SR 179/SR 89A/SR 260 CORRIDOR PROFILE STUDY

SR 179: 1-17 TO SR 89A
SR 89A: SR 179 TO SR 260
SR 260: 89A TO I-17

ADOT WORK TASK NO. MPD 0041-17
ADOT CONTRACT NO. 18-177731

DRAFT REPORT: PERFORMANCE AND NEEDS EVALUATION

AUGUST 2017

PREPARED FOR:

ARIZONA DEPARTMENT OF TRANSPORTATION

PREPARED BY:

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ACRONYMS & ABBREVIATIONS

AADT	Average Annual Daily Traffic
ABISS	Arizona Bridge Information and Storage System
ADOT	Arizona Department of Transportation
AGFD	Arizona Game and Fish Department
ASLD	Arizona State Land Department
AZTDM	Arizona Statewide Travel Demand Model
BLM	Bureau of Land Management
BQAZ	Building a Quality Arizona
CCTV	Closed Circuit Television
CR	Cracking Rating
DCR	Design Concept Report
DMS	Dynamic Message Sign
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
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
RTP	Regional Transportation Plan
RWIS	Road Weather Information System
SATS	Small Area Transportation Study
SB	Southbound
SERI	Species of Economic and Recreational Importance
SHSP	Strategic Highway Safety Plan
SOV	Single Occupancy Vehicle
SR	State Route
TAC	Technical Advisory Committee
TI	Traffic Interchange
TIP	Transportation Improvement Plan
TPTI	Truck Planning Time Index
TTI	Travel Time Index
TTTI	Truck Travel Time Index
UP	Underpass
USDOT	United States Department of Transportation
V/C	Volume-to-Capacity Ratio
VMT	Vehicle-Miles Travelled
WIM	Weigh-in-Motion

1.0 INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of State Route 179 (SR 179)/State Route 89A (SR 89A)/State Route 260 (SR 260) between Junction Interstate 17 (I-17) at Exit 298 and Junction I-17 at Exit 287. The study examines key performance measures relative to the SR 179/SR 89A/SR 260 corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT has already conducted eleven CPS within three separate groupings or rounds.

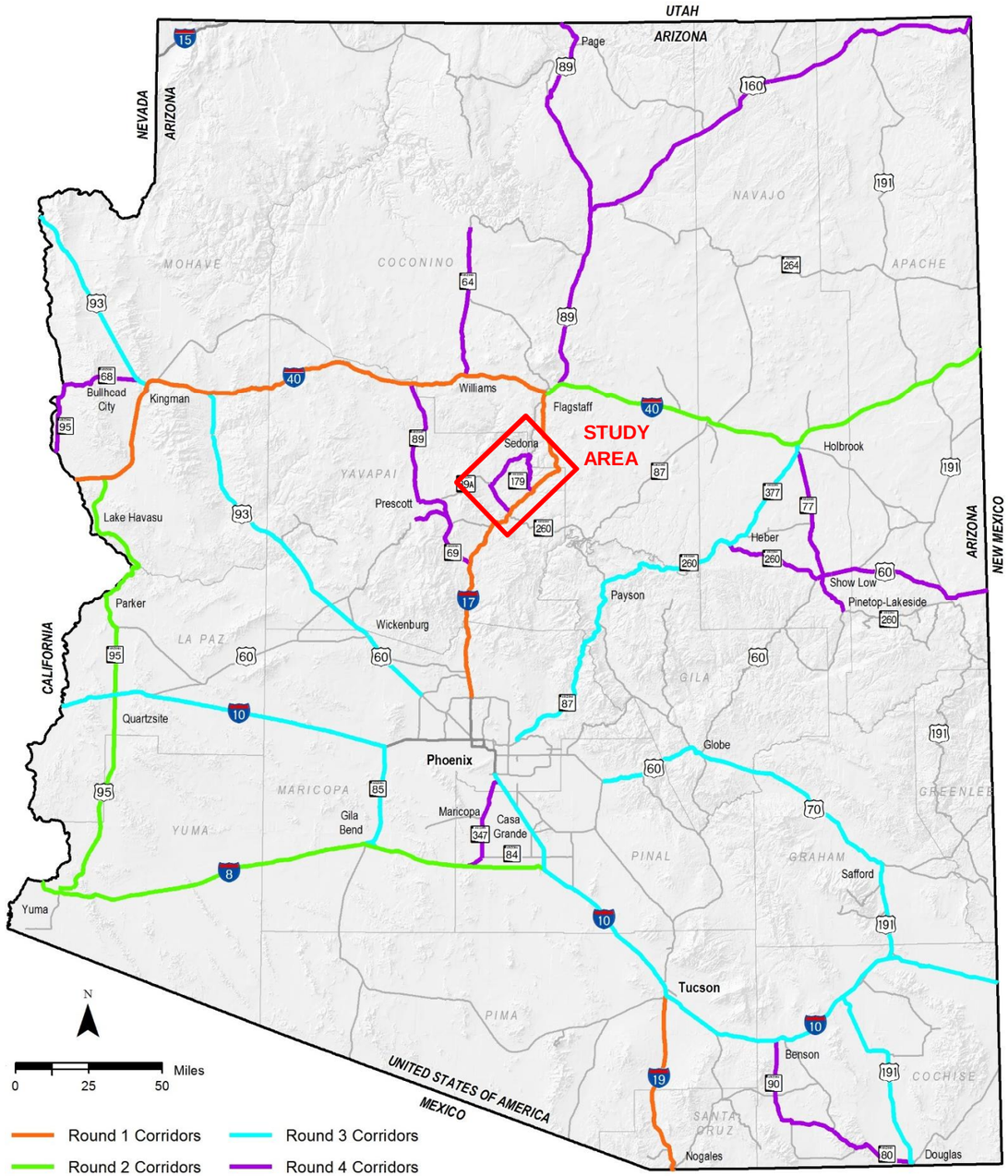
The fourth round (Round 4) of studies began in Spring 2017, and includes:

- SR 69/SR 89: I-17 to I-40
- US 89: I-40 to Utah State Line
- SR 64: I-40 to Grand Canyon National Park
- SR 179/SR 89A/SR 260: I-17 (Camp Verde) to I-17 (Montezuma Well Road)
- SR 347/SR 84: I-10 to I-8
- SR 260: SR 277 to SR 73; US 60: SR 260 to New Mexico State Line
- SR 77: US 60 to SR 377
- SR 68/SR 95: US 93 to California State Line
- US 160: US 89 to New Mexico State Line
- SR 90/SR 80: I-10 to US 191

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 179/SR 89A/SR 260 corridor, depicted in **Figure 1** along with the previous three rounds corridors**,** is one of the strategic statewide corridors identified and the subject of this Round 4 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 179/SR 89A/SR 260 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 179/SR 89A/SR 260 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 179/SR 89A/SR 260 corridor between I-17 at Exit 298 and I-17 at Exit 287 provides movement for regional, tourism, and recreation needs within Arizona. It provides access to the Verde Valley area. The corridor connects Sedona, Oak Creek, Cottonwood, Camp Verde, Cornville and the Yavapai-Apache Nation. This corridor also serves several recreational areas and National Forests. The SR 179/SR 89A/SR 260 corridor is approximately 46 miles in length.

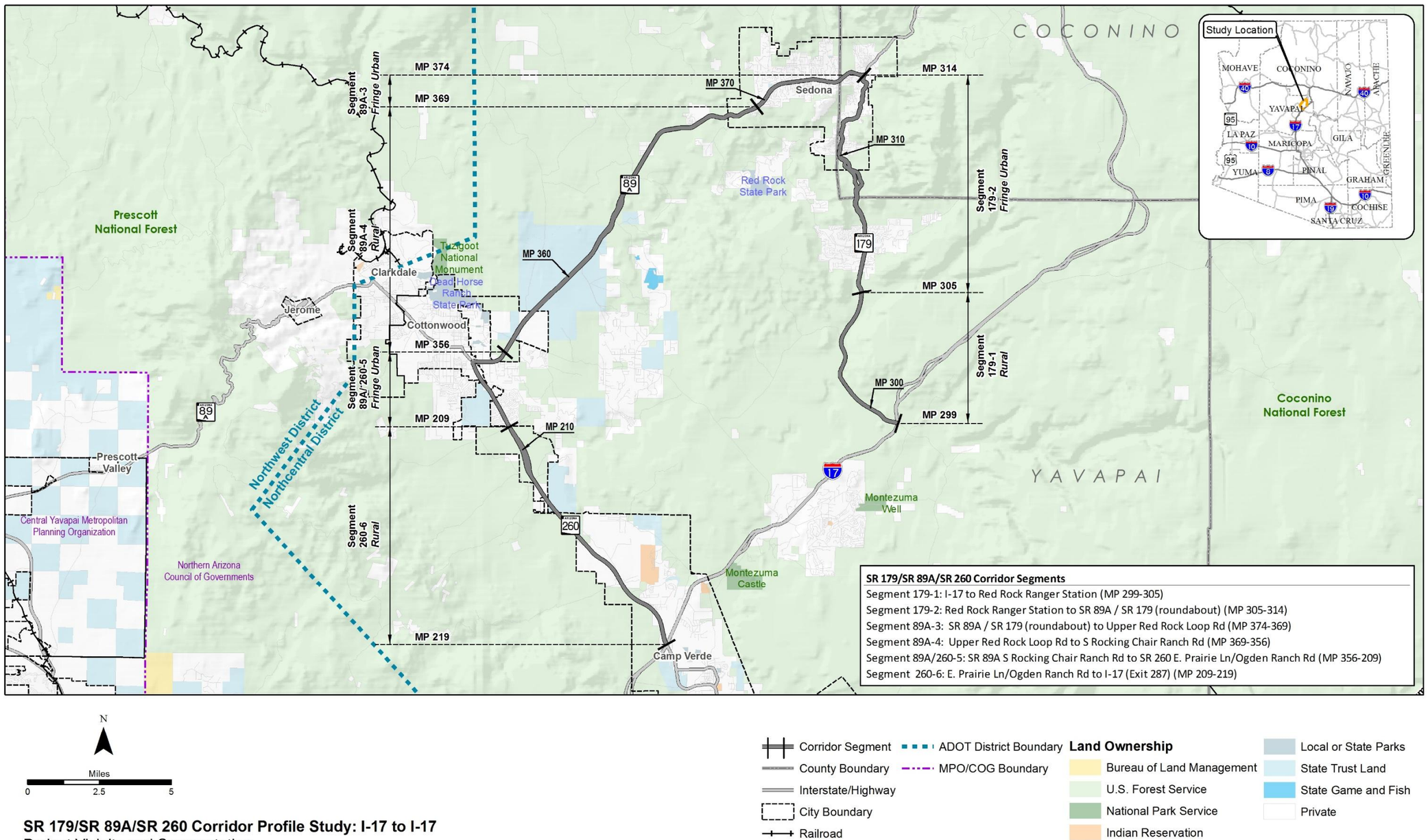
1.4 Corridor Segments

The SR 179/SR 89A/SR 260 corridor is divided into 6 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 179/SR 89A/SR 260 Corridor Segments

Segment #	Route	Begin	End	Approx. Begin Milepost	Approx. End Milepost	Approx. Length (miles)	Typical Through Lanes (NB/EB, SB/WB)	2015/2035 Average Annual Daily Traffic Volume (vpd)	Character Description
179-1	SR 179	Interstate 17 (Exit 298)	Red Rock Ranger Station	299	305	6	1,1	7,000/10,000	This rural segment has uninterrupted flow, and a two-lane undivided section, which transitions to a two-lane divided section near the Ranger Station.
179-2	SR 179	Red Rock Ranger Station	SR 89A / SR 179 (roundabout)	305	314	9	1,1	11,000/18,000	This fringe urban segment, which is in the Village of Oak Creek and Sedona, has interrupted flow characteristics, access points, consistent traffic volumes, and a two-lane divided section. This section encompasses a number of roundabouts. There are two passing lane sections between Oak Creek and Sedona, one in each direction. This segment has a number of curves, and climbing sections.
89A-3	SR 89A	SR 89A / SR 179 (roundabout)	Upper Red Rock Loop Road	374	369	5	2,2	22,000/38,000	This fringe urban segment has interrupted flow, and a five-lane undivided section, which is within the City of Sedona.
89A-4	SR 89A	Upper Red Rock Loop Road	S Rocking Chair Ranch Road	369	356	13	2,2	14,000/18,000	This rural segment has interrupted flow and is comprised of a four-lane divided section. There is a traffic signal at the SR 89A/Cornville Road/E. Mingus Avenue intersection.
89A/260-5	SR 89A / SR 260	SR 89A S Rocking Chair Ranch Road	SR 260 E Prairie Lane/Ogden Ranch Road	356 (on SR 89A)	209 (on SR 260)	4	2,2	23,000/33,000	This fringe urban segment has interrupted flow, is comprised of a five-lane undivided section, with access throughout. This segment is in the City of Cottonwood. There is a traffic signal at the SR89A/SR 260 intersection, at the SR 260 intersections with Fir Street, Rodeo Drive, E Del Rio Drive, and Western Drive.
260-6	SR 260	E Prairie Lane/Ogden Ranch Road	I-17 (Exit 287)	209	219	10	2,2 1,1	17,000/23,000	This rural segment has interrupted flow and is comprised of a four-lane divided section and a two-lane undivided section. There are some passing sections in both directions. There is a traffic signal at the SR 260 / Forest Route 372 intersection. There is a four-lane divided section near the I-17 Interchange (Exit 287).

Figure 2: Corridor Location and Segments



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Project Vicinity and Segmentation

1.5 Corridor Characteristics

The SR 179/SR 89A/SR 260 corridor is an important travel corridor in the north central 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 network.

National Context

The SR 179/SR 89A/SR 260 corridor is a strategic transportation link in north central Arizona for recreation and tourism travel. The SR 179/SR 89A/SR 260 corridor also functions as an alternate route to I-17 when this facility is closed due to adverse weather or incidents.

Regional Connectivity

The SR 179/SR 89A/SR 260 corridor between the SR 179 at I-17 Exit 298 and SR 260 at I-17 Exit 287 provides movement for regional traffic, freight, tourism, and recreation needs within Arizona. The corridor is located in two ADOT Districts (Northcentral and Northwest); one planning area (Northern Arizona Council of Governments [NACOG]); and two counties (Coconino and Yavapai). Within the corridor study limits, SR 179/SR 89A/SR 260 offers connection to I-17 at two locations. Beyond the study limits, SR 89A connects to SR 89 to the west and I-17 to the north. SR 260 continues east beyond the study area and connects to SR 87. This corridor directly serves several Arizona cities and towns including Sedona, Oak Creek, Cottonwood, Camp Verde, Cornville, and one tribal community, the Yavapai-Apache Nation.

Commercial Truck Traffic

Communities along the SR 179/SR 89A/SR 260 corridor are dependent on the corridor to access the state economy through freight deliveries and travel to other locations. Freight traffic (trucks) comprise from 4% to 10% of the total traffic flow on the corridor, with the higher truck percentages within the Sr 179 and SR 260 portions of the corridor near I-17.

Commuter Traffic

A majority of the commuter traffic along the SR 179/SR 89A/SR 260 corridor occurs within the urbanized areas of Sedona and Cottonwood. 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 24,000 vehicles per day on SR 89A and SR 260 in Sedona and Cottonwood to 7,000 vehicles per day on SR 179 between I-17 (MP 299) and the Red Rock Ranger Station (MP 305).

According to the 2013 American Community Survey data from the US Census Bureau, 88% of the workforce in areas along the corridor relies on a private vehicle to get to work.

Recreation and Tourism

The SR 179/SR 89A/SR 260 corridor provides access to many Arizona attractions such as state parks, national forests, and other recreational activities. It provides access to Red Rock State Park, the Coconino National Forest, Munds Mountain Wilderness Area, and Page Springs Hatchery. The roads themselves are tourist attractions; SR 179, between MP 302.5 and MP 310 is designated as the Red Rock All American Road, a National Scenic Byway that is the gateway to the red rock country of Sedona. A section SR 89A, from MP 363.5 to MP 370 is designated as the Dry Creek Scenic Road. This route crosses the Verde Valley and provides access to Cathedral Rock, Montezuma ruins, and various trails.

Multimodal Uses

Freight Rail

The Arizona Central Railroad operates a 38-mile rail line from Clarkdale, Arizona to a connection with the BNSF railway at Drake, Arizona. The Arizona Central Railroad ships inbound coal to the Phoenix Cement Company and ships outbound cement.

Passenger Rail

An excursion train, The Verde Canyon Railroad, also runs on the Arizona Central line through Verde Canyon. The Verde Canyon Railroad provides a scenic railroad trip between Clarkdale, the Verde Valley, and the Perkinsville Ghost Ranch and back. The train schedule varies depending on the time of year.

Bicycles/Pedestrians

Opportunities for bicycle and pedestrian travel vary on the SR 179/SR 89A/SR 260 corridor. On SR 179, 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. A portion of SR 179 and SR 89A near Sedona has striped bicycle lanes on the outside shoulder of the roadway.

Bus/Transit

The Verde Lynx public transportation service connects central Cottonwood with major employers in Sedona along SR 89A and northern portions of SR 179. The service operates seven days per week. The Cottonwood Area Transit service provides transit service on SR 260 and three routes have transit stops near the SR 89A/SR 260 intersection. This service operates five days per week

Aviation

There are two general aviation facilities in proximity to the SR 179/SR 89A/SR 260 corridor which are the Sedona Airport, owned and operated by the Sedona–Oak Creek Airport Authority, and the Cottonwood Municipal Airport, owned by the City of Cottonwood.

Land Ownership, Land Uses and Jurisdictions

As shown previously in **Figure 2**, the SR 179/SR 89A/SR 260 corridor traverses multiple jurisdictions and land owned or managed by various entities in two Arizona counties: Coconino and Yavapai. Much of the corridor traverses the Coconino National Forest land. Land ownership in the Sedona, Cottonwood, Oak Creek, and Camp Verde areas is mainly private, but is surrounded by U.S. Forest Service land, and State Trust Land.

Population Centers

Population centers of various sizes exist along the SR 179/SR 89A/SR 260 corridor. **Table 2** provides a summary of the populations for communities along the corridor. Population growth between 17 and 58 percent is projected between 2010 and 2040, according to the Arizona State Demographer's Office. The Cottonwood area is projected to grow by almost 3,500 persons, which is the highest growth in total population.

Table 2: Current and Future Population

Community	2010 Population	2015 Population	2040 Population	% Change 2010-2040	Total Growth
Coconino County	134,421	141,602	167,897	25%	33,476
Sedona (part)	2,842	2,942	3,471	22%	629
Yavapai County	211,033	217,778	302,815	43%	91,782
Camp Verde	10,873	10,970	13,636	25%	2,763
Cottonwood	11,265	11,532	14,705	31%	3,440
Sedona (part)	7,189	7,302	8,989	25%	1,800
Cornville CDP	3,280	3,387	5,187	58%	1,907
Village of Oak Creek (Big Park) CDP	6,147	6,206	7,177	17%	1,030
Yavapai-Apache Nation Reservation	718	726	933	30%	215

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

Major Traffic Generators

The Cities of Sedona, Cottonwood, Camp Verde, and the Village of Oak Creek are major traffic generators for the SR 179/SR 89A/SR 260 corridor.

Tribes

The Yavapai Apache Nation Reservation area is located north of SR 260, and west of I-17, within Camp Verde.

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 179/SR 89A/SR 260 corridor:

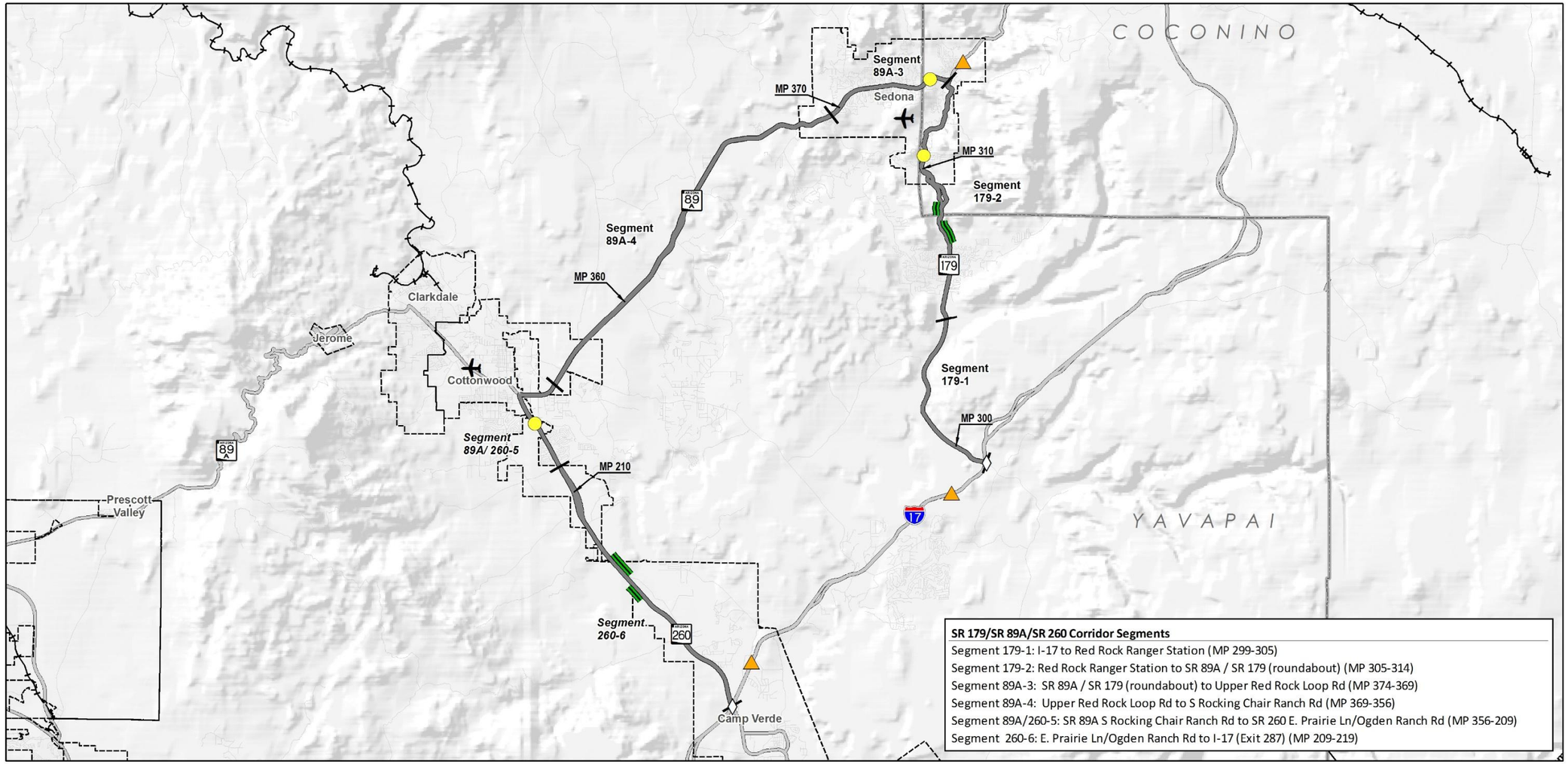
- Arizona Game and Fish Department (AGFD) Wildlife Waters are located east and west of SR 179 between Oak Creek and Sedona. Two Wildlife Water locations were noted.
- Arizona Important Bird Areas: The Lower Oak Creek Important Bird Area is located south of SR 89A, and north of Page Springs Road.
- The corridor travels through allotments controlled by the Arizona State Land Department (ASLD), and United States Forest Service.
- Riparian areas are located adjacent to and northeast of SR 260, and there are numerous crossings along SR 89A, and SR 179, particularly near the SR 179/SR 89A intersection.
- Arizona Wildlife Linkages: No missing linkages are noted. There are potential wildlife linkage zones along all the corridor roadways.
- According to the Species and Habitat Conservation Guide (SHCG), sensitive habitats that have moderate to high conservation potential exist along the corridor, particularly near riparian areas.
- 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 (SERI) are located on both sides of SR 260, along the south side of SR 89A, and along sections of SR 179.

