too small
Hot Spot Crash Summaries				Hot spot NB MP 213-215		Hot spot SB MP 245-245		Hot spot NB MP 252-253	
Previously Completed Safety-Related Projects				Signage and rumble strips just added - per District meeting	Signage and rumble strips just added - per District meeting				
District Interviews/Discussions				The SR 87/SR 188 intersection has experienced high numbers of crashes. A grade separated intersection is desired by the District. Many vehicles run the stop sign on SR 188. The area experiences heavy recreational use (trucks with trailers or boats).	The SR 87/SR 188 intersection has experienced high numbers of crashes. A grade separated intersection is desired by the District. Many vehicles run the stop sign on SR 188. The area experiences heavy recreational use (trucks with trailers or boats).	Temporary Jersey barriers have been placed along Corvair curve (MP 246 SB) in the past to help promote safety but they have since been removed.			
Contributing Factors	• Roadway departure • Driver inattention/distraction • Inadequate barrier between pedestrian and vehicle facilities • Shoulder/rumble strip condition • Inadequate lighting • Lack of crossing opportunity • Driving under the influence	N/A - Sample size too small	• Speed too fast for conditions • Driver inattention/distraction • Roadway departure • Pavement surface condition • Improper lane changes • Shoulder/rumble strip condition • Clear zone slopes and obstructions • Slippery/wet pavement surface	• Speed too fast for conditions • Driver inattention/distraction • Roadway departure • Pavement surface condition • Shoulder/rumble strip condition • Clear zone slopes and obstructions • Slippery/wet pavement surface	N/A - Sample size too small	• Speed too fast for conditions • Driver inattention/distraction • Roadway departure • Pavement surface condition • Shoulder/rumble strip condition • Clear zone slopes and obstructions • Slippery/wet pavement surface • Driving under the influence	N/A - Sample size too small	• Speed too fast for conditions • Driver inattention/distraction • Urban operating conditions • High traffic volume operating conditions • Animals on roadway • Inadequate lighting • Slippery/wet pavement surface	N/A - Sample size too small

Segment Number		260-10	260-11	260-12	260-13	277-14	377-15	77-16	40B-17	Corridor-Wide Crash Characteristics
Segment Length (miles)		16.53	4.89	21.74	2.05	6.83	33.83	2.36	0.75	
Segment Milepost (MP)		260-277	277-282	282-304	304-306	306-313	0-34	386-389	287-288	
Final Need		Low	N/A	High	N/A	N/A	High	N/A	N/A	
Segment Crash Overview		3 Crashes were fatal 5 Crashes had incapacitating injuries 1 Crashes involve trucks 1 Crashes involve Motorcycles	0 Crashes were fatal 2 Crashes had incapacitating injuries 0 Crashes involve trucks 1 Crashes involve Motorcycles	5 Crashes were fatal 10 Crashes had incapacitating injuries 0 Crashes involve trucks 2 Crashes involve Motorcycles	0 Crashes were fatal 1 Crashes had incapacitating injuries 0 Crashes involve trucks 0 Crashes involve Motorcycles	0 Crashes were fatal 1 Crashes had incapacitating injuries 0 Crashes involve trucks 0 Crashes involve Motorcycles	4 Crashes were fatal 7 Crashes had incapacitating injuries 3 Crashes involve trucks 0 Crashes involve Motorcycles	1 Crashes were fatal 0 Crashes had incapacitating injuries 0 Crashes involve trucks 0 Crashes involve Motorcycles	1 Crashes were fatal 0 Crashes had incapacitating injuries 0 Crashes involve trucks 0 Crashes involve Motorcycles	48 Crashes were fatal 81 Crashes had incapacitating injuries 6 Crashes involve trucks 32 Crashes involve Motorcycles
Segment Crash Summaries (Fatal and Serious Injury Crashes)	First Harmful Event Type	25% Involve Collision with Motor Vehicle 25% Involve Overturning 25% Involve Other Non-Collision	N/A - Sample size too small	33% Involve Collision with Motor Vehicle 27% Involve Overturning 20% Involve Collision with Fixed Object	N/A - Sample size too small	N/A - Sample size too small	73% Involve Overturning 18% Involve Collision with Motor Vehicle 9% Involve Collision with Fixed Object	N/A - Sample size too small	N/A - Sample size too small	26% Involve Collision with Motor Vehicle 26% Involve Overturning 19% Involve Other Non-Collision
	Collision Type	75% Involve Single Vehicle 25% Involve Head On	N/A - Sample size too small	60% Involve Single Vehicle 27% Involve Head On 7% Involve Angle	N/A - Sample size too small	N/A - Sample size too small	73% Involve Single Vehicle 9% Involve Sideswipe (same) 9% Involve Sideswipe (opposite)	N/A - Sample size too small	N/A - Sample size too small	63% Involve Single Vehicle 9% Involve Other 8% Involve Head On
	Violation or Behavior	25% Involve Speed too Fast for Conditions 25% Involve Drove in Opposing Lane 13% Involve Made Improper Turn	N/A - Sample size too small	40% Involve Speed too Fast for Conditions 13% Involve Failure to Yield Right-of- 13% Involve Drove in Opposing Lane	N/A - Sample size too small	N/A - Sample size too small	27% Involve Speed too Fast for Conditions 27% Involve Failure to Keep in Proper 18% Involve Inattention/Distraction	N/A - Sample size too small	N/A - Sample size too small	31% Involve Speed too Fast for Conditions 13% Involve No Improper Action 12% Involve Unknown
	Lighting Conditions	63% Occur in Daylight Conditions 25% Occur in Dark-Unlighted 13% Occur in Dark-Lighted Conditions	N/A - Sample size too small	80% Occur in Daylight Conditions 7% Occur in Dawn Conditions 7% Occur in Dusk Conditions	N/A - Sample size too small	N/A - Sample size too small	73% Occur in Daylight Conditions 27% Occur in Dark-Unlighted Conditions	N/A - Sample size too small	N/A - Sample size too small	68% Occur in Daylight Conditions 20% Occur in Dark-Unlighted 5% Occur in Dawn Conditions
	Surface Conditions	88% Involve Dry Conditions 13% Involve Wet Conditions	N/A - Sample size too small	100% Involve Dry Conditions	N/A - Sample size too small	N/A - Sample size too small	91% Involve Dry Conditions 9% Involve Ice/Frost Conditions	N/A - Sample size too small	N/A - Sample size too small	81% Involve Dry Conditions 12% Involve Wet Conditions 3% Involve Unknown Conditions
	First Unit Event	50% Involve a first unit event of Ran Off the Road (Left) 13% Involve a first unit event of Collision with Animal 13% Involve a first unit event of Crossed Centerline	N/A - Sample size too small	40% Involve a first unit event of Ran Off the Road (Right) 27% Involve a first unit event of Motor Vehicle in Transport 20% Involve a first unit event of Crossed Centerline	N/A - Sample size too small	N/A - Sample size too small	64% Involve a first unit event of Ran Off the Road (Right) 27% Involve a first unit event of Crossed Centerline 9% Involve a first unit event of Motor Vehicle in Transport	N/A - Sample size too small	N/A - Sample size too small	35% Involve a first unit event of Ran Off the Road (Right) 23% Involve a first unit event of Motor Vehicle in Transport 17% Involve a first unit event of Ran Off the Road (Left)
	Driver Physical Condition	38% No Apparent Influence 25% Under the Influence of Drugs or Alcohol 25% Unknown	N/A - Sample size too small	60% No Apparent Influence 20% Unknown 13% Under the Influence of Drugs or Alcohol	N/A - Sample size too small	N/A - Sample size too small	36% Under the Influence of Drugs or Alcohol 36% Unknown 27% No Apparent Influence	N/A - Sample size too small	N/A - Sample size too small	46% No Apparent Influence 32% Unknown 17% Under the Influence of Drugs or Alcohol
	Safety Device Usage	38% Shoulder And Lap Belt Used 25% None Used 13% Helmet Used	N/A - Sample size too small	60% Shoulder And Lap Belt Used 13% Helmet Used 13% Air Bag Deployed/Shoulder-Lap Belt	N/A - Sample size too small	N/A - Sample size too small	55% Shoulder And Lap Belt Used 36% None Used 9% Air Bag Deployed/Shoulder-Lap Belt	N/A - Sample size too small	N/A - Sample size too small	39% Shoulder And Lap Belt Used 19% Helmet Used 19% None Used
Hot Spot Crash Summaries										
Previously Completed Safety-Related Projects		SR 260 was widened from a 2-lane undivided highway to a 4-lane divided highway in 2010-2011 at MP 263-267 and in 2011-2012 at MP 269-272.					Programmed: Design and Reconstruct Curves, entire segment, FY 2018			
District Interviews/Discussions							The intersection of SR 77 and SR 377 has experienced fatalities in the past; Coordinating the traffic signal timing at I-40 Buisiness Loop/SR 77 to the railroad crossing would be beneficial	There is no left-turn lane on SR 77 in Holbrook south of Erie Street (safety and operations concern); Coordinating the traffic signal timing at I-40 Buisiness Loop/SR 77 to the railroad crossing would be beneficial		
Contributing Factors		• Speed too fast for conditions • Driver inattention/distraction • Roadway departure • Inadequate roadway geometry • Pavement surface condition • Shoulder/rumble strip condition • Clear zone slopes and obstructions • Slippery/wet pavement surface • Animals on roadway • Driving under the influence Comment: Conversion from 2-lane undivided to 4-lane divided in 2010-2011 at MP 263-267 and in 2011-2012 at MP 269-272 may have eliminated some of these contributing factors	N/A - Sample size too small	• Speed too fast for conditions • Driver inattention/distraction • Roadway departure • Inadequate roadway geometry • Pavement surface condition • Shoulder/rumble strip condition • Clear zone slopes and obstructions • Driving under the influence	N/A - Sample size too small	N/A - Sample size too small	• Speed too fast for conditions • Driver inattention/distraction • Roadway departure • Pavement surface condition • Shoulder/rumble strip condition • Clear zone slopes and obstructions • Slippery/wet pavement surface • Driving under the influence • Lack of restraint usage	N/A - Sample size too small	N/A - Sample size too small	• Speed too fast for conditions • Driver inattention/distraction • Roadway departure • Inadequate roadway geometry • Pavement surface condition • Shoulder/rumble strip condition • Clear zone slopes and obstructions • Slippery/wet pavement surface • Animals on roadway • Driving under the influence

Freight Performance Needs Analysis

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Roadway Variables								Traffic Variables					Relevant Freight Related Existing Infrastructure
				Functional Classification	Environmental Type (Urban/Rural)	Terrain	# of Lanes/ Direction	Weighted Average Speed Limit	Aux Lanes	Divided/ Non-Divided	% No Passing	Existing LOS	Future 2035 LOS	% Trucks	NB/EB Buffer Index (TPTI-TTTI)	SB/WB Buffer Index (TPTI-TTTI)	
87-1	177-182	5.28	Low	State Highway	Urban	Level	2	59	No	Divided	-	A-C	D	5%	2.59	2.28	
87-2	182-191	8.73	Low	State Highway	Fringe Urban	Level	2	65	No	Divided	-	D	E/F	5%	1.53	2.75	
87-3	191-213	21.61	High	State Highway	Rural	Level	2	65	No	Divided	-	A/B	A/B	10%	0.26	1.14	DMS NB, MP 191.2; Climbing/Passing Lane SB MP 205.4 - 207.0
87-4	213-235	22.02	High	State Highway	Rural	Mountainous	2	63	No	Divided	-	A/B	A/B	10%	1.00	0.42	Truck Escape Ramp NB, MP 227; Safety pullout area SB, MP 223 and MP 217; Brake check area NB, MP 223
87-5	235-241	5.24	High	State Highway	Rural	Level	2	65	No	Divided	-	A/B	A/B	10%	0.34	0.92	Mazatzal Rest Area EB, MP 235.7 (currently closed)
87-6	241-250	9.6	High	State Highway	Rural	Mountainous	2	65	No	Divided	-	A/B	A/B	10%	0.97	0.79	Safety pullout area SB, MP 248
87-7	250-253	1.64	Low	State Highway	Urban	Level	2	39	Yes	Non-Divided	-	D	E/F	8%	2.10	1.97	
260-8	252-256	4.28	High	State Highway	Urban	Level	2	51	Yes	Non-Divided	-	A-C	A-C	2%	7.98	2.94	DMS EB, MP 255.0; Speed cameras EB/WB, MP 255.5 and 255.9)
260-9	256-260	3.48	High	State Highway	Rural	Level	1	53	No	Non-Divided	-	D-F	D-F	2%	1.89	0.21	Elk crossing EB/WB MP 259.5
260-10	260-277	16.53	High	State Highway	Rural	Level	2	60	No	Divided	-	A/B	A/B	4%	0.59	0.50	
260-11	277-282	4.89	High	State Highway	Rural	Mountainous	2	55	No	Non-Divided	-	A/B	A/B	6%	1.08	0.18	
260-12	282-304	21.74	High	State Highway	Rural	Level	1	54	No	Non-Divided	73%	A/B	A/B	9%	0.19	0.59	DMS EB/WB, MP 302.4; CCTV EB/WB, MP 302.4; Safety pullout EB/WB MP 282; Passing Lane: NB, MP 284.8 - 285.4; SB, MP 288.5 - 287.9; SB, MP 291.0 - 291.8; NB, MP 290.4 - 291.3; NB, MP 295.0 - 295.8; SB, MP 296.6 - 297.8; NB, MP 297.8 - 299.4; SB, MP 301.0 - 302.1
260-13	304-306	2.05	High	State Highway	Fringe Urban	Level	2	45	Yes	Non-Divided	-	A-C	A-C	12%	1.65	1.46	

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 2035 LOS	% Trucks	NB/EB Buffer Index (TPTI-TTTI)	SB/WB Buffer Index (TPTI-TTTI)	
277-14	306-313	6.83	N/A	State Highway	Rural	Level	1	52	No	Non-Divided	54%	A/B	A/B	10%	-	-	
377-15	0-34	33.83	N/A	State Highway	Rural	Level	1	64	No	Non-Divided	30%	A/B	A/B	10%	-	-	RWIS NB, MP 0.1; Flash flood warning signs NB/SB, MP 12.5
77-16	386-389	2.36	Medium	State Highway	Fringe Urban	Level	1	49	No	Non-Divided	40%	D	E/F	13%	2.41	4.11	DMS SB, MP 387.5; CCTV NB/SB, MP 387.5; Speed feedback sign NB/SB, MP 388
40B-17	287-288	0.75	High	State Highway	Urban	Level	2	35	Yes	Non-Divided	-	A-C	A-C	9%	27.78	6.94	

Freight Performance Needs Analysis (continued)

Segment	Segment Mileposts (MP)	Segment Length (miles)	Final Need	Closure Extent							Non-Actionable Conditions	Programmed and Planned Projects or Issues from Previous Documents Relevant to Final Need	Contributing Factors
				Total Number of Closures	# Incidents/ Accidents	% Incidents/ Accidents	# Obstructions/ Hazards	% Obstructions/ Hazards	# Weather Related	% Weather Related			
87-1	177-182	5.28	Low	12	12	100%	0	0%	0	0%		Planned: DMS SR 87 SB MP 180	Percentage of closures due to incidents above the statewide average (100% to 96%)
87-2	182-191	8.73	Low	17	16	94%	1	6%	0	0%			Percentage of closures due to obstructions/hazards above the statewide average (6% to 3%)
87-3	191-213	21.61	High	27	21	78%	6	22%	0	0%		Planned: Widen/upgrade to six lanes (BQAZ)	Percentage of closures due to obstructions/hazards above the statewide average (22% to 3%)
87-4	213-235	22.02	High	36	31	86%	5	14%	0	0%		Planned: Widen/upgrade to six lanes (BQAZ); Construct landslide mitigation measures (Project Assessment, 2012)	Percentage of closures due to obstructions/hazards above the statewide average (14% to 3%)
87-5	235-241	5.24	High	9	8	89%	1	11%	0	0%		Planned: Widen/upgrade to six lanes (BQAZ)	Percentage of closures due to obstructions/hazards above the statewide average (11% to 3%)
87-6	241-250	9.6	High	18	17	94%	0	0%	1	6%		Planned: Widen/upgrade to six lanes (BQAZ)	Percentage of closures due to weather above the statewide average (6% to 1%)
87-7	250-253	1.64	Low	2	1	50%	0	0%	1	50%			Percentage of closures due to weather above the statewide average (50% to 1%)
260-8	252-256	4.28	High	1	1	100%	0	0%	0	0%		Planned: SR 260, SR 87 to Manzanita Drive - incorporate recommendations from RSA and TOAS (Payson Transportation Study); SR 260/Manzanita Drive intersection - incorporate recommendations from RSA and TOAS (Payson Transportation Study)	Percentage of closures due to incidents above the statewide average (100% to 96%)
260-9	256-260	3.48	High	13	11	85%	0	0%	2	15%		Programmed: SR 260, Lion Springs Section (MP 258-260) - reconstruct to 4-lane divided highway - FY 2021 for design (ADOT Five Year Facility Construction Program 2017-2021) Planned: Widen/upgrade road to four lanes (BQAZ)	Percentage of closures due to weather above the statewide average (6% to 1%)
260-10	260-277	16.53	High	19	14	74%	2	11%	3	16%		Planned: Widen/upgrade road to four lanes (BQAZ)	Percentage of closures due to obstructions/hazards above the statewide average (11% to 3%) Percentage of closures due to weather above the statewide average (16% to 1%)

260-11	277-282	4.89	High	11	7	64%	0	0%	4	36%		Planned: Widen/upgrade road to four lanes (BQAZ)	Percentage of closures due to weather above the statewide average (36% to 1%)
260-12	282-304	21.74	High	27	21	78%	0	0%	6	22%		Planned: Shoulder widening, MP 282-304 (Project Assessment, 2014); Planned: Widen/upgrade road to four lanes (BQAZ);	Percentage of closures due to weather above the statewide average (22% to 1%)
260-13	304-306	2.05	High	3	2	67%	0	0%	1	33%		Planned: Widen/upgrade road to four lanes (BQAZ)	Percentage of closures due to weather above the statewide average (33% to 1%)
277-14	306-313	6.83	N/A	4	3	75%	1	25%	0	0%			Percentage of closures due to obstructions/hazards above the statewide average (25% to 3%)
377-15	0-34	33.83	N/A	14	14	100%	0	0%	0	0%		Programmed: Reconstruct horizontal curves and widen shoulders to 8 ft in both directions (MP 3-34) FY 2018 (ADOT Five Year Facility Construction Program 2017-2021); Widen/upgrade road to four lanes (BQAZ)	Percentage of closures due to incidents above the statewide average (100% to 96%)
77-16	386-389	2.36	Medium	0	0	0%	0	0%	0	0%		Planned: Widen SR 77, Holbrook to Tucson (BQAZ); Construct an alternate route to SR 77/40B-17 in Holbrook (ADOT, unpublished)	At-grade railroad crossing
40B-17	287-288	0.75	High	No Data								Planned: Construct an alternate route to SR 77/40B-17 in Holbrook (ADOT, unpublished)	

Needs Summary Table

Performance Area	87-1	87-2	87-3	87-4	87-5	87-6	87-7	260-8	260-9	260-10	260-11	260-12	260-13	277-14	377-15	77-16	40B-17^
	MP 177-182	MP 182-191	MP 191-213	MP 213-235	MP 235-241	MP 241-250	MP 250-253	MP 252-256	MP 256-260	MP 260-277	MP 277-282	MP 282-304	MP 304-306	MP 306-313	MP 0-34	MP 386-389	MP 287-288
Pavement	Low	None	Low	Low	None	None	None	None	None	None	None	None	Medium	High	None	Medium	Low
Bridge	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	Low	None
Mobility*	Low	Low	Low	Low	Low	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	High	Low
Safety*	High	Low	High	High	Medium	High	N/A#	Low	N/A	Low	N/A	High	N/A	N/A	High	N/A	N/A
Freight*	Low	Low	High	High	High	High	Low	High	High	High	High	High	High	N/A	N/A	Medium	High
Average Need	**1.31**	**0.69**	**1.77**	**1.77**	**1.38**	**1.62**	**0.60**	**1.15**	**1.80**	**1.15**	**1.20**	**1.62**	**1.60**	**1.29**	**1.20**	**2.10**	**1.40**

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

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

Appendix E: Life-Cycle Cost Analysis

Pavement Life-Cycle Cost Analysis Worksheet

Project Details	
Project title	Slate Creek Pavement Improvements
Route	SR 87
Milepost begin	224
Milepost end	226

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)	=	4	
Right shoulder width (ft)	=	10	
Total roadway analysis segment length (centerline miles)	=	1	
Current year	=	2016	
Elevation (> 4,000 ft or < 4,000 ft)?	=	> 4,000 ft	<<Select from Pull-down List>>
Roadway width (ft) [each direction lanes & shoulders]	=	38	
Total lane-miles [total traffic direction lanes & shoulders]	=	6.3	
Total square feet [total traffic direction lanes & shoulders]	=	401,280	
Total square yards [total traffic direction lanes & shoulders]	=	44,587	

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

Design Alternatives (DA)

	Characteristics		Pavement Material Cost ($)		
Treatment Type	*Pavement Thickness*	*Typical Service Life (years)*	*Lane-miles*	*Square Feet*	*Square Yards*
Concrete Reconstruction	8"-12"	26-30	$350,000	$5.5	$50
Asphalt Reconstruction	8"-12"	22-26	$280,000	$4.4	$40
Concrete Medium Rehab	1"-3"	20-24	$75,000	$1.2	$11
Concrete Light Rehab	<1"	14-18	$50,000	$0.8	$7
Asphalt Medium Rehab	3"-8"	16-20	$105,000	$1.7	$15
Asphalt Light Rehab	<3"	10-14	$70,000	$1.1	$10

Reconstruction: Other Materials Cost Factor
1.60

Rehab: Other Materials Cost Factor
1.20

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

			Total Unit Cost ($) [includes material costs and indirect costs]			Total Bi-Directional Cost ($)
Treatment Type	Pavement Thickness	Typical Service Life (years)	Lane-miles	Square Feet	Square Yards	Total Cost
Concrete Reconstruction	8"-12"	26-30	$1,366,400	$21.6	$194	$8,653,867
Asphalt Reconstruction	8"-12"	22-26	$1,093,120	$17.3	$155	$6,923,093
Concrete Medium Rehab	1"-3"	20-24	$219,600	$3.5	$31	$1,390,800
Concrete Light Rehab	<1"	14-18	$146,400	$2.3	$21	$927,200
Asphalt Medium Rehab	3"-8"	16-20	$307,440	$4.9	$44	$1,947,120
Asphalt Light Rehab	<3"	10-14	$204,960	$3.2	$29	$1,298,080

Pavement Service Life, Intervals, and Sequence of Improvements

SR 87 MP 224 - MP 226

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	5	9
Asphalt Light Rehab	12	10-14	0	3	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

SR 87 MP 224 - MP 226

Year	Project Number	Tracs No.	Direction of Improvement	Treatment Type	Improvement Description	Thickness (inches)	Beg. MP	End MP	Length (miles)
2001	STP-053-1(31)	H2306 02 C	NB/SB	Asphalt Reconstruction	Initial construction of the new portion of the roadway (both directions)				
					Aggregate Base	5	218	226	8
					Asphaltic Concrete	6	218	226	8
					ACFC with Asphaltic Rubber (AR-ACFC)	0.5	218	226	8
2006	087-B-NFA	H7055 01 C	SB	Asphalt Medium Rehab	Mill existing material	3.5	218	226	8
					Asphaltic Concrete	3	218	226	8
					AR-ACFC	0.5	218	226	8
2012	087 MA 218	H8272 01 C	NB/SB	Asphalt Medium Rehab	Mill existing material	3.5	218	226	8
					Asphaltic Concrete	3	218	226	8
					AR-ACFC	0.5	218	226	8

Interval between Improvements in Years	Treatment Type Options	Estimated Historical Interval Value
After Asphalt Reconstruction:	Concrete Reconstruction	
After Asphalt Medium Rehab: 5	Asphalt Reconstruction	
After Asphalt Medium Rehab: 6	Concrete Medium Rehab	
	Concrete Light Rehab	
	Asphalt Medium Rehab	5.5
	Asphalt Light Rehab	

Design Alternative # 1 - Concrete Reconstruction

SR 87 MP 224 - MP 226

Concrete Reconstruction

Number of Years	Year	Concrete Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Concrete Reconstruction	$8,653,867	$7,688,848	$6,601,993
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	None	$0	$0	$0
9	2025	None	$0	$0	$0
10	2026	None	$0	$0	$0
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	None	$0	$0	$0
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	None	$0	$0	$0
17	2033	None	$0	$0	$0
18	2034	None	$0	$0	$0
19	2035	Concrete Light Rehab	$927,200	$544,632	$274,325
20	2036	None	$0	$0	$0
21	2037	None	$0	$0	$0
22	2038	None	$0	$0	$0
23	2039	None	$0	$0	$0
24	2040	None	$0	$0	$0
25	2041	None	$0	$0	$0
26	2042	None	$0	$0	$0
27	2043	Concrete Medium Rehab	$1,390,800	$644,907	$239,489
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	None	$0	$0	$0
32	2048	None	$0	$0	$0
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	None	$0	$0	$0
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	Concrete Light Rehab	$927,200	$310,596	$75,853
39	2055	None	$0	$0	$0
40	2056	None	$0	$0	$0
41	2057	None	$0	$0	$0
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	None	$0	$0	$0
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Concrete Light Rehab	$521,550	$142,056	$26,571
Enter Year of Last Used DA Improvement ››		2054	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$9,046,928	$7,165,090
AGENCY COST	$11,377,517	

Design Alternative # 2 - Asphalt Reconstruction

SR 87 MP 224 - MP 226

Enter Name of Design Alternative

Number of Years	Year	Asphalt Reconstruction	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Asphalt Reconstruction	$6,923,093	$6,151,079	$5,281,595
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	None	$0	$0	$0
9	2025	None	$0	$0	$0
10	2026	None	$0	$0	$0
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	None	$0	$0	$0
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	None	$0	$0	$0
17	2033	Asphalt Light Rehab	$1,298,080	$808,921	$439,705
18	2034	None	$0	$0	$0
19	2035	None	$0	$0	$0
20	2036	None	$0	$0	$0
21	2037	None	$0	$0	$0
22	2038	None	$0	$0	$0
23	2039	Asphalt Medium Rehab	$1,947,120	$1,016,187	$439,491
24	2040	None	$0	$0	$0
25	2041	None	$0	$0	$0
26	2042	None	$0	$0	$0
27	2043	None	$0	$0	$0
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	None	$0	$0	$0
32	2048	Asphalt Light Rehab	$1,298,080	$519,215	$159,369
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	None	$0	$0	$0
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	Asphalt Reconstruction	$6,923,093	$2,319,118	$566,370
39	2055	None	$0	$0	$0
40	2056	None	$0	$0	$0
41	2057	None	$0	$0	$0
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	None	$0	$0	$0
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Asphalt Reconstruction	$4,903,858	$1,335,672	$249,834
Enter Year of Last Used DA Improvement ››		2054	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$9,478,848	$6,636,695
AGENCY COST	$13,485,609	

Design Alternative # 3 - Asphalt Medium Rehab

SR 87 MP 224 - MP 226

Enter Name of Design Alternative

Number of Years	Year	Asphalt Medium Rehab	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Asphalt Medium Rehab	$1,947,120	$1,729,991	$1,485,449
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	None	$0	$0	$0
9	2025	None	$0	$0	$0
10	2026	Asphalt Light Rehab	$1,298,080	$994,870	$706,070
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	Asphalt Reconstruction	$6,923,093	$4,855,718	$3,073,936
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	None	$0	$0	$0
17	2033	None	$0	$0	$0
18	2034	None	$0	$0	$0
19	2035	None	$0	$0	$0
20	2036	None	$0	$0	$0
21	2037	None	$0	$0	$0
22	2038	None	$0	$0	$0
23	2039	None	$0	$0	$0
24	2040	None	$0	$0	$0
25	2041	Asphalt Light Rehab	$1,298,080	$638,569	$255,912
26	2042	None	$0	$0	$0
27	2043	None	$0	$0	$0
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	Asphalt Medium Rehab	$1,947,120	$802,188	$255,788
32	2048	None	$0	$0	$0
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	None	$0	$0	$0
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	None	$0	$0	$0
39	2055	None	$0	$0	$0
40	2056	Asphalt Light Rehab	$1,298,080	$409,873	$92,754
41	2057	None	$0	$0	$0
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	None	$0	$0	$0
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Asphalt Light Rehab	$757,213	$206,244	$38,577
Enter Year of Last Used DA Improvement ››		2056	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$9,224,966	$5,831,331
AGENCY COST	$13,954,360	