Corridor Assets

Corridor transportation assets are summarized in **Figure 3**. There are two passing lanes sections on the SR 260 portion of the corridor between MP 212 and MP 214 (one NB and one SB). There is one climbing lane on SR 179 NB at approximately MP 307, and a passing lane SB at approximately MP 308. The corridor termini are at two traffic interchanges (TI) at I-17: one interchange with SR 179 at MP 299, and one with SR 260 at MP 219.

Other assets include dynamic message signs (DMS) located near the corridor on SR 89A at MP 375.3 and on I-17 at MP 297.4 and 288.9. There are 16 ADOT traffic signals along the corridor (8 on SR 89A in Sedona, 6 on SR 89A and SR 260 in Cottonwood, and 2 on SR 260 near the I-17 junction.

Figure 3: Corridor Assets



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, meetings were conducted with key stakeholders in August 2017 to present the results and obtain feedback.

Key stakeholders identified for this study included:

- ADOT Northcentral District
- ADOT Technical Groups
- NACOG
- AGFD
- ASLD
- Federal Highway Administration (FHWA)

Several draft chapters were developed during the course of the CPS. The draft chapters 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 179/SR 89A/SR 260 corridor were reviewed to understand the full context of future planning and design efforts within and around the study area. These studies are organized below into four categories: Framework and Statewide Studies, Regional Planning Studies, Planning Assistance for Rural Areas (PARAs) and Small Area Transportation Studies (SATS), and Design Concept Reports (DCRs) and Project Assessments (PAs).

Framework and Statewide Studies

- ADOT Bicycle and Pedestrian Plan Update (2013)
- ADOT Pedestrian Safety Action Plan (2017)
- ADOT Five-Year Transportation Facilities Construction Program (2018 – 2022)
- ADOT Climbing and Passing Lane Prioritization Study (2015)
- ADOT Arizona Key Commerce Corridors (2014)
- ADOT Arizona Multimodal Freight Analysis Study (2009)
- ADOT Arizona Ports of Entry Study (2013)
- ADOT Arizona State Airport Systems Plan (2008)
- ADOT Arizona State Freight Plan (2016)
- ADOT Arizona State Rail Plan (2011)
- AGFD Arizona State Wildlife Action Plan (2012) / Arizona Wildlife Linkages Assessment
- ADOT Arizona Statewide Dynamic Message Sign Master Plan (2011)
- ADOT Arizona Statewide Rail Framework Study (2010)
- ADOT Arizona Statewide Rest Area Study (2011)
- ADOT Arizona Statewide Shoulders Study (2015)
- ADOT Arizona Strategic Highway Safety Plan (2014)
- ADOT Arizona Roadway Departure Safety Implementation Plan (RDSIP) (2014)
- ADOT AASHTO U.S. Bicycle Route System (2015)
- ADOT Low Volume State Routes Study (2017)
- ADOT Statewide Transportation Planning Framework – Building a Quality Arizona (BQAZ) (2010)
- ADOT What Moves You Arizona? Long-Range Transportation Plan (2010-2035)

Regional Planning Studies

- NACOG, Regional Transportation Improvement Program FY 17-23
- Verde Valley Master Transportation Plan (2016)

Planning Assistance for Rural Areas and Small Area Transportation Studies

- City of Sedona Uptown Parking Management Plan (2012 Update)
- City of Sedona Transportation Master Plan (2017- in process)
- State Route 89A-Mingus Mountain Scenic Road; Jerome, Clarkdale, Cottonwood Historic Road; Dry Creek Scenic Road Corridor Management Plan (2006)
- Sedona Community Plan (2014)
- Sedona Transportation Feasibility Study (2008)
- Soldiers Pass Road Area Traffic Study (2007)
- The Sedona Transit Project Final Report (2004)
- Town of Camp Verde Business Corridor Study, Finnie Flat Road: SR 260 to Main Street (2013)
- Town of Camp Verde Small Area Transportation Study (2009)
- 89A Crash Analysis and Safety Evaluation (December 2010)
- Wildlife-Vehicle Collision Mitigation for Safer Wildlife Movement across Highways: State Route 260 (2012)

Design Concept Reports and Project Assessments

- SR 179: State Route 179 at Cortez Drive, MP 306.43 – Initial Scoping Letter (2002)
- SR 260: SR 260 Passing Lanes (Cottonwood to Camp Verde) - Initial Project Assessment (August 2002)
- SR 260, Thousand Trails to I-17, Design Concept Report Addendum (June 2014)

Summary of Prior Recommendations

Various studies and plans have recommended improvements to the SR 179/SR 89A/SR 260 corridor as shown in **Table 3** and **Figure 4**. They include, but are not limited to:

- Widening SR 260 between Thousand Trails Road and I-17, which will add one general purpose lane in each direction and will construct seven roundabout intersections. Construction began March 2017.
- Widening and improving SR 179 to two general purpose lanes in both directions.
- Performing pavement rehabilitation on SR 179, from I-17 to Red Rock Vista, MP 299-305.
- On SR 179, install edge line rumble strips, enhanced signing and marking for curves, alignment delineation and lighting, and shoulder widening in several areas between MP 299 and MP 305. Install enhanced signing and marking for curves, alignment delineation and lighting on several locations on SR 179 between MP 309 and 313.
- On SR 260, install centerline rumble strips, alignment delineation and lighting, and edge line rumble strips in areas between MP 206 and MP 215.
- Install centerline rumble strips on SR 179 between MP 300 and 310.
- Conduct an ITS assessment to determine a location for a dynamic message sign on SR 179 and on SR 260.
- Construct pedestrian improvements at SR 179 /Portal Lane, MP 313.
- Construct intersection improvements at the SR 179/Cortez Road intersection, MP 306.4.
- Redesigning and reconstructing the SR 89A/Page Springs Road intersection, MP 363.
- Conduct a traffic signal warrant study at SR 179/Beaverhead Flat Road, conduct traffic studies at SR 89A/260, SR 89A/SR 179, SR 89A/Cornville Rd, SR 260/Fir St
- Construct continuous raised medians, enhanced pedestrian crossing and bicycle lanes on SR 89A between Andante Drive and Soldier Pass Rd, MP 372-373.
- Conducting several Road Safety Assessments on SR 179 and SR 89A.
- Rehabilitating the Dry Beaver Creek Bridge on SR 179 and the Cherry Creek Bridge (MP 215) and I-17 Bridge (MP 219) on SR 260.
- Expanding existing transit service to the Village of Oak Creek and conducting a transit feasibility study to determine the demand and need for:
    - Shuttle service between Oak Creek and Sedona,
    - Sedona circulator route,
    - Service connecting Cottonwood, Cornville, and Oak Creek,
    - Service connecting Camp Verde and Lake Montezuma
    - Service connecting Lake Montezuma and Oak Creek
- Provide major transit centers in Sedona, Cottonwood, and Camp Verde
- Construct scenic pullouts and wayfinding signage on SR 89A and SR 260.

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 179											
1	299	305	6	Perform major pavement rehabilitation, I-17 to Red Rock Vista, MP 299-304.7	√			-	N/A	N	Verde Valley Master Transportation Plan (2016) Tentative 2018-2022 Five -Year Transportation Facilities and Construction Program
2	299	314	15	Widen/improve SR 179, I-17 to SR 89A to 4-lanes			√	-	N/A	N	BQAZ 2010 Statewide Transportation Framework Study (2010)
3	299	305	6	Install edge line rumble strips or shoulder rumble strips on 8 segments, install enhanced signing and marking for curves on MP 301.5-302 and MP 305-305.49. Install alignment delineation and lighting MP 300-300.5 and MP 303-303.5. Construct shoulder widening, MP 299-302 and MP 302-304.5		√		-	N/A	N	ADOT Arizona Roadway Departure Safety Implementation Plan (2014) ADOT Statewide Shoulder Study (2015)
4	300	310	10	Install centerline rumble strips		√		-	N/A	N	ADOT Arizona Roadway Departure Safety Implementation Plan (2014)
5	301	N/A	-	Conduct an ITS Assessment to determine the feasibility and potential location for a Dynamic Message Sign or variable message sign board. A suggested location was at MP 301.		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
6	303	N/A	-	Rehabilitate Dry Beaver Creek Bridge (#736), MP 302.5	√			-	N/A	N	Verde Valley Master Transportation Plan (2016)
7	306	N/A	-	Install a traffic signal, pedestrian ramps, and drainage and intersection improvements at Cortez Road intersection, MP 306.4		√		-	N/A	N	SR 179 at Cortez Drive, Initial Scoping Letter (2002)
8	309	313	4	Install Enhanced signs and markings for curves at MP 308.5-30310, and MP 311-311.5. Install alignment delineation and lighting MP 309-310, MP 310.5-311, MP 312-313		√		-	N/A	N	ADOT Arizona Roadway Departure Safety Implementation Plan (2014)
9	N/A	N/A	-	Expand existing Verde Lynx service to the Village of Oak Creek. Currently service goes to the Poco Diablo Resort, approximately at SR 179, MP 311.2 (not shown on Figure 4)		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)

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)?	
10	313.2	N/A	-	Install a Rapid Rectangular Flashing Beacons on both SR 179 lanes at the existing cross walk, additional streetlight in the SR 179 median adjacent to the crosswalk, textured crosswalk across Portal Lane, and low walls and landscaping in the median to further define the crosswalk		√		-	N/A	N	Pedestrian Crossing Study, SR 179 between Tlaquepaque and Proposed Tlaquepaque North (2014)
11	303	N/A	-	- Conduct traffic signal warrant study at the State Route 179/Beaverhead Flat Road intersection. - Remove roadside vegetation near the intersection to improve sight distance.		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
12	299	306	7	Conduct a Road Safety Assessment and implement findings on SR 179 from MP 299 (I-17) to MP 306.2 (Verde Valley School Road)		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
SR 89A											
13	355	370	15	General recommendation to increase the number of scenic pullouts, and include clearly marked pedestrian, bicycle and ATV lanes along the roadway. Also, include interpretive and wayfinding signage along the 89A and SR 260 corridors		√		-	N/A	N	SR 89A (Mingus Mountain Scenic Road, Jerome Clarkdale Cottonwood Historic Road, Dry Creek Scenic Road) Corridor Management Plan (2006)
14	363	N/A	-	Redesign and reconstruct SR 89A / Page Springs Road intersection, MP 362.6		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
15	372	373	1	Construct continuous raised medians, with a pedestrian barrier, enhanced pedestrian crossings, and bicycle lanes, between Andante Drive and Soldier Pass Road, MP 371.6 -MP 372.9		√		-	N/A	N	SR 89A Crash Analysis and Safety Evaluation (2010)
16	370	N/A	-	Construct an interpretive kiosk at MP 370 (Red Rock Loop Rd)		√		-	N/A	N	SR 89A (Mingus Mountain Scenic Road, Jerome Clarkdale Cottonwood Historic Road, Dry Creek Scenic Road) Corridor Management Plan (2006)
17	373	N/A	-	Remove traffic signal at SR89A/Soldiers Pass Road (MP 372.9) and construct traffic signals at US 89A at Saddlerock Circle (MP 372.8) and Airport Road (MP 373.1)		√		-	N/A	N	Soldiers Pass Road Area Traffic Study (2007)
18	355	N/A	-	Conduct traffic study to evaluate the performance and operation of the intersection at State Route 89A/State Route 260, MP 355.2		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
19	374	N/A	-	Conduct traffic study to evaluate the performance and operation of the intersection at State Route 89A/State Route179, MP 374.2		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
20	374	N/A	-	Provide wayfinding signage at State Route 89A/State Route179 intersection, MP 374.2		√		-	N/A	N	Sedona Community Plan (2014)

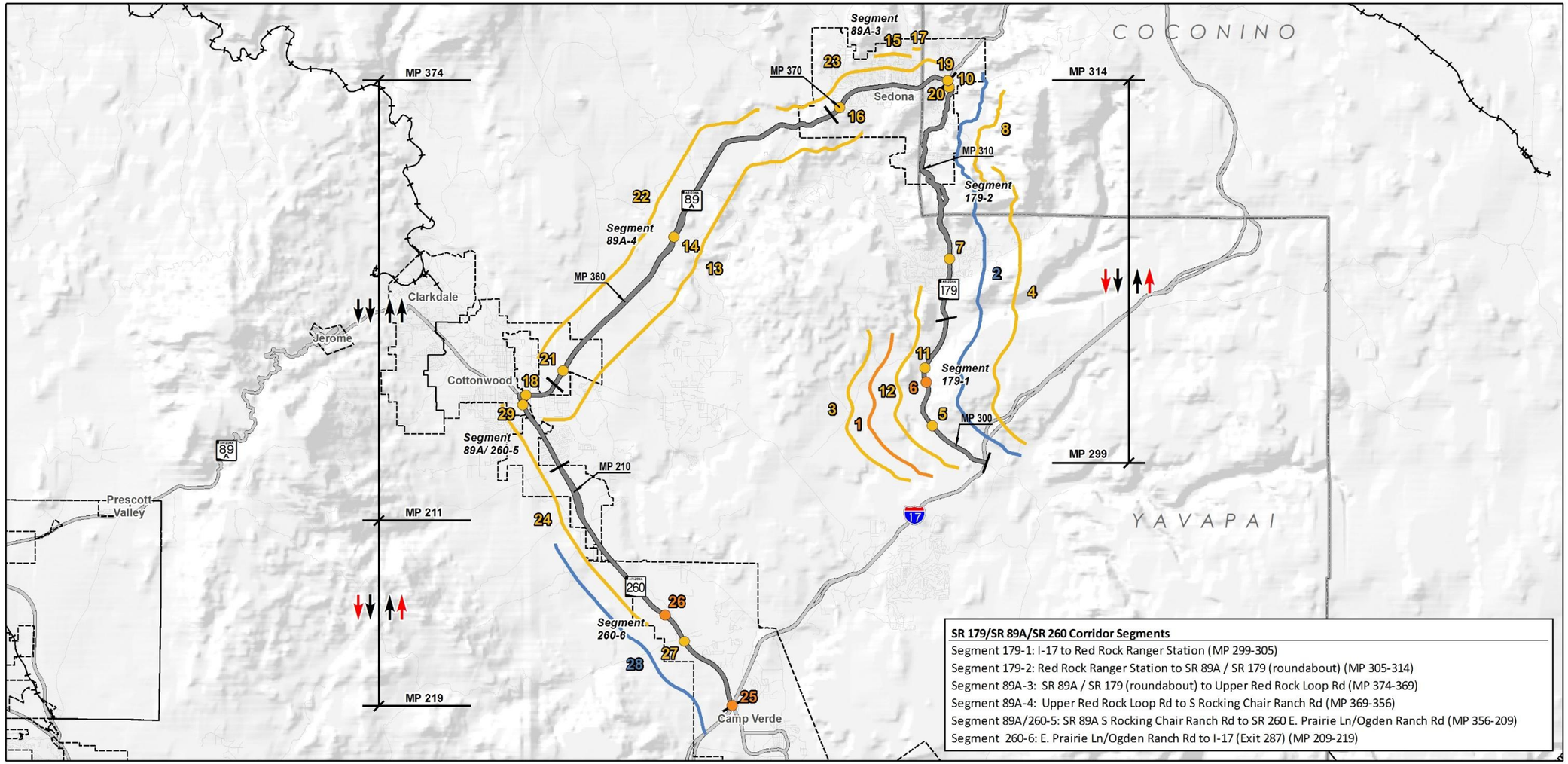
Table 3: Corridor Recommendations from Previous Studies (continued)

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)?	
21	357.1	N/A	-	Conduct traffic study to evaluate the performance and operation of the intersection at State Route 89A/Cornville Road		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
22	357	368	11	Conduct a Road Safety Assessment at State Route 89A: Cornville Road to MP 368.3		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
23	368	374	6	Conduct an Access Management Assessment on State Route 89A: MP 368.3 (Red Rock Loop Road) to Uptown Sedona		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
SR 260											
24	206	215	9	Install centerline rumble strips, MP 200-210, MP210-220 (some of these segments extend beyond the CPS limits). Install alignment delineation and lighting, MP 208-208.5. Install edge line rumble strips or shoulder rumble strips MP 208-210.5, MP 211.5-212, MP 214.5-215.		√		-	N/A	N	ADOT Arizona Roadway Departure Safety Implementation Plan (2014)
25	219	N/A	-	Rehabilitate 1-17 Bridge (# 2575)	√			-	N/A	N	Verde Valley Master Transportation Plan (2016)
26	215	N/A	-	Rehabilitate Cherry Creek Bridge (#966), MP 215	√			-	N/A	N	Verde Valley Master Transportation Plan (2016)
27	216	N/A	-	Conduct an ITS Assessment to determine the feasibility and potential location for a Dynamic Message Sign or variable message sign board. A suggested location was at MP 216		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)
28	211.2	219	7	Construct roadway widening to four-lane roadway, Thousand Trails Rd to I-17. Construct seven roundabout intersections at Thousand Trails Road, Coury Drive, Cherry Creek Road, Horseshoe Bend Drive, Wilshire Road and two locations that will accommodate future development. Construction began March 2017. Shoulder widening was recommended from MP 211.2-213.4 and MP 215.8-216.9			√	2017	TRACS H869901C	N	Verde Valley Master Transportation Plan (2016) NACOG FY Transportation Improvement Program, FY 2017-2023, Amendment 2 SR 260, Thousand Trails to I-17, Design Concept Report Addendum (2014) BQAZ Statewide Framework Study (2010) Town of Camp Verde Small Area Transportation Study (2009) ADOT Statewide Shoulder Study (2015)
29	206.7	N/A	-	Traffic study to evaluate the performance and operation of the intersection at State Route 260/Fir Street		√		-	N/A	N	Verde Valley Master Transportation Plan (2016)

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)?	
30	N/A	N/A	-	Conduct a transit feasibility study to determine the demand and need for: - Shuttle service between Oak Creek and Sedona, - Sedona circulator route, - Service connecting Cottonwood, Cornville, and Oak Creek, - Service connecting Camp Verde and Lake Montezuma - Service connecting Lake Montezuma and Oak Creek (not shown on Figure 4)		√		-	N/A	N	Verde Valley Master Transportation Plan (2016) BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)
31	N/A	N/A	-	Provide major transit centers in Sedona, Cottonwood, and Camp Verde (not shown on Figure 4)		√		-	N/A	N	BQAZ 2010 Statewide Transportation Planning Framework Final Report (2010)

Figure 4: Corridor Recommendations from Previous Studies



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Corridor Recommendations from Previous Studies

2.0 CORRIDOR PERFORMANCE

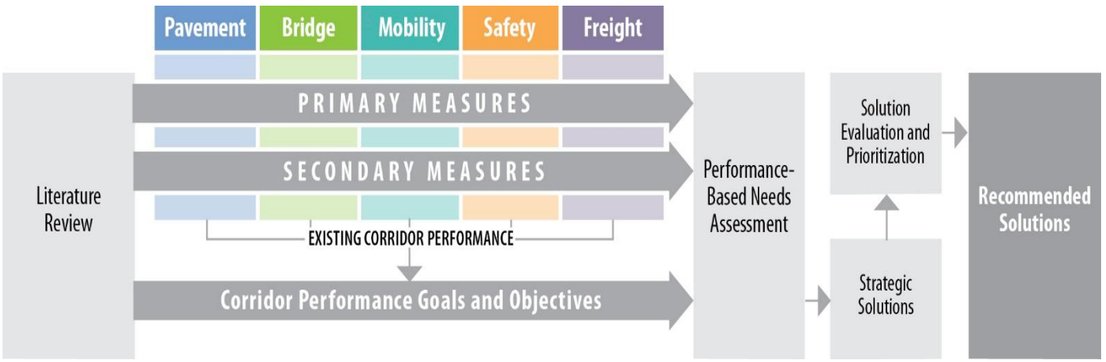
This chapter describes the evaluation of the existing performance of the SR 179/SR 89A/SR 260 corridor. A series of performance measures is used to assess the corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

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

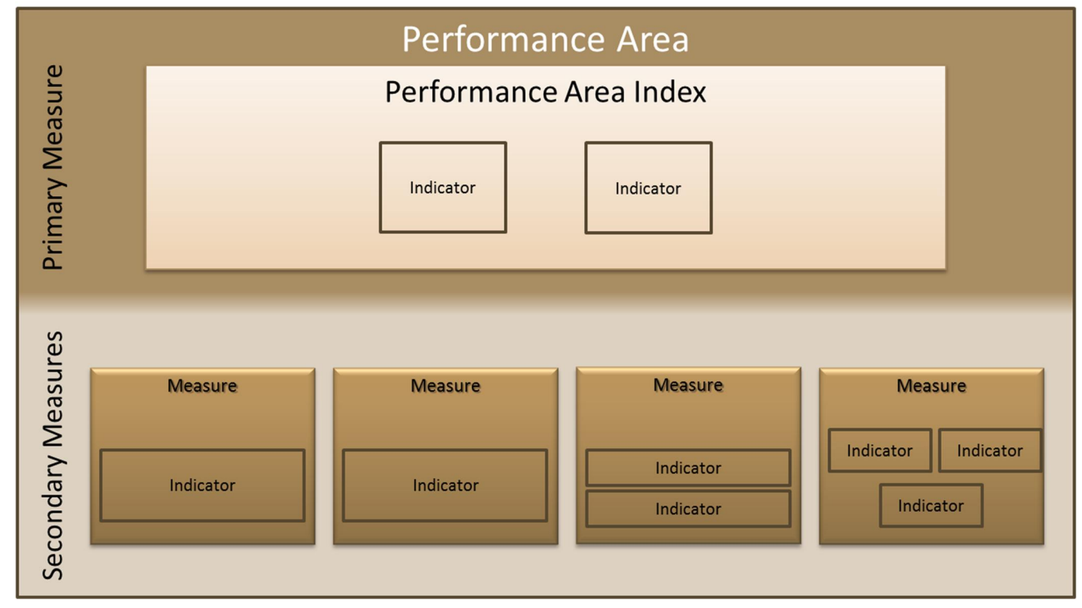
Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index and cracking	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure 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