Design Alternative # 4 - Asphalt Light Rehab

SR 87 MP 224 - MP 226

Enter Name of Design Alternative

Number of Years	Year	Asphalt Light Rehab	Agency Cost ($)	Net Present Value @ 3%	Net Present Value @ 7%
0	2016	None	$0	$0	$0
1	2017	None	$0	$0	$0
2	2018	None	$0	$0	$0
3	2019	None	$0	$0	$0
4	2020	None	$0	$0	$0
5	2021	Asphalt Light Rehab	$1,298,080	$1,153,327	$990,299
6	2022	None	$0	$0	$0
7	2023	None	$0	$0	$0
8	2024	Asphalt Reconstruction	$6,923,093	$5,629,108	$4,311,355
9	2025	None	$0	$0	$0
10	2026	None	$0	$0	$0
11	2027	None	$0	$0	$0
12	2028	None	$0	$0	$0
13	2029	None	$0	$0	$0
14	2030	None	$0	$0	$0
15	2031	None	$0	$0	$0
16	2032	None	$0	$0	$0
17	2033	None	$0	$0	$0
18	2034	None	$0	$0	$0
19	2035	None	$0	$0	$0
20	2036	Asphalt Light Rehab	$1,298,080	$740,277	$358,930
21	2037	None	$0	$0	$0
22	2038	None	$0	$0	$0
23	2039	None	$0	$0	$0
24	2040	None	$0	$0	$0
25	2041	None	$0	$0	$0
26	2042	Asphalt Medium Rehab	$1,947,120	$929,955	$358,755
27	2043	None	$0	$0	$0
28	2044	None	$0	$0	$0
29	2045	None	$0	$0	$0
30	2046	None	$0	$0	$0
31	2047	None	$0	$0	$0
32	2048	None	$0	$0	$0
33	2049	None	$0	$0	$0
34	2050	None	$0	$0	$0
35	2051	Asphalt Light Rehab	$1,298,080	$475,156	$130,093
36	2052	None	$0	$0	$0
37	2053	None	$0	$0	$0
38	2054	None	$0	$0	$0
39	2055	None	$0	$0	$0
40	2056	None	$0	$0	$0
41	2057	Asphalt Reconstruction	$6,923,093	$2,122,322	$462,327
42	2058	None	$0	$0	$0
43	2059	None	$0	$0	$0
44	2060	None	$0	$0	$0
45	2061	None	$0	$0	$0
Pick Last Used DA treatment type to calculate Remaining Service Life ››		Asphalt Reconstruction	$5,769,244	$1,571,379	$293,922
Enter Year of Last Used DA Improvement ››		2057	Remaining Service Life Cost ^^		

	Net Present Value ($) @ 3%	Net Present Value ($) @ 7%
NET PRESENT VALUE	$9,478,766	$6,317,836
AGENCY COST	$13,918,302	

Summary of LCCA Results

SR 87 MP 224 - MP 226

	Concrete Reconstruction	Asphalt Reconstruction	Asphalt Medium Rehab	Asphalt Light Rehab
Net Present Value - 3%	$9,046,928	$9,478,848	$9,224,966	$9,478,766
Net Present Value - 7%	$7,165,090	$6,636,695	$5,831,331	$6,317,836
Agency Cost	$11,377,517	$13,485,609	$13,954,360	$13,918,302

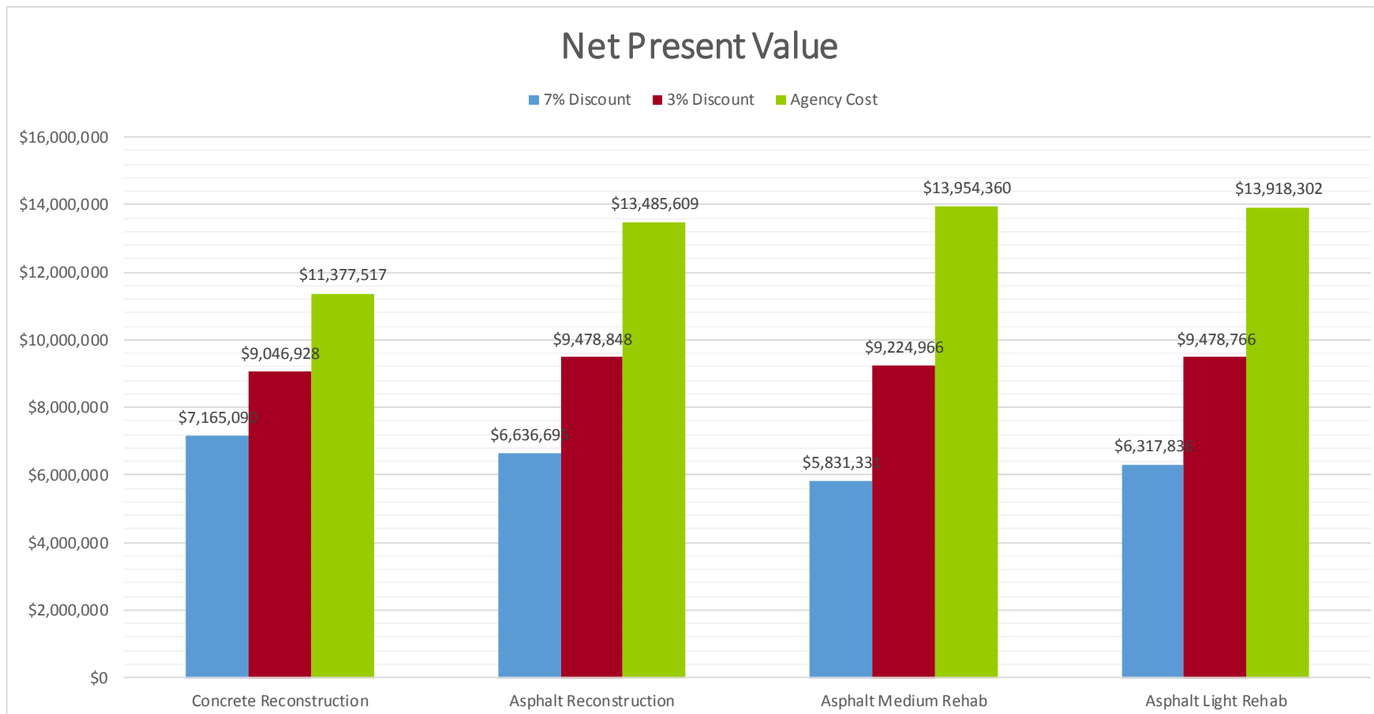
Cost Ratio at 3% Discount Rate

0.98 Ratio of Concrete Reconstruction to Lowest Cost Rehab
1.03 Ratio of Asphalt Reconstruction to Lowest Cost Rehab

Cost Ratio at 7% Discount Rate

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

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct Reversible Lane (Low)	$2,400,000	Lane-Mile	2.20	$5,280,000	All costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a conc barrier
Construct Reversible Lane (High)	$4,800,000	Lane-Mile	2.20	$10,560,000	All costs except bridges; applicable to areas with large fills and cuts, retaining walls, rock blasting, mountainous terrain	0.73 for uphill and 0.88 for downhill	Based on proposed conditions on I-17 with 2 reversible lanes and a conc barrier
Construct Passing Lane	$1,500,000	Mile	2.20	$3,300,000	In one direction; all costs except bridges; applicable to areas with small or moderate fills and cuts, minimal retaining walls	0.63	Average of 3 values from clearinghouse
Construct Entry/Exit Ramp	$730,000	Each	2.20	$1,610,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, typical earthwork & drainage; does not include any major structures or improvements on crossroad	1.09	Average of 16 values on clearinghouse; for adding a ramp not reconstructing. CMF applied to crashes 0.25 miles upstream/downstream from the gore.
Relocate Entry/Exit Ramp	$765,000	Each	2.20	$1,680,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, typical earthwork , drainage and demolition of existing ramp; does not include any major structures or improvements on crossroad	1.00	Assumed to not add any crashes since the ramp is simply moving and not being added. CMF applied to crashes 0.25 miles upstream/downstream from the gore.
Construct Turn Lanes	$42,500	Each	2.20	$93,500	Includes 14' roadway widening (AC) for one additional turn lane (250' long) on one leg of an intersection; includes AC pavement, curb & gutter, sidewalk, ramps, striping, and minor signal modifications	0.81	Avg of 7 values from HSM; CMF applied to intersection related crashes; this solution also applies when installing a deceleration lane
Modify Entry/Exit Ramp	$445,000	Each	2.20	$979,000	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, minor earthwork, & drainage; For converting existing ramp to parallel-type configuration	0.21	Average of 4 values from clearinghouse (for exit ramps) and equation from HSM (for entrance ramp). CMF applied to crashes within 1/8 mile upstream/downstream from the gore.
Widen & Modify Entry/Exit Ramp	$619,000	Each	2.20	$1,361,800	Cost per ramp; includes pavement, striping, signing, RPMs, lighting, minor earthwork, & drainage; For converting 1-lane ramp to 2-lane ramp and converting to parallel-type ramp	0.21	Will be same as "Modify Ramp"
Replace Pavement (AC) (with overexcavation)	$1,446,500	Mile	2.20	$3,180,000	Accounts for 38' width; for one direction of travel on two lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	Same as rehab
Replace Pavement (PCCP) (with overexcavation)	$1,736,500	Mile	2.20	$3,820,000	Accounts for 38' width; for one direction of travel on two lane roadway; includes pavement, overexcavation, striping, delineators, RPMs, rumble strips	0.70	Same as rehab
Replace Bridge (Short)	$125	SF	2.20	$280	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing small washes	0.95	Assumed - should have a minor effect on crashes at the bridge

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Replace Bridge (Medium)	$160	SF	2.20	$350	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing over the mainline freeway, crossroads, or large washes	0.95	Assumed - should have a minor effect on crashes at the bridge
Replace Bridge (Long)	$180	SF	2.20	$400	Based on deck area; bridge only - no other costs included; cost developed generally applies to bridges crossing large rivers or canyons	0.95	Assumed - should have a minor effect on crashes at the bridge
Widen Bridge	$175	SF	2.20	$390	Based on deck area; bridge only - no other costs included	0.90	Assumed - should have a minor effect on crashes at the bridge
Install Pedestrian Bridge	$135	SF	2.20	$300	Includes cost to construct bridge based on linear feet of the bridge. This costs includes and assumes ramps and sidewalks leading to the structure.	0.1 (ped only)	Assumed direct access on both sides of structure
Implement Automated Bridge De-icing	$115	SF	2.20	$250	Includes cost to replace bridge deck and install system	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice
Install Wildlife Crossing Under Roadway	$650,000	Each	2.20	$1,430,000	Includes cost of structure for wildlife crossing under roadway and 1 mile of fencing in each direction that is centered on the wildlife crossing	0.25 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Install Wildlife Crossing Over Roadway	$1,140,000	Each	2.20	$2,508,000	Includes cost of structure for wildlife crossing over roadway and 1 mile of fencing in each direction that is centered on the wildlife crossing	0.25 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Construct Drainage Structure - Minor	$280,000	Each	2.20	$616,000	Includes 3-36" pipes and roadway reconstruction (approx. 1,000 ft) to install pipes	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Intermediate	$540,000	Each	2.20	$1,188,000	Includes 5 barrel 8'x6' RCBC and roadway reconstruction (approx. 1,000 ft) to install RCBC	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Construct Drainage Structure - Major	$8,000	LF	2.20	$17,600	Includes bridge that is 40' wide and reconstruction of approx. 500' on each approach	0.70	Same as rehab; CMF applied to crashes 1/8 mile upstream/downstream of the structure
Install Acceleration Lane	$127,500	Each	2.20	$280,500	For addition of an acceleration lane (AC) on one leg of an intersection that is 1,000' long plus a taper; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.85	Average of 6 values from the FHWA Desktop Reference for Crash Reduction Factors
OPERATIONAL IMPROVEMENT							
Implement Variable Speed Limits (Wireless, Overhead)	$718,900	Mile	2.20	$1,580,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors	0.92	From 1 value from clearinghouse
Implement Variable Speed Limits (Wireless, Ground-mount)	$169,700	Mile	2.20	$373,300	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors	0.92	From 1 value from clearinghouse
Implement Variable Speed Limits (Wireless, Solar, Overhead)	$502,300	Mile	2.20	$1,110,000	In one direction; includes 1 sign assembly per mile (foundation and structure), wireless communication, detectors, solar power	0.92	From 1 value from clearinghouse

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Implement Variable Speed Limits (Wireless, Solar, Ground-mount)	$88,400	Mile	2.20	$194,500	In one direction; includes 2 signs per mile (foundations and posts), wireless communication, detectors, solar power	0.92	From 1 value from clearinghouse
Implement Ramp Metering (Low)	$25,000	Each	2.20	$55,000	For each entry ramp location; urban area with existing ITS backbone infrastructure; includes signals, poles, cabinet, detectors, pull boxes, etc	0.64	From 1 value from clearinghouse; CMF applied to crashes 0.25 miles after gore
Implement Ramp Metering (High)	$150,000	Mile	2.20	$330,000	Area without existing ITS backbone infrastructure; in addition to ramp meters, also includes conduit, fiber optic lines, and power	0.64	From 1 value from clearinghouse
Implement Signal Coordination	$140,000	Mile	2.20	$308,000	Includes conduit, conductors, and controllers for 4 intersections that span a total of approximately 2 miles	0.90	Assumed
Implement Left-Turn Phasing	$7,500	Each	2.20	$16,500	Includes four new signal heads (two in each direction) and associated conductors for one intersection	0.88 (protected) 0.98 (perm/prot or prot/perm)	From HSM; CMF = 0.94 for each protected approach and 0.99 for each perm/prot or prot/perm approach. CMFs of different approaches should be multiplied together. CMF applied to crashes within intersection
ROADSIDE DESIGN							
Install Guardrail	$130,000	Mile	2.20	$286,000	One side of road	0.62 (ROR)	0.62 is avg of 2 values from clearinghouse
Install Cable Barrier	$80,000	Mile	2.20	$176,000	In median	0.81	0.81 is average of 5 values from clearinghouse
Widen Shoulder (AC)	$256,000	Mile	2.20	$563,000	Assumes 10' of existing shoulder (combined left and right), includes widening shoulder by a total of 4'; new pavement for 4' width and mill and replace existing 10' width; includes pavement, minor earthwork, striping edge lines, RPMs, high-visibility delineators, safety edge, and rumble strips	0.68 (1-4') 0.64 (>= 4')	0.86 is avg of 5 values from clearing house for widening shoulder 1-4'. 0.76 is calculated from HSM for widening shoulder >= 4'. (Cost needs to be updated if dimension of existing and widened shoulder differ from Description.)
Rehabilitate Shoulder (AC)	$113,000	Mile	2.20	$249,000	One direction of travel (14' total shldr width-4' left and 10' right); includes paving (mill and replace), striping, high-visibility delineators, RPMs, safety edge, and rumble strips for both shoulders	0.72	0.98 is average of 34 values on clearinghouse for shldr rehab/replace; include striping, delineators, RPMs (0.77 combined CMF), and rumble strips (0.89). (Cost needs to be updated if dimension of existing shoulder differs from Description.)
Replace Shoulder (AC)	$364,000	Mile	2.20	$801,000	One direction of travel (14' total shldr width-4' left and 10' right); includes paving (full reconstruction), striping, high-visibility delineators, RPMs, safety edge, and rumble strips for both shoulders	0.72	0.98 is average of 34 values on clearinghouse for shldr rehab/replace; include striping, delineators, RPMs (0.77 combined CMF), and rumble strips (0.89). (Cost needs to be updated if dimension of existing shoulder differs from Description.)
Install Rumble Strip	$5,500	Mile	2.20	$12,000	Both edges - one direction of travel; includes only rumble strip; no shoulder rehab or paving or striping	0.89	Average of 75 values on clearinghouse and consistent with HSM
Install Centerline Rumble Strip	$2,800	Mile	2.20	$6,000	Includes rumble strip only; no pavement rehab or striping	0.85	From HSM

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Wildlife Fencing	$340,000	Mile	2.20	$748,000	Fencing only plus jump outs for 1 mile (both directions)	0.50 (wildlife)	Assumed
Remove Tree/Vegetation	$200,000	Mile	2.20	$440,000	Intended for removing trees that shade the roadway to allow sunlight to help melt snow and ice (see Increase Clear Zone CMF for general tree/vegetation removal in clear zone)	0.72 (snow/ice)	Average of 3 values on clearinghouse for snow/ice
Increase Clear Zone	$59,000	Mile	2.20	$130,000	In one direction; includes widening the clear zone by 10' to a depth of 3'	0.71	Median of 14 values from FHWA Desktop Reference for Crash Reduction Values
Install Access Barrier Fence	$15	LF	2.20	$33	8' fencing along residential section of roadway	0.10 (ped only)	Equal to ped overpass
Install Rock-Fall Mitigation - Wire Mesh	$1,320,000	Mile	2.20	$2,904,000	Includes wire mesh and rock stabilization (one direction)	0.75 (debris)	Assumed
Install Rock-Fall Mitigation - Containment Fence & Barrier	$2,112,000	Mile	2.20	$4,646,000	Includes containment fencing, concrete barrier, and rock stabilization (one direction)	0.75 (debris)	Assumed
Install Raised Concrete Barrier in Median	$650,000	Mile	2.20	$1,430,000	Includes concrete barrier with associated striping and reflective markings; excludes lighting in barrier (one direction)	0.90 (Cross-median and head on crashes eliminated completely)	All cross median and head-on fatal or incapacitating injury crashes are eliminated completely; all remaining crashes have 0.90 applied
Formalize Pullout (Small)	$7,500	Each	2.20	$17,000	Includes paving and signage (signs, posts, and foundations) - approximately 4,200 sf	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
Formalize Pullout (Medium)	$27,500	Each	2.20	$61,000	Includes paving and signage (signs, posts, and foundations) - approximately 22,500 sf	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
Formalize Pullout (Large)	$80,500	Each	2.20	$177,100	Includes paving and signage (signs, posts, and foundations) - approximately 70,000 sf	0.97	Assumed - similar to Install Other General Warning Signs; CMF applied to crashes within 0.25 miles after sign
INTERSECTION IMPROVEMENTS							
Construct Traffic Signal	$150,000	Each	2.20	$330,000	4-legged intersection; includes poles, foundations, conduit, controller, heads, luminaires, mast arms, etc.	0.95	From HSM; CMF applied to crashes within intersection only
Improve Signal Visibility	$35,000	Each	2.20	$77,000	4-legged intersection; signal head size upgrade, installation of new back-plates, and installation of additional signal heads on new poles.	0.85	Avg of 7 values from clearinghouse; CMF applied to crashes within intersection only

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Raised Median	$360,000	Mile	2.20	$792,000	Includes removal of 14' wide pavement and construction of curb & gutter; does not include cost to widen roadway to accommodate the median; if the roadway needs to be widened, include cost from New General Purpose Lane	0.83	Avg from HSM
Install Transverse Rumble Strip/Pavement Markings	$3,000	Each	2.20	$7,000	Includes ped markings and rumble strips only across a 30' wide travelway; no pavement rehab or other striping	0.95	Avg of 17 values from clearinghouse; CMF applied to crashes within 0.5 miles after the rumble strips and markings
Construct Single-Lane Roundabout	$1,500,000	Each	2.20	$3,300,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.22	From HSM; CMF applied to crashes within intersection only
Construct Double-Lane Roundabout	$1,800,000	Each	2.20	$3,960,000	Removal of signal at 4-legged intersection; realignment of each leg for approx. 800 feet including paving, curbs, sidewalk, striping, lighting, signing	0.40	From HSM; CMF applied to crashes within intersection only
ROADWAY DELINEATION							
Install High-Visibility Edge Line Striping	$10,800	Mile	2.20	$23,800	2 edge lines and lane line - one direction of travel	0.77	Avg of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install High-Visibility Delineators	$6,500	Mile	2.20	$14,300	Both edges - one direction of travel		Avg of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install Raised Pavement Markers	$2,000	Mile	2.20	$4,400	Both edges - one direction of travel		Avg of 3 values from clearinghouse. Assumes package of striping, delineators, and RPMs. (If implemented separately, CMF will be higher.)
Install In-Lane Route Markings	$6,000	Each	2.20	$13,200	Installation of a series of three in-lane route markings in one lane	0.95	Assumed; CMF applied to crashes within 1.0 mile before the gore
IMPROVED VISIBILITY							
Cut Side Slopes	$80	LF	2.20	$200	For small grading to correct sight distance issues; not major grading	0.85	Intent of this solution is to improve sight distance. Most CMF's are associated with vehicles traveling on slope. Recommended CMF is based on FDOT and NCDOT but is more conservative.
Install Lighting (connect to existing power)	$270,000	Mile	2.20	$594,000	One side of road only; offset lighting, not high-mast; does not include power supply; includes poles, luminaire, pull boxes, conduit, conductor	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM
Install Lighting (solar powered LED)	$10,000	Pole	2.20	$22,000	Offset lighting, not high-mast; solar power LED; includes poles, luminaire, solar panel	0.75 (night)	Average of 3 values on clearinghouse & consistent with HSM

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
DRIVER INFORMATION/WARNING							
Install Dynamic Message Sign (DMS)	$250,000	Each	2.20	$550,000	Includes sign, overhead structure, and foundations; wireless communication; does not include power supply	1.00	Not expected to reduce crashes
Install Dynamic Weather Warning Beacons	$40,000	Each	2.20	$88,000	Assumes solar operation and wireless communication or connection to existing power and communication; ground mounted; includes posts, foundations, solar panel, and dynamic sign	0.80 (weather related)	Avg of 3 values from FHWA Desktop Reference for Crash Reduction Factors; CMF applies to crashes within 0.25 miles after a sign
Install Dynamic Speed Feedback Signs	$25,000	Each	2.20	$55,000	Assumes solar operation and no communication; ground mounted; includes regulatory sign, posts, foundations, solar panel, and dynamic sign	0.94	Average of 2 clearinghouse values; CMF applies to crashes within 0.50 miles after a sign
Install Chevrons	$18,400	Mile	2.20	$40,500	On one side of road - includes signs, posts, and foundations	0.79	Average of 11 clearinghouse values
Install Curve Warning Signs	$2,500	Each	2.20	$5,500	Includes 2 signs, posts, and foundations	0.83	Average of 4 clearinghouse values; CMF applies to crashes within 0.25 miles after a sign
Install Traffic Control Device Warning Signs (e.g., stop sign ahead, signal ahead, etc.)	$2,500	Each	2.20	$5,500	Includes 2 signs, posts, and foundations	0.85	FHWA Desktop Reference for Crash Reduction Factors; CMF applies to crashes within 0.25 miles after a sign
Install Other General Warning Signs (e.g., intersection ahead, wildlife in area, slow vehicles, etc.)	$2,500	Each	2.20	$5,500	Includes 2 signs, posts, and foundations	0.97	Assumed; CMF applies to crashes within 0.25 miles after a sign
Install Wildlife Warning System	$162,000	Each	2.20	$356,400	Includes wildlife detection system at a designated wildlife crossing, flashing warning signs (assumes solar power), advance signing, CCTV (solar and wireless), game fencing for approximately 0.25 miles in each direction - centered on the wildlife crossing, and regular fencing for 1.0 mile in each direction - centered on the wildlife crossing.	0.50 (wildlife)	Assumed; CMF applies to wildlife-related crashes within 0.5 miles both upstream and downstream of the wildlife crossing in both directions
Install Warning Sign with Beacons	$15,000	Each	2.20	$33,000	In both directions; includes warning sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.75	FHWA Desktop Reference for Crash Reduction Factors for Installing Flashing Beacons as Advance Warning; CMF applies to crashes within 0.25 miles after a sign
Install Larger Stop Sign with Beacons	$10,000	Each	2.20	$22,000	In one direction; includes large stop sign, post, and foundation, and flashing beacons (assumes solar power) at one location	0.85/0.81	Use 0.85 for adding beacons to an existing sign; 0.81 for installing a larger sign with flashing beacons; CMF applies to intersection related crashes
DATA COLLECTION							
Install Roadside Weather Information System (RWIS)	$60,000	Each	2.20	$132,000	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	Not expected to reduce crashes

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Install Closed Circuit Television (CCTV) Camera	$25,000	Each	2.20	$55,000	Assumes connection to existing ITS backbone or wireless communication; does not include fiber-optic backbone infrastructure; includes pole, camera, etc	1.00	Not expected to reduce crashes
Install Vehicle Detection Stations	$15,000	Each	2.20	$33,000	Assumes wireless communication and solar power, or connection to existing power and communications	1.00	Not expected to reduce crashes
Install Flood Sensors (Activation)	$15,000	Each	2.20	$33,000	Sensors with activation cabinet to alert through texting (agency)	1.00	Not expected to reduce crashes
Install Flood Sensors (Gates)	$100,000	Each	2.20	$220,000	Sensors with activation cabinet to alert through texting (agency) and beacons (public) plus gates	1.00	Not expected to reduce crashes
WIDEN CORRIDOR							
Construct New General Purpose Lane (PCCP)	$1,740,000	Mile	2.20	$3,830,000	For addition of 1 GP lane (PCCP) in one direction; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.90	North Carolina DOT uses 0.90 and Florida DOT uses 0.87
Construct New General Purpose Lane (AC)	$1,200,000	Mile	2.20	$2,640,000	For addition of 1 GP lane (AC) in one direction; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.90	North Carolina DOT uses 0.90 and Florida DOT uses 0.88
Convert a 2-Lane undivided highway to a 5-Lane highway	$1,576,000	Mile	2.20	$3,467,200	For expanding a 2-lane undivided highway to a 5-lane highway (4 through lanes with TWLTL), includes standard shoulder widths but no curb, gutter, or sidewalks	0.60	Assumed to be slightly lower than converting from a 4-lane to a 5-lane highway
Install Center Turn Lane	$1,053,000	Mile	2.20	$2,316,600	For adding a center turn lane (i.e., TWLTL); assumes symmetrical widening on both sides of the road; includes standard shoulder widths but no curb, gutter, or sidewalk	0.75	From FHWA Desktop Reference for Crash Reduction Factors, CMF Clearinghouse, and SR 87 CPS comparison
Construct 4-Lane Divided Highway (Using Existing 2-Lane Road for one direction)	$3,000,000	Mile	2.20	$6,600,000	In both directions; one direction uses existing 2-lane road; other direction assumes addition of 2 new lanes (AC) with standard shoulders; includes all costs except bridges	0.67	Assumed
Construct 4-Lane Divided Highway (No Use of Existing Roads)	$6,000,000	Mile	2.20	$13,200,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.67	Assumed
Construct Bridge over At-Grade Railroad Crossing	$10,000,000	Each	2.20	$22,000,000	Assumes bridge width of 4 lanes (AC) with standard shoulders; includes abutments and bridge approaches; assumes vertical clearance of 23'4" + 6'8" superstructure	0.72 (All train-related crashes eliminated)	Removes all train-related crashes at at-grade crossing; all other crashes CMF = 0.72
Construct Underpass at At-Grade Railroad Crossing	$15,000,000	Each	2.20	$33,000,000	Assumes underpass width of 4 lanes (AC) with standard shoulders; includes railroad bridge with abutments and underpass approaches; assumes vertical clearance of 16'6" + 6'6" superstructure	0.72 (All train-related crashes eliminated)	Removes all train-related crashes at at-grade crossing; all other crashes CMF = 0.72