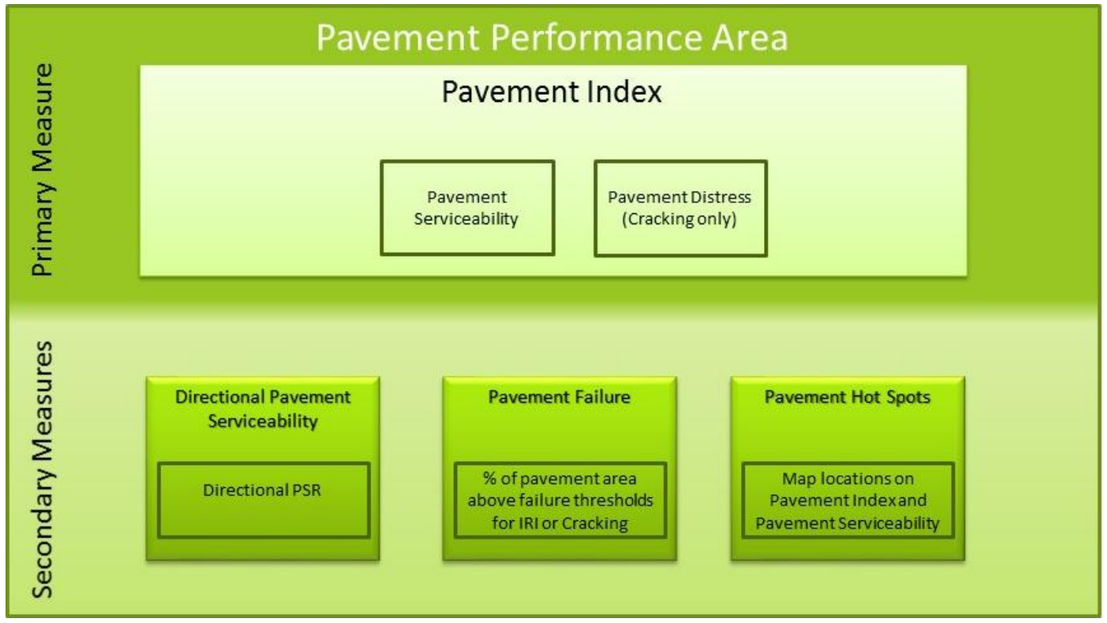
Figure 6: Performance Area Template



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 179/SR 89A/SR 260 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 179/SR 89A/SR 260 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:

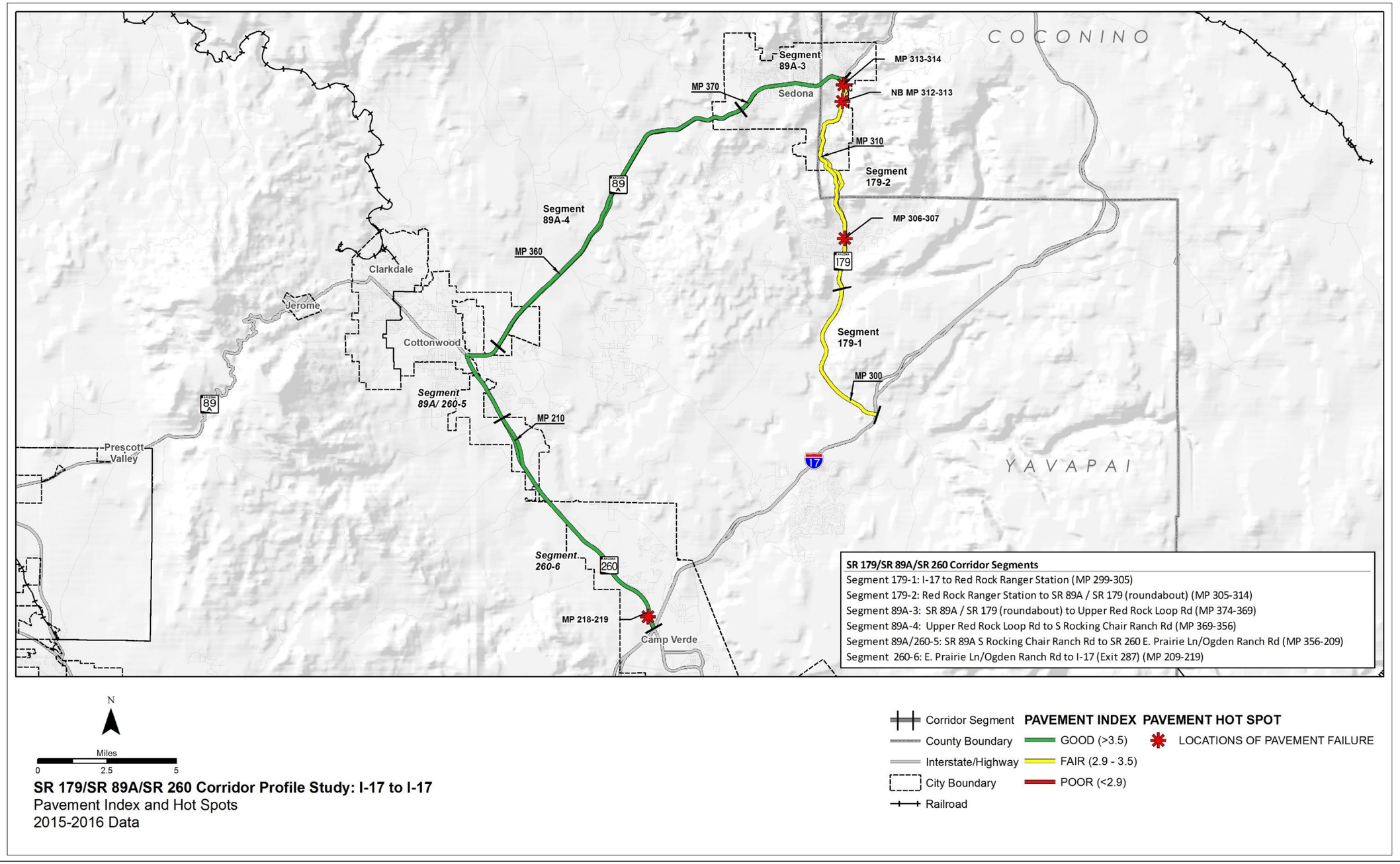
- The weighted average of the Pavement Index shows "good" overall performance for the SR 179/SR 89A/SR 260 corridor
- According to the Pavement Index, nearly all of the pavement is in "good" condition with the exception of Segments 179-1 and 179-2, which are in "fair" condition
- Cracking data was not available for the SR 179 corridor
- The weighted average of the Directional PSR shows "good" overall performance for the SR 179/SR 89A/SR 260 corridor
- The weighted average of the % Area Failure shows "fair" overall performance; Segment 179-2 shows "poor" performance for this secondary measure
- Pavement hot spots along the corridor include:
    - Segment 179-2 MP 306-307; NB MP 312-313; MP 313-314
    - Segment 260-6 SB/EB MP 218-219

Table 5 summarizes the Pavement performance results for the SR 179/SR 89A/SR 260 corridor. **Figure 8** illustrates the primary Pavement Index performance and locations of Pavement hot spots along the SR 179/SR 89A/SR 260 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
			SB/EB (& NB 179)	NB/WB (& SB 179)	
179-1	6	3.27	3.31	3.24	0.0%
179-2	9	3.31	3.33	3.28	27.8%
89A-3	5	3.71	3.51	3.46	0.0%
89A-4	13	3.87	3.75	3.75	0.0%
89A/260-5	4	3.97	3.61	3.61	0.0%
260-6	10	3.89	3.65	3.76	6.7%
Weighted Corridor Average		3.68	3.56	3.55	6.7%
SCALES					
Performance Level		**Non-Interstate**			
Good		> 3.50			< 5%
Fair		2.90 - 3.50			5% - 20%
Poor		< 2.90			> 20%

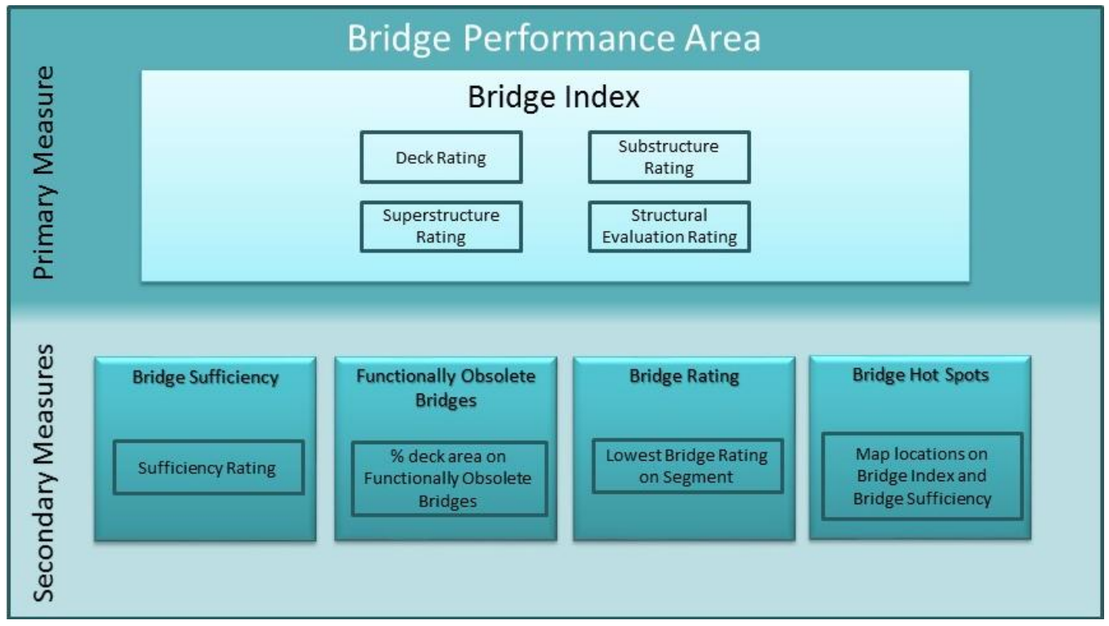
Figure 8: Pavement Performance



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 179/SR 89A/SR 260 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:

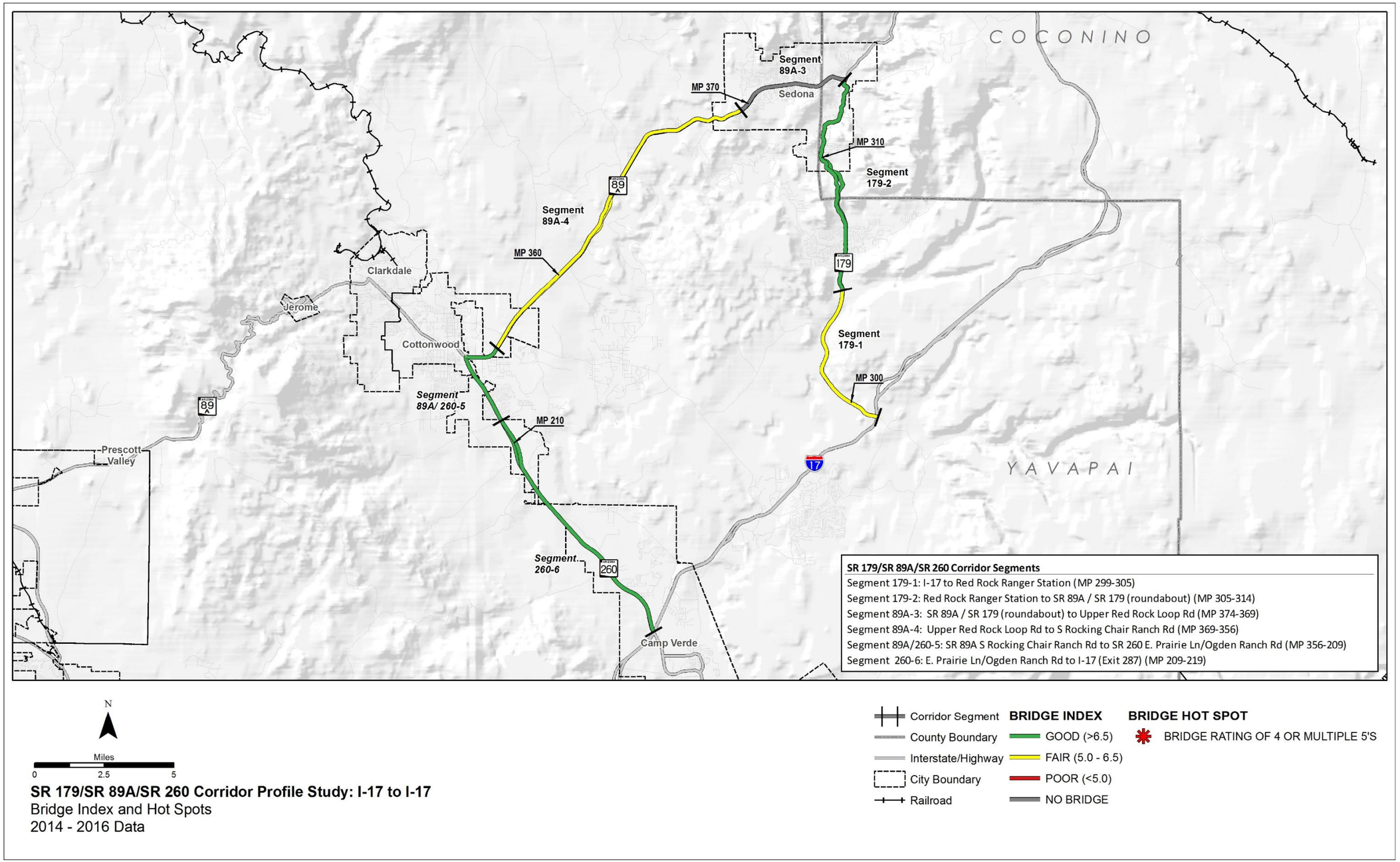
- The weighted average of the Bridge Index shows "good" overall performance for the SR 179/SR 89A/SR 260 corridor
- Segment 89A-3 contains no bridges
- The Bridge Index and Lowest Bridge Rating both show "fair" ratings for Segments 179-1 and 89A-4
- Segment 179-1 shows "poor" performance for % of Deck Area on Functionally Obsolete Bridges, which only includes one bridge: Dry Beaver Creek Bridge (#736, MP 302.5), this bridge is considered functionally obsolete due to narrow shoulders and absence of a center median
- All segments that contain bridges have a "fair" or "good" Lowest Bridge Rating indicators
- There are no bridge hot spots along the corridor

Table 6 summarizes the Bridge performance results for the SR 179/SR 89A/SR 260 corridor. **Figure 10** illustrates the primary Bridge Index performance and locations of Bridge hot spots along the SR 179/SR 89A/SR 260 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
179-1	6	1	5.00	59.90	100.0%	5
179-2	9	3	8.00	90.27	0.0%	8
89A-3	5	0	No Bridges			
89A-4	13	4	5.31	98.81	0.0%	5
89A/260-5	4	1	7.00	84.00	0.0%	7
260-6	10	5	6.95	91.24	0.0%	5
Weighted Corridor Average			6.57	90.44	7.1%	5.79
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

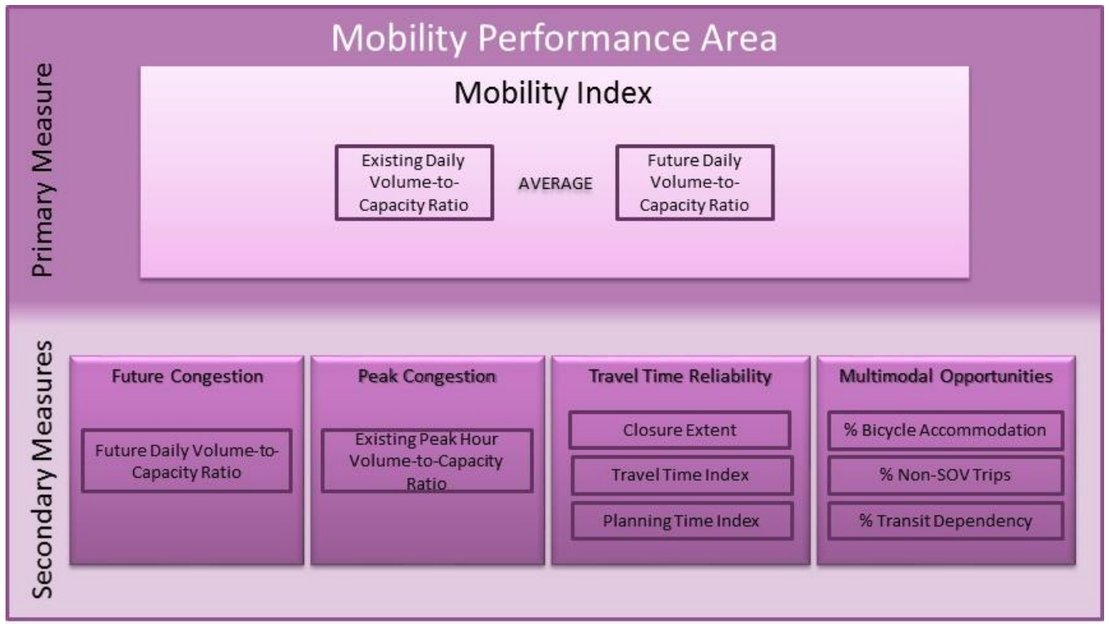
Figure 10: Bridge Performance



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 179/SR 89A/SR 260 corridor. The detailed calculations and equations developed for each measure are available in **Appendix B** and the performance data for this corridor is contained in **Appendix C**.

Figure 11: Mobility Performance Measures



Primary Mobility Index

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

Each corridor segment is rated on a scale with other segments in similar operating environments. Within the Mobility performance area, the relevant operating environments are urban vs. rural setting and interrupted flow (e.g., signalized at-grade intersections are present) vs. uninterrupted flow (e.g., controlled access grade-separated conditions such as a freeway or interstate highway). For the SR 179/SR 89A/SR 260 corridor, the following operating environments were identified:

- Urban Interrupted Flow: Segments 179-2, 89A-3 and 89A/260-5
- Rural Interrupted Flow: Segments 179-1, 89A-4, and 260-6

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 occurs
  - Closures related to crashes, weather, or other incidents are a significant contributor to non-recurring delays; construction-related closures were excluded from the analysis
- Directional Travel Time Index (TTI):
  - The ratio of the average peak period travel time to the free-flow travel time (based on the posted speed limit) in a given direction
  - The TTI recognizes the delay potential from recurring congestion during peak periods; different thresholds are applied to uninterrupted flow (freeways) and interrupted flow (non-freeways) to account for flow characteristics
- Directional Planning Time Index (PTI):
  - The ratio of the 95th percentile travel time to the free-flow travel time (based on the posted speed limit) in a given direction
  - The PTI recognizes the delay potential from non-recurring delays such as traffic crashes, weather, or other incidents; different thresholds are applied to uninterrupted flow (freeways) and interrupted flow (non-freeways) to account for flow characteristics

  - The PTI indicates the amount of time in addition to the typical travel time that should be allocated to make an on-time trip 95% of the time in a given direction

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

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

Mobility Performance Results

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

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

- The weighted average of the Mobility Index shows “fair” overall performance for the SR 179/SR 89A/SR 260 corridor, with Segment 260-6 indicating “poor” performance
- The existing peak hour traffic operations show “good” performance for all segments except Segment 260-6, which indicates “fair” performance
- Segments 179-2, 89A-3, 89A/260-5, and 260-6 are anticipated to have “poor” traffic operations performance in the future according to the Future Daily V/C performance indicator
- The weighted average for the Closure Extent performance indicator for both NB/WB and SB/EB travel indicates “good” performance
- The TTI performance indicator shows that the majority of segments have “good” performance levels for the corridor
- The PTI performance indicator shows many of the SR 179/SR 89A/SR 260 segments, both NB/EB and SB/WB, have “fair” or “poor” performance in terms of reliability
- All SR 179/SR 89A/SR 260 segments show “good” or “fair” performance for non-SOV trips
- Segments 179-1 and 89A/260-5 show “poor” performance in % Bicycle Accommodation; most other segments show ‘fair” performance

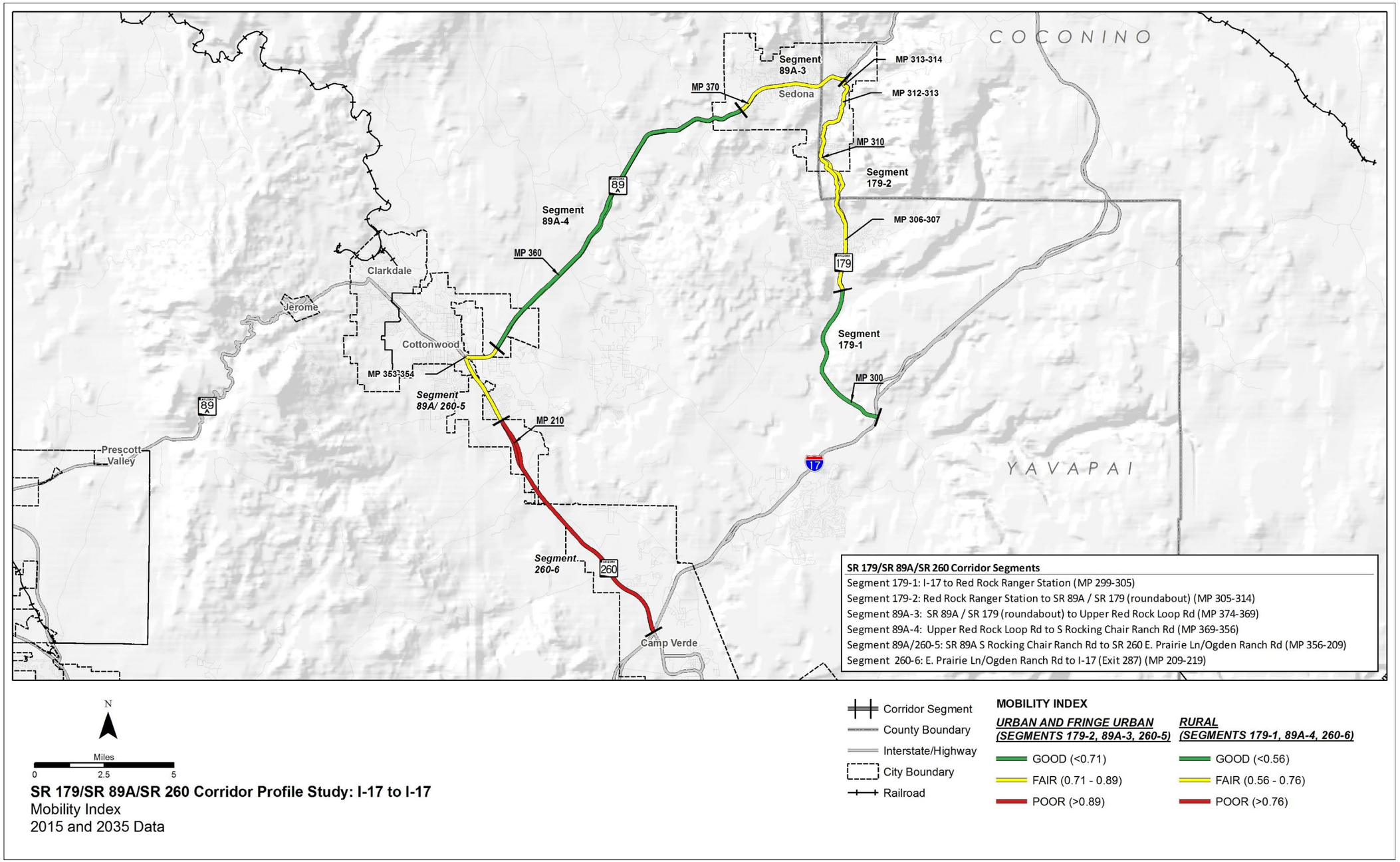
Table 7 summarizes the Mobility performance results for the SR 179/SR 89A/SR 260 corridor. **Figure 12** illustrates the primary Mobility Index performance along the SR 179/SR 89A/SR 260 corridor. Maps for each secondary measure can be found in **Appendix A**.

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/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)		
179-1[2]*	6	0.35	0.41	0.27	0.26	0.00	0.10	1.17	1.21	2.81	3.55	4%	17.1%
179-2[1]*	9	0.83	1.01	0.57	0.56	0.09	0.02	1.27	1.33	3.39	4.37	83%	17.0%
89A-3[1]*	5	0.86	1.08	0.54	0.54	0.00	0.16	1.29	1.24	6.97	5.55	71%	17.9%
89A-4[2]*	13	0.48	0.54	0.34	0.33	0.54	0.03	1.15	1.08	3.24	1.88	97%	18.0%
89A/260-5[1]*	4	0.77	0.90	0.57	0.53	0.05	0.10	1.30	1.27	5.29	3.02	29%	20.1%
260-6[2]*	10	1.22	1.40	0.76	0.76	0.12	0.12	1.01	1.07	1.33	1.97	90%	16.1%
Weighted Corridor Average		0.75	0.88	0.50	0.49	0.20	0.08	1.17	1.17	3.36	3.05	73%	17.5%
SCALES													
Performance Level		**Urban Rural**				**All**		**Uninterrupted**		**Interrupted**		**All**	
Good		< 0.71[1] < 0.56[2]				< 0.22		< 1.15^ < 1.30*		< 1.30^ < 3.00*		> 90%	> 17%
Fair		0.71 - 0.89[1] 0.56 - 0.76[2]				0.22 – 0.62		1.15 - 1.33^ 1.30 - 2.00*		1.30 - 1.50^ 3.00 - 6.00*		60% - 90%	11% - 17%
Poor		> 0.89[1] > 0.76[2]				> 0.62		> 1.33^ > 2.00*		> 1.50^ > 6.00*		< 60%	< 11%

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

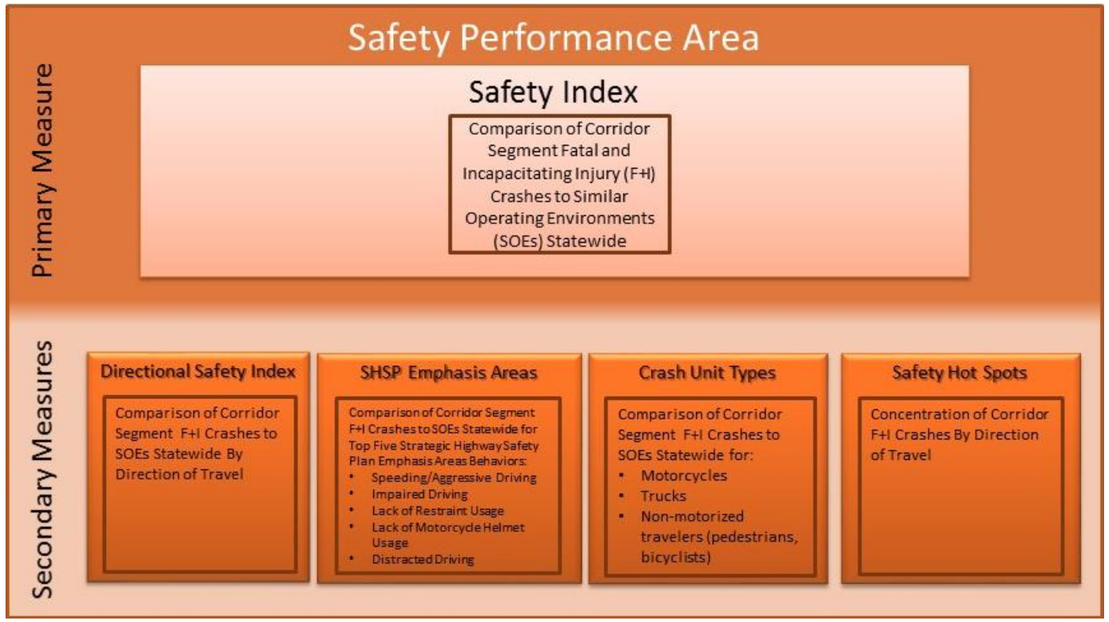
Figure 12: Mobility Performance



2.5 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 179/SR 89A/SR 260 corridor, the following operating environments were identified:

- 2 or 3 lane Undivided Highway: Segments 179-1, and 260-6
- 2 or 3 or 4 Lane Divided Highway: Segments 179-2, and 89A-4
- 4 or 5 Lane Undivided Highway: Segments 89A-3, and 89A/260-5

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, Motorcycles, and non-motorized travelers had insufficient data to generate reliable performance ratings for the SR 179/SR 89A/SR 260 corridor; Segment 179-1 had insufficient data to generate reliable performance ratings for crashes involving SHSP Top 5 Emphasis Areas
- A total of 60 fatal and incapacitating injury crashes occurred along the SR 179/SR 89A/SR 260 corridor in 2011-2015; of these crashes, 22 were fatal and 38 involved incapacitating injuries
- The weighted average of the Safety Index and Directional Safety Indices shows “below average” performance for the SR 179/SR 89A/SR 260 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 89A-3, 89A-4, 89A/260-5, and 260-6 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” compared to similar operating environments statewide
- The percentage of fatal and incapacitating crashes related to the SHSP Top 5 Emphasis Areas is higher in Segments 179-2 and 89A-3 than the statewide average for similar operating environments
- Safety hot spots include:
    - SR 260 MP 216-218
    - SR 260 MP 206-209 through SR 89A MP 355-357
    - SR 89A MP 362-363
    - SR 89A MP 367-370
    - SR 89A MP 371-372

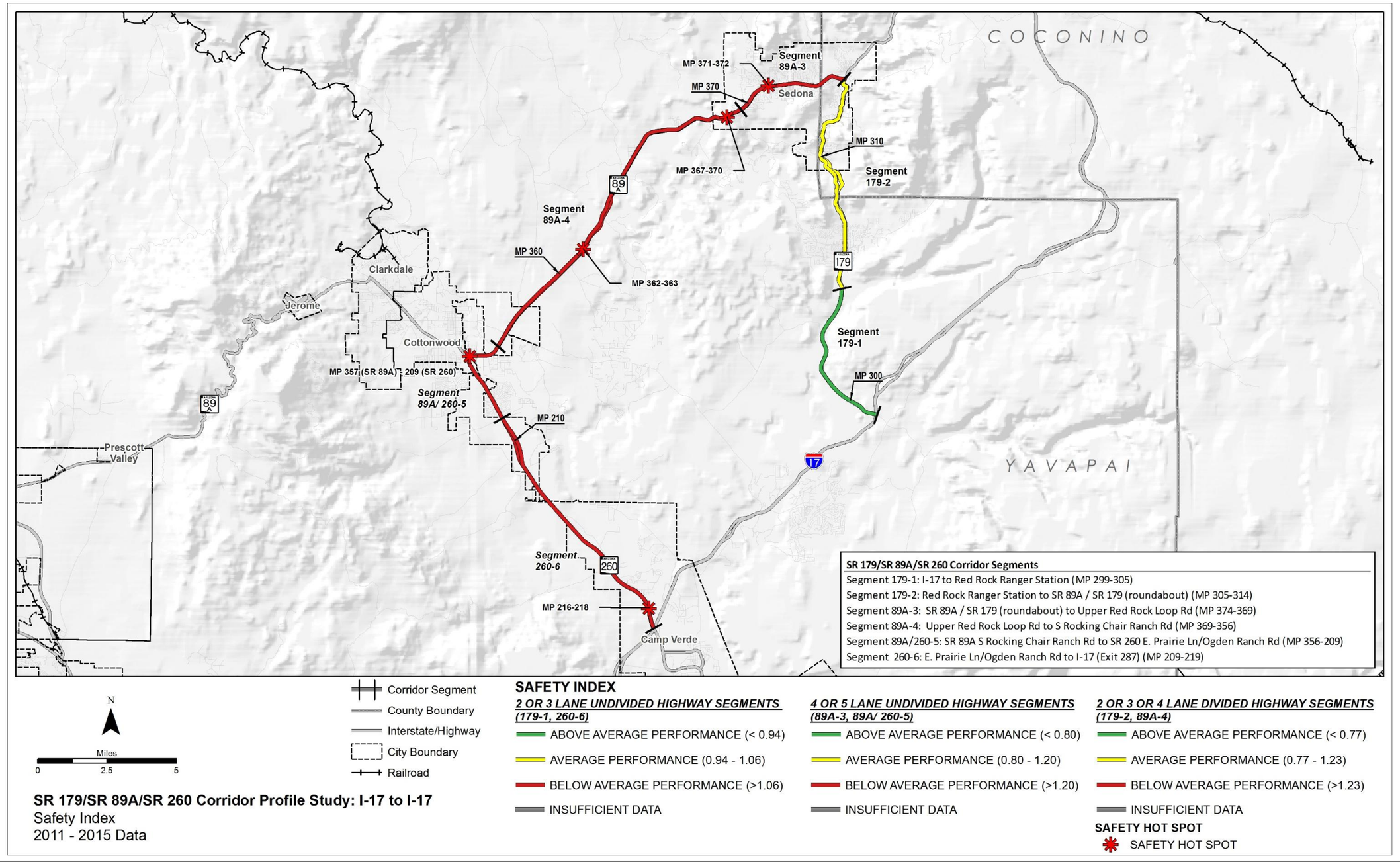
Table 8 summarizes the Safety performance results for the SR 179/SR 89A/SR 260 corridor. **Figure 14** illustrates the primary Safety Index performance and locations of Safety hot spots along the SR 179/SR 89A/SR 260 corridor. Maps for each secondary measure can be found in **Appendix A**.

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/WB (& SB 179)	SB/EB (& NB 179)				
179-1[c]	6	0/3	0.13	0.26	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
179-2[a]	9	2/4	0.79	0.79	0.79	50%	Insufficient Data	Insufficient Data	Insufficient Data
89A-3[b]	5	3/4	1.37	0.12	2.62	57%	Insufficient Data	Insufficient Data	Insufficient Data
89A-4[a]	13	10/10	2.05	0.98	3.13	56%	Insufficient Data	Insufficient Data	Insufficient Data
89A/260-5[b]	4	3/10	2.22	4.24	0.19	27%	Insufficient Data	Insufficient Data	Insufficient Data
260-6[c]	10	4/8	2.19	2.19	2.19	33%	Insufficient Data	Insufficient Data	Insufficient Data
Weighted Corridor Average			1.54	1.30	1.79	46%	Insufficient Data	Insufficient Data	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 179/SR 89A/SR 260 corridor, the following operating environments were identified:

- Interrupted Flow: All Segments

Secondary Freight Measures

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

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

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

Non-Recurring Delay (Directional TPTI)

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

Closure Duration

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

Bridge Vertical Clearance

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

Bridge Vertical Clearance Hot Spots

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

Freight Performance Results

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

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

- The weighted average of the Freight Index shows "fair" overall performance for the SR 179/SR 89A/SR 260 corridor, with Segments 89A-3 and 89A/260-5 showing "poor" performance
- Segments 179-2, 89A-3, and 89A/260-5 show "fair" performance for the Directional TTTI measure; all other segments along the corridor show "good" performance for this measure
- 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 directions due to non-recurring congestion
- Segment 89A-4 in the NB/WB direction shows "poor" performance in the Closure Duration performance measure, all other segments show "good" or "fair" performance
- No bridge vertical clearance hot spots exist along the SR 179/SR 89A/SR 260 corridor

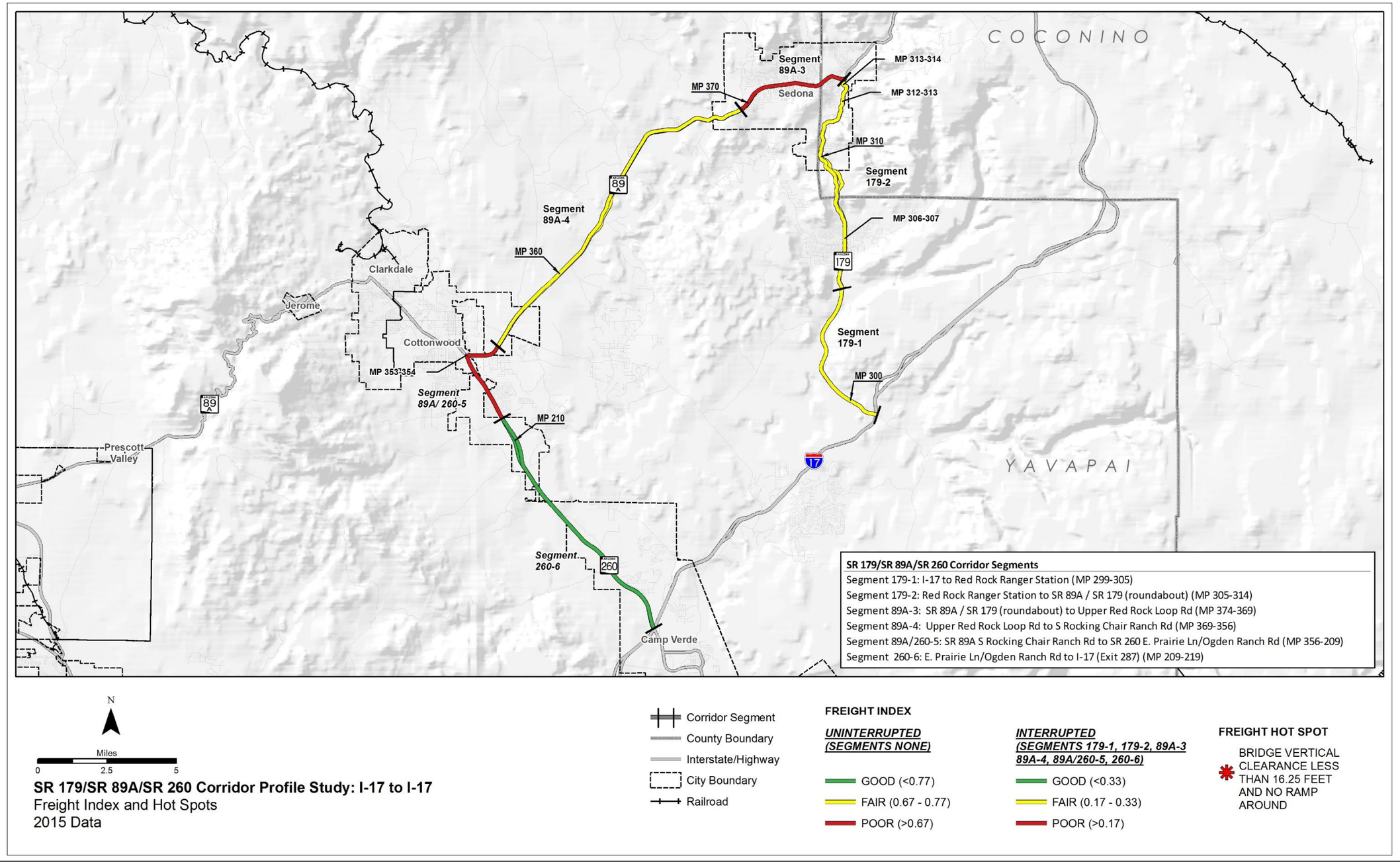
Table 9 summarizes the Freight performance results for the SR 179/SR 89A/SR 260 corridor. **Figure 16** illustrates the primary Freight Index performance and locations of freight hot spots along the SR 179/SR 89A/SR 260 corridor. Maps for each secondary measure can be found in **Appendix A**.

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/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	
179-1[2]*	6	0.24	1.25	1.27	3.16	5.33	0.00	12.13	No UP
179-2[1]*	9	0.20	1.48	1.42	4.06	5.97	21.76	4.18	No UP
89A-3[1]*	5	0.15	1.43	1.33	6.43	7.21	0.00	48.84	No UP
89A-4[2]*	13	0.27	1.28	1.16	4.38	3.14	145.51	7.40	No UP
89A/260-5[1]*	4	0.14	1.50	1.40	9.47	5.17	9.90	13.40	No UP
260-6[2]*	10	0.42	1.05	1.14	1.58	3.16	19.82	27.98	No UP
Weighted Corridor Average		0.26	1.30	1.26	4.22	4.55	50.88	16.35	No UP
SCALES									
Performance Level		**Uninterrupted Interrupted**					**All**		
Good		> 0.77^ > 0.33*	< 1.15^ < 1.30*		< 1.30^ < 3.00*		< 44.18		> 16.5
Fair		0.67 - 0.77^ 0.17 - 0.33*	1.15 -1.33^ 1.30 - 2.00*		1.30 - 1.50^ 3.00-6.00*		44.18 -124.86		16.0 - 16.5
Poor		< 0.67^ < 0.17*	> 1.33^ > 2.00*		> 1.50^ > 6.00*		> 124.86		< 16.0

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

Figure 16: Freight Performance



2.7 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 179/SR 89A/SR 260 corridor:

- Overall Performance: The Pavement and Bridge performance areas show "good" or "fair" performance; the Freight performance area shows generally "fair" performance; the Mobility performance area shows a mix of "good", "fair", and "poor" performance; the Safety performance area shows generally "below average" and "average" performance
- Pavement Performance: The weighted average of the Pavement Index shows "good" overall performance for the SR 179/SR 89A/SR 260 corridor; Segment 179-2 shows "fair" or "poor" performance for all Pavement performance area measures; the weighted average for the % Area Failure measure shows "fair" performance for the corridor
- Bridge Performance: The weighted average of the Bridge Index shows "good" overall performance for the SR 179/SR 89A/SR 260 corridor; the weighted average for the Lowest Bridge Rating measure shows "fair" performance for the corridor; Segment 89A-3 contains no bridges
- Mobility Performance: The weighted average of the Mobility Index shows "fair" overall performance for the SR 179/SR 89A/SR 260 corridor; the weighted average Future Daily V/C shows "poor" traffic operations performance; Segment 260-6 shows "poor" or "fair" performance for the Mobility Index, Future Daily V/C, and Existing Peak Hour V/C measures; the weighted average % Bicycle Accommodation measure shows "fair" performance for the corridor
- Safety Performance: The weighted average of the Safety Index and the Directional Safety Index measures show "below average" performance for the SR 179/SR 89A/SR 260 corridor; the weighted average for crashes related to the SHSP Top 5 Emphasis Areas measure shows "above average" performance; there was "insufficient data" for crashes involving trucks, motorcycles, and non-motorized travelers, meaning 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 "fair" overall performance for the SR 179/SR 89A/SR 260 corridor; the Directional TTTI measures shows "good" or "fair" performance along the corridor; Segments 89A-3 and 89A/260-5 show "poor" performance for the Directional TPTI measure in at least one direction; the weighted average for the Directional TPTI measure along the corridor shows "fair" performance; Segment 89A-4 in the NB/WB direction shows "poor" performance in the Closure Duration performance measure
- Lowest Performing Segments: Segments 89A-3, 89A-4, and 260-6 show "poor/below average" performance for many performance measures
- Highest Performing Segments: Segments 179-1 and 89A-4 show "good/above average" performance for many performance measures

Figure 17 shows the percentage of the SR 179/SR 89A/SR 260 corridor that rates either "good/above average" performance, "fair/average" performance, or "poor/below average" performance for each primary measure. On the SR 179/SR 89A/SR 260 corridor, Safety is the lowest performing area with 68% of the corridor having "below average" performance as it relates to the primary measure. The Pavement and Bridge performance areas are the highest performing areas on the SR 179/SR 89A/SR 260 corridor with 68% and 64% of the corridor, respectively, having "good" performance as it relates to the primary measures. The Mobility and Freight performance areas show a more even mix of "good", "fair", and "poor" performance.

Table 10 shows a summary of corridor performance for all primary measures and secondary measure indicators for the SR 179/SR 89A/SR 260 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

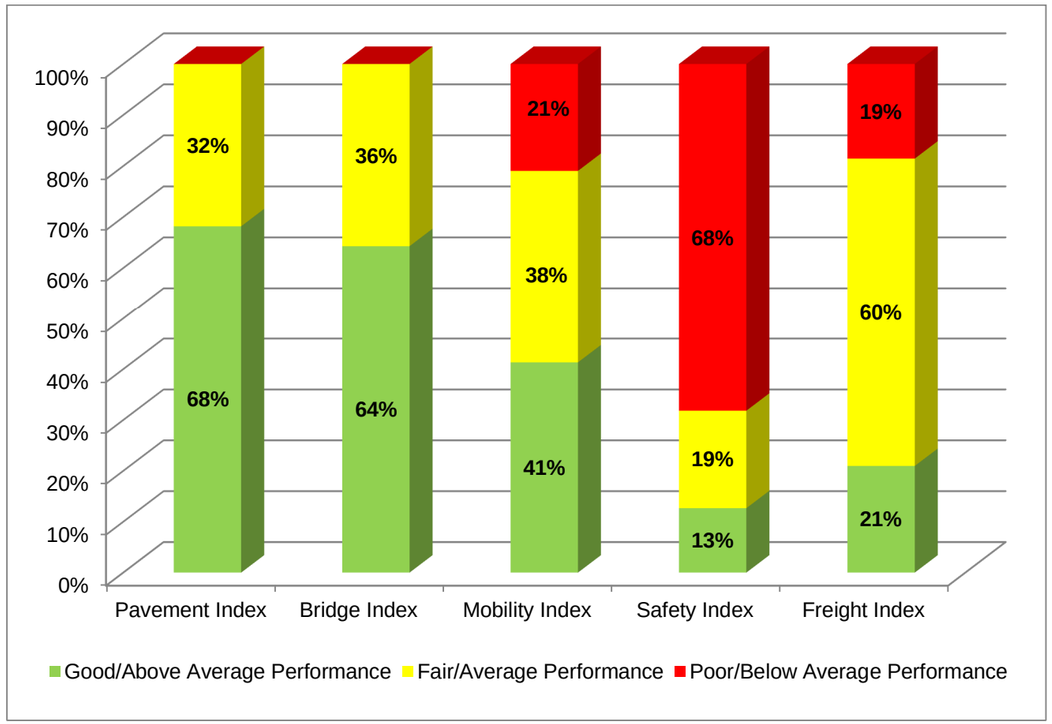


Figure 18: Corridor Performance Summary by Performance Measure

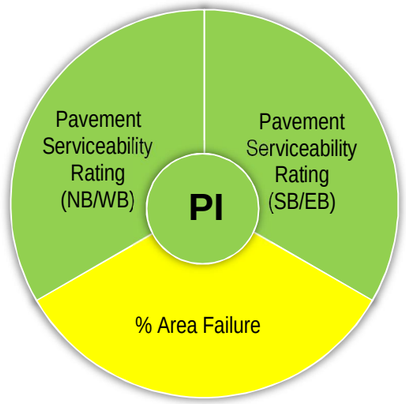
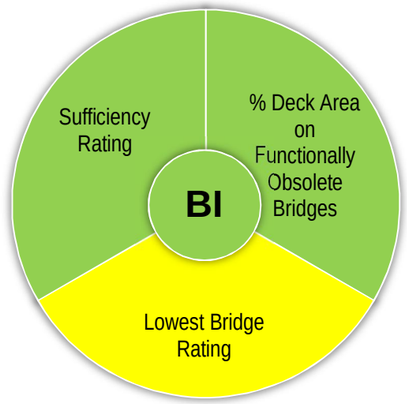
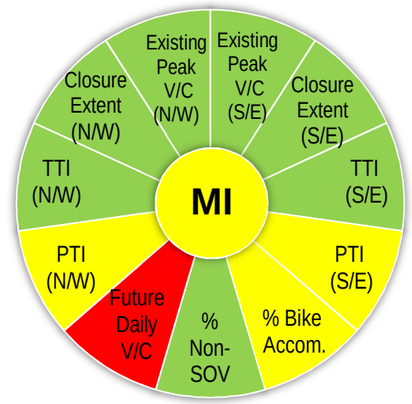
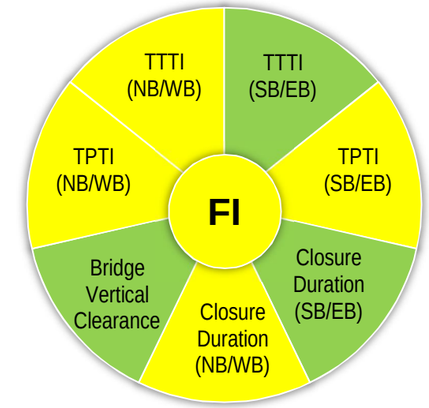
Pavement	Bridge	Mobility	Safety	Freight
				