SOLUTION	CONSTRUCTION UNIT COST	UNIT	FACTOR^	FACTORED CONSTRUCTION UNIT COST	DESCRIPTION	CMF FOR CORRIDOR PROFILE STUDIES	CMF NOTES
Construct High-Occupancy Vehicle (HOV) Lane	$900,000	Mile	2.20	$1,980,000	For addition of 1 HOV lane (AC) in one direction with associated signage and markings; includes all costs except bridges; for generally at-grade facility with minimal walls and no major drainage improvements	0.95	Similar to general purpose lane
ALTERNATE ROUTE							
Construct Frontage Roads	$2,400,000	Mile	2.20	$5,280,000	For 2-lane AC frontage road; includes all costs except bridges; for generally at-grade facility with minimal walls	0.90	Assumed - similar to new general purpose lane
Construct 2-Lane Undivided Highway	$3,000,000	Mile	2.20	$6,600,000	In both directions; assumes addition of 2 new lanes (AC) with standard shoulders in each direction; includes all costs except bridges	0.90	Assuming new alignment for a bypass

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

Appendix G: Performance Area Risk Factors

Pavement Performance Area

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

Elevation

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

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

Mainline Daily Traffic Volume

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

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

Mainline Daily Truck Volume

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

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

Bridge Performance Area

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

Mainline Daily Traffic Volume

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

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

Elevation

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

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

Carries Mainline Traffic

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

Detour Length

Divides detour length by 10 and multiplies by 2.5

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

Scour Critical Rating

Variance below 8

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

Vertical Clearance

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

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

Mobility Performance Area

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

Mainline VMT

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

Score	Condition
0	<16,000
0-5	16,000-400,000
5	>400,000

Buffer Index

Buffer Index x 10

Score	Condition
0	Buffer Index = 0.00
0-5	Buffer Index 0.00-0.50
5	Buffer Index > 0.50

Detour Length

Score	Condition
0	Detour < 10 miles
5	Detour > 10 miles

Outside Shoulder Width

Variance below 10', if only 1 lane in each direction

Score	Condition
0	10' or above or >1 lane in each direction
0-5	10'-5' and 1 lane in each direction
5	5' or less and 1 lane in each direction

Safety Performance Area

- Mainline Daily Traffic Volume
- Interrupted Flow
- Elevation
- Outside Shoulder Width
- Vertical Grade

Mainline Daily Traffic Volume

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

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

Interrupted Flow

Score	Condition
0	Not interrupted flow
5	Interrupted Flow

Elevation

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

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

Outside Shoulder Width

Variance below 10'

Score	Condition
0	10' or above
0-5	10' - 5'
5	5' or less

Grade

Variance above 3% x 1.5

Score	Condition
0	< 3%
0-5	3% - 6.33%
5	>6.33%

Freight Performance Area

- Mainline Daily Truck Volume
- Detour Length
- Truck Buffer Index (TPTI-TTTI)
- Outside Shoulder Width

Mainline Daily Truck Volume

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

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

Detour Length

Score	Condition
0	Detour < 10 miles
5	Detour > 10 miles

Truck Buffer Index

Truck Buffer Index x 10

Score	Condition
0	Buffer Index = 0.00
0-5	Buffer Index 0.00-0.50
5	Buffer Index > 0.50

Outside Shoulder Width

Variance below 10', if only 1 lane in each direction

Score	Condition
0	10' or above or >1 lane in each direction
0-5	10'-5' and 1 lane in each direction
5	5' or less and 1 lane in each direction

Solution Number	Mainline Traffic Vol (vpd) (2-way)	Solution Length (miles)	Bridge Detour Length (miles) (N19)	Elevation (ft)	Scour Critical Rating (0-9)	Carries Mainline Traffic (Y/N)	Bridge Vert. Clear (ft)	Mainline Truck Vol (vpd) (2-way)	Detour Length > 10 miles (Y/N)	Truck Buffer Index	Non-Truck Buffer Index	Grade (%)	Interrupted Flow (Y/N)	Outside/ Right Shoulder Width (ft)	1-lane each direction
87.1	15,116	1.6		1,250				693	N	2.43	2.39	1.4	Y	6.97	N
87.2	9,827	14.0		2,100				983	Y	0.70	0.46	3.9	N	9.42	N
87.3	10,778	21.0		3,600				1,072	Y	0.71	0.65	6.0	N	9.29	N
87.4	10,778	6.0		3,650				1,072	Y	0.71	0.65	8.3	N	9.29	N
87.5	10,778	1.0		3,600				1,072	Y	0.71	0.65	6.5	N	9.29	N
87.6	11,717	2.5		3,100				1,200	Y	0.63	0.42	2.5	N	9.86	N
87.7	11,717	5.0		4,200				1,200	Y	0.88	0.93	5.6	N	7.52	N
87.8	11,717	4.0		4,150				1,200	Y	0.88	0.93	9.0	N	7.52	N
87.9	11,717	4.7		4,700				1,200	Y	0.88	0.93	4.7	N	7.52	N
260.10-1 (Segment 7, 87 Portion)	19,185	1.6		4,935				1,609	N	2.03	3.93	1.5	Y	5.82	N
260.10-2 (Segment 8, 260 Portion)	14,233	0.4		4,960				289	N	5.46	4.79	2.0	Y	4.62	N
260.11	13,796	4.0		4,900				242	Y	1.05	0.33	3.6	N	1.21	Y
260.12	6,270	6.2		5,900				241	Y	0.54	0.43	6.8	N	9.53	N
260.13	6,112	5.0		6,800				391	Y	0.63	0.53	6.4	N	5.19	N
260.14	6,112	3.0		6,800				391	Y	0.63	0.53	6.4	N	5.19	N
260.15	5,954	22.0		7,300				533	Y	0.39	0.24	2.0	N	2.26	Y
77.16A (SR 377/SR 77 connection)	7,694	3.2	26	5,100	8	Y	20.00	1,020	Y	3.26	4.03	1.0	Y	1.49	Y
77.16B (US 180/SR 77 connection)	7,694	1.6	26	5,100	8	Y	20.00	1,020	Y	3.26	4.03	1.0	Y	1.49	Y
77.16C (adjacent to SR 77)	7,694	0.7	26	5,100	8	Y	20.00	1,020	Y	3.26	4.03	1.0	Y	1.49	Y

Solution Number	Bridge	Pavement	Mobility	Safety	Freight	Risk Score (0 to 10)				
						Bridge	Pavement	Mobility	Safety	Freight
87.1	N	N	Y	Y	Y	0.00	0.00	1.63	4.10	1.34
87.2	N	N	Y	Y	Y	0.00	0.00	6.95	1.40	5.55
87.3	N	N	Y	Y	Y	0.00	0.00	7.39	2.77	5.59
87.4	N	N	Y	Y	Y	0.00	0.00	6.48	2.97	5.59
87.5	N	Y	Y	Y	Y	0.00	1.92	5.35	2.97	5.59
87.6	N	N	Y	Y	Y	0.00	0.00	5.44	0.78	5.65
87.7	N	N	Y	Y	Y	0.00	0.00	6.39	3.36	5.65
87.8	N	N	Y	Y	Y	0.00	0.00	6.20	3.78	5.65
87.9	N	N	Y	Y	Y	0.00	0.00	6.34	3.02	5.65
260.10-1 (Segment 7, 87 Portion)	N	N	Y	Y	Y	0.00	0.00	2.39	5.09	1.61
260.10-2 (Segment 8, 260 Portion)	N	N	Y	Y	Y	0.00	0.00	2.03	5.23	2.28
260.11	N	Y	Y	Y	Y	0.00	2.17	7.98	3.55	7.65
260.12	N	N	Y	Y	Y	0.00	0.00	5.67	3.38	5.15
260.13	N	N	Y	Y	Y	0.00	0.00	5.86	5.46	5.23
260.14	N	N	Y	Y	Y	0.00	0.00	5.56	5.46	5.23
260.15	N	N	Y	Y	Y	0.00	0.00	8.30	3.73	7.27
77.16A (SR 377/SR 77 connection)	Y	Y	Y	Y	Y	4.13	2.34	7.28	4.95	6.82
77.16B (US 180/SR 77 connection)	Y	Y	Y	Y	Y	4.13	2.34	6.95	4.95	6.82
77.16C (adjacent to SR 77)	Y	Y	Y	Y	Y	4.13	2.34	6.73	4.95	6.82

Appendix H: Candidate Solution Cost Estimates

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
CS87.1	L1	Salt River Area Safety Improvements	Install warning signs on curved Salt River Bridge approaches	-	-	each	4	$5,500	$1,000	$2,000	$0	$22,000	$25,000	
			Install chevrons on curved Salt River Bridge approaches	varies		mi	0.4	$40,500	$0	$2,000	$0	$16,200	$18,200	
			Install raised pavement markers along outside edge line	177	182	mi	5	$4,400	$1,000	$2,000	$0	$22,000	$25,000	
			Install lighting at Oak St, Center St, Mesa Dr, and Camelback Rd	178.5	181	mi	5.4	$594,000	$100,000	$320,000	$0	$3,207,600	$3,627,600	Quantity was doubled because the Factored Construction Unit Cost was developed for only one side of the roadway.
			Install raised concrete barrier median on Salt River Bridge and approaches	178	178.5	mi	0.6	$1,430,000	$30,000	$90,000	$0	$858,000	$978,000	
								Solution Total	**$132,000**	**$416,000**	**$0**	**$4,125,800**	**$4,673,800**	
CS87.2	L3/L4	Bush Highway Area Safety and Freight Improvements	Rehabilitate shoulders	194	205	mi	22	$249,000	$160,000	$550,000	$0	$5,478,000	$6,188,000	Quantity was doubled because the Factored Construction Unit Cost was developed for only one side of the roadway.
			Install speed feedback signs	-	-	each	4	$55,000	$10,000	$20,000	$0	$220,000	$250,000	
			Widen inside shoulder (SB only)	209	211	mi	2	$159,000	$10,000	$30,000	$0	$318,000	$358,000	Existing shoulder widths were used to alter Factored Construction Unit Costs for Widening Shoulders
								Solution Total	**$180,000**	**$600,000**	**$0**	**$6,016,000**	**$6,796,000**	
CS87.3	L6/L7	Sunflower Area Safety Improvements	Install speed feedback signs	-	-	each	12	$55,000	$20,000	$70,000	$0	$660,000	$750,000	
			Install speed advisory warning signs with flashing beacons	-	-	each	12	$33,000	$10,000	$40,000	$0	$396,000	$446,000	
			Rehabilitate shoulders	213	235	mi	42	$249,000	$310,000	$1,050,000	$0	$10,458,000	$11,818,000	Quantity was doubled because the Factored Construction Unit Cost was developed for only one side of the roadway
			Widen inside shoulder (SB only)	226	228.5	mi	2.5	$138,000	$10,000	$30,000	$0	$345,000	$385,000	Existing shoulder widths were used to alter Factored Construction Unit Costs for Widening Shoulders
			Install rock-fall mitigation	varies		mi	1.5	$2,904,000	$130,000	$440,000	$0	$4,356,000	$4,926,000	Priced for the wire mesh option
								Solution Total	**$480,000**	**$1,630,000**	**$0**	**$16,215,000**	**$18,325,000**	

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
CS87.4	L8	Sunflower Area Freight Improvements	Construct NB climbing lane	213	215	mi	2	$4,950,000	$300,000	$990,000	$0	$9,900,000	$11,190,000	Priced for the Medium Climbing Lane option
			Construct NB climbing lane	219	223	mi	4	$4,950,000	$700,000	$2,330,000	$0	$23,258,910	$26,288,910	Priced for the Medium Climbing Lane option
			Widen Whiskey Springs Bridge, #2515	NB MP 220.32		sf	5928	$390	$70,000	$230,000	$0	$2,311,920	$2,611,920	Bridge is 494 ft. long, widened by 12 ft.
			Widen Upper Kitty Joe Bridge, #2497	NB MP 221.39		sf	7392	$390	$90,000	$290,000	$0	$2,882,880	$3,262,880	Bridge is 616 ft. long, widened by 12 ft.
								Solution Total	**$1,160,000**	**$3,840,000**	**$0**	**$38,353,710**	**$43,353,710**	
CS87.5	L9	Slate Creek Pavement Improvements	Replace pavement	224	226	mi	2	$3,180,000	$190,000	$640,000	$0	$6,360,000	$7,190,000	Quantity was doubled because the Factored Construction Unit Cost was developed for only one direction of the roadway; only two miles total because SR 87 does not have a MP 225
								Solution Total	**$190,000**	**$640,000**	**$0**	**$6,360,000**	**$7,190,000**	
CS87.6	L10/L11	Rye Area Safety and Freight Improvements	Install advisory signs about approaching areas with intersections	-	-	each	8	$5,500	$1,000	$4,000	$0	$44,000	$49,000	
			Install reduced speed advisory signs on SR 87	-	-	each	4	$5,500	$1,000	$2,000	$0	$22,000	$25,000	
			Install speed feedback signs	-	-	each	2	$55,000	$3,000	$10,000	$0	$110,000	$123,000	
			Add flashing beacons to WB stop sign on SR 188	-	-	each	1	$22,000	$1,000	$2,000	$0	$22,000	$25,000	
								Solution Total	**$6,000**	**$18,000**	**$0**	**$198,000**	**$222,000**	
CS87.7	L13	Ox Bow Estates Area Safety Improvements	Install speed feedback signs	-	-	each	2	$55,000	$3,000	$10,000	$0	$110,000	$123,000	
			Install speed advisory warning signs with flashing beacons	-	-	each	2	$33,000	$2,000	$10,000	$0	$66,000	$78,000	
			Implement variable speed limit signs	241	246	mi	10	$194,500	$60,000	$190,000	$0	$1,945,000	$2,195,000	Quantity was doubled because the Factored Construction Unit Cost was developed for only one direction of the roadway; priced for wireless, solar, ground mount version of VSL
			Install new DMS	-	-	each	2	$550,000	$30,000	$110,000	$0	$1,100,000	$1,240,000	
			Install new CCTV	-	-	each	2	$55,000	$3,000	$10,000	$0	$110,000	$123,000	
			Install dynamic weather warning beacons	-	-	each	2	$88,000	$10,000	$20,000	$0	$176,000	$206,000	
			Install RWIS	-	-	each	1	$132,000	$4,000	$10,000	$0	$132,000	$146,000	
								Solution Total	**$112,000**	**$360,000**	**$0**	**$3,639,000**	**$4,111,000**	

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
CS87.8	L12	Ox Bow Estates Area Freight Improvements	Construct NB climbing lane	243	247	mi	4	$4,950,000	$590,000	$1,980,000	$0	$19,800,000	$22,370,000	Priced for the Medium Climbing Lane option
								Solution Total	**$590,000**	**$1,980,000**	**$0**	**$19,800,000**	**$22,370,000**	
CS87.9	L14	Mazatzal Area Safety Improvements	Widen Shoulders (SB only)	246.2	250.9	mi	4.7	$430,000	$60,000	$200,000	$0	$2,021,000	$2,281,000	Existing shoulder widths were used to alter Factored Construction Unit Costs for Widening Shoulders
								Solution Total	**$60,000**	**$200,000**	**$0**	**$2,021,000**	**$2,281,000**	
CS260.10	L15/L16	Payson Area Safety and Freight Improvements	Implement signal coordination for six signals in Payson urban area	-	-	each	1	$346,000	$10,000	$30,000	$0	$346,000	$386,000	The Factored Construction Unit Cost is slightly higher than shown in the CMF/Cost list due to this solution spanning two miles and six signals while the cost shown in the spreadsheet was developed for spanning two miles and only four signals
			Implement protected/permitted left-turn phasing at SR 87/Manzanita Dr intersection	-	-	each	1	$16,500	$0	$2,000	$0	$16,500	$18,500	
			Install advanced signal advisory sign with flashing beacons WB on SR 260 before Manzanita signal	-	-	each	1	$33,000	$1,000	$3,000	$0	$33,000	$37,000	
								Option A: Solution Total	**$11,000**	**$35,000**	**$0**	**$395,500**	**$441,500**	
			Reconstruct three signalized intersections as double-lane roundabouts	-	-	each	3	$3,960,000	$360,000	$1,190,000	$138,000	$11,880,000	$13,568,000	Assuming $12/sf for ROW cost
			Implement signal coordination for three signals in Payson urban area	-	-	each	1	$273,000	$10,000	$30,000	$0	$273,000	$313,000	The Factored Construction Unit Cost is slightly lower than shown in the CMF/Cost list due to this solution spanning only 1.75 miles and three signals while the cost shown in the spreadsheet was developed for spanning two miles and four signals
								Option B: Solution Total	**$370,000**	**$1,220,000**	**$138,000**	**$12,153,000**	**$13,881,000**	
CS260.11	L17/L18	Lion Springs Area Mobility and Freight Improvements	Reconstruct to 4-lane divided highway (using the existing 2-lane road for one direction)	256	260	mi	4	-	$1,200,000	$4,000,000	$4,815,360	$39,984,640	$50,000,000	$50M total approximation taken from ADOT's 2017-2021 five-year construction program; assuming $6/sf ROW cost due to rural area
								Solution Total	**$1,200,000**	**$4,000,000**	**$4,815,360**	**$39,984,640**	**$50,000,000**	

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
CS260.12	L19	Christopher Creek Area Freight Improvements	Install rock-fall mitigation	varies		mi	1.3	$2,904,000	$110,000	$380,000	$0	$3,775,200	$4,265,200	Priced for the wire mesh option
			Implement variable speed limit signs	272	277	mi	10	$194,500	$60,000	$190,000	$0	$1,945,000	$2,195,000	Quantity was doubled because the Factored Construction Unit Cost was developed for only one side of the roadway; priced for wireless, solar, ground mount version of VSL
			Install new DMS	-	-	each	1	$550,000	$20,000	$60,000	$0	$550,000	$630,000	
			Install new CCTV	-	-	each	1	$55,000	$2,000	$10,000	$0	$55,000	$67,000	
								Solution Total	**$192,000**	**$640,000**	**$0**	**$6,325,200**	**$7,157,200**	
CS260.13	L20	Mogollon Rim Area Freight Improvements	Install centerline rumble strips	277	282	mi	5	$6,000	$1,000	$3,000	$0	$30,000	$34,000	
			Install rock-fall mitigation	varies		mi	1.9	$2,904,000	$170,000	$550,000	$0	$5,517,600	$6,237,600	Priced for the wire mesh option
			Install dynamic weather warning beacons	-	-	each	2	$88,000	$10,000	$20,000	$0	$176,000	$206,000	
			Install RWIS	-	-	each	1	$132,000	$4,000	$10,000	$0	$132,000	$146,000	
			Implement variable speed limit signs	277	282	mi	10	$194,500	$60,000	$190,000	$0	$1,945,000	$2,195,000	Quantity was doubled because the Factored Construction Unit Cost was developed for only one side of the roadway; priced for wireless, solar, ground mount version of VSL
			Install new DMS	-	-	each	1	$550,000	$20,000	$60,000	$0	$550,000	$630,000	
			Install new CCTV	-	-	each	1	$55,000	$2,000	$10,000	$0	$55,000	$67,000	
								Solution Total	**$267,000**	**$843,000**	**$0**	**$8,405,600**	**$9,515,600**	
CS260.14	L20	Mogollon Rim Area Climbing Lane	Construct EB climbing lane	277	280	mi	3	$4,950,000	$450,000	$1,490,000		$14,850,000	$16,790,000	Priced for the Medium Climbing Lane option
								Solution Total	**$450,000**	**$1,490,000**	**$0**	**$14,850,000**	**$16,790,000**	
CS260.15	L21/L22	Forest Lakes Area Safety and Freight Improvements	Widen shoulders	282	304	mi	22	$562,000	$370,000	$1,240,000	$0	$12,364,000	$13,974,000	Existing shoulder widths were used to alter Factored Construction Unit Costs for Widening Shoulders
			Construct alternating passing lanes	Varies		mi	11	$3,300,000	$1,130,000	$3,760,000	$0	$37,620,000	$42,510,000	Only 11 of the 22 miles in the project limits would be receiving passing lanes; there are existing passing lanes in some areas
								Solution Total	**$1,500,000**	**$5,000,000**	**$0**	**$49,984,000**	**$56,484,000**	

Candidate Solution #	Location #	Candidate Solution Name	Scope	BMP	EMP	Unit	Quantity	Factored Construction Unit Cost	Preliminary Engineering Cost	Design Cost	Right-of-Way Cost	Construction Cost	Total Cost	Notes
CS77.16	L29/L30	Holbrook Area Mobility and Freight Improvements	Construct new roadway connection between SR 377/SR 77 intersection and I-40/40B West TI west of Holbrook			mi	2.3	$6,600,000	$460,000	$1,530,000	$6,470,000	$15,312,500	$23,772,500	Assuming $12/sf for ROW cost
			Bridge over the Little Colorado River and RR			each	1	$56,410,800	$1,690,000	$5,640,000	$4,560,000	$56,410,800	$68,300,800	Calculated for a 4750' long bridge; assuming $12/sf for ROW cost
			Option A: Solution Total						**$2,150,000**	**$7,170,000**	**$11,030,000**	**$71,723,300**	**$92,073,300**	
			Construct new roadway connection between US 180/SR 77 intersection and I-40/40B West TI west of Holbrook			mi	0.7	$6,600,000	$140,000	$480,000	$2,030,000	$4,812,500	$7,462,500	Assuming $12/sf for ROW cost
			Bridge over the Little Colorado River and RR			each	1	$56,410,800	$1,690,000	$5,640,000	$4,560,000	$56,410,800	$68,300,800	Calculated for a 4750' long bridge; assuming $12/sf for ROW cost
			Option B: Solution Total						**$1,830,000**	**$6,120,000**	**$6,590,000**	**$61,223,300**	**$75,763,300**	
			Construct overpass at at-grade railroad crossing and new bridge over the Little Colorado River adjacent to existing SR 77 alignment			each	1	$32,091,000	$960,000	$3,210,000	$0	$32,091,000	$36,261,000	Calculated for a 2579' long bridge
			Remove exiting Little Colorado River Bridge			sf	89908	$50	$130,000	$450,000	$2,480,000	$4,495,400	$7,555,400	Assume $50/sf bridge removal cost
			Option C: Solution Total						**$1,090,000**	**$3,660,000**	**$2,480,000**	**$36,586,400**	**$43,816,400**	

Appendix I: Performance Effectiveness Scores

Need Reduction

-user entered value
-calculated value for reference only
-calculated value for entry/use in other spreadsheet
-for input into PES spreadsheet
-assumed values

			Solution #	87.1	87.2	87.3	87.4	87.5B	87.6	87.7	87.8	87.9	260.10A-1 (87 Portion)	260.10A-2 (260 Portion)	260.10B-1 (87 Portion)	260.10B-2 (260 Portion)	260.11	260.12	260.13	260.14	260.15	77.16A	77.16B	77.16C
			Description	Gila River Area Safety Improvements	Bush Highway Area Safety and Freight Improvements	Sunflower Area Safety Improvements	Sunflower Area Freight Improvements	Slate Creek Pavement Improvements (Replace)	Rye Area Safety and Freight Improvements	Ox Bow Estates Area Safety Improvements	Ox Bow Estates Area Freight Improvements	Mazatzal Area Safety Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Lion Springs Area Mobility and Freight Improvements	Christopher Creek Area Freight Improvements	Mogollon Rim Area Freight Improvements	Mogollon Rim Area Climbing Lane	Forest Lakes Area Safety and Freight Improvements	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)
			Project Beg MP	177	191	213	213	224	235	241	243	246	251	252	251	252	256	260	277	277	282	386	386	386
			Project End MP	182	213	235	223	226	241	250	247	251	253	253	253	253	260	277	282	280	304	389	389	389
			Project Length (miles)	1.6	14	21	6	1	2.5	5	4	4.7	1.6	0.4	1.6	0.4	4	6.2	5	3	22	3	1.6	0.7
			Segment Beg MP	177	191	213	213	213	235	241	241	241	250	252	250	252	256	260	277	277	282	386	386	386
			Segment End MP	182	213	235	235	235	241	250	250	250	253	256	253	256	260	277	282	282	304	389	389	389
			Segment Length (miles)	5	22	21	21	21	6	9	9	9	3	4	3	4	4	17	5	5	22	3	3	3
			Segment #	1	3	4	4	4	5	6	6	6	7	8	7	8	9	10	11	11	12	16	16	16
			Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	4	4	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	one-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	one-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	1	0.25	1	1	0
			Pro-Rated # of Lanes	4.00	4.00	4.00	4.29	4.00	4.00	4.00	4.44	4.00	4.00	4.00	4.00	4.00	6.00	4.00	4.00	4.60	2.50	4.00	3.07	2.00
			Description																					
SAFETY	DIRECTIONAL SAFETY	DIRECTIONAL SAFETY	Orig Segment Directional Safety Index (direction 1)	4.046	0.475	1.482	1.482	1.482	0.081	0.088	0.088	0.088	2.480	0.559	2.480	0.559	0.198	0.622	0.159	0.159	2.246	8.784	8.784	8.784
			Orig Segment Directional Fatal Crashes (direction 1)	4	1	4	4	4	0	0	0	0	1	0	1	0	0	1	0	0	4	2	2	2
			Orig Segment Directional Incap Crashes (direction 1)	1	8	11	11	11	1	2	2	2	1	7	1	7	1	2	1	1	5	0	0	0
			Original Fatal Crashes in project limits (direction 1)	4	1	4	3	0	0	0	0	0	1	0	1	0	0	0	0	0	4	0	0	2
			Original Incap Crashes in project limits (direction 1)	1	7	11	6	3	1	2	1	0	1	3	1	2	1	0	1	0	5	0	0	0
			CMF 1 (direction 1)(lowest CMF)	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet	0.75	0.7	0.97	0.92	0.75	1	0.9	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet	0.4	0.67	0.92	0.85	0.75	Total CMF calculated in separate worksheet	1	1	0.1
			CMF 2 (direction 1)				1	1	1	1	1	1	1			1	1	1	0.92	1		1	1	1
			CMF 3 (direction 1)				1	1	1	1	1	1	1			1	1	1	1	1		1	1	1
			CMF 4 (direction 1)				1	1	1	1	1	1	1			1	1	1	1	1		1	1	1
			CMF 5 (direction 1)				1	1	1	1	1	1	1			1	1	1	1	1		1	1	1
			Total CMF (direction 1)	1.000	1.000	1.000	0.750	0.700	0.970	0.920	0.750	1.000	0.900	1.000	1.000	0.400	0.670	0.920	0.816	0.750	1.000	1.000	1.000	0.100
			Fatal Crash reduction (direction 1)	1.743	0.060	1.300	0.750	0.000	0.000	0.000	0.000	0.000	0.100	0.000	0.100	0.000	0.000	0.000	0.000	0.000	1.934	0.000	0.000	1.800
			Incap Crash reduction (direction 1)	0.301	1.300	3.800	1.500	0.900	0.030	0.160	0.250	0.000	0.100	0.468	0.600	1.200	0.330	0.000	0.184	0.000	2.294	0.000	0.000	0.000
			Post-Project Segment Directional Fatal Crashes (direction 1)	2.257	0.940	2.700	3.250	4.000	0.000	0.000	0.000	0.000	0.900	0.000	0.900	0.000	0.000	1.000	0.000	0.000	2.066	2.000	2.000	0.200
			Post-Project Segment Directional Incap Crashes (direction 1)	0.699	6.700	7.200	9.500	10.100	0.970	1.840	1.750	2.000	0.900	6.532	0.400	5.800	0.670	2.000	0.816	1.000	2.706	0.000	0.000	0.000
			Post-Project Segment Directional Safety Index (direction 1)	2.292	0.429	0.996	1.216	1.463	0.078	0.081	0.077	0.088	2.231	0.521	2.150	0.463	0.132	0.622	0.130	0.159	1.165	8.784	8.784	0.880
			Post-Project Segment Directional Safety Index (direction 1)	2.292	0.429	0.996	1.216	1.463	0.078	0.081	0.077	0.088	2.231	0.521	2.150	0.463	0.132	0.622	0.130	0.159	1.165	8.784	8.784	0.880
			Orig Segment Directional Safety Index (direction 2)	1.983	1.902	1.759	1.759	1.759	2.361	4.132	4.132	4.132	0.160	0.000	0.160	0.000	3.069	1.239	0.479	0.479	0.622	4.370	4.370	4.370
			Orig Segment Directional Fatal Crashes (direction 2)	2	6	5	5	5	2	6	6	6	0	0	0	0	1	2	0	0	1	1	1	1
			Orig Segment Directional Incap Crashes (direction 2)	0	3	10	10	10	0	6	6	6	1	0	1	0	1	3	3	3	3	0	0	0
			Original Fatal Crashes in project limits (direction 2)	2	6	5	0	1	2	2	0	4	0	0	0	0	1	1	0	0	1	1	1	1
			Original Incap Crashes in project limits (direction 2)	0	2	10	0	0	0	4	0	1	1	0	1	0	1	3	3	0	3	0	0	0
			CMF 1 (direction 2)(lowest CMF)	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet	Total CMF calculated in separate worksheet	1	0.70	0.85	0.92	1	0.64	0.9	1	0.9	1	0.67	0.92	0.85	1	Total CMF calculated in separate worksheet	0.72	0.72	1
			CMF 2 (direction 2)				1	1	1	0.94	1	1	1	1	1	1	1	1	0.92	1		1	1	1
			CMF 3 (direction 2)				1	1	1	0.97	1	1	1	1	1	1	1	1	1	1		1	1	1
			CMF 4 (direction 2)				1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1
			CMF 5 (direction 2)				1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1
			Total CMF (direction 2)	1.000	1.000	1.000	1.000	0.700	0.850	0.879	1.000	0.640	0.900	1.000	0.900	1.000	0.670	0.920	0.816	1.000	1.000	0.720	0.720	1.000
			Fatal Crash reduction (direction 2)	0.603	1.801	1.625	0.000	0.300	0.300	0.242	0.000	1.440	0.000	0.000	0.000	0.000	0.330	0.080	0.000	0.000	0.483	0.280	0.280	1.000
			Incap Crash reduction (direction 2)	0.000	0.620	3.430	0.000	0.000	0.000	0.484	0.000	0.360	0.100	0.000	0.100	0.000	0.330	0.240	0.552	0.000	1.203	0.000	0.000	0.000
			Post-Project Segment Directional Fatal Crashes (direction 2)	1.397	4.199	3.375	5.000	4.700	1.700	5.758	6.000	4.560	0.000	0.000	0.000	0.000	0.670	1.920	0.000	0.000	0.517	0.720	0.720	0.000
			Post-Project Segment Directional Incap Crashes (direction 2)	0.000	2.380	6.570	10.000	10.000	0.000	5.516	6.000	5.640	0.900	0.000	0.900	0.000	0.670	2.760	2.448	3.000	1.797	0.000	0.000	0.000
			Post-Project Segment Directional Safety Index (direction 2)	1.385	1.337	1.183	1.759	1.666	2.007	3.955	4.132	3.189	0.146	0.000	0.150	0.000	2.056	1.185	0.391	0.479	0.330	3.146	3.146	0.000
			Post-Project Segment Directional Safety Index (direction 2)	1.385	1.337	1.183	1.759	1.666	2.007	3.955	4.132	3.189	0.146	0.000	0.150	0.000	2.056	1.185	0.391	0.479	0.330	3.146	3.146	0.000
	SAFETY INDEX	SAFETY INDEX	Current Safety Index	3.015	1.189	1.620	1.620	1.620	1.221	2.110	2.110	2.110	1.320	0.279	1.320	0.279	1.634	0.931	0.319	0.319	1.434	6.577	6.577	6.577
			Post-Project Safety Index	1.839	0.883	1.090	1.488	1.565	1.043	2.018	2.105	1.638	1.189	0.261	1.150	0.232	1.094	0.904	0.261	0.319	0.748	5.965	5.965	0.440
	Needs	Needs	Original Segment Safety Need	9.238	2.825	4.418	4.418	4.418	2.553	6.452	6.452	6.452	3.09	0.180	3.09	0.180	5.082	0.909	0.206	0.206	4.209	23.902	23.902	23.902
			Post-Project Segment Safety Need	4.751	1.239	2.352	3.911	4.206	1.774	6.102	6.435	4.651	2.522	0.168	2.352	0.150	2.986	0.812	0.168	0.206	0.669	21.566	21.566	0.269