Pavement Index (PI): based on two pavement condition ratings from the ADOT Pavement Database; the two ratings are the International Roughness Index (IRI) and the Cracking Rating	Bridge Index (BI): based on four bridge condition ratings from the ADOT Bridge 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
			SB/EB (& NB 179)	NB/WB (& SB 179)								NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)		
179-1[2*c]	6	3.27	3.31	3.24	0.0%	5.00	59.90	100.0%	5	0.35	0.41	0.27	0.26	0.00	0.10	1.17	1.21	2.81	3.55	4%	17.1%
179-2[1*a]	9	3.31	3.33	3.28	27.8%	8.00	90.27	0.0%	8	0.83	1.01	0.57	0.56	0.09	0.02	1.27	1.33	3.39	4.37	83%	17.0%
89A-3[1*b]	5	3.71	3.51	3.46	0.0%	No Bridges				0.86	1.08	0.54	0.54	0.00	0.16	1.29	1.24	6.97	5.55	71%	17.9%
89A-4[2*a]	13	3.87	3.75	3.75	0.0%	5.31	98.81	0.0%	5	0.48	0.54	0.34	0.33	0.54	0.03	1.15	1.08	3.24	1.88	97%	18.0%
89A/260-5[1*b]	4	3.97	3.61	3.61	0.0%	7.00	84.00	0.0%	7	0.77	0.90	0.57	0.53	0.05	0.10	1.30	1.27	5.29	3.02	29%	20.1%
260-6[2*c]	10	3.89	3.65	3.76	6.7%	6.95	91.24	0.0%	5	1.22	1.40	0.76	0.76	0.12	0.12	1.01	1.07	1.33	1.97	90%	16.1%
Weighted Corridor Average		3.68	3.56	3.55	6.7%	6.57	90.44	7.1%	5.79	0.75	0.88	0.50	0.49	0.20	0.08	1.17	1.17	3.36	3.05	73%	17.5%
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/WB (& SB 179)	SB/EB (& NB 179)						NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	
179-1[2*c]	5	0.13	0.26	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.24	1.25	1.27	3.16	5.33	0.00	12.13	No UP
179-2[1*a]	9	0.79	0.79	0.79	50%	Insufficient Data	Insufficient Data	Insufficient Data	0.20	1.48	1.42	4.06	5.97	21.76	4.18	No UP
89A-3[1*b]	22	1.37	0.12	2.62	57%	Insufficient Data	Insufficient Data	Insufficient Data	0.15	1.43	1.33	6.43	7.21	0.00	48.84	No UP
89A-4[2*a]	22	2.05	0.98	3.13	56%	Insufficient Data	Insufficient Data	Insufficient Data	0.27	1.28	1.16	4.38	3.14	145.51	7.40	No UP
89A/260-5[1*b]	5	2.22	4.24	0.19	27%	Insufficient Data	Insufficient Data	Insufficient Data	0.14	1.50	1.40	9.47	5.17	9.90	13.40	No UP
260-6[2*c]	10	2.19	2.19	2.19	33%	Insufficient Data	Insufficient Data	Insufficient Data	0.42	1.05	1.14	1.58	3.16	19.82	27.98	No UP
Weighted Corridor Average		1.54	1.30	1.79	46%	Insufficient Data	Insufficient Data	Insufficient Data	0.26	1.30	1.26	4.22	4.55	50.88	16.35	No UP

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 179/SR 89A/SR 260 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 179/SR 89A/SR 260 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 179/SR 89A/SR 260 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 179/SR 89A/SR 260 Corridor Goals	SR 179/SR 89A/SR 260 Corridor Objectives	Performance Area	Primary Measure	Performance Objective	
				Secondary Measure Indicators	Corridor Average	Segment
Improve Mobility, Reliability, and Accessibility	Improve mobility through additional capacity and improved roadway geometry Provide a safe and reliable route for recreational and tourist travel Provide safe, reliable and efficient connection to all communities along the corridor to permit efficient regional travel Implement critical/cost-effective investments to improve access to multimodal transportation	Reduce current congestion and plan to facilitate future congestion that accounts for anticipated growth Reduce delays from recurring and non-recurring events to improve reliability Better accommodate bicycle and pedestrian use on the state system Emphasize the deployment of technology to optimize existing system capacity and performance Support and facilitate better accessibility to the statewide multimodal transportation system	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		
Make Cost-Effective Investment Decisions and Support Economic Vitality	Provide a safe, reliable, and efficient freight route	Implement the most cost-effective transportation solutions Reduce delays and restrictions to freight movement to improve reliability Improve travel time reliability (including impacts to motorists due to freight traffic)	Freight	Freight Index	Fair or better	Fair or better
				Directional Truck Travel Time Index		
				Directional Truck Planning Time Index		
				Closure Duration		
				Bridge Vertical Clearance		
Preserve and Maintain the System	Maintain, preserve, extend the service life, and modernize State Transportation System 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 *(Emphasis Area)*	Pavement Index	Good	Fair or better
				Directional Pavement Serviceability Rating		
				% Area Failure		
Enhance Safety	Provide a safe, reliable, and efficient connection for the communities along the corridor Improve transportation system safety for all modes	Reduce the number and rate of 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		

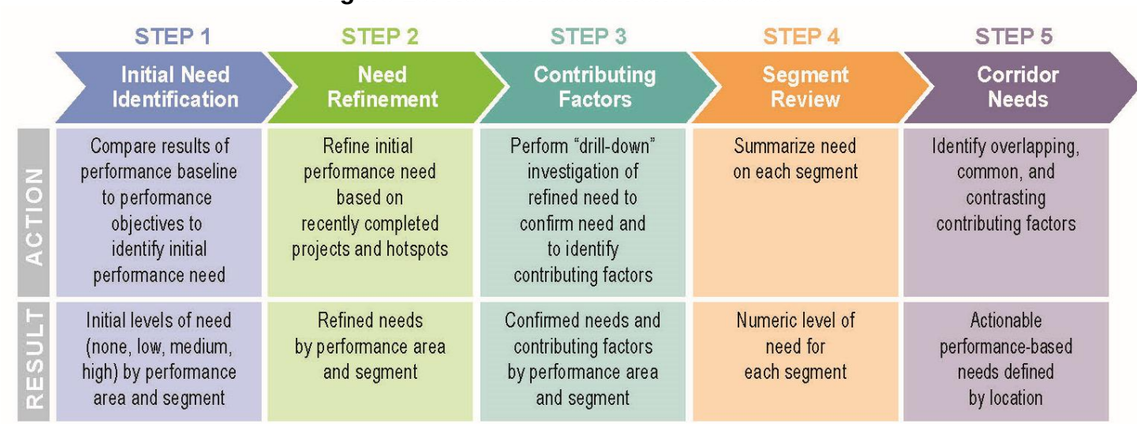
3.2 Needs Assessment Process

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

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

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

Step 3: Contributing Factors

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

Pavement Performance Area

- Pavement Rating Database

Bridge Performance Area

- ABISS

Mobility Performance Area

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

Safety Performance Area

- Crash Database

Freight Performance Area

- HERE Database
- HCRS Database

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

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

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

Step 4: Segment Review

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

Step 5: Corridor Needs

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

3.3 Corridor Needs Assessment

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

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

Pavement Needs Refinement and Contributing Factors

- The level of need for Segment 260-6 was raised to Low due to the presence of a hot spot
- Segment 89A/260-5 has a High potential pavement repetitive historical investment issue
- 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				
		SB/EB (& SR 179 NB)	NB/WB (& SR 179 SB)					
179-1	3.27	3.31	3.24	0%	1.10	None	None	Low
179-2	3.31	3.33	3.28	28%	0.70	MP 306-307; MP 313-314; SB MP 312-313	None	Low
89A-3	3.71	3.51	3.46	0%	0.00	None	None	None
89A-4	3.87	3.75	3.75	0%	0.00	None	None	None
89A/260-5	3.97	3.61	3.61	0%	0.00	None	None	None
260-6	3.89	3.65	3.76	7%	0.00	SB/EB MP 218-219	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

- No changes were made to the level of need to account for hot spots or recently completed projects
- One bridge in Segment 179-1 (Dry Beaver Creek Br #736, MP 302.5) has potential repetitive historical investment issues, an evaluation rating of 5, and is considered functionally obsolete, but is not a bridge hot spot
- 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				
179-1	5.00	59.90	100.00%	5.00	2.9	None	None	High
179-2	8.00	90.27	0.00%	8.00	0.0	None	None	None
89A-3	No Bridges				0.0	None	None	None
89A-4	5.31	98.81	0.00%	5.00	2.2	None	None	Medium
89A/260-5	7.00	84.00	0.00%	7.00	0.0	None	None	None
260-6	6.95	91.24	0.00%	5.00	0.2	None	None	Low
Level of Need (Score)	**Performance Score Need Scale**				**Segment Level Need Scale**			
None (0)	≥ 6.0	≥ 70	≤ 21.0%	> 5	0			
Low (1)	5.5 - 6.0	60 - 70	21.0% - 31.0%	5	< 1.5			
Medium (2)	4.5 - 5.5	40 - 60	31.0% - 49.0%	4	1.5 - 2.5			
High (3)	≤ 4.5	≤ 40	≥ 49.0%	< 4	> 2.5			

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

Mobility Needs Refinement and Contributing Factors

- There are a few recently completed projects along the corridor but they did not substantially affect the overall segment performance so no changes were made to the level of need
- 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/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)				
179-1[b]	0.35	0.41	0.27	0.26	0.00	0.10	1.17	1.21	2.81	3.55	4%	0.6	None	Low
179-2[b]	0.83	1.01	0.57	0.56	0.09	0.02	1.27	1.33	3.39	4.37	83%	2.7	None	High
89A-3[b]	0.86	1.08	0.54	0.54	0.00	0.16	1.29	1.24	6.97	5.55	71%	3.2	None	High
89A-4[b]	0.48	0.54	0.34	0.33	0.54	0.03	1.15	1.08	3.24	1.88	97%	0.2	None	Low
89A/260-5[b]	0.77	0.90	0.57	0.53	0.05	0.10	1.30	1.27	5.29	3.02	29%	1.2	Add turn lane, MP 355.2 (2013)	Low
260-6[b]	1.22	1.40	0.76	0.76	0.12	0.12	1.01	1.07	1.33	1.97	90%	4.0	Construct erosion control features, MP 210.0 (Wilbur Canyon) (2014)	High
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 Refinements and Contributing Factors

- No changes were made to the level of need to account for hot spots
- Safety hot spots are present in every segment excluding 179-1 and 179-2
- There are a few recently completed projects along the corridor but they did not substantially affect the overall segment performance so no changes were made to the level of 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/WB (& SB 179)	SB/EB (& NB 179)								
179-1[c]	0.13	0.26	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.0	None	None	None
179-2[a]	0.79	0.79	0.79	0.50	Insufficient Data	Insufficient Data	Insufficient Data	0.2	None	None	Low
89A-3[b]	1.37	0.12	2.62	0.57	Insufficient Data	Insufficient Data	Insufficient Data	3.9	MP 369-370; MP 371-372	None	High
89A-4[a]	2.05	0.98	3.13	0.56	Insufficient Data	Insufficient Data	Insufficient Data	3.8	MP 362-363; MP 367-369	None	High
89A/260-5[b]	2.22	4.24	0.19	0.27	Insufficient Data	Insufficient Data	Insufficient Data	3.3	SR 260 MP 206-209 through SR 89A MP 355-357	Add turn lane, MP 355.2 (2013)	High
260-6[c]	2.19	2.19	2.19	0.33	Insufficient Data	Insufficient Data	Insufficient Data	3.6	MP 216-218	Construct erosion control features, MP 210.0 (Wilbur Canyon), (2014); Construct improvements, MP 211.0 (Thousand Trails-I-17 Junctions), (2016)	High

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 Refinements and Contributing Factors

- No changes were made to the level of need to account for hot spots as there are no bridge vertical clearance hot spots on the corridor
- There are a few recently completed projects along the corridor but they did not substantially affect the overall segment performance so no changes were made to the level of need
- 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/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)	NB/WB (& SB 179)	SB/EB (& NB 179)					
179-1[b]	0.24	1.25	1.27	3.16	5.33	0.00	12.13	No UP	1.2	None	None	Low
179-2[b]	0.20	1.48	1.42	4.06	5.97	21.76	4.18	No UP	2.3	None	None	Medium
89A-3[b]	0.15	1.43	1.33	6.43	7.21	0.00	48.84	No UP	2.5	None	None	High
89A-4[b]	0.27	1.28	1.16	4.38	3.14	145.51	7.40	No UP	1.3	None	None	Low
89A/260-5[b]	0.14	1.50	1.40	9.47	5.17	9.90	13.40	No UP	2.5	None	Add turn lane, MP 355.2 (2013)	High
260-6[b]	0.42	1.05	1.14	1.58	3.16	19.82	27.98	No UP	0.0	None	Construct erosion control features, MP 210.0 (Wilbur Canyon) (2014)	None

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 (Pavement, Mobility, and Safety for the SR 179/SR 89A/SR 260 corridor). All segments on the SR 179/SR 89A/SR 260 corridor have a Medium average need.

Table 17: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)					
	179-1	179-2	89A-3	89A-4	89A/260-5	260-6
	MP 299 – 305	MP 305 – 314	MP 374 – 369	MP 369 – 356	MP 356 – 209	MP 209 – 219
Pavement*	Low	Low	None	None	None	Low
Bridge	High	None	None	Medium	None	Low
Mobility*	Low	High	High	Low	Low	High
Safety*	None	Low	High	High	High	High
Freight	Low	Medium	High	Low	High	None
Average Need	**1.08**	**1.46**	**1.85**	**1.38**	**1.38**	**1.77**

* Identified as Emphasis Areas for SR 179/SR 89A/SR 260Corridor
[#] N/A indicates insufficient or no data available to determine level of need
[+] A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study

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

Summary of Corridor

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

Pavement Needs

- Two segments (179-2 and 89A/260-5) contain Pavement hot spots
- Segments 179-1, 179-2, and 260-6 have a final segment need of Low; all other segments on the corridor have final segment need of None
- Segment 89A/260-5 was identified as having potential pavement repetitive historical investment issues

Bridge Needs

- There are no bridge hot spots along the corridor but there are three bridges that have potential repetitive historical investment issues
- Segment 179-1 has a final segment need of High; the segment contains one bridge which is functionally obsolete and has one evaluation rating of 5
- Segment 89A-4 has a final segment need of Medium; Segment 260-6 has a final segment need of Low; all other segments have a final segment need of None

Mobility Needs

- Segments 179-2, 89A-3, and 260-6 have a final segment need of High; all other segments on the corridor have final segment need of Low
- Mobility needs are related to high existing and projected traffic volumes, high PTI, and lack of bicycle accommodation

Safety Needs

- All segments have a final segment need of High except Segments 179-1 and 179-2, which have final segment needs of None and Low, respectively
- Safety hot spots exist in Segments 89A-3, 89A-4, 89A/260-5, and 260-6
- Crashes involving SHSP Top 5 Emphasis Area Behaviors are above the statewide average for Segments 179-2 and 89A-3

Freight Needs

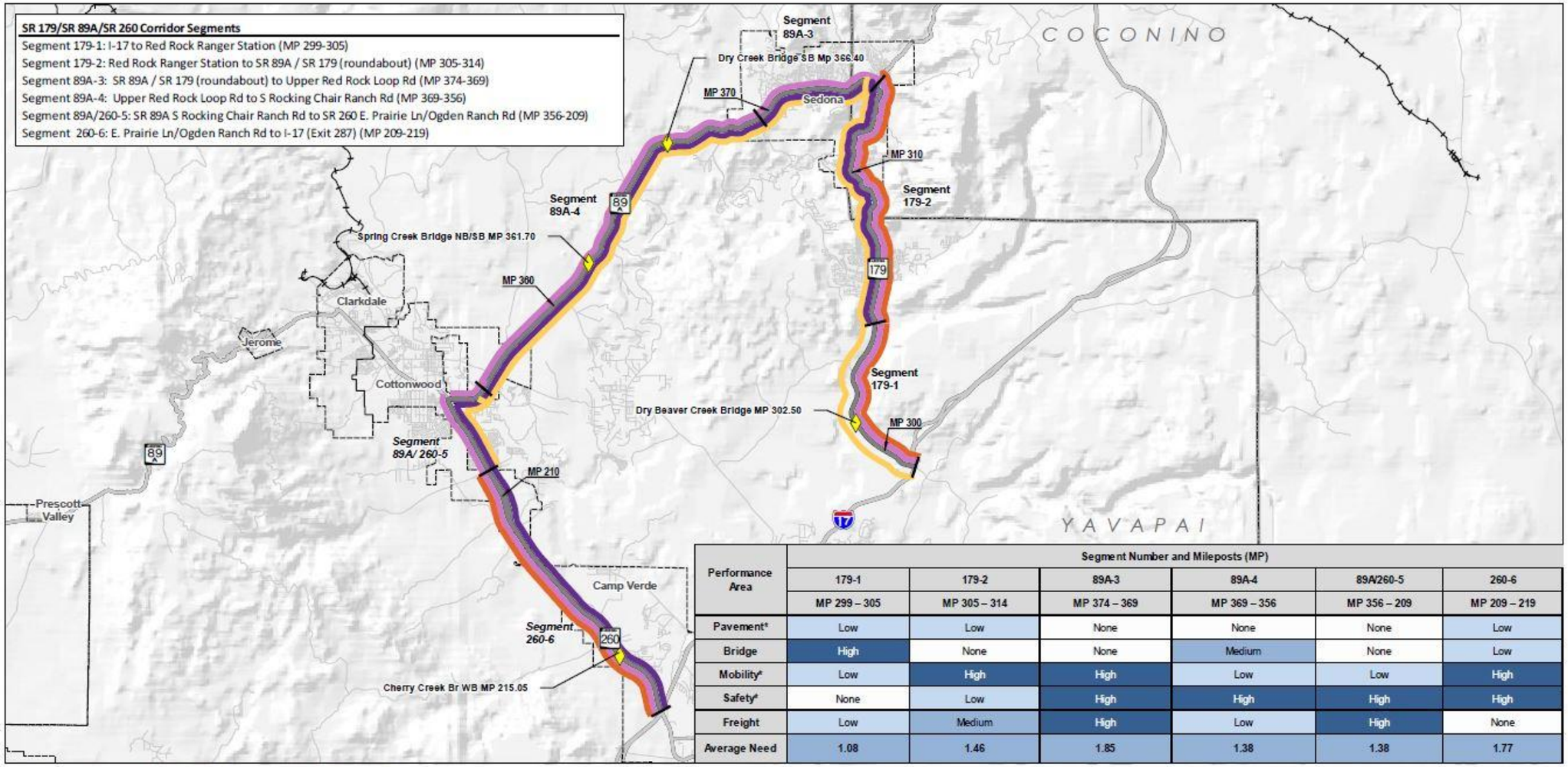
- No freight hot spots exist along the corridor
- Segment 89A/260-5 and Segment 89A-3 has a final segment need of High while Segment 179-2 has a final segment need of Medium; all other segments on the corridor have a final segment need of Low
- Freight needs are primarily related to the Freight Index and high PTI

Overlapping Needs

This section identifies overlapping performance needs on the SR 179/SR 89A/SR 260 corridor, which provides guidance to develop strategic solutions that address more than one performance area with elevated levels of need (i.e., Medium or High). Completing projects that address multiple needs presents the opportunity to more effectively improve overall performance. A summary of the overlapping needs that relate to locations with elevated levels of need is provided below:

- Segment 89A-3, which has the highest average need score of all the segments of the corridor, has elevated needs in the Mobility, Safety, and Freight performance areas
- Segment 179-2 contains elevated needs in the Mobility and Freight performance areas
- Segment 89A-4 contains elevated needs in the Bridge and Safety performance areas
- Segment 260-5 contains elevated needs in the Safety and Freight performance areas
- Segment 260-6 contains elevated needs in the Mobility and Safety performance areas

Figure 21 Corridor Needs Summary



Performance Area	Segment Number and Mileposts (MP)					
	179-1	179-2	89A-3	89A-4	89A/260-5	260-6
	MP 299 – 305	MP 305 – 314	MP 374 – 369	MP 369 – 356	MP 356 – 209	MP 209 – 219
Pavement*	Low	Low	None	None	None	Low
Bridge	High	None	None	Medium	None	Low
Mobility*	Low	High	High	Low	Low	High
Safety*	None	Low	High	High	High	High
Freight	Low	Medium	High	Low	High	None
Average Need	1.08	1.46	1.85	1.38	1.38	1.77

* Identified as Emphasis Areas for SR 179/SR 89A/SR 260 Corridor
# 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 2.5 5 N

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

Performance Area Needs
Pavement
Mobility
Safety
Freight

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

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Needs Summary

Appendix A: Corridor Performance Maps

This appendix contains maps of each primary and secondary measure associated with the five performance areas for the SR 179/SR 260/Sr 89A 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:

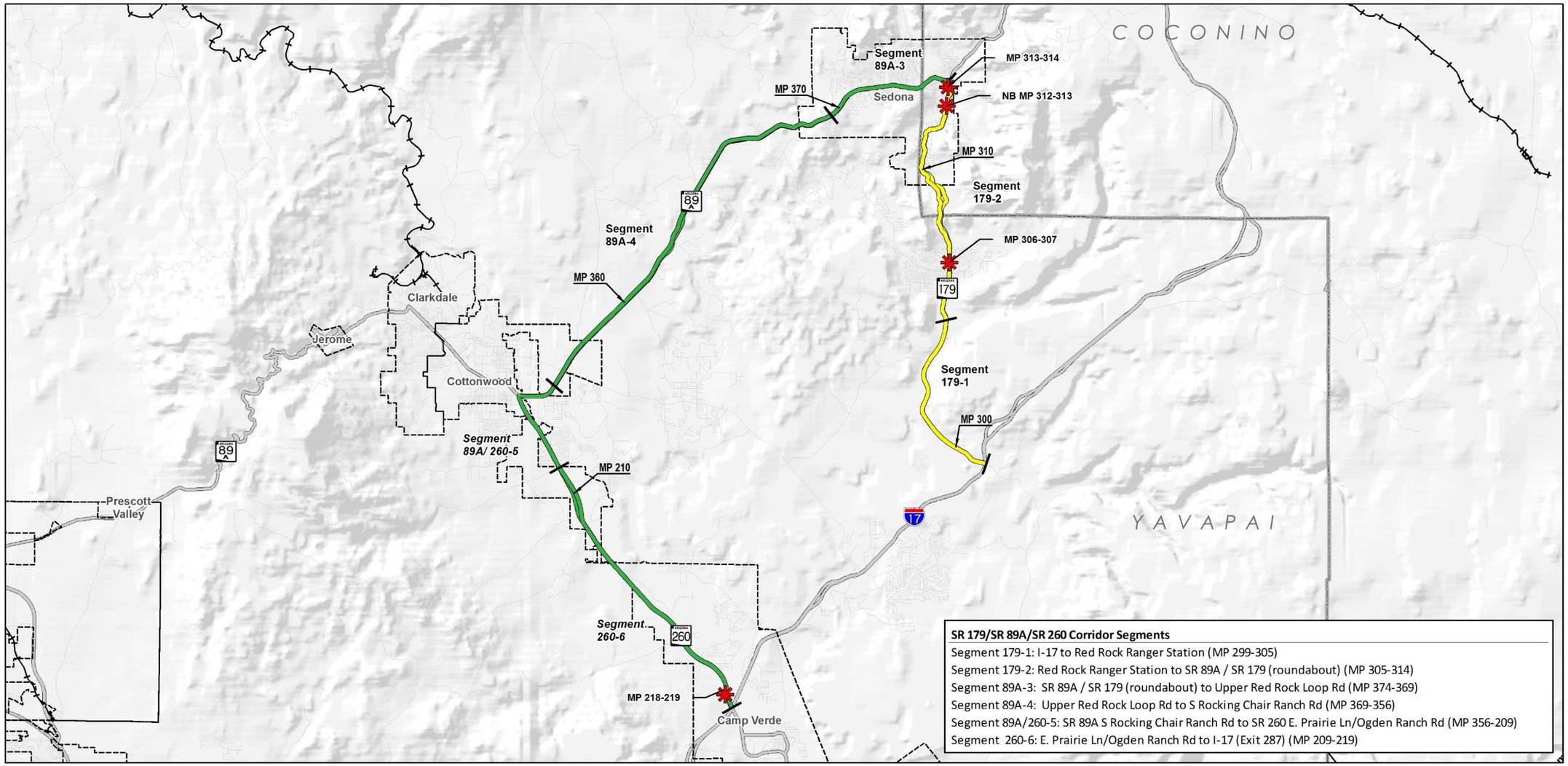
- Mobility Index
- Future Daily V/C
- Existing Peak V/C (directional)
- Average Instances Per Year a Given Milepost is Closed Per Segment Mile
- All Vehicles Travel Time Index
- All Vehicles Planning Time Index
- Multimodal Opportunities
- Percentage of Bicycle Accommodation

Safety Performance Area:

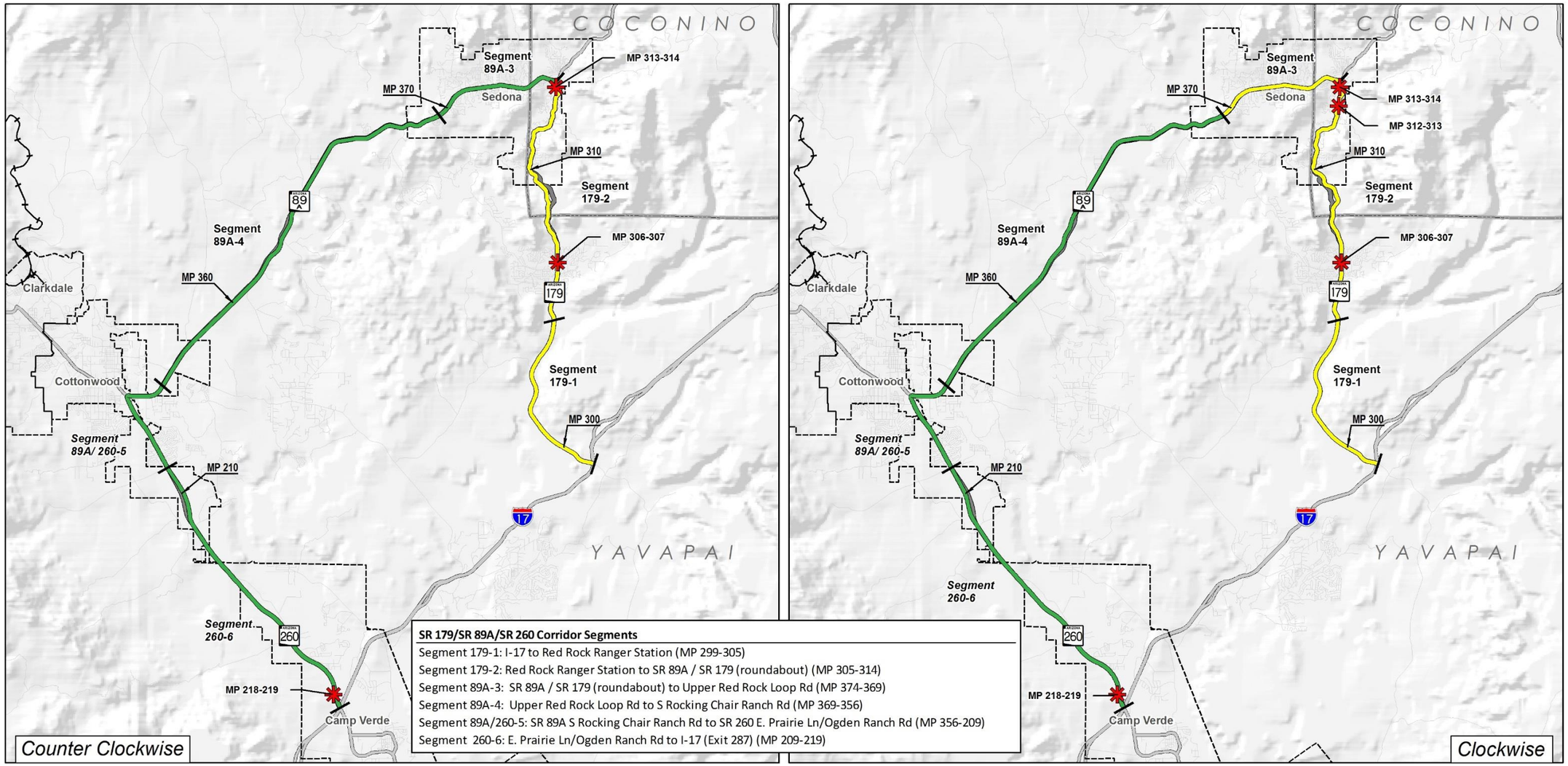
- Safety Index and Hot Spots
- Safety Index and Hot Spots (directional)
- Relative Frequency of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors Compared to the Statewide Average for Similar Segments

Freight Performance Area:

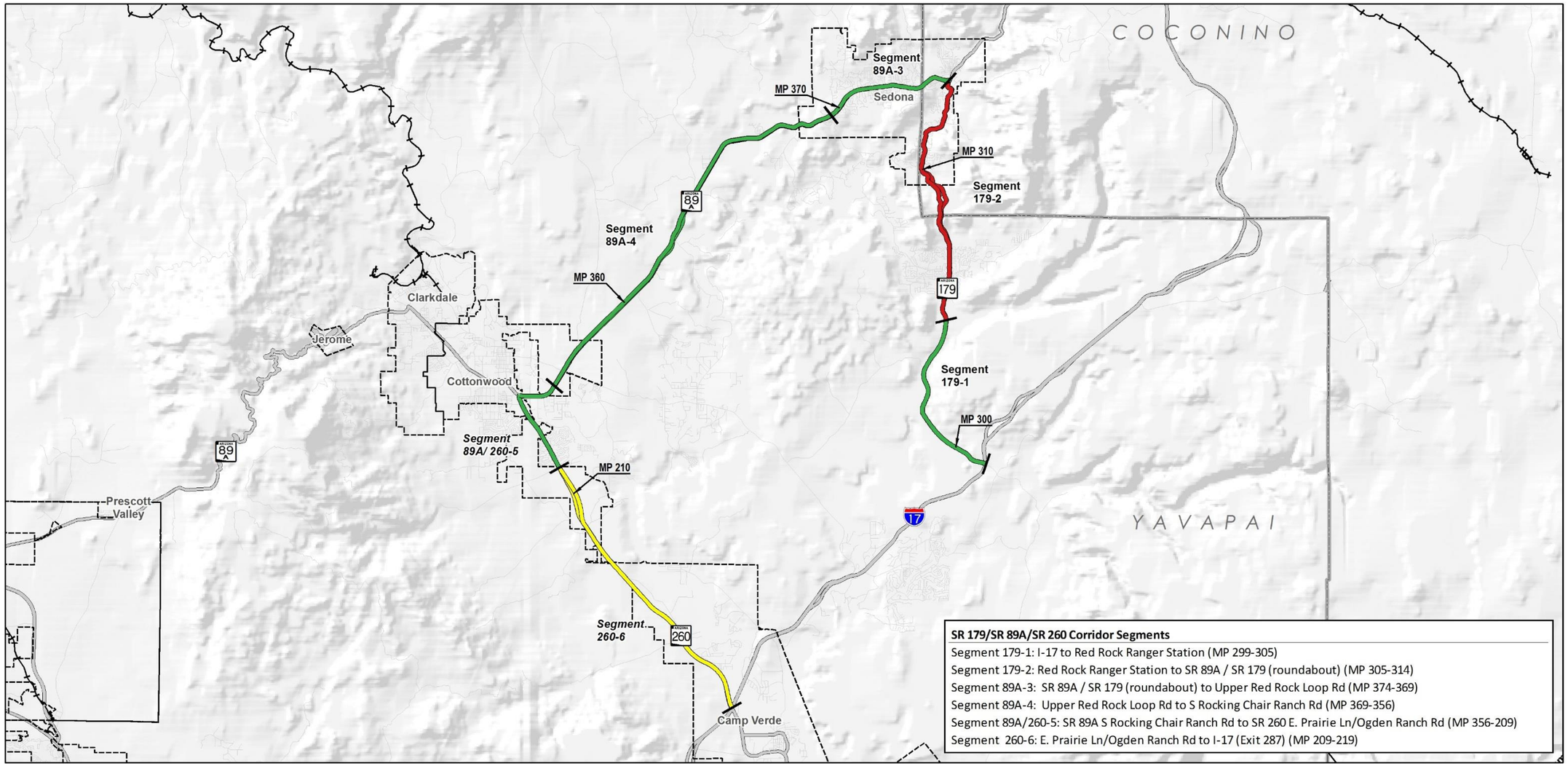
- Freight Index and Hot Spots
- Truck Travel Time Index
- Truck Planning Time Index
- Average Minutes Per Year Given Milepost is Closed Per Segment Mile



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Pavement Index and Hot Spots
2015-2016 Data



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Pavement Serviceability and Hot Spots
2015-2016 Data



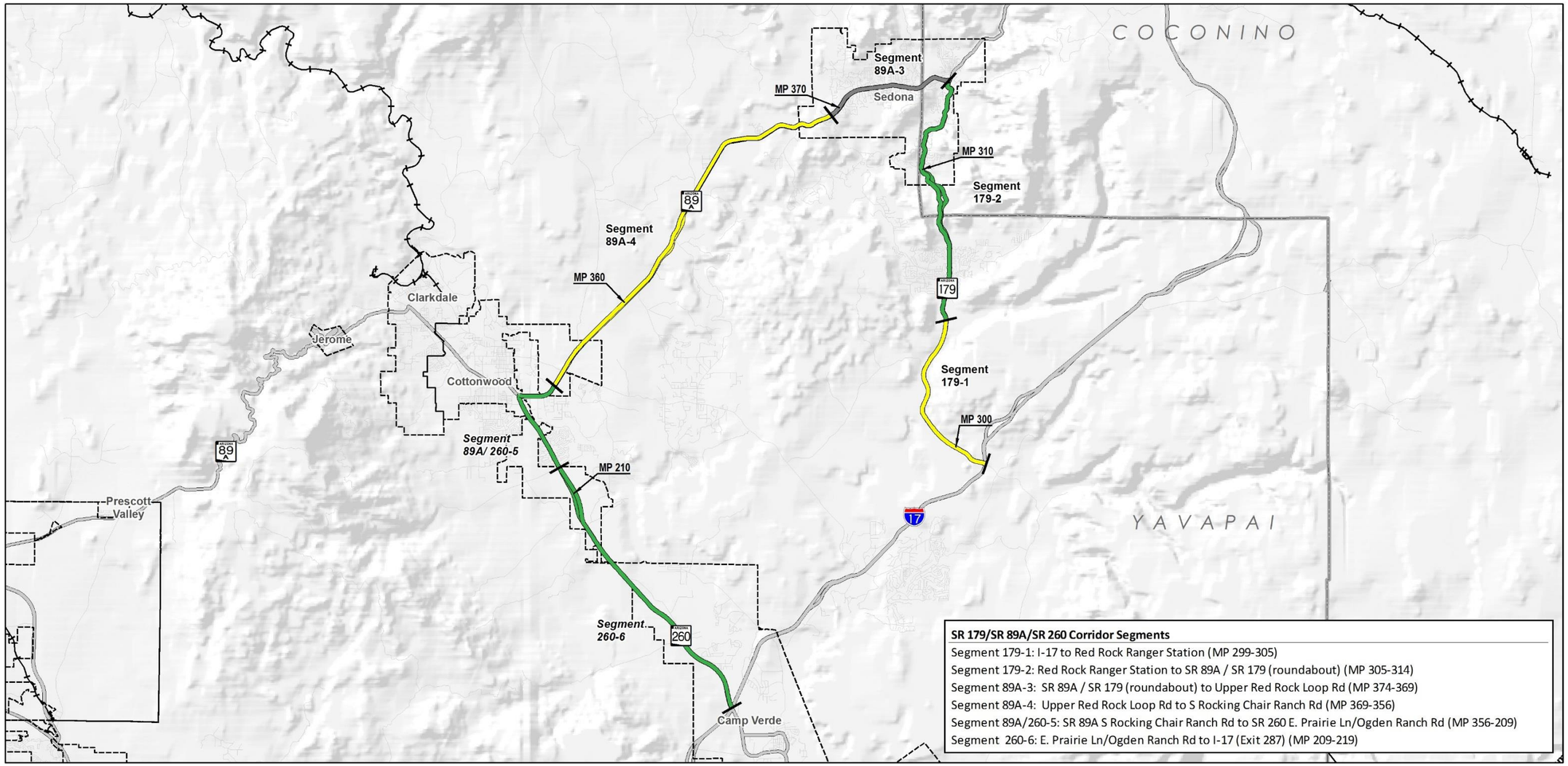
N

Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

PERCENTAGE OF PAVEMENT AREA FAILURE
GOOD (<5%)
FAIR (5%-20%)
POOR (>20%)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Percentage of Pavement Area Failure
2015-2016 Data



N

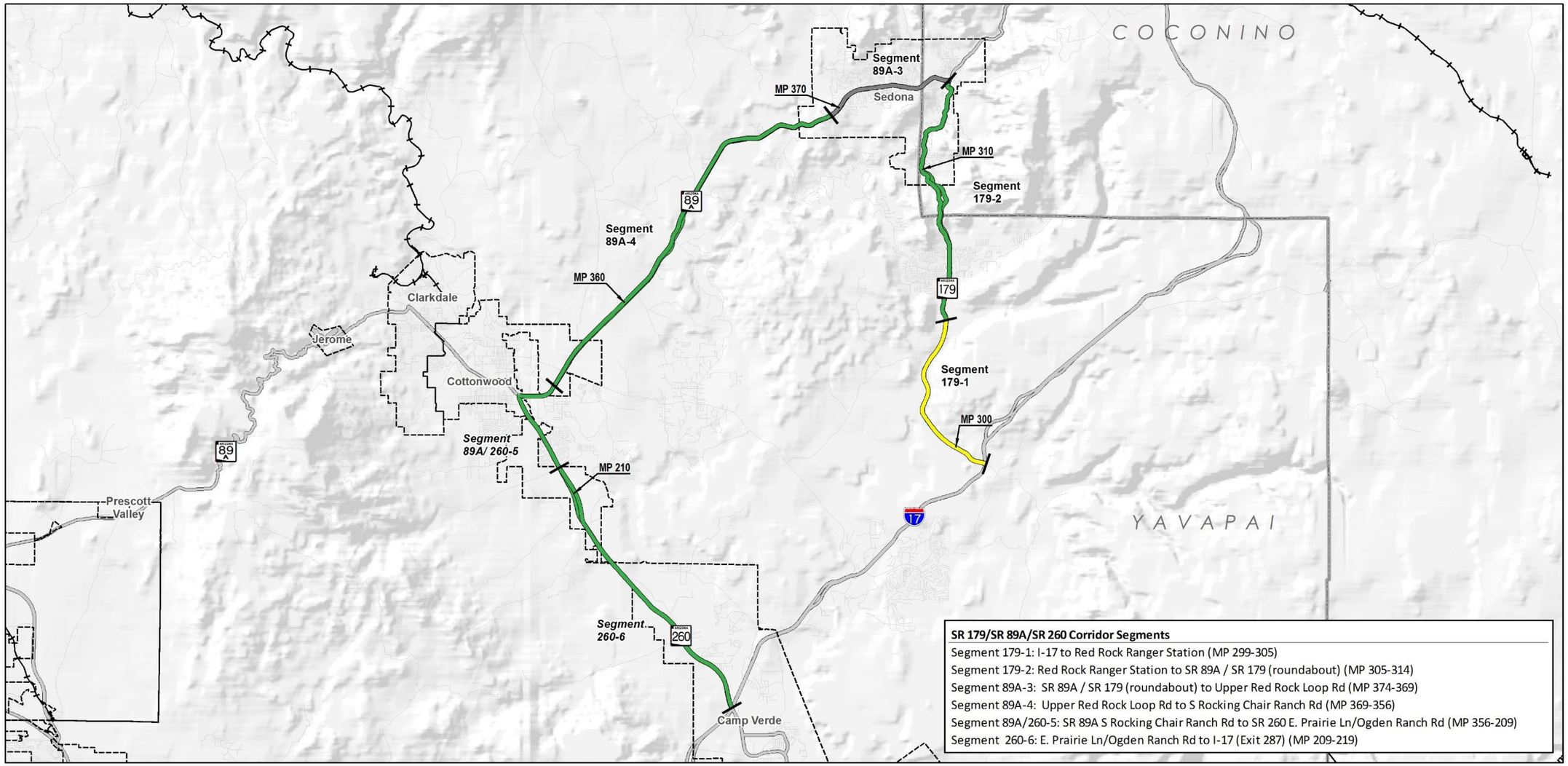
Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

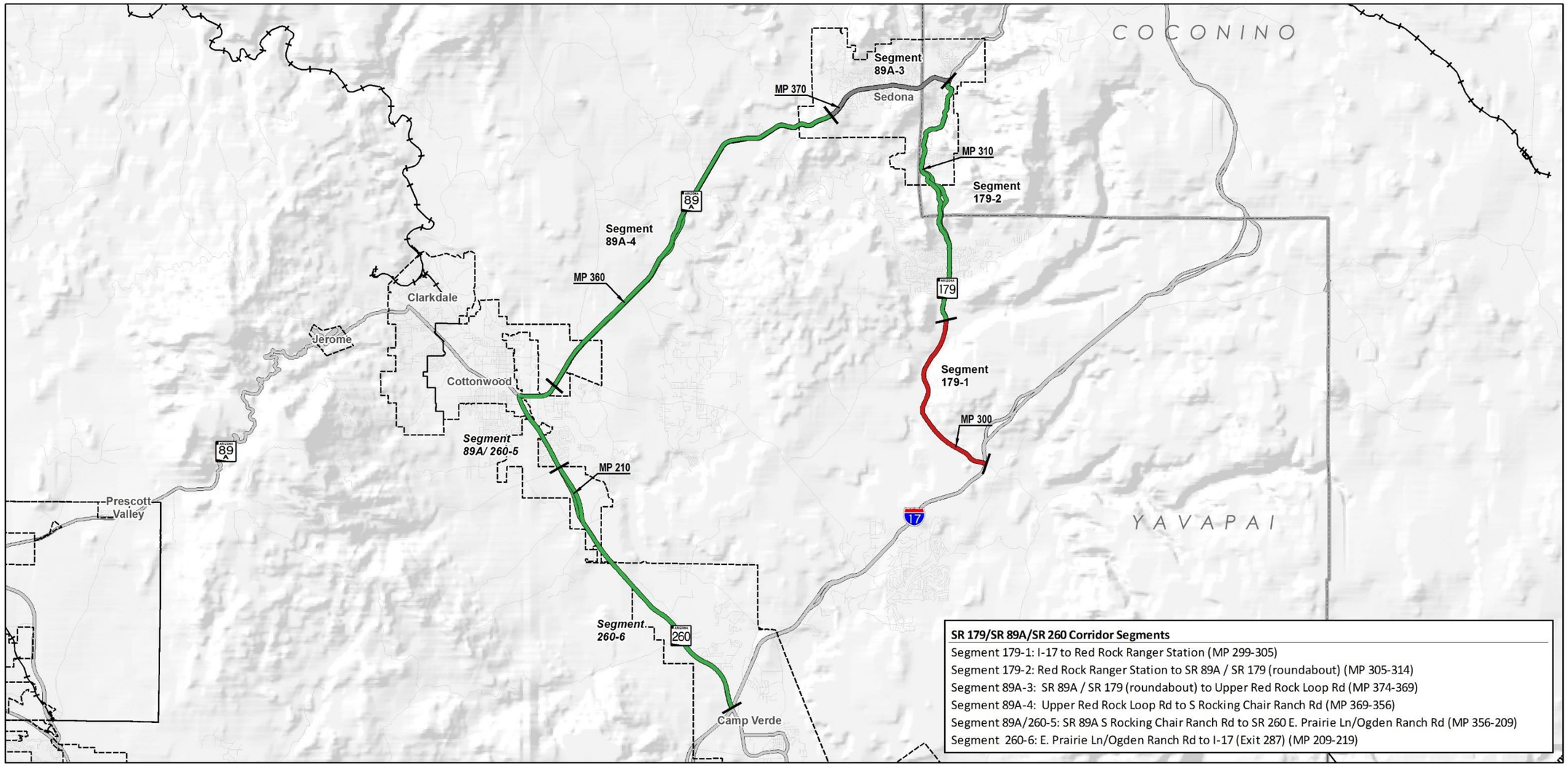
BRIDGE INDEX
GOOD (>6.5)
FAIR (5.0 - 6.5)
POOR (<5.0)
NO BRIDGE

BRIDGE HOT SPOT
BRIDGE RATING OF 4 OR MULTIPLE 5'S

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Bridge Index and Hot Spots
2014 - 2016 Data



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Bridge Sufficiency
2014 - 2016 Data



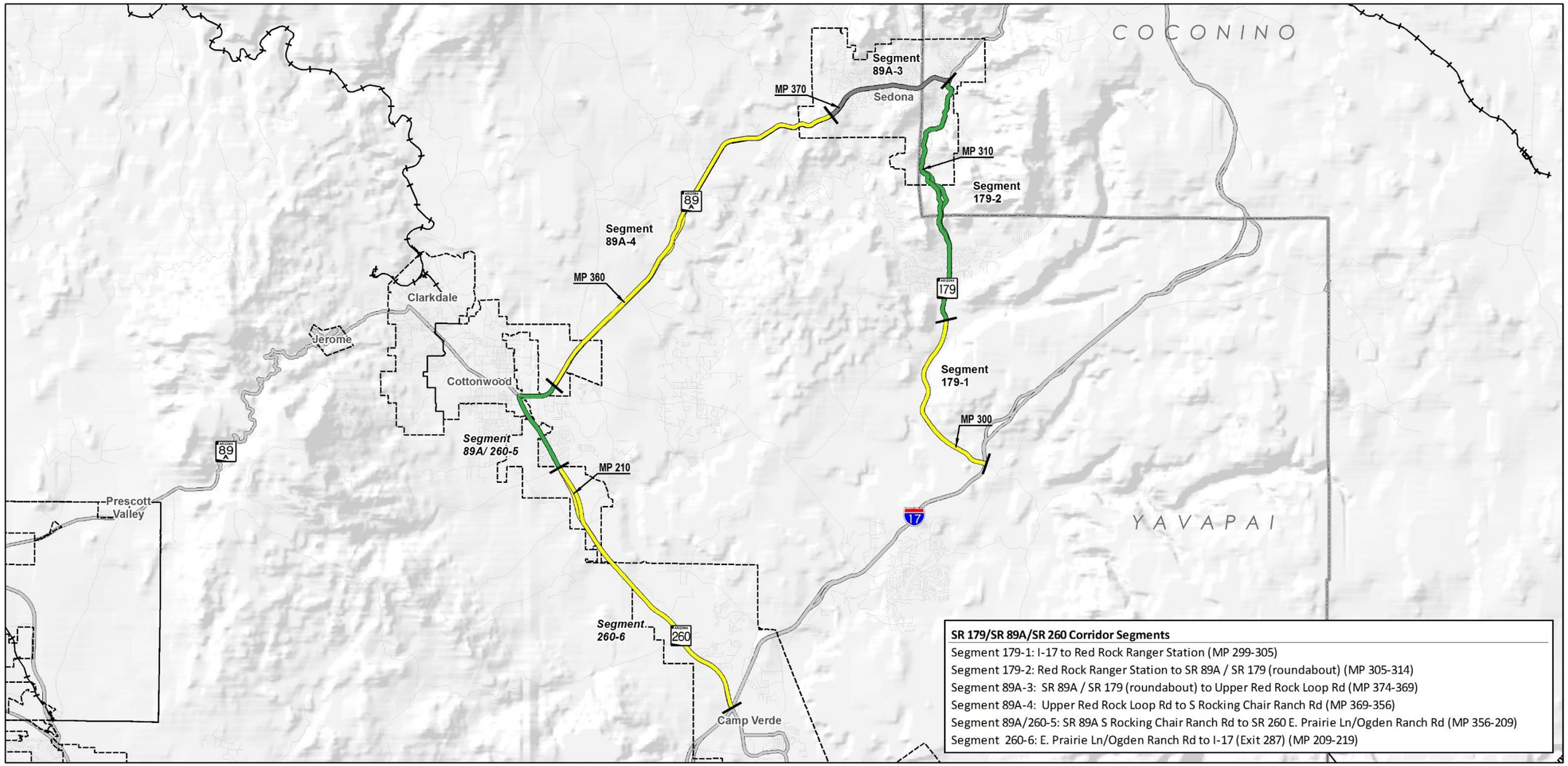
N

Miles
0 2.5 5

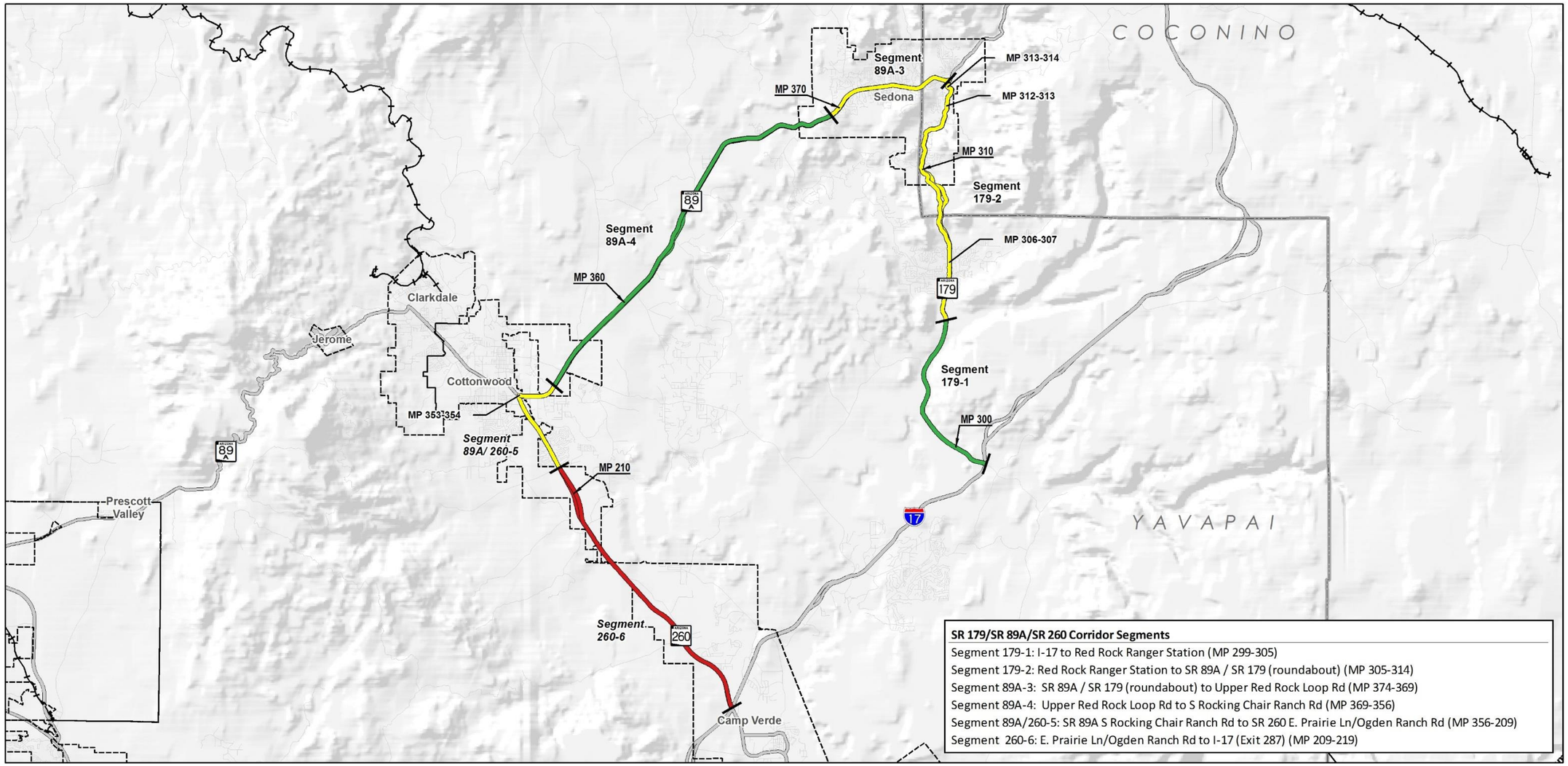
SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Percentage of Deck Area on Functionally Obsolete Bridges
2014 - 2016 Data

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

% FUNCTIONALLY OBSOLETE DECK AREA
GOOD (<12%)
FAIR (12%-40%)
POOR (>40%)
NO BRIDGE



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Lowest Bridge Rating
2014 - 2016 Data



SR 179/SR 89A/SR 260 Corridor Segments

Segment 179-1: I-17 to Red Rock Ranger Station (MP 299-305)
Segment 179-2: Red Rock Ranger Station to SR 89A / SR 179 (roundabout) (MP 305-314)
Segment 89A-3: SR 89A / SR 179 (roundabout) to Upper Red Rock Loop Rd (MP 374-369)
Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

N

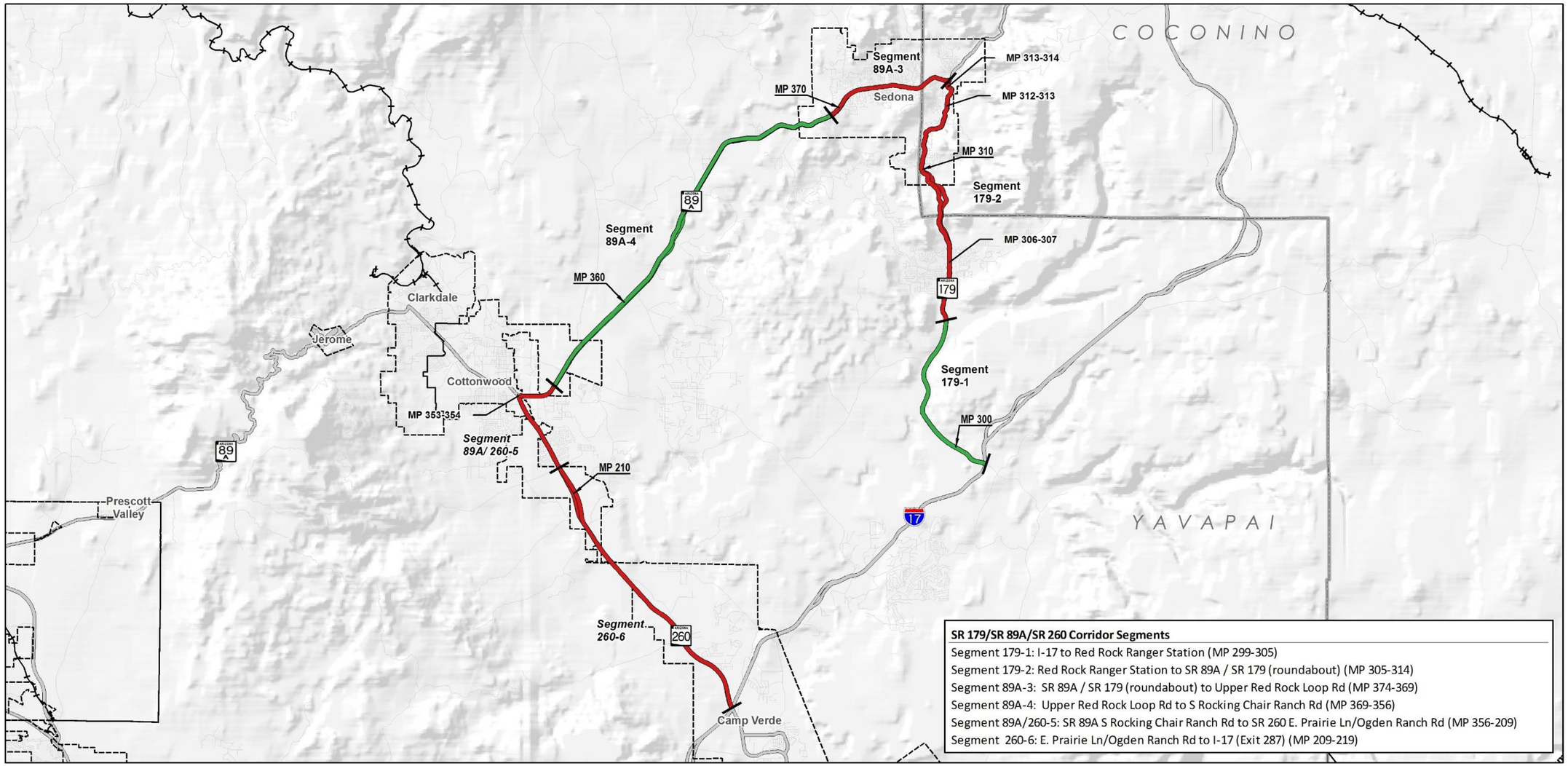
Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

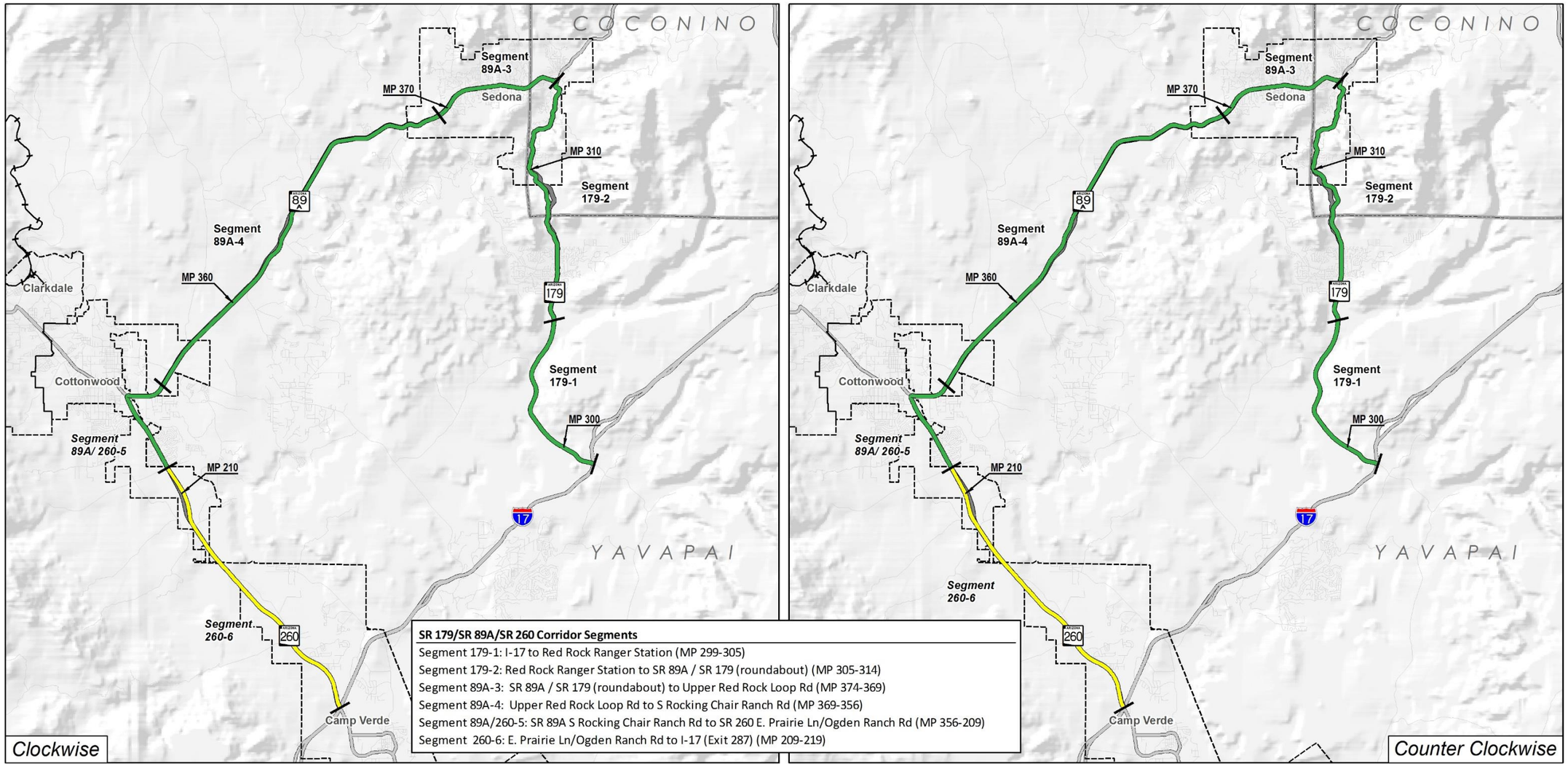
MOBILITY INDEX

URBAN AND FRINGE URBAN (SEGMENTS 179-2, 89A-3, 260-5)	*RURAL (SEGMENTS 179-1, 89A-4, 260-6)*
GOOD (<0.71)	GOOD (<0.56)
FAIR (0.71 - 0.89)	FAIR (0.56 - 0.76)
POOR (>0.89)	POOR (>0.76)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Mobility Index
2015 and 2035 Data



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Future Daily Volume/Capacity (V/C) Ratio
2035 Data



SR 179/SR 89A/SR 260 Corridor Segments

Segment 179-1: I-17 to Red Rock Ranger Station (MP 299-305)
Segment 179-2: Red Rock Ranger Station to SR 89A / SR 179 (roundabout) (MP 305-314)
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Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

N

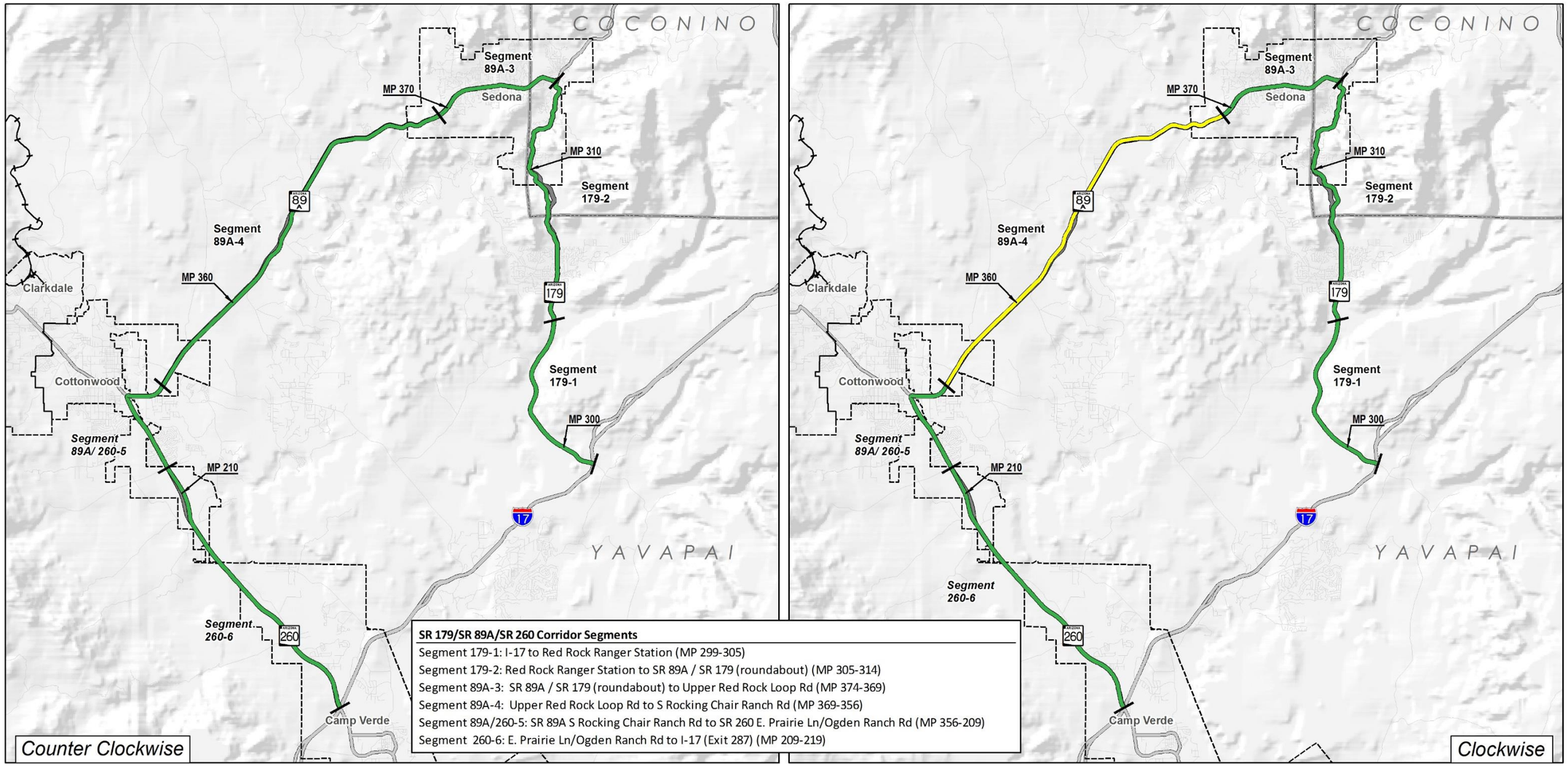
Miles
0 2.5 5

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Existing Peak Hour V/C
2015 Data

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

EXISTING V/C

URBAN AND FRINGE URBAN (SEGMENTS 179-2, 89A-3, 260-5)	***RURAL (SEGMENTS 179-1, 89A-4, 260-6)***
GOOD (<0.71)	GOOD (<0.56)
FAIR (0.71 - 0.89)	FAIR (0.56 - 0.76)
POOR (>0.89)	POOR (>0.76)



SR 179/SR 89A/SR 260 Corridor Segments

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Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

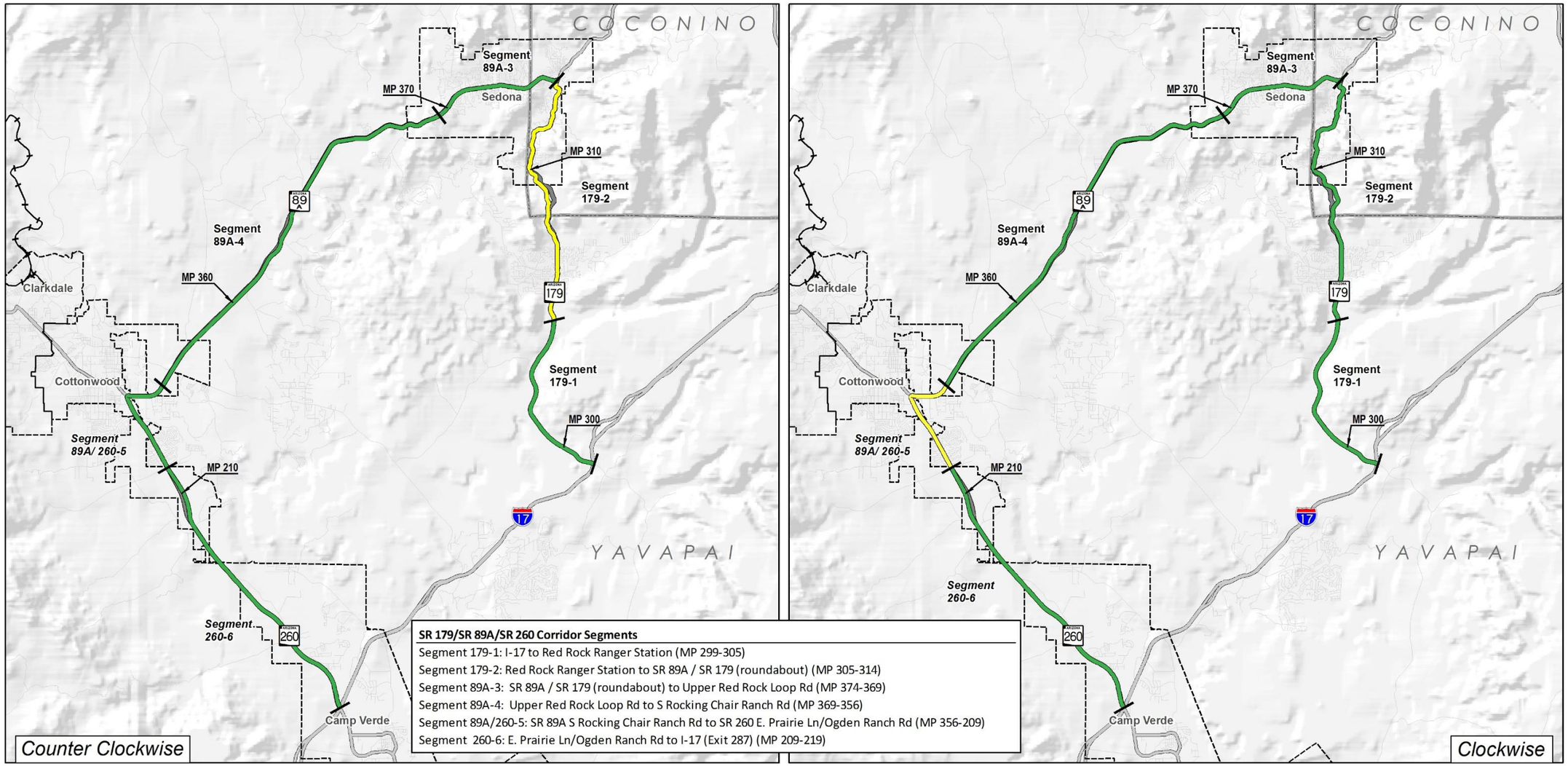
N

Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

CLOSURES PER MILE PER YEAR
GOOD (<0.22)
FAIR (0.22 - 0.62)
POOR (>0.62)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Average Instances Per Year A
Given Milepost Is Closed Per Segment Mile
2011-2015 Data