-user entered value
-calculated value for reference only
-calculated value for entry/use in other spreadsheet
-for input into PES spreadsheet
-assumed values

		Solution #	87.1	87.2	87.3	87.4	87.5B	87.6	87.7	87.8	87.9	260.10A-1 (87 Portion)	260.10A-2 (260 Portion)	260.10B-1 (87 Portion)	260.10B-2 (260 Portion)	260.11	260.12	260.13	260.14	260.15	77.16A	77.16B	77.16C
		Description	Gila River Area Safety Improvements	Bush Highway Area Safety and Freight Improvements	Sunflower Area Safety Improvements	Sunflower Area Freight Improvements	Slate Creek Pavement Improvements (Replace)	Rye Area Safety and Freight Improvements	Ox Bow Estates Area Safety Improvements	Ox Bow Estates Area Freight Improvements	Mazatzal Area Safety Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Lion Springs Area Mobility and Freight Improvements	Christopher Creek Area Freight Improvements	Mogollon Rim Area Freight Improvements	Mogollon Rim Area Climbing Lane	Forest Lakes Area Safety and Freight Improvements	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)
		Project Beg MP	177	191	213	213	224	235	241	243	246	251	252	251	252	256	260	277	277	282	386	386	386
		Project End MP	182	213	235	223	226	241	250	247	251	253	253	253	253	260	277	282	280	304	389	389	389
		Project Length (miles)	1.6	14	21	6	1	2.5	5	4	4.7	1.6	0.4	1.6	0.4	4	6.2	5	3	22	3	1.6	0.7
		Segment Beg MP	177	191	213	213	213	235	241	241	241	250	252	250	252	256	260	277	277	282	386	386	386
		Segment End MP	182	213	235	235	235	241	250	250	250	253	256	253	256	260	277	282	282	304	389	389	389
		Segment Length (miles)	5	22	21	21	21	6	9	9	9	3	4	3	4	4	17	5	5	22	3	3	3
		Segment #	1	3	4	4	4	5	6	6	6	7	8	7	8	9	10	11	11	12	16	16	16
		Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	4	4	2	2	2	2
		Project Type (one-way or two-way)	two-way	two-way	two-way	one-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	one-way	two-way	two-way	two-way	two-way
		Additional Lanes (one-way)	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	1	0.25	1	1	0
		Pro-Rated # of Lanes	4.00	4.00	4.00	4.29	4.00	4.00	4.00	4.44	4.00	4.00	4.00	4.00	4.00	6.00	4.00	4.00	4.60	2.50	4.00	3.07	2.00
		Description																					
MOBILITY	MOBILITY INDEX	Original Segment Mobility Index	0.650	0.210	0.230	0.230	0.230	0.150	0.210	0.210	0.210	0.750	0.540	0.750	0.540	0.940	0.080	0.120	0.120	0.360	0.850	0.850	0.850
	MOBILITY INDEX	Post-Project # of Lanes (both directions)	4.00	4.00	4.00	4.29	4.00	4.00	4.00	4.44	4.00	4.00	4.00	4.00	4.00	6.00	4.00	4.00	4.60	2.50	4.00	3.07	2.00
	MOBILITY INDEX	Post-Project Segment Mobility Index	0.65	0.21	0.23	0.22	0.23	0.15	0.19	0.19	0.21	0.75	0.54	0.75	0.54	0.27	0.07	0.11	0.11	0.32	0.68	0.53	0.77
	MOBILITY INDEX	Post-Project Segment Mobility Index	0.650	0.210	0.230	0.220	0.230	0.150	0.190	0.190	0.210	0.750	0.540	0.750	0.540	0.270	0.070	0.110	0.110	0.320	0.680	0.530	0.770
	FUT V/C	Original Segment Future V/C	0.860	0.290	0.270	0.270	0.270	0.140	0.210	0.210	0.210	0.940	0.680	0.940	0.680	1.150	0.080	0.140	0.140	0.390	1.090	1.090	1.090
	FUT V/C	Post-Project Segment Future V/C	0.860	0.290	0.270	0.250	0.270	0.140	0.190	0.190	0.210	0.940	0.680	0.940	0.680	0.330	0.070	0.130	0.120	0.350	0.870	0.700	0.980
	FUT V/C	Post-Project Segment Future V/C	0.860	0.290	0.270	0.250	0.270	0.140	0.190	0.190	0.210	0.940	0.680	0.940	0.680	0.330	0.070	0.130	0.120	0.350	0.870	0.700	0.980
	PEAK HOUR V/C	Original Segment Peak Hour V/C (direction 1)	0.340	0.140	0.200	0.200	0.200	0.150	0.190	0.190	0.190	0.570	0.470	0.570	0.470	1.290	0.130	0.140	0.140	0.340	0.600	0.600	0.600
	PEAK HOUR V/C	Original Segment Peak Hour V/C (direction 2)	0.340	0.130	0.210	0.210	0.210	0.150	0.190	0.190	0.190	0.500	0.510	0.500	0.510	1.330	0.110	0.130	0.130	0.340	0.650	0.650	0.650
	PEAK HOUR V/C	Adjusted # of Lanes for use in directional peak hr	N/A	N/A	N/A	4.57	N/A	N/A	N/A	4.89	4.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.20	N/A	N/A	N/A	N/A
	PEAK HOUR V/C	Post-Project Segement Peak Hr V/C (direction 1)	0.340	0.14	0.20	0.18	0.20	0.15	0.17	0.16	0.19	0.51	0.43	0.51	0.43	0.37	0.11	0.12	0.10	0.30	0.48	0.42	0.54
	PEAK HOUR V/C	Post-Project Segement Peak Hr V/C (direction 2)	0.340	0.13	0.21	0.21	0.21	0.15	0.16	0.19	0.19	0.45	0.46	0.45	0.46	0.38	0.10	0.11	0.10	0.30	0.52	0.45	0.59
	PEAK HOUR V/C	Post-Project Segment Peak Hr V/C (direction 1)	0.340	0.140	0.200	0.180	0.200	0.150	0.170	0.160	0.190	0.510	0.430	0.510	0.430	0.370	0.110	0.120	0.100	0.300	0.480	0.420	0.540
	PEAK HOUR V/C	Post-Project Segment Peak Hr V/C (direction 2)	0.340	0.130	0.210	0.210	0.210	0.150	0.160	0.190	0.190	0.450	0.460	0.450	0.460	0.380	0.100	0.110	0.100	0.300	0.520	0.450	0.590
	TTI AND PTI	Safety Reduction Factor	0.610	0.743	0.672	0.918	0.965	0.854	0.956	0.997	0.776	0.900	0.933	0.871	0.829	0.670	0.971	0.817	1.000	0.521	0.907	0.907	0.067
	TTI AND PTI	Safety Reduction	0.390	0.257	0.328	0.082	0.035	0.146	0.044	0.003	0.224	0.100	0.067	0.129	0.171	0.330	0.029	0.183	0.000	0.479	0.093	0.093	0.933
	TTI AND PTI	Mobility Reduction Factor	1.000	1.000	1.000	0.957	1.000	1.000	0.905	0.905	1.000	1.000	1.000	1.000	1.000	0.287	0.875	0.917	0.917	0.889	0.800	0.624	0.906
	TTI AND PTI	Mobility Reduction	0.000	0.000	0.000	0.043	0.000	0.000	0.095	0.095	0.000	0.000	0.000	0.000	0.000	0.713	0.125	0.083	0.083	0.111	0.200	0.376	0.094
	TTI AND PTI	Mobility effect on TTI	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	TTI AND PTI	Mobility effect on PTI	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
	TTI AND PTI	Safety effect on TTI	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	0.00	0.00
	TTI AND PTI	Safety effect on PTI	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	TTI AND PTI	Original Directional Segment TTI (direction 1)	1.218	1.049	1.170	1.170	1.170	1.007	1.306	1.306	1.306	1.180	1.456	1.180	1.456	1.120	1.131	1.233	1.233	1.000	1.075	1.075	1.075
	TTI AND PTI	Original Directional Segment PTI (direction 1)	4.014	1.538	2.051	2.051	2.051	1.422	2.378	2.378	2.378	4.425	7.152	4.425	7.152	1.610	1.638	2.158	2.158	1.178	3.837	3.837	3.837
	TTI AND PTI	Original Directional Segment TTI (direction 2)	1.056	1.042	1.046	1.046	1.046	1.078	1.148	1.148	1.148	1.862	1.097	1.862	1.097	1.000	1.055	1.000	1.000	1.052	1.487	1.487	1.487
	TTI AND PTI	Original Directional Segment PTI (direction 2)	3.033	1.480	1.471	1.471	1.471	1.506	1.937	1.937	1.937	6.477	4.972	6.477	4.972	1.165	1.399	1.141	1.141	1.356	6.793	6.793	6.793
	TTI AND PTI	Reduction Factor for Segment TTI	0.000	0.000	0.000	0.013	0.000	0.000	0.029	0.029	0.000	0.000	0.000	0.000	0.000	0.214	0.038	0.025	0.025	0.033	0.060	0.113	0.028
	TTI AND PTI	Reduction Factor for Segment PTI	0.117	0.077	0.098	0.033	0.010	0.044	0.032	0.020	0.067	0.030	0.020	0.039	0.051	0.242	0.034	0.072	0.017	0.166	0.068	0.103	0.299
	TTI AND PTI	Post-Project Directional Segment TTI (direction 1)	1.218	1.049	1.170	1.155	1.170	1.007	1.269	1.269	1.306	1.180	1.456	~~1.180~~	~~1.456~~	1.060	1.089	1.202	1.202	1.000	~~1.011~~	~~1.038~~	~~1.045~~
	TTI AND PTI	Post-Project Directional Segment PTI (direction 1)	3.544	1.419	1.849	1.983	2.030	1.360	2.302	2.331	2.218	4.293	7.008	~~4.254~~	~~6.785~~	1.221	1.583	2.003	2.122	1.089	~~3.576~~	~~3.441~~	~~2.691~~
	TTI AND PTI	Post-Project Directional Segment TTTI (direction 2)	1.056	1.042	1.046	1.046	1.046	1.078	1.115	1.148	1.148	1.862	1.097	~~1.862~~	~~1.097~~	1.000	1.015	1.000	1.000	1.017	~~1.398~~	~~1.319~~	~~1.445~~
	TTI AND PTI	Post-Project Directional Segment TPTI (direction 2)	2.678	1.366	1.326	1.471	1.456	1.440	1.875	1.937	1.937	6.283	4.872	~~6.227~~	~~4.717~~	1.083	1.35	1.06	1.141	1.131	~~6.332~~	~~6.092~~	~~4.764~~
	CLOSURE EXTENT	Orig Segment Directional Closure Extent (direction 1)	0.372	0.872	1.465	1.465	1.465	0.233	0.178	0.178	0.178	0.070	0.050	0.070	0.050	0.300	0.494	0.400	0.400	0.434	0.000	0.000	0.000
	CLOSURE EXTENT	Orig Segment Directional Closure Extent (direction 2)	0.320	0.109	0.145	0.145	0.145	0.067	0.267	0.267	0.267	0.200	0.000	0.200	0.000	0.550	0.482	0.880	0.880	0.845	0.000	0.000	0.000
	CLOSURE EXTENT	Segment Closures with fatalities/injuries	8	12	17	17	17	3	12	12	12	0	1	0	1	6	5	2	2	9	0	0	0
	CLOSURE EXTENT	Total Segment Closures	12	27	36	36	36	9	18	18	18	2	1	2	1	13	19	11	11	27	0	0	0
	CLOSURE EXTENT	% Closures with Fatality/Injury	0.67	0.44	0.47	0.47	0.47	0.33	0.67	0.67	0.67	0.00	1.00	0.00	1.00	0.46	0.26	0.18	0.18	0.33	0.00	0.00	0.00
	CLOSURE EXTENT	Closure Reduction	0.260	0.114	0.155	0.039	0.016	0.049	0.029	0.002	0.149	0.000	0.067	0.000	0.171	0.152	0.008	0.033	0.000	0.160	0.000	0.000	0.000
	CLOSURE EXTENT	Closure Reduction Factor	0.740	0.886	0.845	0.961	0.984	0.951	0.971	0.998	0.851	1.000	0.933	1.000	0.829	0.848	0.992	0.967	1.000	0.840	0.000	0.000	0.000
	CLOSURE EXTENT	Post-Project Segment Directional Closure Extent (direction 1)	0.275	0.772	1.238	1.408	1.441	0.222	0.173	0.178	0.151	0.070	0.047	~~0.070~~	~~0.041~~	0.254	0.490	0.387	0.400	0.365	0.000	0.000	0.000
	CLOSURE EXTENT	Post-Project Segment Directional Closure Extent (direction 2)	0.237	0.097	0.123	0.145	0.143	0.064	0.259	0.267	0.267	0.200	0.000	~~0.200~~	~~0.000~~	0.466	0.478	0.851	0.880	0.710	0.000	0.000	0.000
	BICYCLE ACCOM	Orig Segment Bicycle Accomodation %	45.0%	99.0%	86.0%	86.0%	86.0%	92.0%	79.0%	79.0%	79.0%	56.0%	16.0%	56.0%	16.0%	2.0%	93.0%	49.0%	49.0%	2.0%	1.0%	1.0%	1.0%
	BICYCLE ACCOM	Orig Segment Outside Shoulder width	6.97	9.42	9.29	9.29	9.29	9.86	7.52	7.52	7.52	5.82	4.62	5.82	4.62	1.21	9.53	5.19	5.19	2.26	1.49	1.49	1.49
	BICYCLE ACCOM	Post-Project Segment Outside Shoulder width	6.97	9.42	9.29	9.29	9.29	9.86	7.52	7.52	8.15	5.82	4.62	5.82	4.62	10.00	9.53	5.19	5.19	10.00	1.49	1.49	3.19
	BICYCLE ACCOM	Post-Project Segment Bicycle Accomodation (%)	45.0%	99.0%	86.0%	86.0%	86.0%	92.0%	79.0%	79.0%	80.0%	56.0%	16.0%	56.0%	16.0%	50.0%	93.0%	49.0%	49.0%	100.0%	1.0%	1.0%	12.0%
	BICYCLE ACCOM	Post-Project Segment Bicycle Accomodation (%)	45.0%	99.0%	86.0%	86.0%	86.0%	92.0%	79.0%	79.0%	80.0%	56.0%	16.0%	56.0%	16.0%	50.0%	93.0%	49.0%	49.0%	100.0%	1.0%	1.0%	12.0%
	Needs	Original Segment Mobility Need	1.609	1.048	1.750	1.750	1.750	0.674	2.035	2.035	2.035	2.046	1.635	2.046	1.635	6.880	0.877	1.891	1.891	1.669	3.549	3.549	3.549
	Needs	Post-Project Segment Mobility Need	1.561	0.774	1.380	1.664	1.714	0.540	1.874	1.947	1.884	2.016	1.611	1.884	1.497	1.148	0.814	1.700	1.809	0.815	1.868	1.472	1.866

*Using the already reduced TTI and PTI values (previously reduced from the Safety and Mobility factors).

	for Solution CS77.16 Reduction for A	Reduction for B	Reduction for C
	10% PTI	10% PTI	80% PTI
	10% TTI	10% TTI	80% TTI
	0.9	0.9	0.2
	0.909	0.934	0.209
	3.219	3.097	0.538
	1.258	1.187	0.289
	5.698	5.483	0.953

Reduction in TTI and PTI for roundabouts (10% reduction) for Solution 260.10B-1&2			
-	-	1.062	1.310
-	-	3.829	6.107
-	-	1.676	0.987
-	-	5.604	4.245

Reduced value for closures for roundabouts (10% reduction) for Solution 260.10B-1 &2			
-	-	0.063	0.037
-	-	0.180	0.000

- -user entered value
- -calculated value for reference only
- -calculated value for entry/use in other spreadsheet
- -for input into PES spreadsheet
- -assumed values

			Solution #	87.1	87.2	87.3	87.4	87.5B	87.6	87.7	87.8	87.9	260.10A-1 (87 Portion)	260.10A-2 (260 Portion)	260.10B-1 (87 Portion)	260.10B-2 (260 Portion)	260.11	260.12	260.13	260.14	260.15	77.16A	77.16B	77.16C
			Description	Gila River Area Safety Improvements	Bush Highway Area Safety and Freight Improvements	Sunflower Area Safety Improvements	Sunflower Area Freight Improvements	Slate Creek Pavement Improvements (Replace)	Rye Area Safety and Freight Improvements	Ox Bow Estates Area Safety Improvements	Ox Bow Estates Area Freight Improvements	Mazatzal Area Safety Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Lion Springs Area Mobility and Freight Improvements	Christopher Creek Area Freight Improvements	Mogollon Rim Area Freight Improvements	Mogollon Rim Area Climbing Lane	Forest Lakes Area Safety and Freight Improvements	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)
			Project Beg MP	177	191	213	213	224	235	241	243	246	251	252	251	252	256	260	277	277	282	386	386	386
			Project End MP	182	213	235	223	226	241	250	247	251	253	253	253	253	260	277	282	280	304	389	389	389
			Project Length (miles)	1.6	14	21	6	1	2.5	5	4	4.7	1.6	0.4	1.6	0.4	4	6.2	5	3	22	3	1.6	0.7
			Segment Beg MP	177	191	213	213	213	235	241	241	241	250	252	250	252	256	260	277	277	282	386	386	386
			Segment End MP	182	213	235	235	235	241	250	250	250	253	256	253	256	260	277	282	282	304	389	389	389
			Segment Length (miles)	5	22	21	21	21	6	9	9	9	3	4	3	4	4	17	5	5	22	3	3	3
			Segment #	1	3	4	4	4	5	6	6	6	7	8	7	8	9	10	11	11	12	16	16	16
			Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	4	4	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	one-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	one-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	1	0.25	1	1	0
			Pro-Rated # of Lanes	4.00	4.00	4.00	4.29	4.00	4.00	4.00	4.44	4.00	4.00	4.00	4.00	4.00	6.00	4.00	4.00	4.60	2.50	4.00	3.07	2.00
			Description																					
FREIGHT			Mobility effect on TTTI	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	0.15	0.15	0.15
			Mobility effect on TPTI	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	0.10	0.10	0.10
			Safety effect on TTTI	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	0.00	0.00
			Safety effect on TPTI	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	0.15	0.15	0.15
	TTTI AND TPTI	TTTI AND TPTI	Original Directional Segment TTTI (direction 1)	1.288	1.112	1.374	1.374	1.374	1.115	1.551	1.551	1.551	1.199	1.663	1.199	1.663	1.202	1.227	1.446	1.446	1.003	1.117	1.117	1.117
			Original Directional Segment TPTI (direction 1)	3.877	1.377	2.378	2.378	2.378	1.453	2.520	2.520	2.520	3.294	9.645	3.294	9.645	3.087	1.821	2.528	2.528	1.194	3.525	3.525	3.525
			Original Directional Segment TTTI (direction 2)	1.105	1.235	1.141	1.141	1.141	1.211	1.220	1.220	1.220	1.911	1.168	1.911	1.168	1.000	1.117	1.000	1.000	1.101	1.537	1.537	1.537
			Original Directional Segment TPTI (direction 2)	3.385	2.377	1.562	1.562	1.562	2.134	2.012	2.012	2.012	3.878	4.106	3.878	4.106	1.212	1.612	1.180	1.180	1.691	5.648	5.648	5.648
			Reduction Factor for Segment TTTI (both directions)	0.000	0.000	0.000	0.007	0.000	0.000	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.107	0.019	0.013	0.013	0.017	0.030	0.056	0.014
			Reduction Factor for Segment TPTI (both directions)	0.059	0.039	0.049	0.017	0.005	0.022	0.016	0.010	0.034	0.015	0.010	0.019	0.026	0.121	0.017	0.036	0.008	0.083	0.034	0.052	0.149
			Post-Project Directional Segment TTTI (direction 1)	1.288	1.112	1.374	1.365	1.374	1.115	1.529	1.529	1.551	1.199	1.663	~~1.199~~	~~1.663~~	1.073	1.204	1.428	1.428	0.995	~~1.083~~	~~1.054~~	~~1.101~~
			Post-Project Directional Segment TPTI (direction 1)	3.650	1.324	2.261	2.338	2.366	1.421	2.479	2.495	2.435	3.245	9.548	~~3.230~~	~~9.398~~	2.714	1.790	2.437	2.507	1.095	~~3.405~~	~~3.343~~	~~2.998~~
			Post-Project Directional Segment TTTI (direction 2)	1.105	1.235	1.141	1.141	1.141	1.211	1.203	1.220	1.220	1.911	1.168	~~1.911~~	~~1.168~~	1.000	1.096	1.000	1.000	1.083	~~1.491~~	~~1.450~~	~~1.515~~
			Post-Project Directional Segment TPTI (direction 2)	3.187	2.285	1.485	1.562	1.554	2.087	1.980	2.012	2.012	3.820	4.065	~~3.803~~	~~4.001~~	1.066	1.585	1.138	1.180	1.551	~~5.456~~	~~5.357~~	~~4.804~~
	FREIGHT INDEX	FREIGHT INDEX	Original Segment TPTI (direction 1)	3.877	1.377	2.378	2.378	2.378	1.453	2.520	2.520	2.520	3.294	9.645	3.294	9.645	3.087	1.821	2.528	2.528	1.194	3.525	3.525	3.525
			Original Segment TPTI (direction 2)	3.385	2.377	1.562	1.562	1.562	2.134	2.012	2.012	2.012	3.878	4.106	3.878	4.106	1.212	1.612	1.180	1.180	1.691	5.648	5.648	5.648
			Original Segment Freight Index	0.275	0.533	0.508	0.508	0.508	0.558	0.441	0.441	0.441	0.279	0.145	0.279	0.145	0.465	0.583	0.539	0.539	0.693	0.218	0.218	0.218
			Post-Project Segment TPTI (direction 1)	3.650	1.324	2.261	2.338	2.366	1.421	2.479	2.495	2.435	3.245	9.548	3.230	9.398	2.714	1.790	2.437	2.507	1.095	3.405	3.343	2.998
			Post-Project Segment TPTI (direction 2)	3.187	2.285	1.485	1.562	1.554	2.087	1.980	2.012	2.012	3.820	4.065	3.803	4.001	1.066	1.585	1.138	1.180	1.551	5.456	5.357	4.804
			Post-Project Segment Freight Index	0.293	0.554	0.534	0.513	0.510	0.570	0.449	0.444	0.450	0.283	0.147	0.316	0.166	0.529	0.593	0.559	0.542	0.756	0.956	0.966	1.000
	CLOSURE DURATION	CLOSURE DURATION	Orig Segment Directional Closure Duration (dir 1)	129.188	2674.129	4359.887	4359.887	4359.887	49.200	37.156	37.156	37.156	21.333	11.450	21.333	11.450	71.850	157.494	144.400	144.400	117.012	0.000	0.000	0.000
			Orig Segment Directional Closure Duration (dir 2)	61.920	59.227	34.009	34.009	34.009	21.667	287.978	287.978	287.978	693.600	0.000	693.600	0.000	726.900	797.706	922.040	922.040	901.618	0.000	0.000	0.000
			Segment Closures with fatalities	8	12	17	17	17	3	12	12	12	0	1	0	1	6	5	2	2	9	0	0	0
			Total Segment Closures	12	27	36	36	36	9	18	18	18	2	1	2	1	13	19	11	11	27	0	0	0
			% Closures with Fatality	0.67	0.44	0.47	0.47	0.47	0.33	0.67	0.67	0.67	0.00	1.00	0.00	1.00	0.46	0.26	0.18	0.18	0.33	0.00	0.00	0.00
			Closure Reduction	0.260	0.114	0.155	0.039	0.016	0.049	0.029	0.002	0.149	0.000	0.067	0.000	0.171	0.152	0.008	0.033	0.000	0.160	0.000	0.000	0.000
			Closure Reduction Factor	0.740	0.886	0.845	0.961	0.984	0.951	0.971	0.998	0.851	1.000	0.933	1.000	0.829	0.848	0.992	0.967	1.000	0.840	0.000	0.000	0.000
			Post-Project Segment Directional Closure Duration (direction 1)	95.589	2368.478	3685.277	4190.942	4288.772	46.805	36.074	37.091	31.617	21.333	10.681	~~21.333~~	~~9.492~~	60.898	156.291	139.585	144.400	98.338	0.000	0.000	0.000
			Post-Project Segment Directional Closure Duration (direction 2)	45.816	52.457	28.747	34.009	33.454	20.612	279.589	287.978	287.978	693.600	0.000	~~693.600~~	~~0.000~~	616.096	791.613	891.297	922.040	757.729	0.000	0.000	0.000
	VERT CLR	VERT CLR	Original Segment Vertical Clearance	No Change	16.97	18.75	18.75	18.75	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
			Original vertical clearance for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
			Post-Project vertical clearance for specific bridge	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
			Post-Project Segment Vertical Clearance	No Change	16.97	18.75	18.75	18.75	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
			Post-Project Segment Vertical Clearance	No Change	16.97	18.75	18.75	18.75	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Needs	**Needs**	Original Segment Freight Need	0.944	8.709	12.193	12.193	12.193	3.617	5.340	5.340	5.340	2.072	2.825	2.072	2.825	5.671	5.151	5.928	5.928	3.957	1.864	1.864	1.864
			Post-Project Segment Freight Need	0.76	8.017	10.748	11.833	12.042	**3.527**	5.221	5.298	5.258	2.051	2.801	1.702	2.495	5.065	5.048	5.746	5.893	2.247	0.092	0.092	0.090

*Using the already reduced TTI and PTI values (previously reduced from the Safety and Mobility factors).

	for Solution CS77.16		
	Reduction for A	Reduction for B	Reduction for C
	80% PTI	80% PTI	90% PTI
	80% TTI	80% TTI	90% TTI
	0.2	0.2	0.1
	0.217	0.211	0.110
	0.681	0.669	0.300
	0.298	0.290	0.152
	1.091	1.071	0.480

Reduction in TTI and PTI for roundabouts (10% reduction) for Solution 260.10B-1&2			
-	-	1.079	1.497
-	-	2.907	8.458
-	-	1.720	1.051
-	-	3.423	3.601
Reduced value for closures for roundabouts (10% reduction) for Solution 260.10B-1 &2			
-	-	19.20	8.54
-	-	624.24	0.00

-user entered value
-calculated value for reference only
-calculated value for entry/use in other spreadsheet
-for input into PES spreadsheet
-assumed values

			Solution #	87.1	87.2	87.3	87.4	87.5B	87.6	87.7	87.8	87.9	260.10A-1 (87 Portion)	260.10A-2 (260 Portion)	260.10B-1 (87 Portion)	260.10B-2 (260 Portion)	260.11	260.12	260.13	260.14	260.15	77.16A	77.16B	77.16C
			Description	Gila River Area Safety Improvements	Bush Highway Area Safety and Freight Improvements	Sunflower Area Safety Improvements	Sunflower Area Freight Improvements	Slate Creek Pavement Improvements (Replace)	Rye Area Safety and Freight Improvements	Ox Bow Estates Area Safety Improvements	Ox Bow Estates Area Freight Improvements	Mazatzal Area Safety Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Payson Area Safety and Freight Improvements	Lion Springs Area Mobility and Freight Improvements	Christopher Creek Area Freight Improvements	Mogollon Rim Area Freight Improvements	Mogollon Rim Area Climbing Lane	Forest Lakes Area Safety and Freight Improvements	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)
			Project Beg MP	177	191	213	213	224	235	241	243	246	251	252	251	252	256	260	277	277	282	386	386	386
			Project End MP	182	213	235	223	226	241	250	247	251	253	253	253	253	260	277	282	280	304	389	389	389
			Project Length (miles)	1.6	14	21	6	1	2.5	5	4	4.7	1.6	0.4	1.6	0.4	4	6.2	5	3	22	3	1.6	0.7
			Segment Beg MP	177	191	213	213	213	235	241	241	241	250	252	250	252	256	260	277	277	282	386	386	386
			Segment End MP	182	213	235	235	235	241	250	250	250	253	256	253	256	260	277	282	282	304	389	389	389
			Segment Length (miles)	5	22	21	21	21	6	9	9	9	3	4	3	4	4	17	5	5	22	3	3	3
			Segment #	1	3	4	4	4	5	6	6	6	7	8	7	8	9	10	11	11	12	16	16	16
			Current # of Lanes (both directions)	4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	4	4	2	2	2	2
			Project Type (one-way or two-way)	two-way	two-way	two-way	one-way	two-way	two-way	two-way	one-way	one-way	two-way	two-way	two-way	two-way	two-way	two-way	two-way	one-way	two-way	two-way	two-way	two-way
			Additional Lanes (one-way)	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	1	0.25	1	1	0
			Pro-Rated # of Lanes	4.00	4.00	4.00	4.29	4.00	4.00	4.00	4.44	4.00	4.00	4.00	4.00	4.00	6.00	4.00	4.00	4.60	2.50	4.00	3.07	2.00
			Description																					
BRIDGE	BRIDGE INDEX	BRIDGE INDEX	Original Segment Bridge Index																			6.00	6.00	6.00
			Original lowest rating for specific bridge																			-	-	6
			Post-Project lowest rating for specific bridge																			-	-	8
			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	-	-	8
			Post-Project Segment Bridge Index																			7.56	7.56	8.00
			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	7.56	7.56	8.00
	SUFF RATING	SUFF RATING	Original Segment Sufficiency Rating																			59.00	59.00	59.00
			Original Sufficiency Rating for specific bridge																			-	-	59.00
			Post-Project Sufficiency Rating for specific bridge																			-	-	98.00
			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	-	-	98.00
			Post-Project Segment Sufficiency Rating																			89.42	89.42	98.00
			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	89.42	89.42	98.00
	BR RTNG	BR RTNG	Original Segment Bridge Rating																			6	6	6
			Post-Project Segment Bridge Rating																			6	6	8
			Post-Project Segment Bridge Rating	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	8
	% FUN OB	% FUN OB	Original Segment % Functionally Obsolete																			100.00%	100.00%	100.00%
			Post-Project Segment % Functionally Obsolete																			22.00%	22.00%	0.00%
			Post-Project Segment % Functionally Obsolete	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	22.00%	22.00%	0.00%
	Needs	Needs	Original Segment Bridge Need																			1.343	1.343	1.343
			Post-Project Segment Bridge Need																			0.060	0.060	0.000
PAVEMENT	PAVEMENT INDEX	PAVEMENT INDEX	Original Segment Pavement Index					4.05									4.27					3.25	3.25	3.25
			Original Segment IRI in project limits														50.72					-	-	159.733
			Original Segment Cracking in project limits														1.75					-	-	0
			Post-Project IRI in project limits					30									40.36					-	-	30
			Post-Project IRI in project limits	0	0	0	0	30	0	0	0	0	0	0	0	0	40.36	0	0	0	0	-	-	30
			Post-Project Cracking in project limits					0									0.88					-	-	0
			Post-Project Cracking in project limits	0	0	0	0	0	0	0	0	0	0	0	0	0	0.88	0	0	0	0	-	-	0
			Post-Project Segment Pavement Index					4.08									4.44					3.86	3.76	4.01
			Post-Project Segment Pavement Index	0	0	0	0	4.08	0	0	0	0	0	0	0	0	4.44	0	0	0	0	3.86	3.76	4.01
	DIRECTION PSR	DIRECTION PSR	Original Segment Directional PSR (direction 1)					3.84									4.12					3.1	3.1	3.1
			Original Segment Directional PSR (direction 2)					3.93									-					-	-	-
			Original Segment IRI in project limits	0	0	0	0	0	0	0	0	0	0	0	0	0	50.72	0	0	0	0	-	-	159.733
			Post-Project directional IRI in project limits	0	0	0	0	30	0	0	0	0	0	0	0	0	40.36	0	0	0	0	-	-	30
			Post-Project Segment Directional PSR (direction 1)					3.87									4.12					3.7	3.76	3.79
			Post-Project Segment Directional PSR (direction 2)					3.95									4.46					-	-	-
			Post-Project Segment Directional PSR (direction 1)	0	0	0	0	3.87	0	0	0	0	0	0	0	0	4.12	0	0	0	0	3.7	3.76	3.79
			Post-Project Segment Directional PSR (direction 2)	0	0	0	0	3.95	0	0	0	0	0	0	0	0	4.46	0	0	0	0	-	-	-
	% FAIL	% FAIL	Original Segment % Failure					0.0%									0.0%					40.0%	40.0%	40.0%
			Post-Project Segment % Failure					0.0%									0.0%					22.2%	25.0%	0.0%
			Post-Project Segment % Failure	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.2%	25.0%	0.0%
	Needs	Needs	Original Segment Pavement Need					0.000									0					1.850	1.850	1.850
			Post-Project Segment Pavement Need					0.000									0					0.444	0.500	0.000

CMF Application

SR 87/SR 260/SR 377 Corridor Profile Study
CMF Application

=user input

CS87.1 (MP 177-182)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effective CMF	Crashes in Segment Limits Fatal	Crashes in Segment Limits Incap	Crashes in Solution Limits Fatal	Crashes in Solution Limits Incap	Post-Solution Crashes Fatal	Post-Solution Crashes Incap	Crash Reduction Fatal	Crash Reduction Incap	
177	177.5	0.90	0.86	1	1	NB	0.837			1	0	0.000	0.000	1.000	0.000	NB fatal crash eliminated due to barrier
177	182	0.86	1	1	1	NB	0.860			1	0	0.860	0.000	0.140	0.000	
Four Intersections		0.75	0.86	1	1	NB	0.698			2	1	1.395	0.698	0.605	0.303	Four intersections receiving lighting
Four Intersections		0.75	0.86	1	1	SB	0.698			2	0	1.395	0.000	0.605	0.000	Four intersections receiving lighting
						NB		4	1	4	1	**2.255**	**0.698**	1.745	0.303	
						SB		2	0	2	0	**1.395**	**0.000**	0.605	0.000	

CS87.2 (MP 191-213)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effective CMF	Crashes in Segment Limits Fatal	Crashes in Segment Limits Incap	Crashes in Solution Limits Fatal	Crashes in Solution Limits Incap	Post-Solution Crashes Fatal	Post-Solution Crashes Incap	Total Crash Reductio Fatal	Total Crash Reductio Incap	
194	205	0.72	1	1	1	NB	0.720			0	4	0.000	2.880	0.000	1.120	
194	205	0.72	1	1	1	SB	0.720			4	1	2.880	0.720	1.120	0.280	
Four Areas		0.94	1	1	1	NB	0.940			1	3	0.940	2.820	0.060	0.180	Four areas corresponding to speed feedback signs
209	211	0.68	0.94	1	1	SB	0.660			2	1	1.319	0.660	0.681	0.340	
						NB		1	8	1	7	**0.940**	**6.700**	0.060	1.300	
						SB		6	3	6	2	**4.199**	**2.380**	1.801	0.620	

CS87.3 (MP 213-235)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effective CMF	Crashes in Segment Limits Fatal	Crashes in Segment Limits Incap	Crashes in Solution Limits Fatal	Crashes in Solution Limits Incap	Post-Solution Crashes Fatal	Post-Solution Crashes Incap	Total Crash Reductio Fatal	Total Crash Reductio Incap	
New Signage Areas		0.72	0.75	1	1	NB	0.630			2	8	1.260	5.040	0.740	2.960	
New Signage Areas		0.72	0.75	1	1	SB	0.630			1	7	0.630	4.410	0.370	2.590	
226	228.5	0.68	0.72	1	1	SB	0.585			1	0	0.585	0.000	0.415	0.000	
213	235	0.72	1	1	1	NB	0.720			2	3	1.440	2.160	0.560	0.840	Crashes within MP 213-235 minus those already
213	235	0.72	1	1	1	SB	0.720			3	3	2.160	2.160	0.840	0.840	accounted for with other components of the solutions
						NB		4	11	4	11	**2.700**	**7.200**	1.300	3.800	
						SB		5	10	5	10	**3.375**	**6.570**	1.625	3.430	

CS260.10B (SR 87 Portion) (MP 251-253)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effective CMF	Crashes in Segment Limits Fatal	Crashes in Segment Limits Incap	Crashes in Solution Limits Fatal	Crashes in Solution Limits Incap	Post-Solution Crashes Fatal	Post-Solution Crashes Incap	Crash Reduction Fatal	Crash Reduction Incap
SR 87/Main St		0.9	1	1	1	NB	0.900			1	0	0.900	0.000	0.100	0.000
SR 87/Phoenix St		0.9	1	1	1	SB	0.900			0	1	0.000	0.900	0.000	0.100
SR 87/Bonita St		0.4	1	1	1	NB	0.400			0	1	0.000	0.400	0.000	0.600
						NB		1	1	1	1	**0.900**	**0.400**	0.100	0.600
						SB		0	1	0	1	**0.000**	**0.900**	0.000	0.100

CS260.10A (SR 260 Portion) (MP 252-253)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effective CMF	Crashes in Segment Limits Fatal	Crashes in Segment Limits Incap	Crashes in Solution Limits Fatal	Crashes in Solution Limits Incap	Post-Solution Crashes Fatal	Post-Solution Crashes Incap	Crash Reduction Fatal	Crash Reduction Incap
252.4		0.75	1	1	1	EB	0.750			0	1	0.000	0.750	0.000	0.250
SR 260/Manzanita D		0.9	0.98	1	1	EB	0.891			0	2	0.000	1.782	0.000	0.218
						EB		0	7	0	3	**0.000**	**6.532**	0.000	0.468

CS260.15 (MP 282-304)

BMP	EMP	CMF1	CMF2	CMF3	CMF4	Dir	Effective CMF	Crashes in Segment Limits Fatal	Crashes in Segment Limits Incap	Crashes in Solution Limits Fatal	Crashes in Solution Limits Incap	Post-Solution Crashes Fatal	Post-Solution Crashes Incap	Crash Reduction Fatal	Crash Reduction Incap	
282	304	0.63	0.64	1	1	EB	0.517			4	4	2.066	2.066	1.934	1.934	
282	304	0.63	0.64	1	1	WB	0.517			1	1	0.517	0.517	0.483	0.483	
282	304	0.64	1	1	1	EB	0.640			0	1	0.000	0.640	0.000	0.360	Crashes within MP 282-304 minus those already
282	304	0.64	1	1	1	WB	0.640			0	2	0.000	1.280	0.000	0.720	accounted for with other component of the solution
						EB		4	5	4	5	**2.066**	**2.706**	1.934	2.294	
						WB		1	3	1	3	**0.517**	**1.797**	0.483	1.203	

Performance Area Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost (in 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	
CS87.1	Salt River Area Safety Improvements	177-182	$4.7			0.000		0.000			0.000		0.000	9.238	4.751	4.487	4.10	18.38	1.609	1.561	0.048	1.63	0.078	0.944	0.760	0.184	1.34	0.246	18.706
CS87.2	Bush Highway Area Safety and Freight Improvements	191-213	$6.8			0.000		0.000			0.000		0.000	2.825	1.239	1.586	1.40	2.23	1.048	0.774	0.274	6.95	1.904	8.709	8.017	0.692	5.55	3.839	7.969
CS87.3	Sunflower Area Safety Improvements	213-235	$18.3			0.000		0.000			0.000		0.000	4.418	2.352	2.066	2.77	5.71	1.750	1.380	0.370	7.39	2.735	12.193	10.748	1.445	5.59	8.078	16.526
CS87.4	Sunflower Area Freight Improvements	213-219	$43.4			0.000		0.000			0.000		0.000	4.418	3.911	0.507	2.97	1.50	1.750	1.664	0.086	6.48	0.557	12.193	11.833	0.360	5.59	2.013	4.073
CS87.5B	Slate Creek Pavement Improvements (Replace)	224-226	$7.2	0.000	0.000	0.000	1.92	0.000			0.000		0.000	4.418	4.206	0.212	2.97	0.63	1.750	1.714	0.036	5.35	0.193	12.193	12.042	0.151	5.59	0.844	1.665
CS87.6	Rye Area Safety and Freight Improvements	235-241	$0.2			0.000		0.000			0.000		0.000	2.553	1.774	0.779	0.78	0.61	0.674	0.540	0.134	5.44	0.729	3.617	3.527	0.090	5.65	0.509	1.848
CS87.7	Ox Bow Estates Area Safety Improvements	241-250	$2.6			0.000		0.000			0.000		0.000	6.452	6.102	0.350	3.36	1.18	2.035	1.874	0.161	6.39	1.029	5.340	5.221	0.119	5.65	0.672	2.878
CS87.8	Ox Bow Estates Area Freight Improvements	243-247	$22.4			0.000		0.000			0.000		0.000	6.452	6.435	0.017	3.78	0.06	2.035	1.947	0.088	6.20	0.545	5.340	5.298	0.042	5.65	0.237	0.847
CS87.9	Mazatzal Area Safety Improvements	246-251	$2.3			0.000		0.000			0.000		0.000	6.452	4.651	1.801	3.02	5.44	2.035	1.884	0.151	6.34	0.957	5.340	5.258	0.082	5.65	0.463	6.859
CS260.10A	Payson Area Safety and Freight Improvements	251-253	$0.4											3.270	2.690	0.580	5.10	2.96	3.681	3.627	0.054	2.23	0.121	4.897	4.852	0.045	1.97	0.089	3.165
CS260.10A-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$0.4			0.000		0.000			0.000		0.000	3.090	2.522	0.568	5.09	2.89	2.046	2.016	0.030	2.39	0.072	2.072	2.051	0.021	1.61	0.034	2.998
CS260.10A-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$0.4			0.000		0.000			0.000		0.000	0.180	0.168	0.012	5.23	0.06	1.635	1.611	0.024	2.03	0.049	2.825	2.801	0.024	2.28	0.055	0.166
CS260.10B	Payson Area Safety and Freight Improvements	251-253	$13.9											3.270	2.502	0.768	5.10	3.92	3.681	3.381	0.300	2.23	0.668	4.897	4.197	0.700	1.93	1.349	5.932
CS260.10B-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$13.9			0.000		0.000			0.000		0.000	3.090	2.352	0.738	5.09	3.76	2.046	1.884	0.162	2.39	0.388	2.072	1.702	0.370	1.61	0.597	4.743
CS260.10B-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$13.9			0.000		0.000			0.000		0.000	0.180	0.150	0.030	5.23	0.16	1.635	1.497	0.138	2.03	0.280	2.825	2.495	0.330	2.28	0.751	1.189
CS260.11	Lion Springs Area Mobility and Freight Improvements	256-260	$50.0	0.000	0.000	0.000	2.17	0.000			0.000		0.000	5.082	2.986	2.096	3.55	7.43	6.880	1.148	5.732	7.98	45.716	5.671	5.065	0.606	7.65	4.634	57.783
CS260.12	Christopher Creek Area Freight Improvements	260-277	$6.5			0.000		0.000			0.000		0.000	0.909	0.812	0.097	3.38	0.33	0.877	0.814	0.063	5.67	0.357	5.151	5.048	0.103	5.15	0.530	1.215
CS260.13	Mogollon Rim Area Freight Improvements	277-282	$8.7			0.000		0.000			0.000		0.000	0.206	0.168	0.038	5.46	0.21	1.891	1.700	0.191	5.86	1.120	5.928	5.746	0.182	5.23	0.953	2.280
CS260.14	Mogollon Rim Area Climbing Lane	277-280	$16.8			0.000		0.000			0.000		0.000	0.206	0.206	0.000	5.46	0.00	1.891	1.809	0.082	5.56	0.456	5.928	5.893	0.035	5.23	0.183	0.639
CS260.15	Forest Lakes Area Safety and Freight Improvements	282-304	$56.5			0.000		0.000			0.000		0.000	4.209	0.669	3.540	3.73	13.21	1.669	0.815	0.854	8.30	7.087	3.957	2.247	1.710	7.27	12.428	32.722
CS77.16A	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	386-389	$92.1	1.850	0.444	1.406	2.34	3.296	1.343	0.060	1.283	4.13	5.297	23.902	21.566	2.336	4.95	11.57	3.549	1.868	1.681	7.28	12.232	1.864	0.092	1.772	6.82	12.086	44.484
CS77.16B	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	386-389	$75.8	1.850	0.500	1.350	2.34	3.165	1.343	0.060	1.283	4.13	5.297	23.902	21.566	2.336	4.95	11.57	3.549	1.472	2.077	6.95	14.426	1.864	0.092	1.772	6.82	12.086	46.547
CS77.16C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)	386-389	$43.8	1.850	0.000	1.850	2.34	4.337	1.343	0.000	1.343	4.13	5.545	23.902	0.269	23.633	4.95	117.08	3.549	1.866	1.683	6.73	11.332	1.864	0.090	1.774	6.82	12.099	150.397

Emphasis Area Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost (in millions)	Safety Emphasis Area						Mobility Emphasis Area						Freight Emphasis Area					
				Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score	Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score	Existing Corridor Need	Post-Solution Corridor Need	Raw Score	Risk Factor	Emphasis Factor	Factored Score
CS87.1	Salt River Area Safety Improvements	177-182	$4.7	3.072	2.939	0.133	4.10	1.50	0.815	0.255	0.255	0.000	1.63	1.50	0.000	2.669	2.668	0.001	1.34	1.50	0.002
CS87.2	Bush Highway Area Safety and Freight Improvements	191-213	$6.8	3.072	2.930	0.141	1.40	1.50	0.297	0.255	0.255	0.000	6.95	1.50	0.000	2.669	2.663	0.006	5.55	1.50	0.049
CS87.3	Sunflower Area Safety Improvements	213-235	$18.3	3.072	2.822	0.250	2.77	1.50	1.035	0.255	0.255	0.000	7.39	1.50	0.000	2.669	2.662	0.007	5.59	1.50	0.060
CS87.4	Sunflower Area Freight Improvements	213-219	$43.4	3.072	3.009	0.062	2.97	1.50	0.277	0.255	0.254	0.001	6.48	1.50	0.012	2.669	2.667	0.001	5.59	1.50	0.013
CS87.5B	Slate Creek Pavement Improvements (Replace)	224-226	$7.2	3.072	3.045	0.027	2.97	1.50	0.118	0.255	0.255	0.000	5.35	1.50	0.000	2.669	2.668	0.001	5.59	1.50	0.006
CS87.6	Rye Area Safety and Freight Improvements	235-241	$0.2	3.072	3.052	0.020	0.78	1.50	0.023	0.255	0.255	0.000	5.44	1.50	0.000	2.669	2.668	0.001	5.65	1.50	0.008
CS87.7	Ox Bow Estates Area Safety Improvements	241-250	$2.6	3.072	3.049	0.023	3.36	1.50	0.114	0.255	0.254	0.001	6.39	1.50	0.010	2.669	2.668	0.001	5.65	1.50	0.008
CS87.8	Ox Bow Estates Area Freight Improvements	243-247	$22.4	3.072	3.070	0.001	3.78	1.50	0.007	0.255	0.254	0.001	6.20	1.50	0.010	2.669	2.669	0.000	5.65	1.50	0.003
CS87.9	Mazatzal Area Safety Improvements	246-251	$2.3	3.072	2.956	0.116	3.02	1.50	0.524	0.255	0.255	0.000	6.34	1.50	0.000	2.669	2.668	0.001	5.65	1.50	0.009
CS260.10A	Payson Area Safety and Freight Improvements	251-253	$0.4	-	-	-		1.50	0.294	-	-	-		1.50	0.000	-	-	-		1.50	0.000
CS260.10A-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$0.4	3.003	2.999	0.004	5.09	1.50	0.031	0.255	0.255	0.000	2.39	1.50	0.000	2.669	2.669	0.000	1.61	1.50	0.000
CS260.10A-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$0.4	3.072	3.038	0.034	5.23	1.50	0.263	0.255	0.255	0.000	2.03	1.50	0.000	2.669	2.669	0.000	2.28	1.50	0.000
CS260.10B	Payson Area Safety and Freight Improvements	251-253	$13.9	-	-	-		1.50	0.725	-	-	-		1.50	0.000	-	-	-		1.50	0.006
CS260.10B-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$13.9	3.003	2.998	0.005	5.09	1.50	0.038	0.255	0.255	0.000	2.39	1.50	0.000	2.669	2.668	0.001	1.61	1.50	0.002
CS260.10B-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$13.9	3.072	2.984	0.088	5.23	1.50	0.687	0.255	0.255	0.000	2.03	1.50	0.000	2.669	2.668	0.001	2.28	1.50	0.004
CS260.11	Lion Springs Area Mobility and Freight Improvements	256-260	$50.0	3.003	2.968	0.035	3.55	1.50	0.186	0.255	0.242	0.013	7.98	1.50	0.158	2.669	2.666	0.003	7.65	1.50	0.032
CS260.12	Christopher Creek Area Freight Improvements	260-277	$6.5	3.072	3.062	0.009	3.38	1.50	0.047	0.255	0.254	0.001	5.67	1.50	0.008	2.669	2.667	0.002	5.15	1.50	0.017
CS260.13	Mogollon Rim Area Freight Improvements	277-282	$8.7	3.003	2.998	0.005	5.46	1.50	0.041	0.255	0.255	0.000	5.86	1.50	0.002	2.669	2.668	0.001	5.23	1.50	0.010
CS260.14	Mogollon Rim Area Climbing Lane	277-280	$16.8	3.003	3.003	0.000	5.46	1.50	0.000	0.255	0.255	0.000	5.56	1.50	0.002	2.669	2.669	0.000	5.23	1.50	0.001
CS260.15	Forest Lakes Area Safety and Freight Improvements	282-304	$56.5	3.072	2.753	0.319	3.73	1.50	1.783	0.255	0.250	0.005	8.30	1.50	0.061	2.669	2.652	0.017	7.27	1.50	0.190
CS77.16A	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	386-389	$92.1	3.003	2.976	0.027	4.95	1.50	0.201	0.255	0.253	0.002	7.28	1.50	0.025	2.669	2.647	0.022	6.82	1.50	0.224
CS77.16B	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	386-389	$75.8	3.003	2.976	0.027	4.95	1.50	0.201	0.255	0.251	0.004	6.95	1.50	0.045	2.669	2.646	0.023	6.82	1.50	0.235
CS77.16C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)	386-389	$43.8	3.003	2.733	0.270	4.95	1.50	2.006	0.255	0.254	0.001	6.73	1.50	0.011	2.669	2.645	0.024	6.82	1.50	0.241

Performance Effectiveness Scoring

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost (in millions)	Total Factored Benefit	VMT Factor	NPV Factor	Performance Effectiveness Score	miles	2014 ADT	1-way or 2-way	VMT
CS87.1	Salt River Area Safety Improvements	177-182	$4.7	19.523	1.43	15.3	91.3	1.60	15116	2	24185
CS87.2	Bush Highway Area Safety and Freight Improvements	191-213	$6.8	8.315	4.26	15.3	79.7	14.00	9827	2	137578
CS87.3	Sunflower Area Safety Improvements	213-235	$18.3	17.621	4.78	15.3	70.4	21.00	10778	2	226338
CS87.4	Sunflower Area Freight Improvements	213-219	$43.4	4.375	1.81	20.2	3.7	6.00	10778	1	32334
CS87.5B	Slate Creek Pavement Improvements (Replace)	224-226	$7.2	1.789	0.70	20.2	3.5	1.00	10778	2	10778
CS87.6	Rye Area Safety and Freight Improvements	235-241	$0.2	1.879	1.67	8.8	125.7	2.50	11717	2	29292.5
CS87.7	Ox Bow Estates Area Safety Improvements	241-250	$2.6	3.010	2.79	15.3	49.3	5.00	11717	2	58585
CS87.8	Ox Bow Estates Area Freight Improvements	243-247	$22.4	0.867	1.39	20.2	1.1	4.00	11717	1	23434
CS87.9	Mazatzal Area Safety Improvements	246-251	$2.3	7.392	1.59	15.3	78.9	4.70	11717	1	27534.95
CS260.10A	Payson Area Safety and Freight Improvements	251-253	$0.4	3.459	1.98	8.8	137.3	-	-	-	36389.2
CS260.10A-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$0.4	3.029	1.74	8.8	105.2	1.60	19185	2	30696
CS260.10A-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$0.4	0.430	0.38	8.8	3.3	0.40	14233	2	5693.2
CS260.10B	Payson Area Safety and Freight Improvements	251-253	$13.9	6.663	1.98	20.2	19.2	-	-	-	36389.2
CS260.10B-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$13.9	4.783	1.74	20.2	12.1	1.60	19185	2	30696
CS260.10B-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$13.9	1.880	0.38	20.2	1.0	0.40	14233	2	5693.2
CS260.11	Lion Springs Area Mobility and Freight Improvements	256-260	$50.0	58.160	2.68	20.2	62.9	4.00	13796	2	55184
CS260.12	Christopher Creek Area Freight Improvements	260-277	$6.5	1.288	2.09	15.3	6.4	6.20	6270	2	38871.6602
CS260.13	Mogollon Rim Area Freight Improvements	277-282	$8.7	2.333	1.73	15.3	7.1	5.00	6112	2	30558.4727
CS260.14	Mogollon Rim Area Climbing Lane	277-280	$16.8	0.643	0.60	20.2	0.5	3.00	6112	1	9167.5418
CS260.15	Forest Lakes Area Safety and Freight Improvements	282-304	$56.5	34.757	4.19	20.2	52.1	22.00	5954	2	130988
CS77.16A	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	386-389	$92.1	44.934	1.45	30.6	21.6	3.20	7694	2	24620.8
CS77.16B	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	386-389	$75.8	47.027	0.79	30.6	14.9	1.60	7694	2	12310.4
CS77.16C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)	386-389	$43.8	152.654	0.36	30.6	38.4	0.70	7694	2	5385.8

Appendix J: Solution Prioritization Scores

Candidate Solution #	Candidate Solution Name	Milepost Location	Estimated Cost (in millions)	Pavement		Bridge		Safety		Mobility		Freight		Total Factored Score	Risk Factors					Weighted Risk Factor	Segment Need	Prioritization Score
				Score	%	Score	%	Score	%	Score	%	Score	%		Pavement	Bridge	Safety	Mobility	Freight			
CS87.1	Salt River Area Safety Improvements	177-182	$4.7	0.000	0.0%	0.000	0.0%	19.196	98.3%	0.078	0.4%	0.248	1.3%	19.523	1.14	1.51	1.78	1.36	1.36	1.773	1.308	**212**
CS87.2	Bush Highway Area Safety and Freight Improvements	191-213	$6.8	0.000	0.0%	0.000	0.0%	2.524	30.3%	1.904	22.9%	3.887	46.7%	8.315	1.14	1.51	1.78	1.36	1.36	1.487	1.769	**210**
CS87.3	Sunflower Area Safety Improvements	213-235	$18.3	0.000	0.0%	0.000	0.0%	6.748	38.3%	2.735	15.5%	8.138	46.2%	17.621	1.14	1.51	1.78	1.36	1.36	1.521	1.769	**189**
CS87.4	Sunflower Area Freight Improvements	213-219	$43.4	0.000	0.0%	0.000	0.0%	1.780	40.7%	0.570	13.0%	2.025	46.3%	4.375	1.14	1.51	1.78	1.36	1.36	1.531	1.769	**10**
CS87.5B	Slate Creek Pavement Improvements (Replace)	224-226	$7.2	0.000	0.0%	0.000	0.0%	0.747	41.7%	0.193	10.8%	0.850	47.5%	1.789	1.14	1.51	1.78	1.36	1.36	1.535	1.769	**9**
CS87.6	Rye Area Safety and Freight Improvements	235-241	$0.2	0.000	0.0%	0.000	0.0%	0.634	33.7%	0.729	38.8%	0.516	27.5%	1.879	1.14	1.51	1.78	1.36	1.36	1.502	1.385	**261**
CS87.7	Ox Bow Estates Area Safety Improvements	241-250	$2.6	0.000	0.0%	0.000	0.0%	1.290	42.9%	1.040	34.5%	0.680	22.6%	3.010	1.14	1.51	1.78	1.36	1.36	1.540	1.615	**123**
CS87.8	Ox Bow Estates Area Freight Improvements	243-247	$22.4	0.000	0.0%	0.000	0.0%	0.072	8.3%	0.555	64.0%	0.240	27.7%	0.867	1.14	1.51	1.78	1.36	1.36	1.395	1.615	**2**
CS87.9	Mazatzal Area Safety Improvements	246-251	$2.3	0.000	0.0%	0.000	0.0%	5.963	80.7%	0.957	12.9%	0.472	6.4%	7.392	1.14	1.51	1.78	1.36	1.36	1.699	1.615	**216**
CS260.10A	Payson Area Safety and Freight Improvements	251-253	$0.4	0.000	0.0%	0.000	0.0%	3.249	93.9%	0.121	3.5%	0.089	2.6%	3.459	1.14	1.51	1.78	1.36	1.36	1.755	0.711	**171**
CS260.10A-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$0.4	0.000	0.0%	0.000	0.0%	2.923	96.5%	0.072	2.4%	0.034	1.1%	3.029	1.14	1.51	1.78	1.36	1.36	1.765	0.600	**111**
CS260.10A-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$0.4	0.000	0.0%	0.000	0.0%	0.326	75.9%	0.049	11.3%	0.055	12.8%	0.430	1.14	1.51	1.78	1.36	1.36	1.679	1.154	**6**
CS260.10B	Payson Area Safety and Freight Improvements	251-253	$13.9	0.000	0.0%	0.000	0.0%	4.641	69.6%	0.668	10.0%	1.354	20.3%	6.663	1.14	1.51	1.78	1.36	1.36	1.653	0.711	**23**
CS260.10B-1 (87 Portion)	Payson Area Safety and Freight Improvements	251-253	$13.9	0.000	0.0%	0.000	0.0%	3.797	79.4%	0.388	8.1%	0.599	12.5%	4.783	1.14	1.51	1.78	1.36	1.36	1.693	0.600	**12**
CS260.10B-2 (260 Portion)	Payson Area Safety and Freight Improvements	252-253	$13.9	0.000	0.0%	0.000	0.0%	0.844	44.9%	0.280	14.9%	0.755	40.2%	1.880	1.14	1.51	1.78	1.36	1.36	1.549	1.154	**2**
CS260.11	Lion Springs Area Mobility and Freight Improvements	256-260	$50.0	0.000	0.0%	0.000	0.0%	7.619	13.1%	45.874	78.9%	4.667	8.0%	58.160	1.14	1.51	1.78	1.36	1.36	1.415	1.800	**160**
CS260.12	Christopher Creek Area Freight Improvements	260-277	$6.5	0.000	0.0%	0.000	0.0%	0.375	29.1%	0.365	28.4%	0.547	42.5%	1.288	1.14	1.51	1.78	1.36	1.36	1.482	1.154	**11**
CS260.13	Mogollon Rim Area Freight Improvements	277-282	$8.7	0.000	0.0%	0.000	0.0%	0.249	10.7%	1.123	48.1%	0.962	41.2%	2.333	1.14	1.51	1.78	1.36	1.36	1.405	1.200	**12**
CS260.14	Mogollon Rim Area Climbing Lane	277-280	$16.8	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.458	71.3%	0.184	28.7%	0.643	1.14	1.51	1.78	1.36	1.36	1.360	1.200	**1**
CS260.15	Forest Lakes Area Safety and Freight Improvements	282-304	$56.5	0.000	0.0%	0.000	0.0%	14.991	43.1%	7.148	20.6%	12.618	36.3%	34.757	1.14	1.51	1.78	1.36	1.36	1.541	1.615	**130**
CS77.16A	Holbrook Area Mobility and Freight Improvements (SR 377/SR 77 connection)	386-389	$92.1	3.296	7.3%	5.297	11.8%	11.774	26.2%	12.257	27.3%	12.310	27.4%	44.934	1.14	1.51	1.78	1.36	1.36	1.472	2.100	**67**
CS77.16B	Holbrook Area Mobility and Freight Improvements (US 180/SR 77 connection)	386-389	$75.8	3.165	6.7%	5.297	11.3%	11.774	25.0%	14.471	30.8%	12.320	26.2%	47.027	1.14	1.51	1.78	1.36	1.36	1.467	2.100	**46**
CS77.16C	Holbrook Area Mobility and Freight Improvements (adjacent to SR 77)	386-389	$43.8	4.337	2.8%	5.545	3.6%	119.090	78.0%	11.343	7.4%	12.340	8.1%	152.654	1.14	1.51	1.78	1.36	1.36	1.687	2.100	**136**

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:	

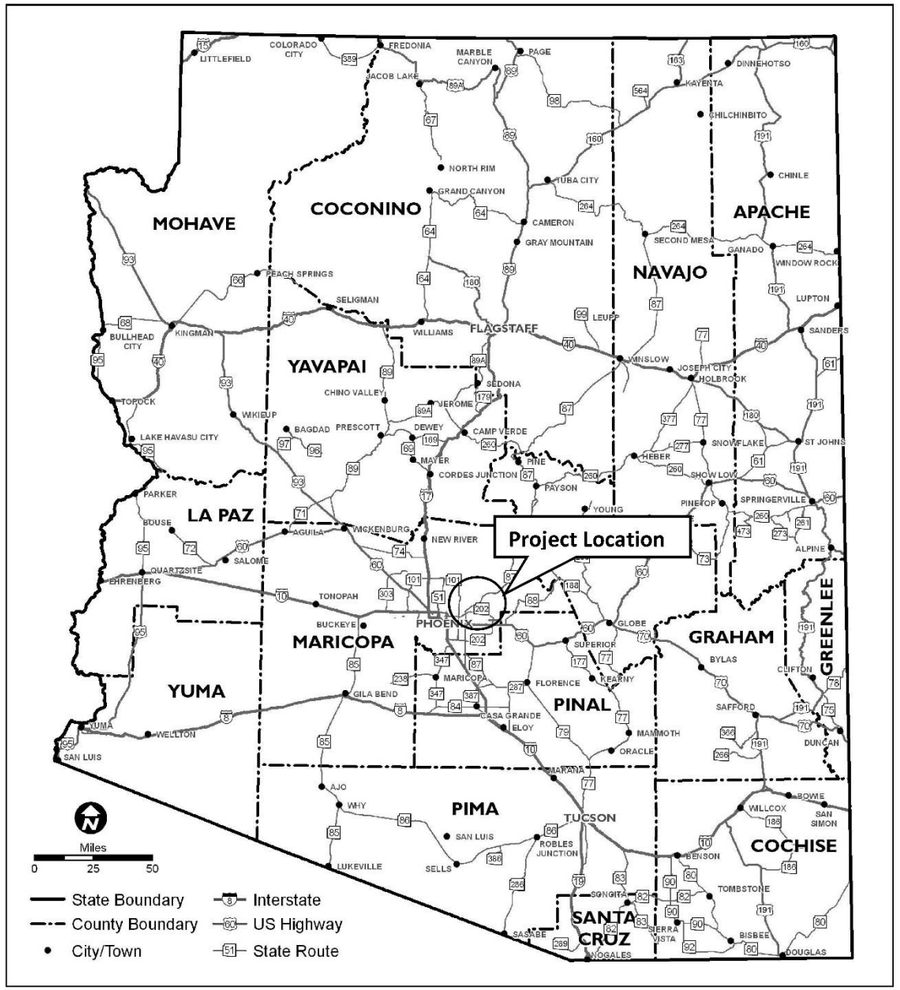
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$132,000	$416,000	$0	$4,125,800	$4,673,800

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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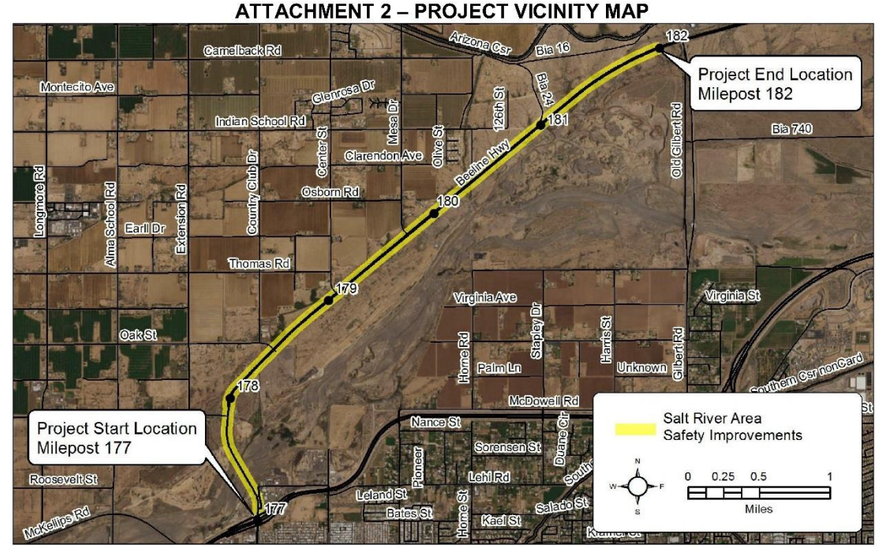
ATTACHMENT 2 – PROJECT VICINITY MAP



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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)

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:	

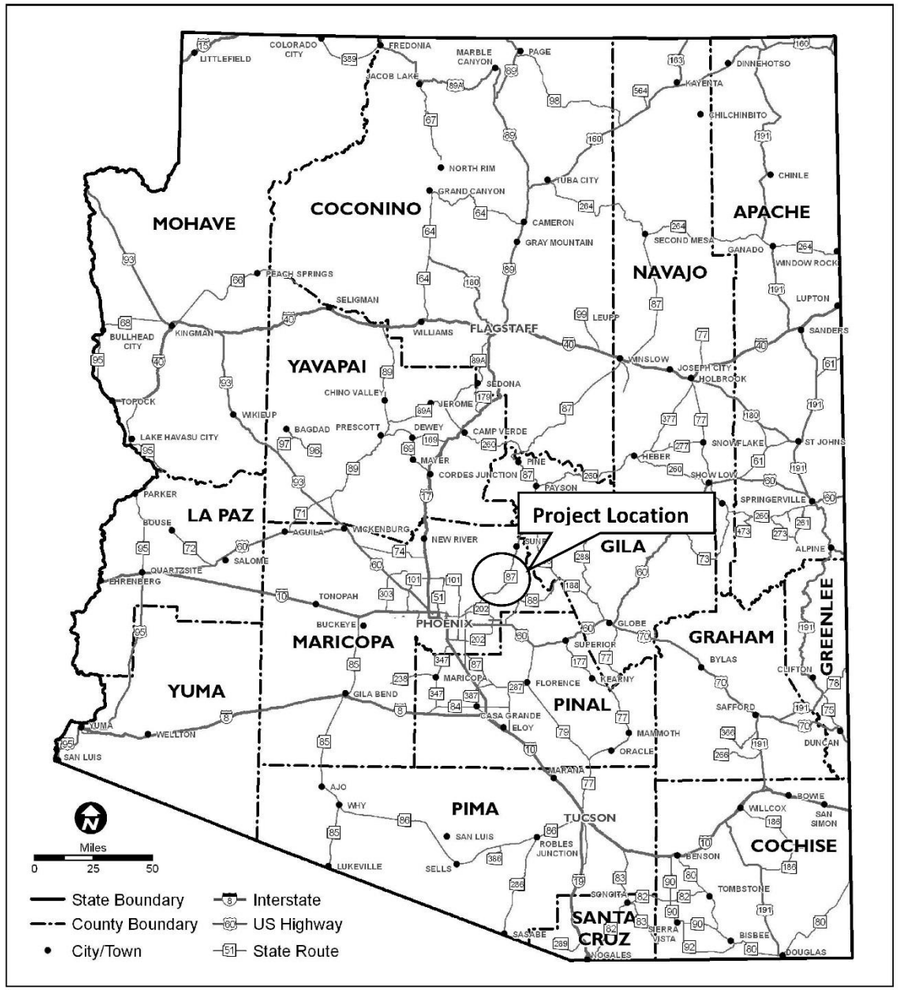
COST ESTIMATE				
Preliminary Engineering $180,000	Design $600,000	Right-of-Way $0	Construction $6,016,000	Total $6,796,000

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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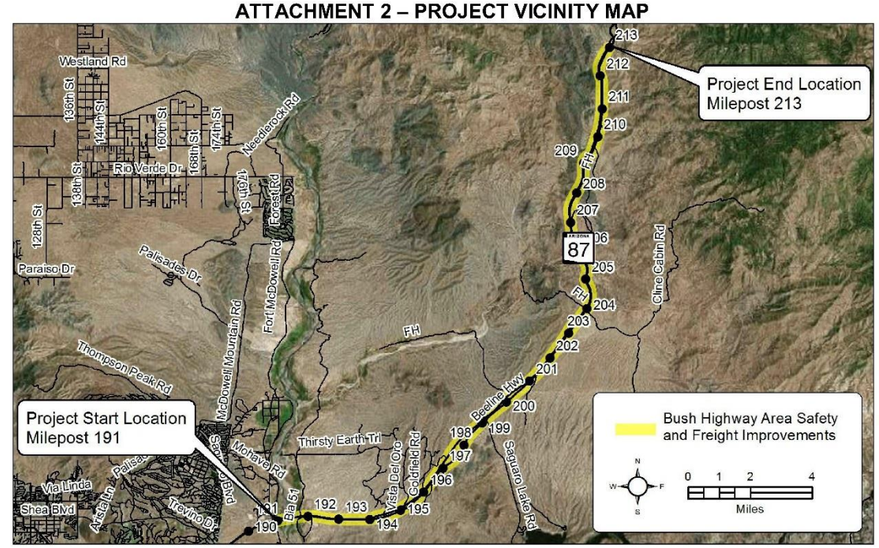
ATTACHMENT 2 – PROJECT VICINITY MAP



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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:	

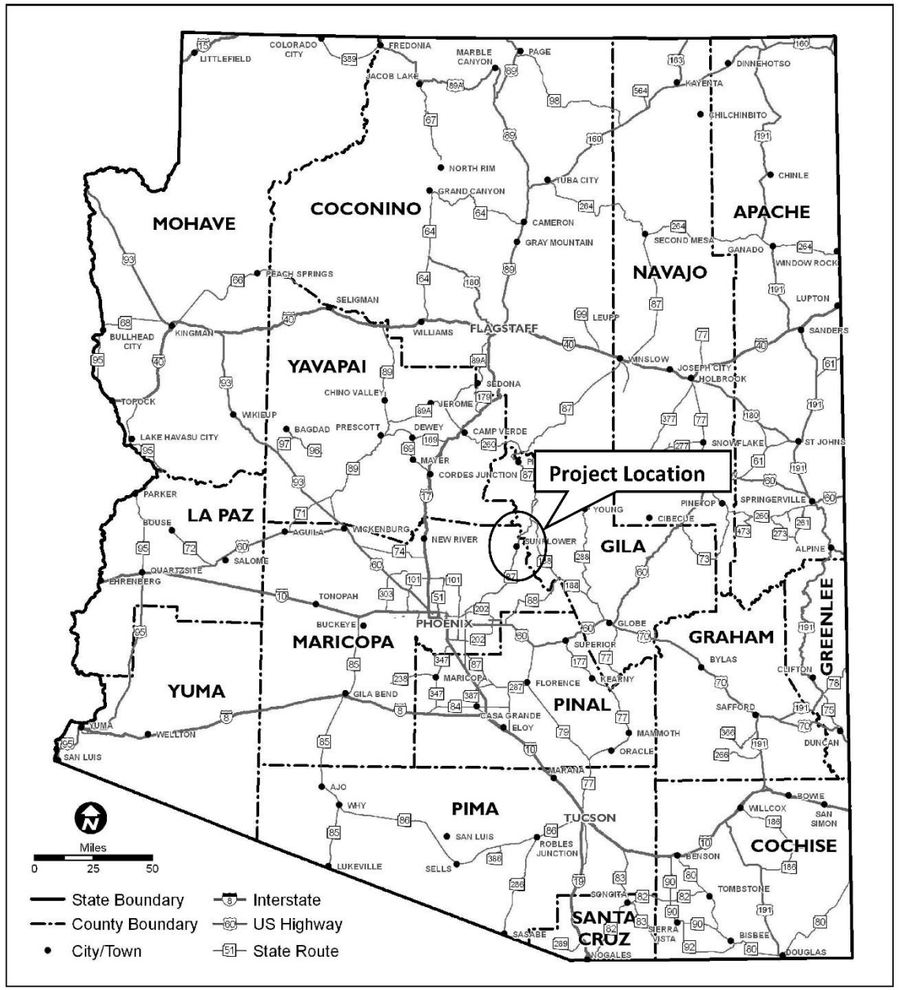
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$480,000	$1,630,000	$0	$16,215,000	$18,325,000

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**

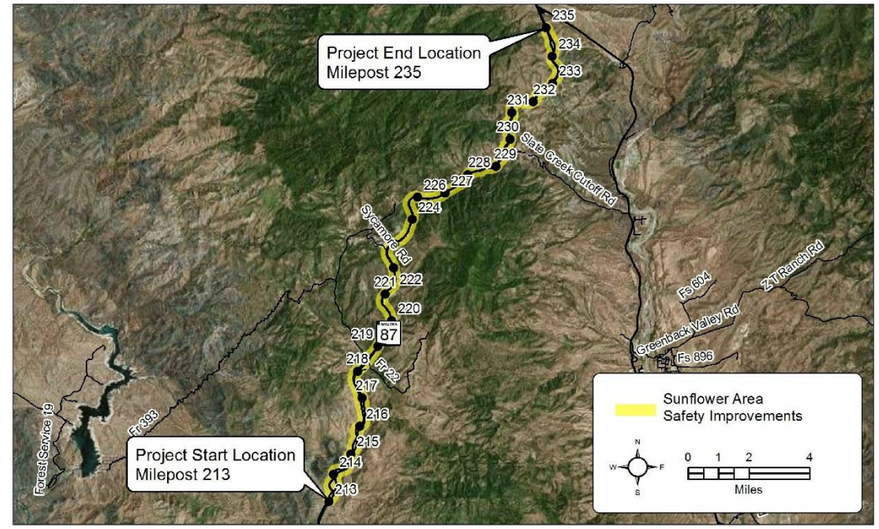
2

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).

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.			

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)*	

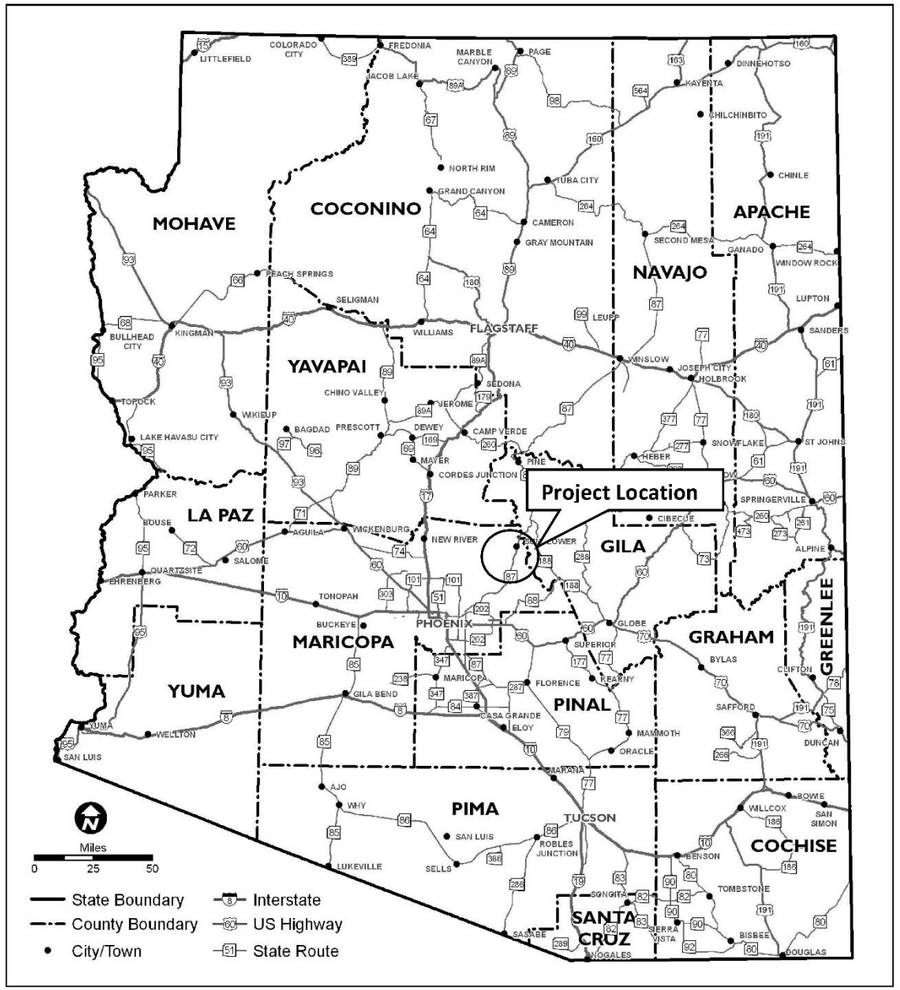
FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

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

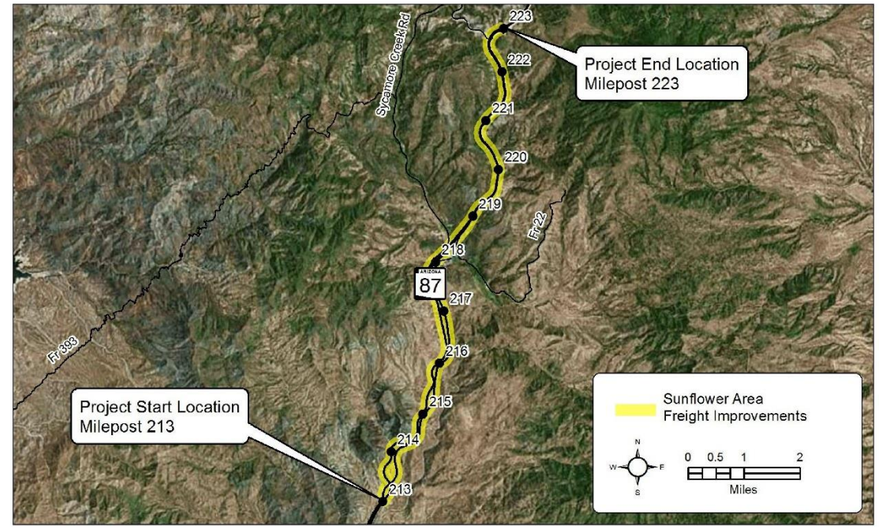
ATTACHMENTS
1) **State Location Map** 2) **Project Vicinity Map** 3) **Project Scope of Work**

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

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:	

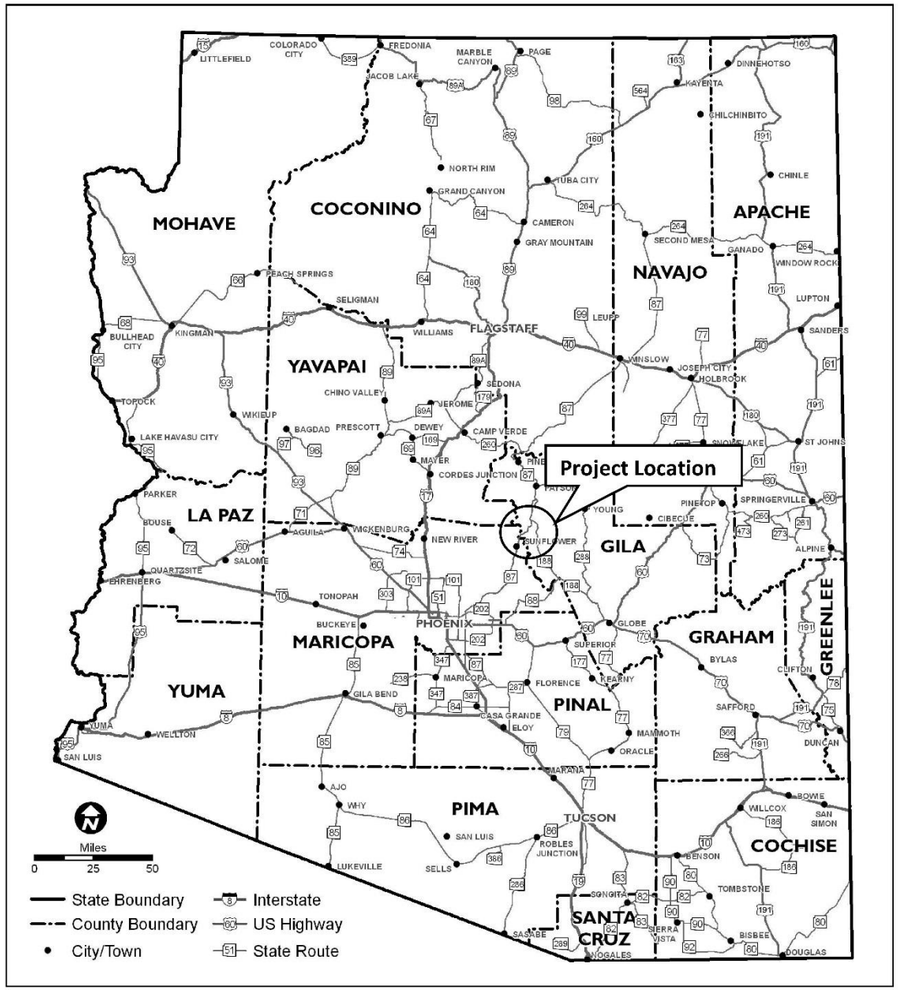
COST ESTIMATE				
Preliminary Engineering $190,000	Design $640,000	Right-of-Way $0	Construction $6,360,000	Total $7,190,000

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

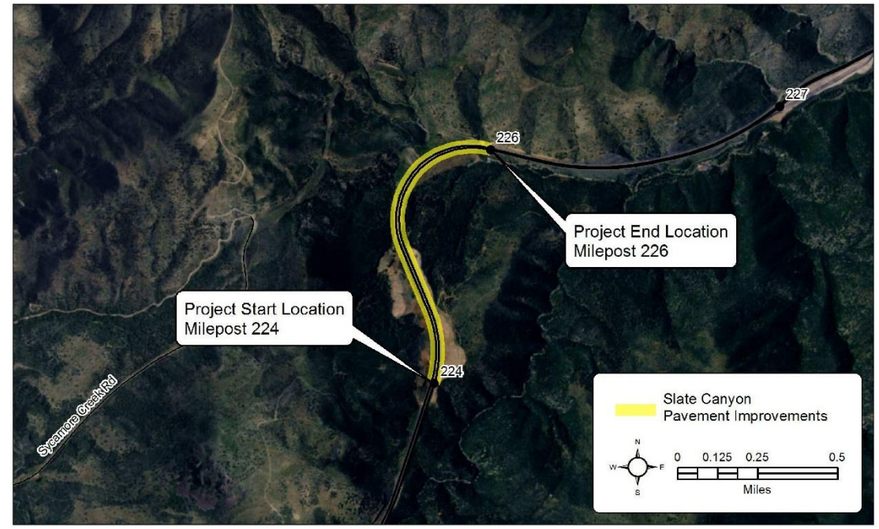
ATTACHMENTS
1) **State Location Map** 2) **Project Vicinity Map** 3) **Project Scope of Work**

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.			

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)*	

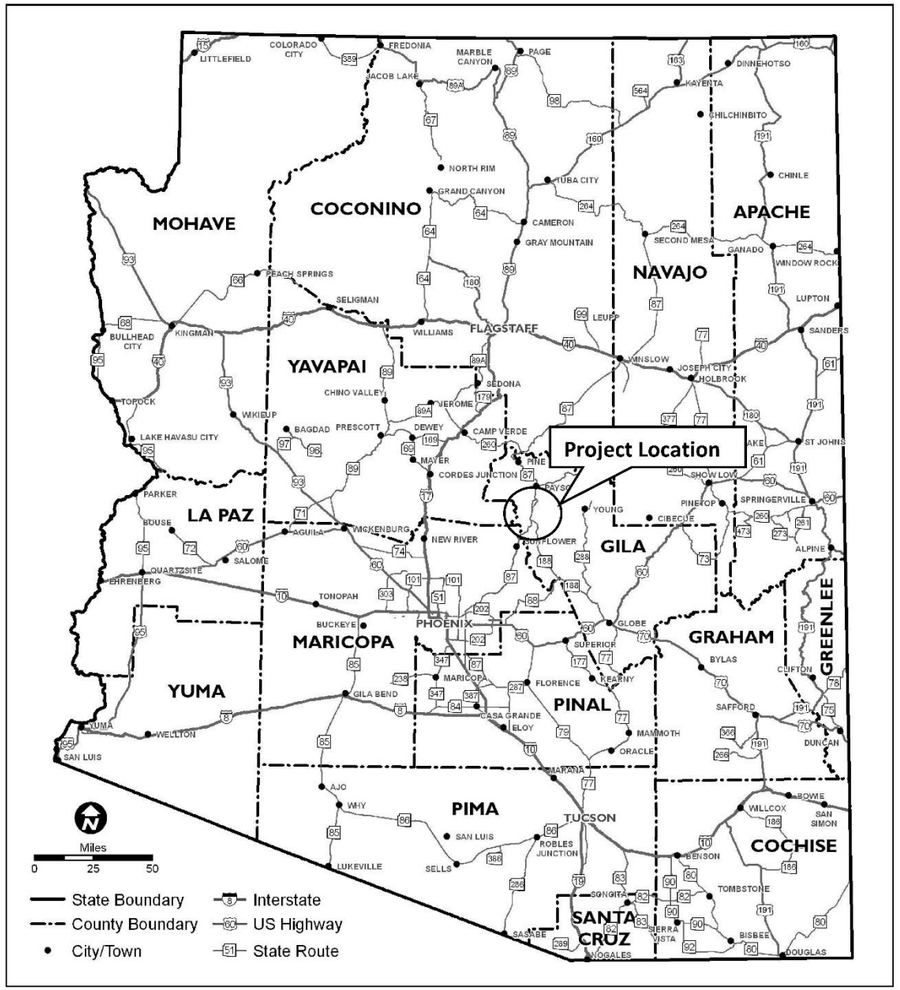
FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

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

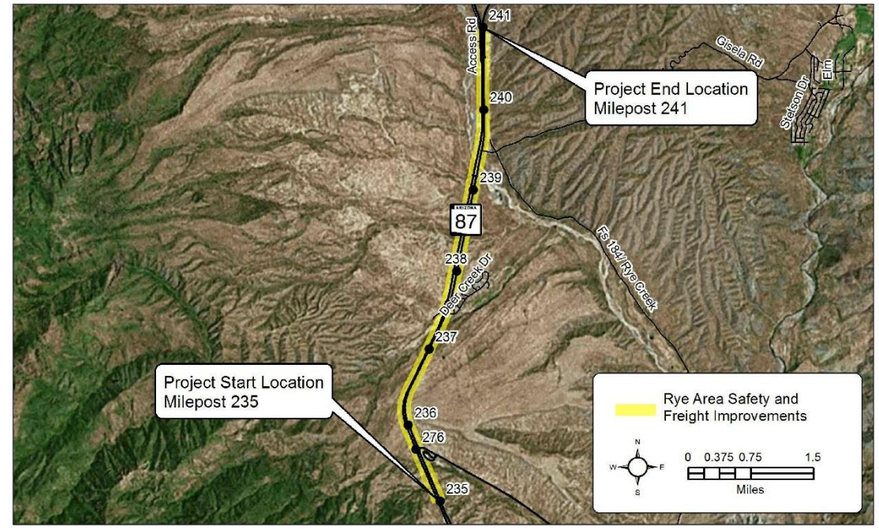
PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

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

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



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:	

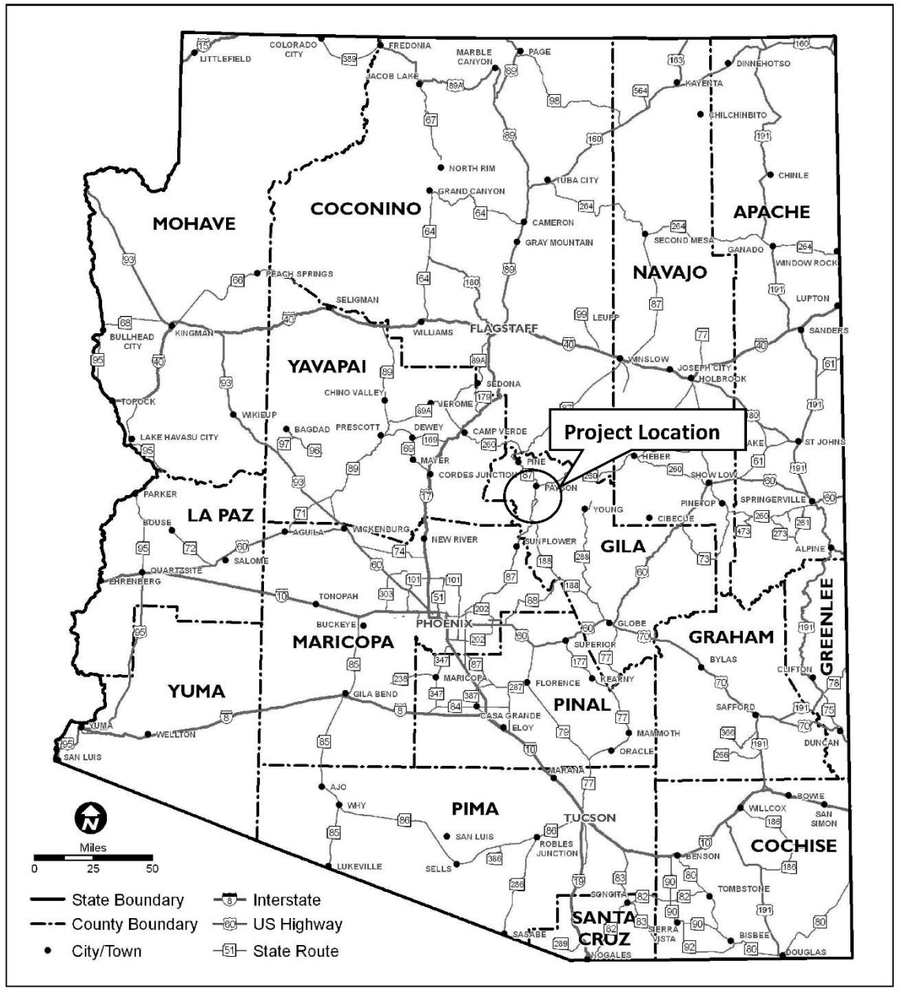
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$112,000	$360,000	$0	$3,639,000	$4,111,000

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**

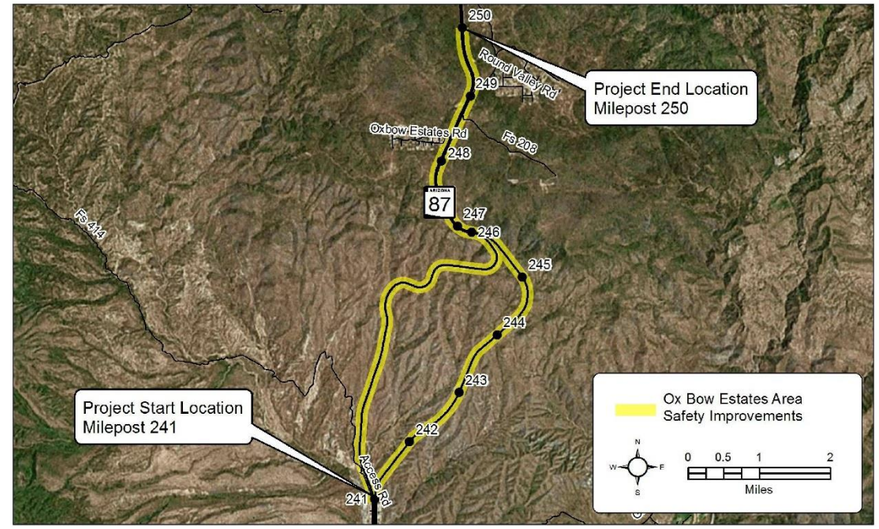
2

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

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:	

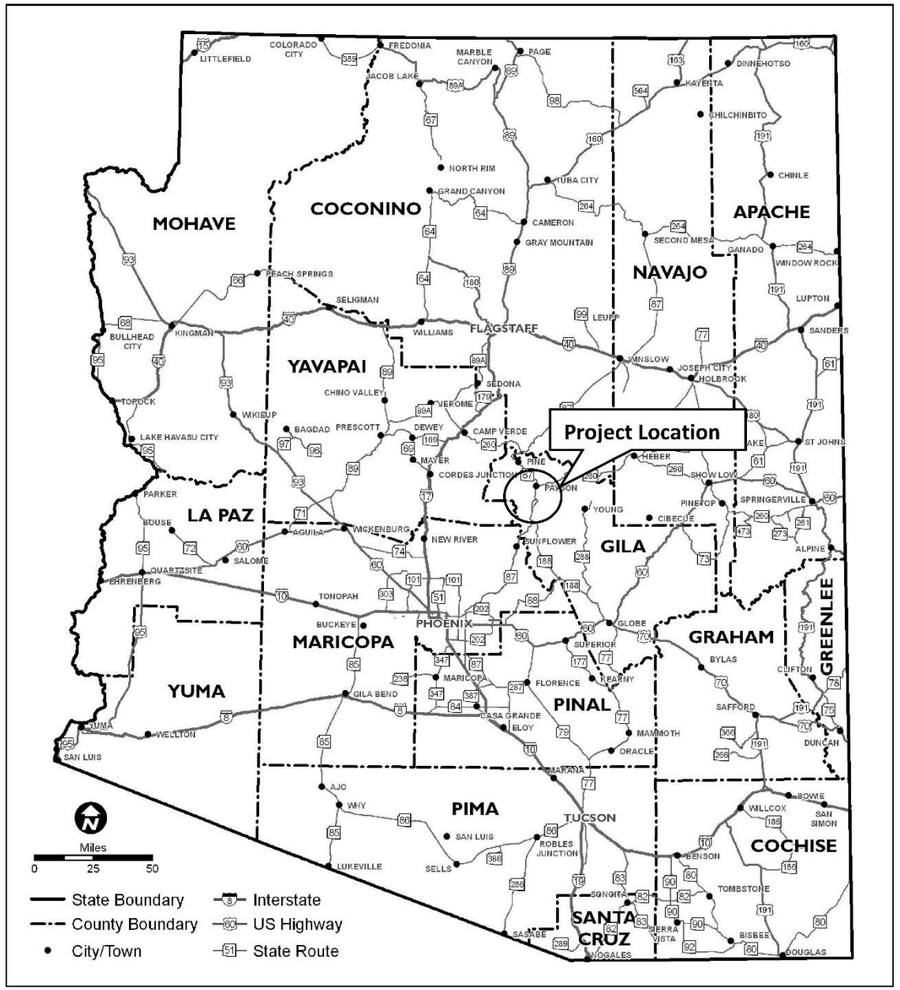
COST ESTIMATE				
Preliminary Engineering $590,000	Design $1,980,000	Right-of-Way $0	Construction $19,800,000	Total $22,370,000

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**

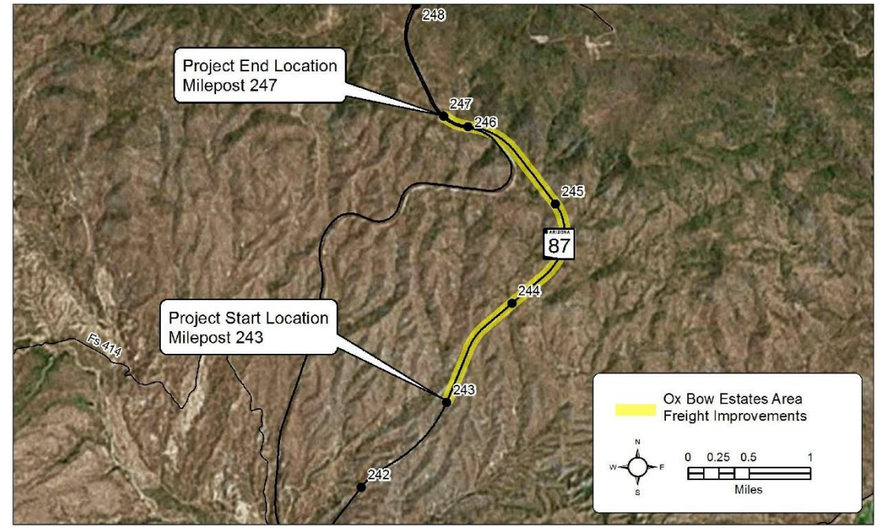
2

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:	

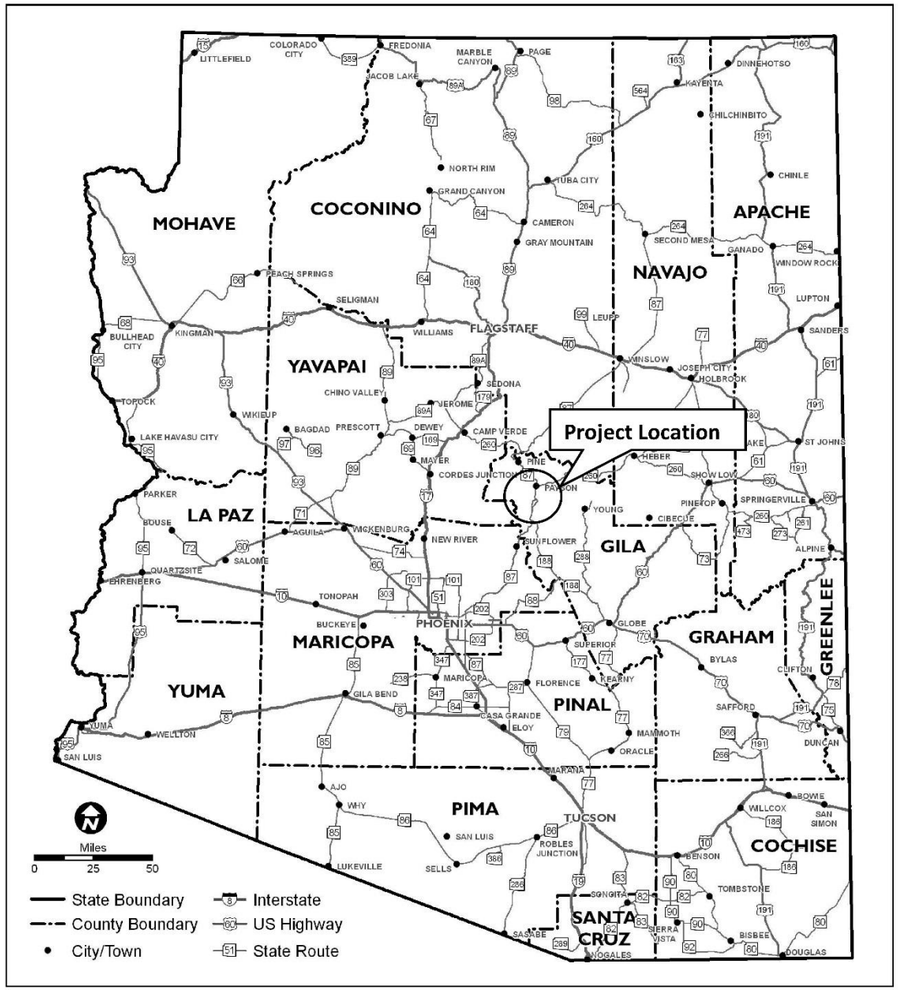
COST ESTIMATE				
Preliminary Engineering $60,000	Design $200,000	Right-of-Way $0	Construction $2,021,000	Total $2,281,000

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

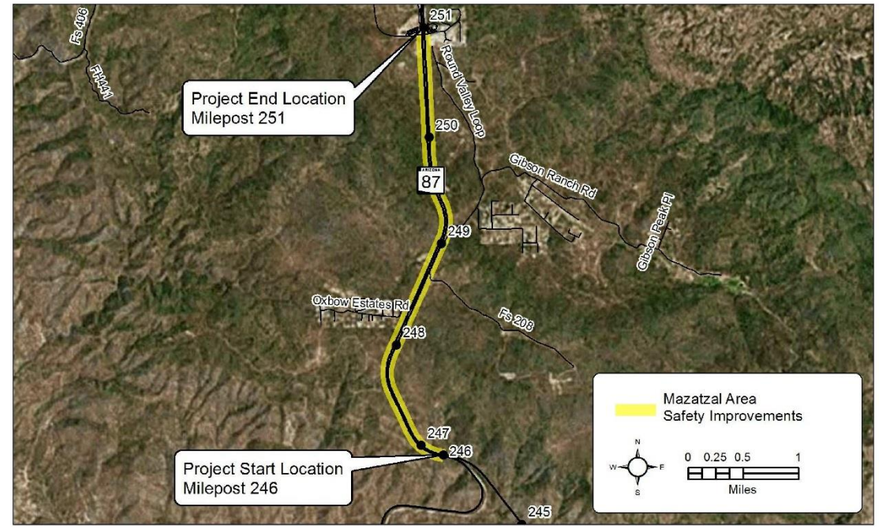
ATTACHMENTS
1) **State Location Map** 2) **Project Vicinity Map** 3) **Project Scope of Work**

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.			

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:	

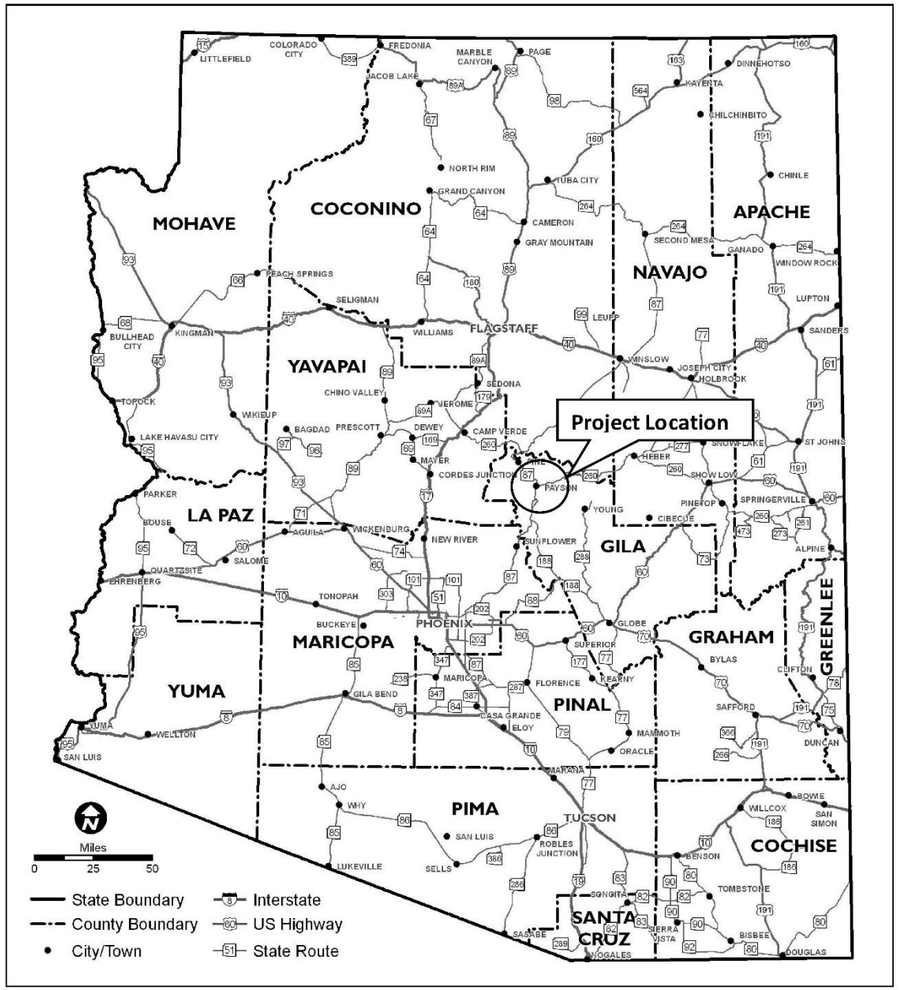
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$11,000	$35,000	$0	$395,500	$441,500

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**

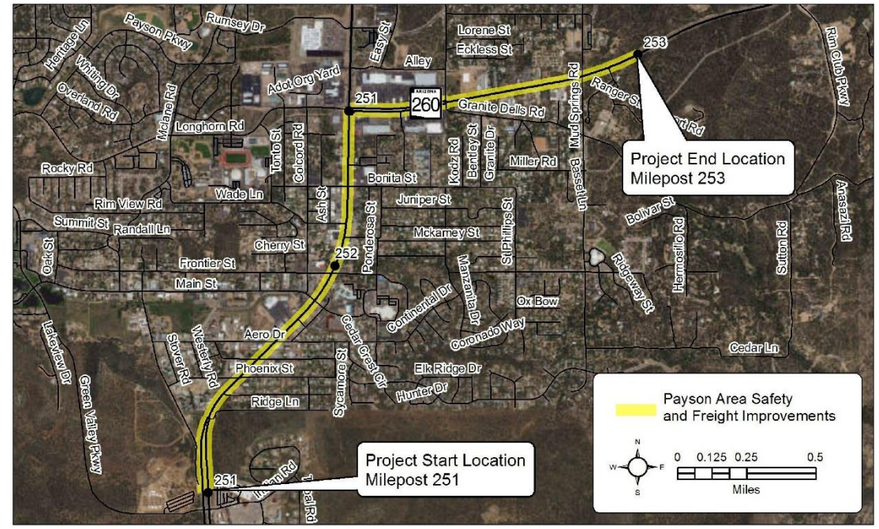
2

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

ADOT **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:	

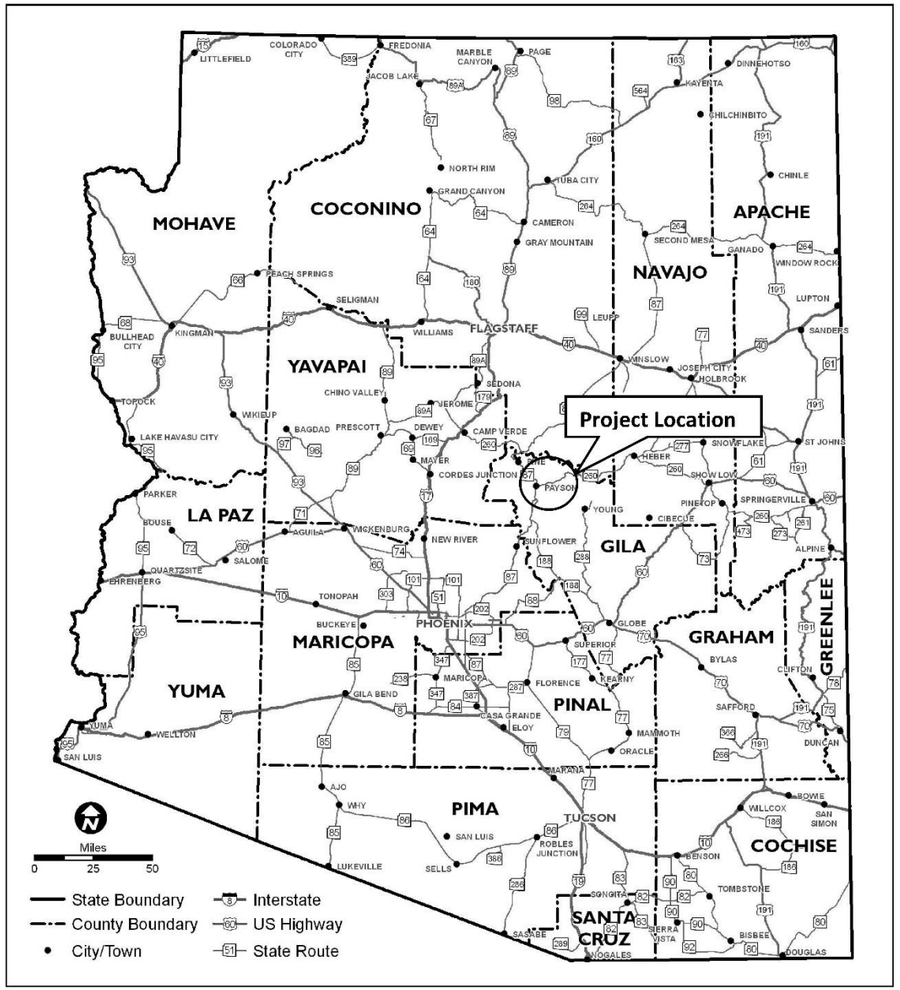
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$1,200,000	$4,000,000	$4,815,360	$39,984,640	$50,000,000

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

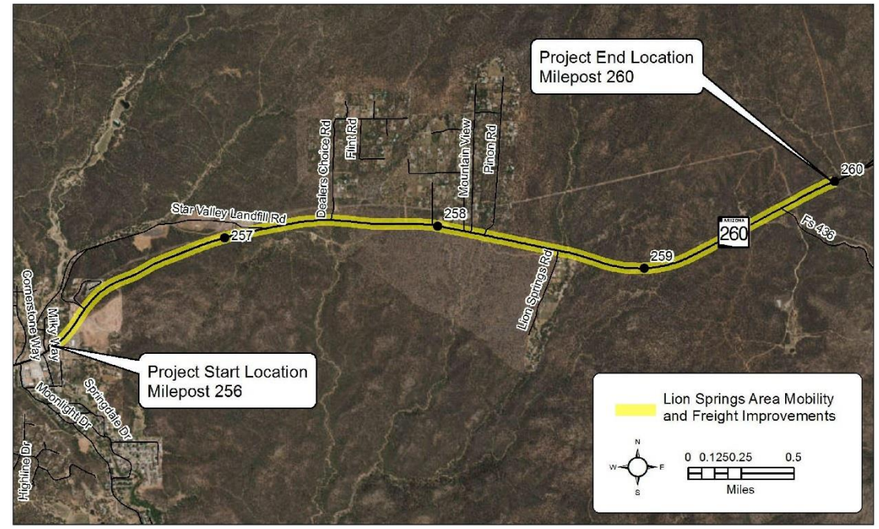
ATTACHMENTS
1) **State Location Map** 2) **Project Vicinity Map** 3) **Project Scope of Work**

2

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



ATTACHMENT 3 – SCOPE OF WORK

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

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)*	

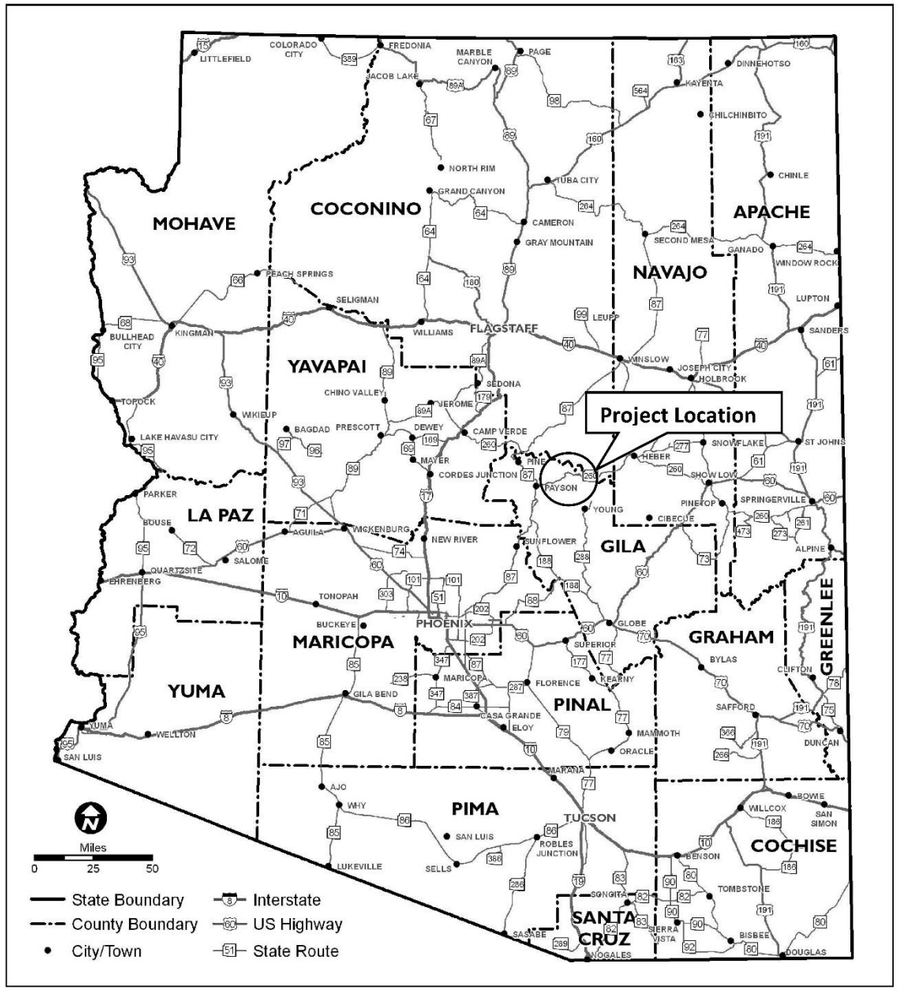
FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

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

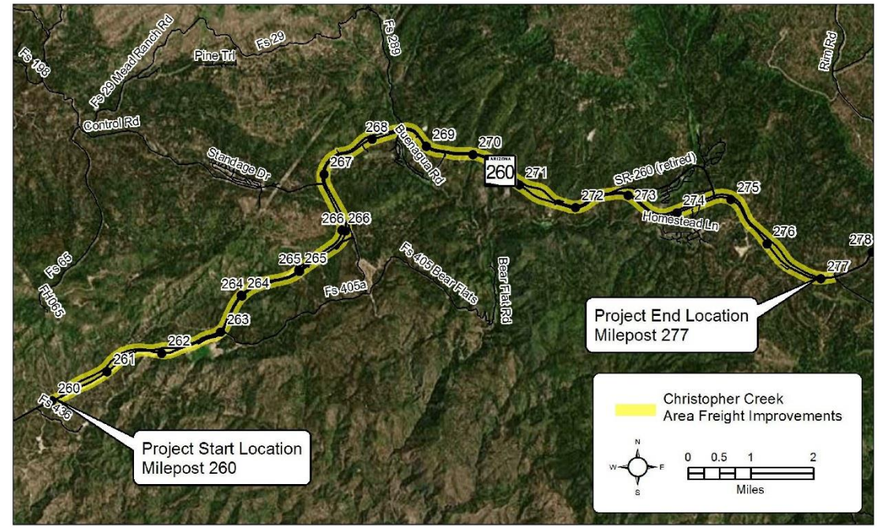
PROJECT DELIVERY
Delivery: ☐ Design-Bid-Build ☐ Design-Build ☐ Other:
Design Program Year: FY
Construction Program Year: FY

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

ATTACHMENT 1 – STATE LOCATION MAP



ATTACHMENT 2 – PROJECT VICINITY MAP



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:	

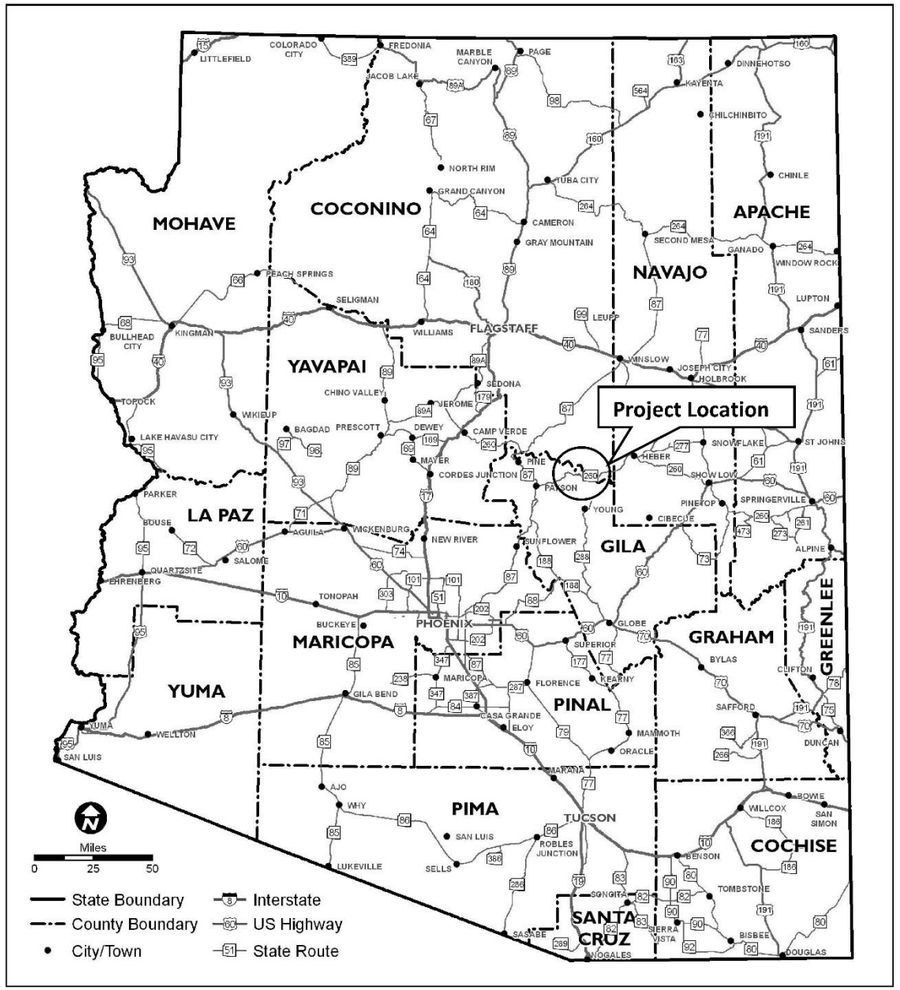
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$267,000	$843,000	$0	$8,405,600	$9,515,600

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**

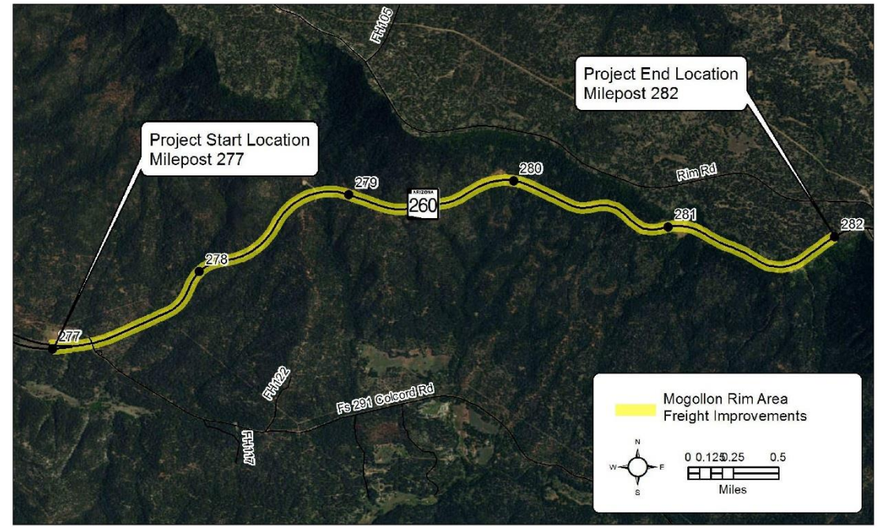
2

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.

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)*	

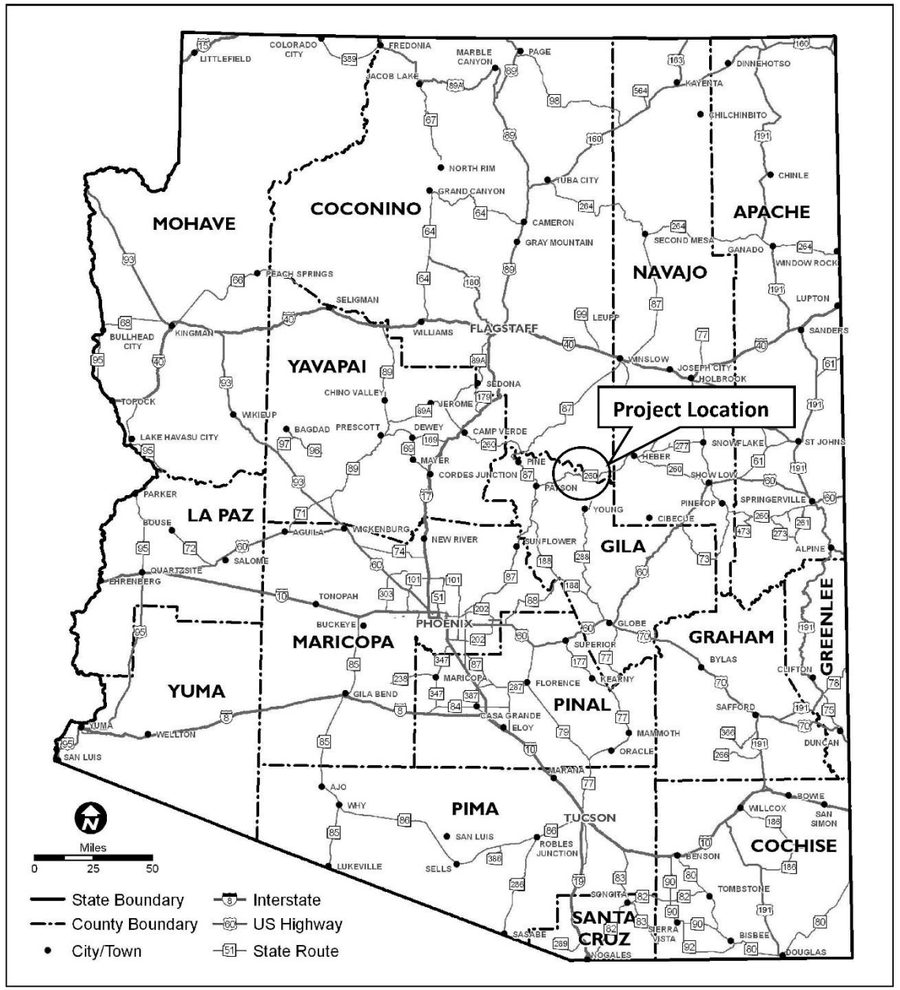
FUNDING SOURCE(S)				
Anticipated Project Design/Construction Funding Type: *(Check all that apply)*	☐ STP	☐ TAP	☐ HSIP	☐ State
	☐ Local	☐ Private	☐ Other:	

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



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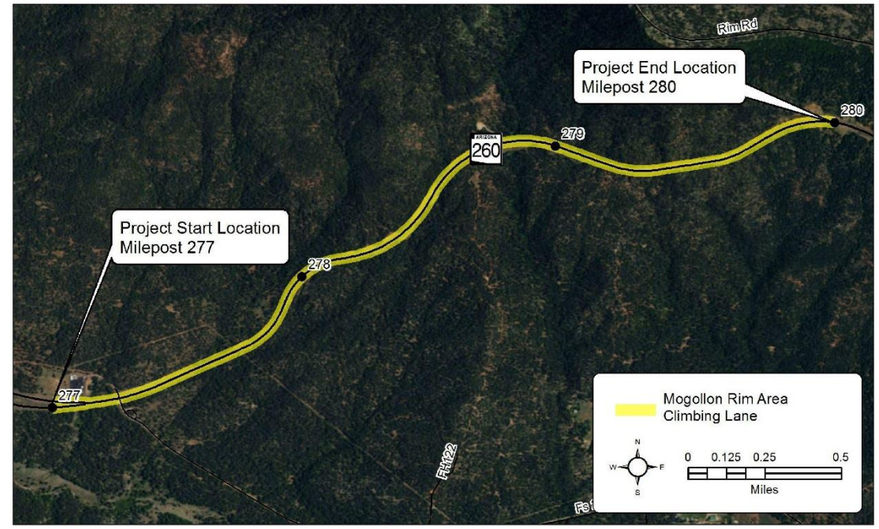
ATTACHMENT 2 – PROJECT VICINITY MAP



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:	

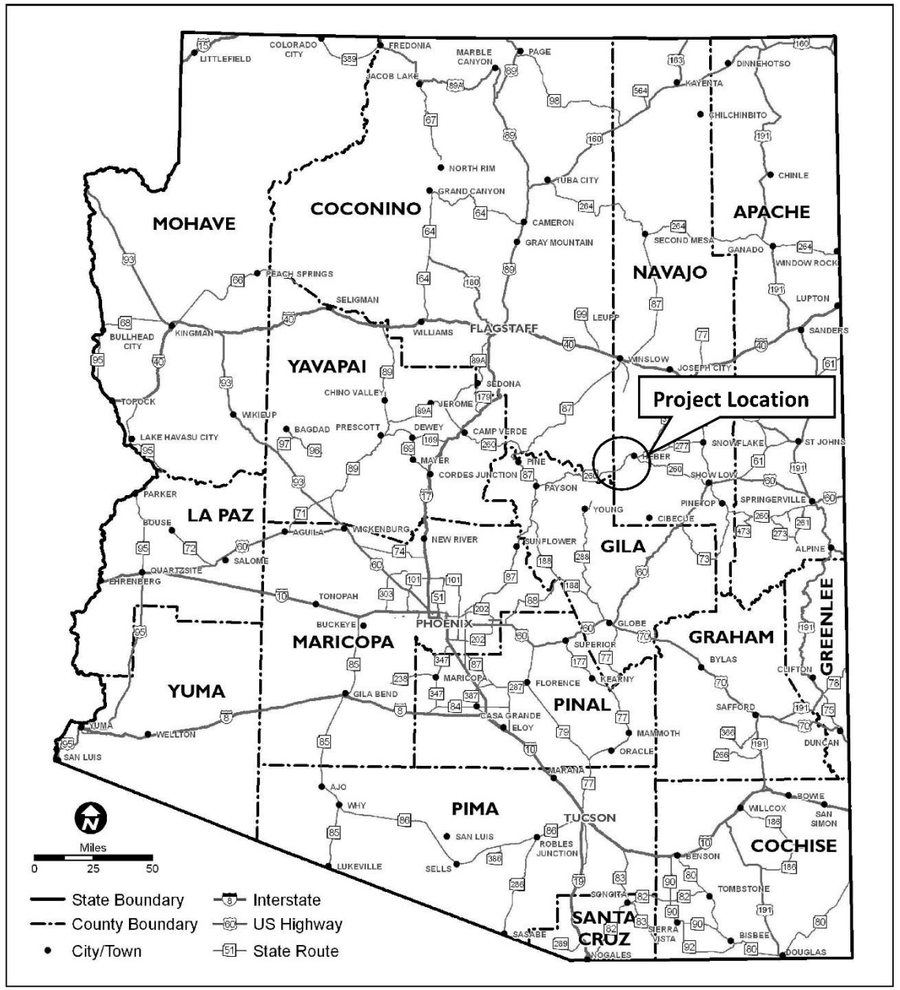
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$1,500,000	$5,000,000	$0	$49,984,000	$56,484,000

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**

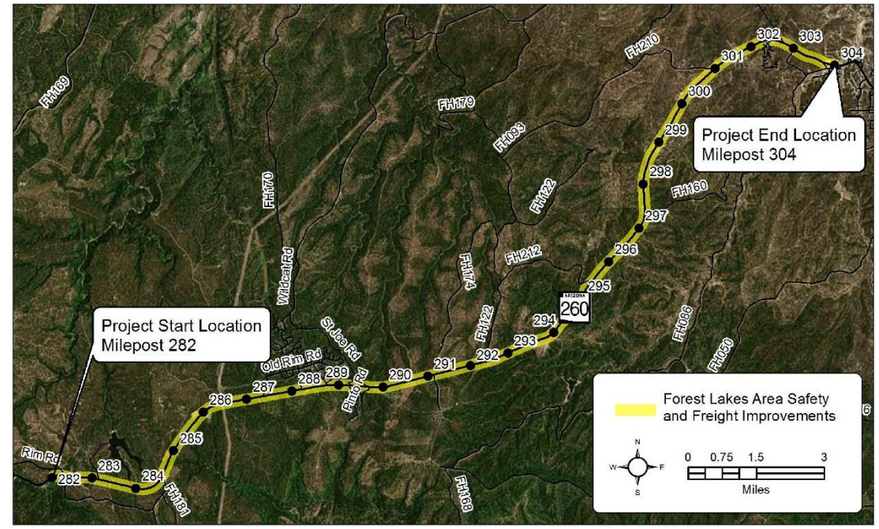
2

ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP



4

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:	

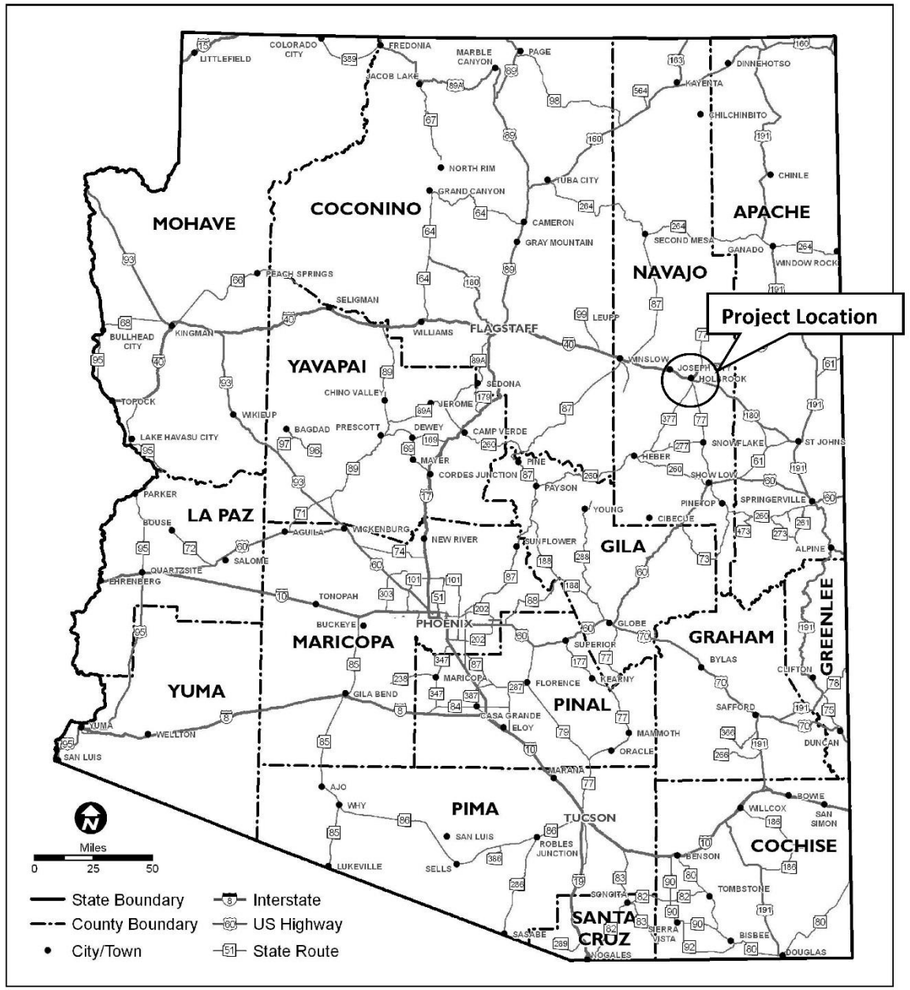
COST ESTIMATE				
Preliminary Engineering	Design	Right-of-Way	Construction	Total
$2,150,000 (option A) $1,830,000 (option B) $1,090,000 (option C)	$7,170,000 (option A) $6,120,000 (option B) $3,660,000 (option C)	$11,030,000 (option A) $6,590,000 (option B) $2,480,000 (option C)	$71,723,300 (option A) $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**

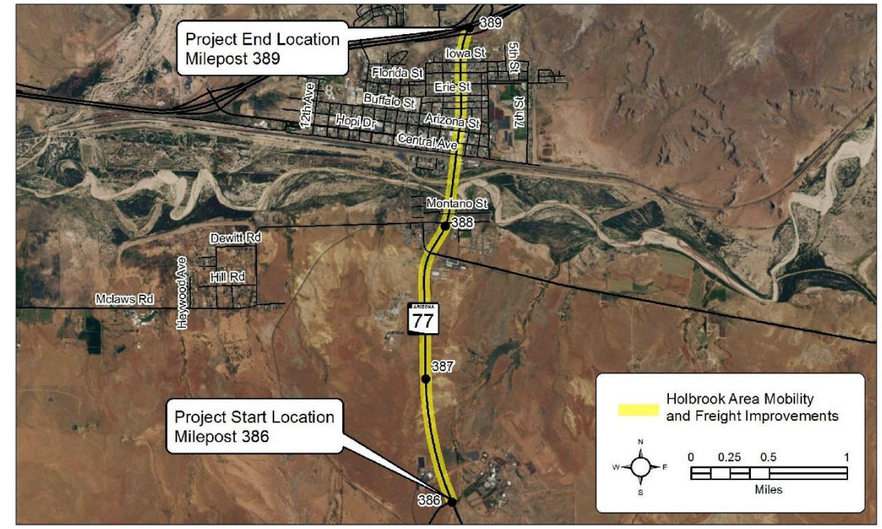
2

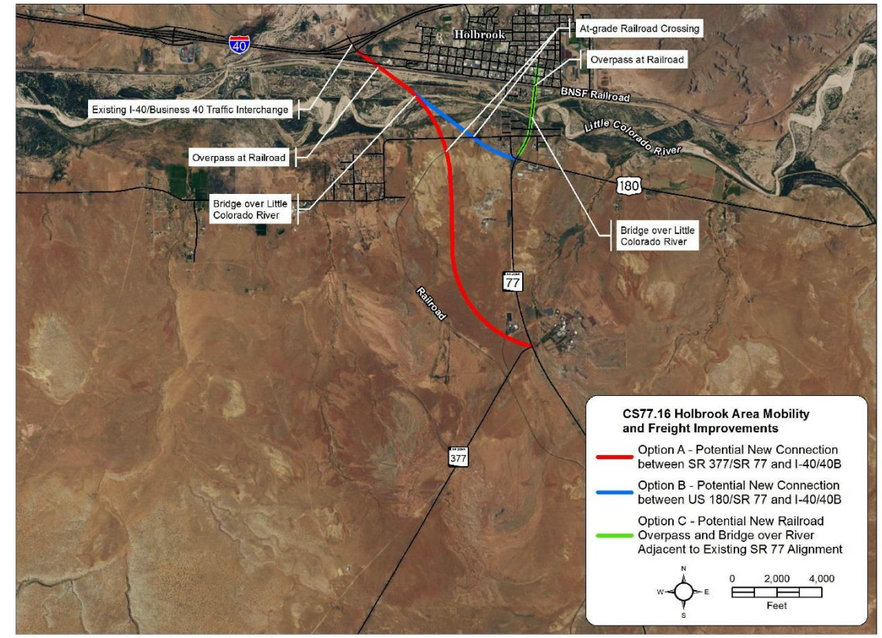
ATTACHMENT 1 – STATE LOCATION MAP



3

ATTACHMENT 2 – PROJECT VICINITY MAP





4

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