SR 179/SR 89A/SR 260 Corridor Segments

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Segment 179-2: Red Rock Ranger Station to SR 89A / SR 179 (roundabout) (MP 305-314)
Segment 89A-3: SR 89A / SR 179 (roundabout) to Upper Red Rock Loop Rd (MP 374-369)
Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

N

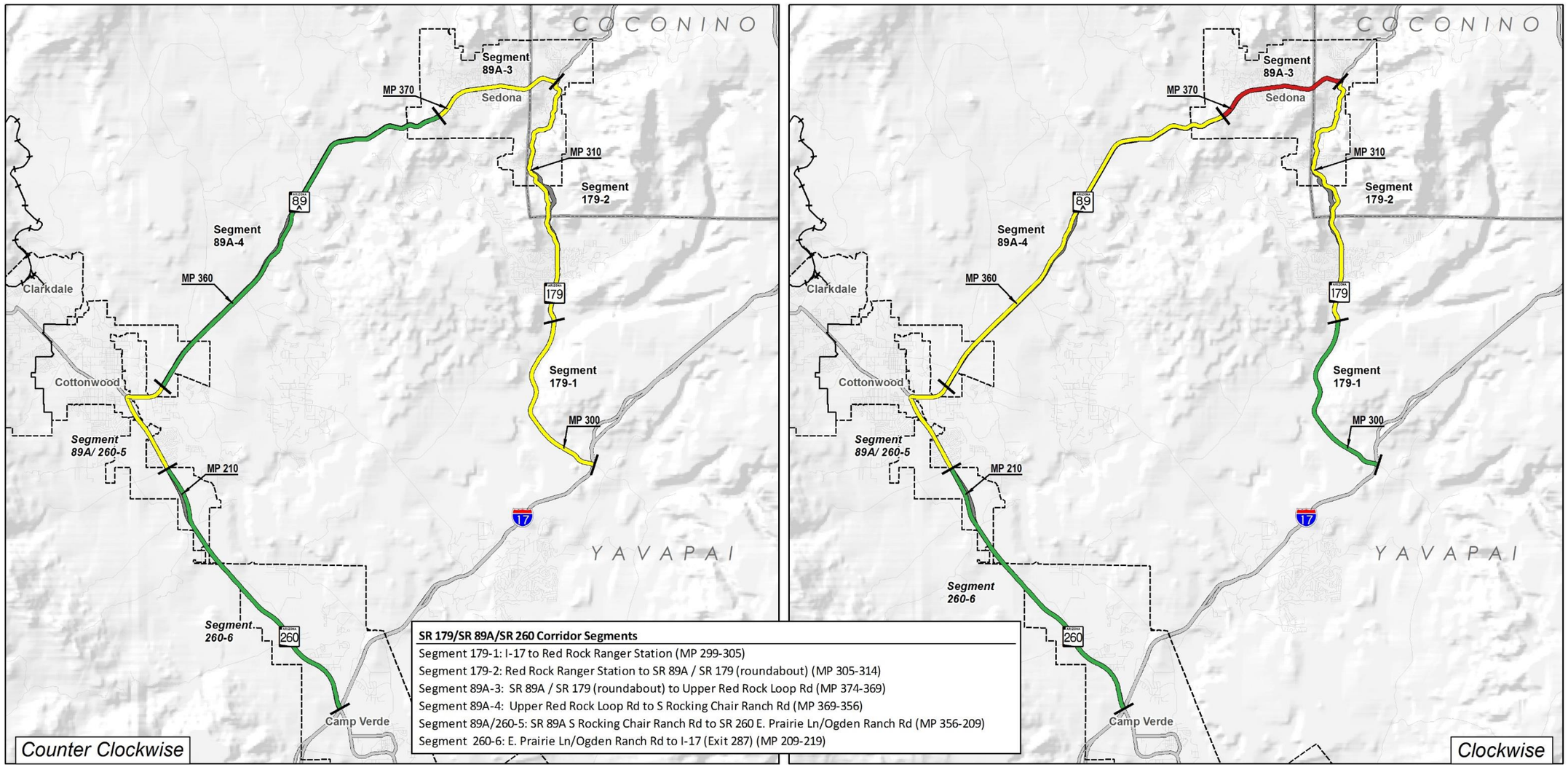
Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

ALL VEHICLES TRAVEL TIME INDEX

UNINTERRUPTED (SEGMENTS NONE)	***INTERRUPTED (SEGMENTS 179-1, 179-2, 89A-3 89A-4, 89A/260-5, 260-6)***
GOOD (<1.15)	GOOD (<1.3)
FAIR (1.15 - 1.33)	FAIR (1.3 - 2.0)
POOR (>1.33)	POOR (>2.0)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
All Vehicles Travel Time Index
2015 Data



SR 179/SR 89A/SR 260 Corridor Segments

Segment 179-1: I-17 to Red Rock Ranger Station (MP 299-305)
Segment 179-2: Red Rock Ranger Station to SR 89A / SR 179 (roundabout) (MP 305-314)
Segment 89A-3: SR 89A / SR 179 (roundabout) to Upper Red Rock Loop Rd (MP 374-369)
Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

N

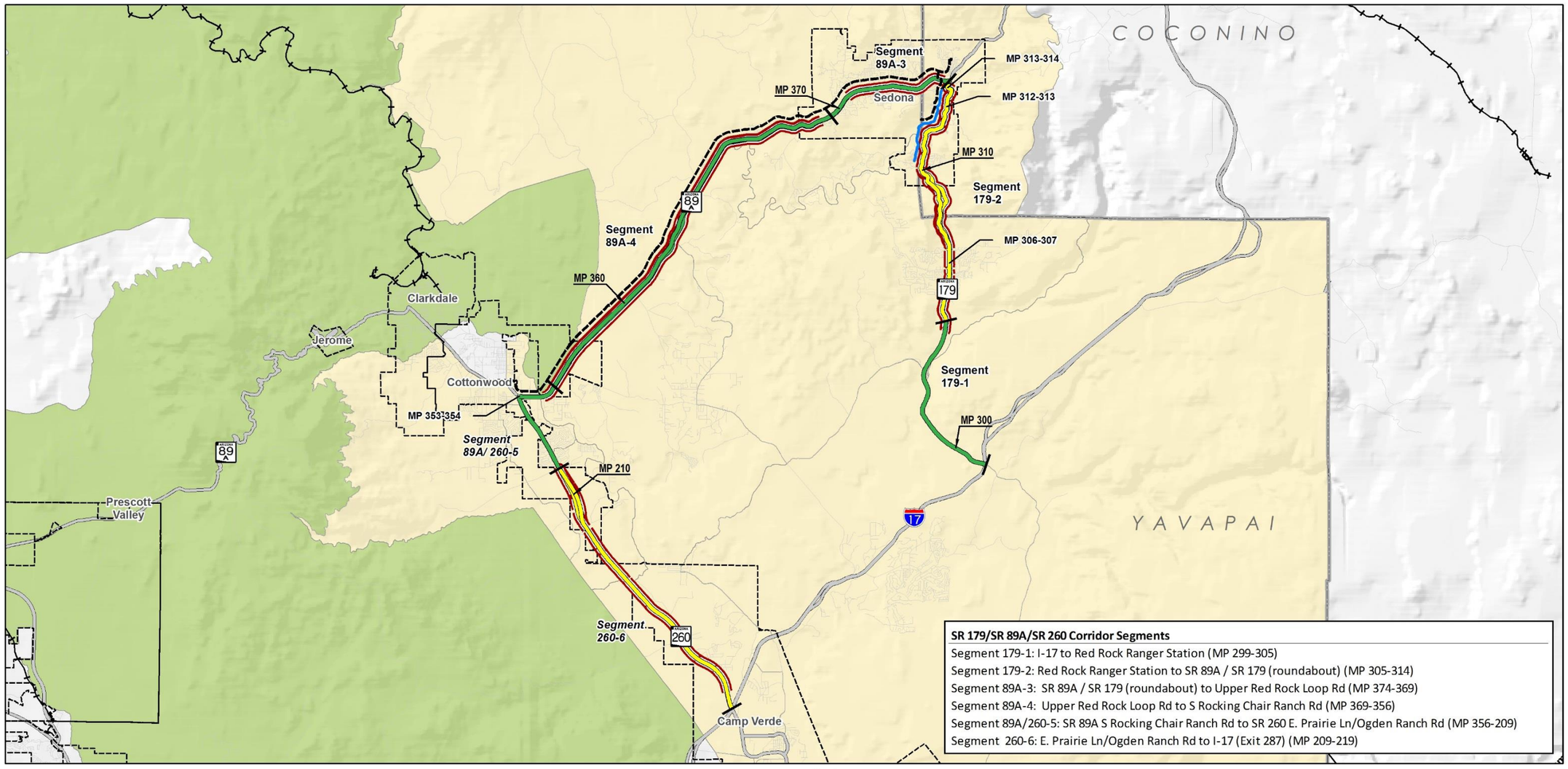
Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

ALL VEHICLES PLANNING TIME INDEX

UNINTERRUPTED (SEGMENTS NONE)	***INTERRUPTED (SEGMENTS 179-1, 179-2, 89A-3 89A-4, 89A/260-5, 260-6)***
GOOD (<1.3)	GOOD (<3.0)
FAIR (1.3 - 1.5)	FAIR (3.0 - 6.0)
POOR (>1.5)	POOR (>6.0)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
All Vehicles Planning Time Index
2015 Data



N

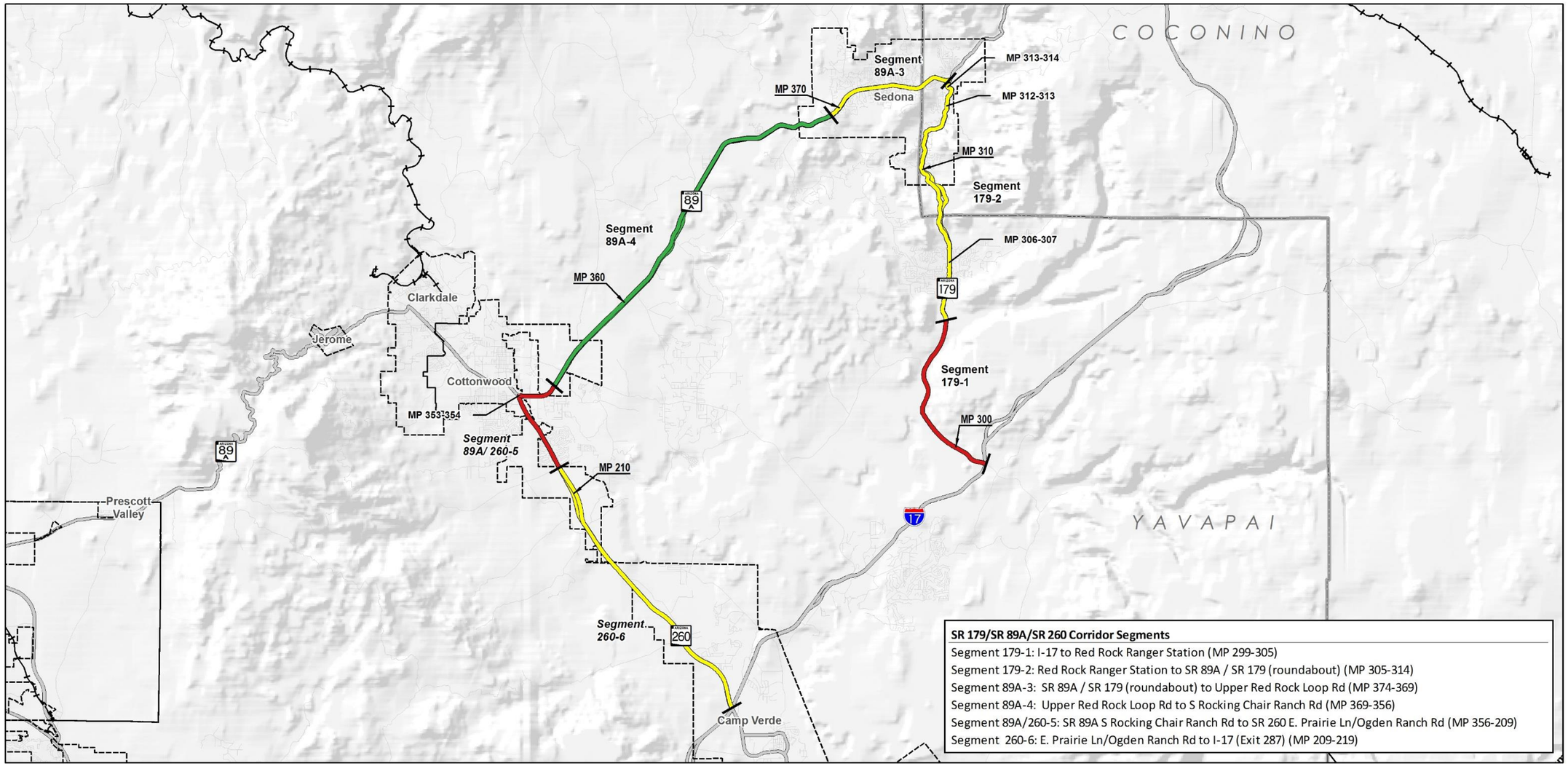
Miles
0 2.5 5

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Multimodal Opportunities
2015 Data

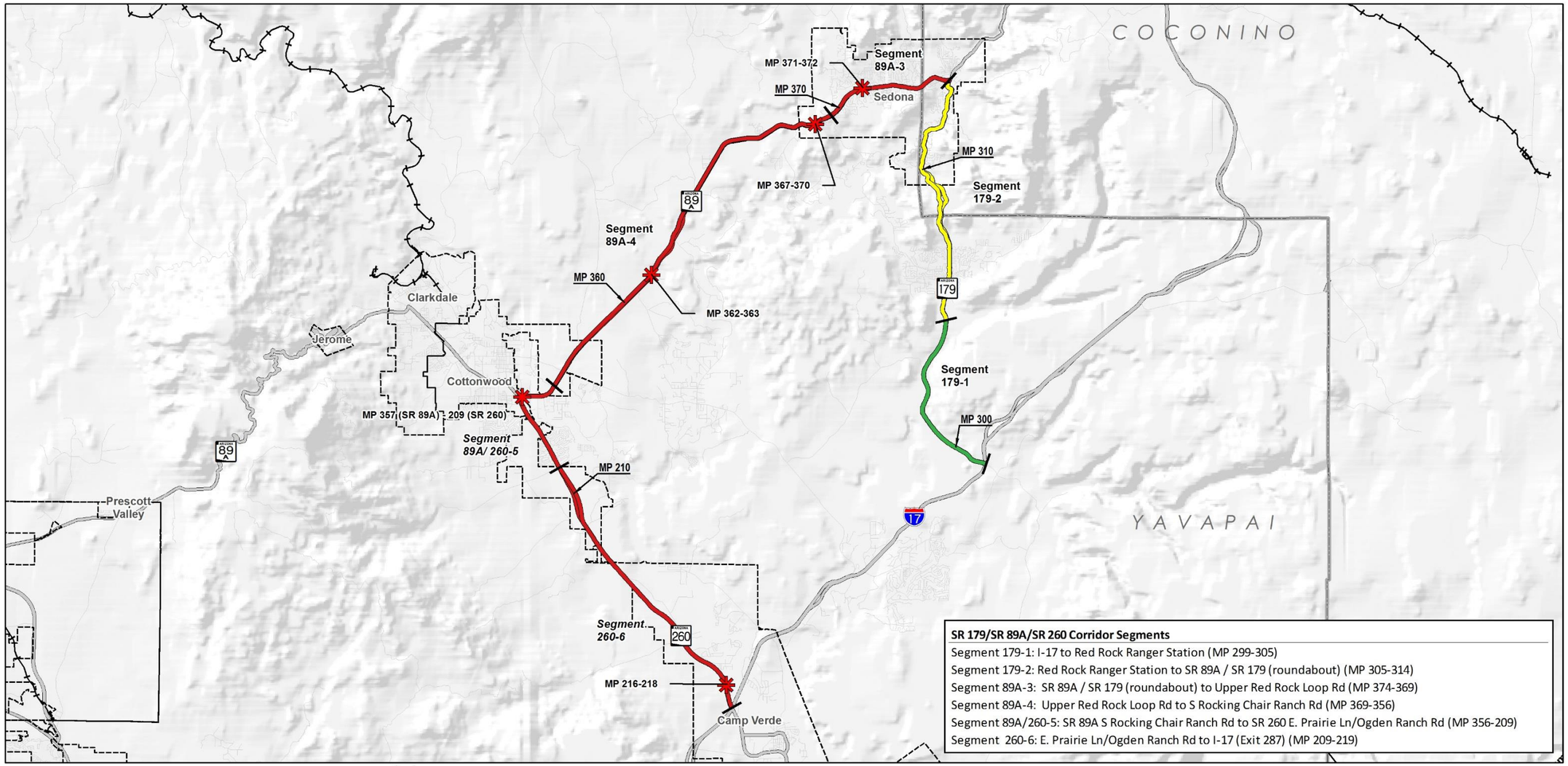
Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad
Shared Use Path
Shoulder ≥ 4 Feet
Intercity Bus Route

Average Non-Single Occupancy Vehicle Trips by Corridor Segment:
Segments ABOVE the state wide average for Non-Single Occupancy Vehicle Trips
Segments WITHIN the state wide average for Non-Single Occupancy Vehicle Trips
Segments BELOW the state wide average for Non-Single Occupancy Vehicle Trips

Census Tracts of Zero/One Vehicle Households and Population in Poverty
Tracts ABOVE the Arizona statewide average range
Tracts WITHIN the Arizona statewide average range
Tracts BELOW the Arizona statewide average range



SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Percentage of Bicycle Accommodation
2015 Data



N

Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Safety Index
2011 - 2015 Data

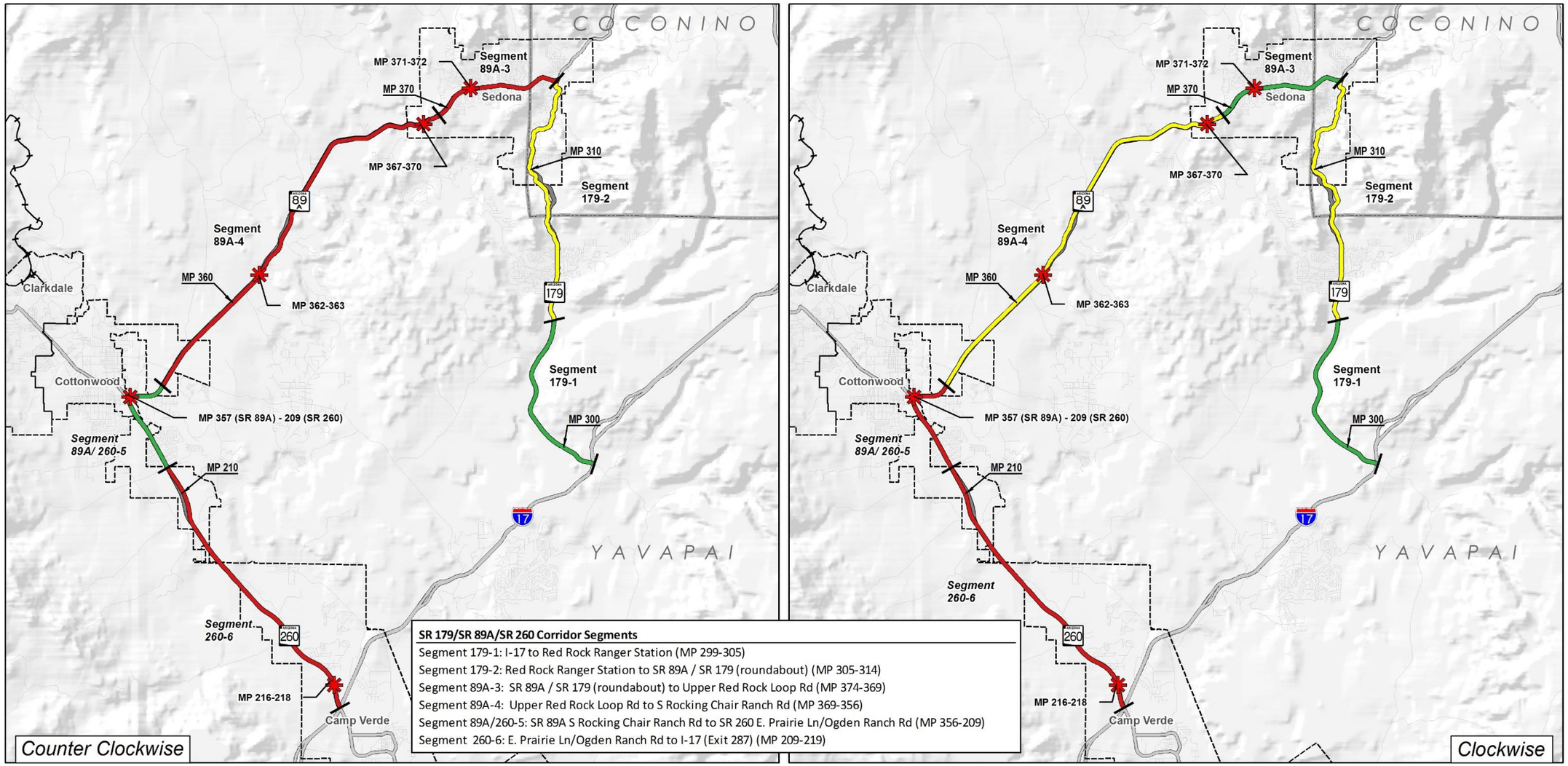
SAFETY INDEX

2 OR 3 LANE UNDIVIDED HIGHWAY SEGMENTS (179-1, 260-6)
- 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 (89A-3, 89A/ 260-5)
- 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 (179-2, 89A-4)
- ABOVE AVERAGE PERFORMANCE (< 0.77)
- AVERAGE PERFORMANCE (0.77 - 1.23)
- BELOW AVERAGE PERFORMANCE (>1.23)
- INSUFFICIENT DATA

SAFETY HOT SPOT
- SAFETY HOT SPOT



SR 179/SR 89A/SR 260 Corridor Segments

Segment 179-1: I-17 to Red Rock Ranger Station (MP 299-305)
Segment 179-2: Red Rock Ranger Station to SR 89A / SR 179 (roundabout) (MP 305-314)
Segment 89A-3: SR 89A / SR 179 (roundabout) to Upper Red Rock Loop Rd (MP 374-369)
Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

N

Miles
0 2.5 5

- Corridor Segment
- County Boundary
- Interstate/Highway
- City Boundary
- Railroad

SAFETY INDEX

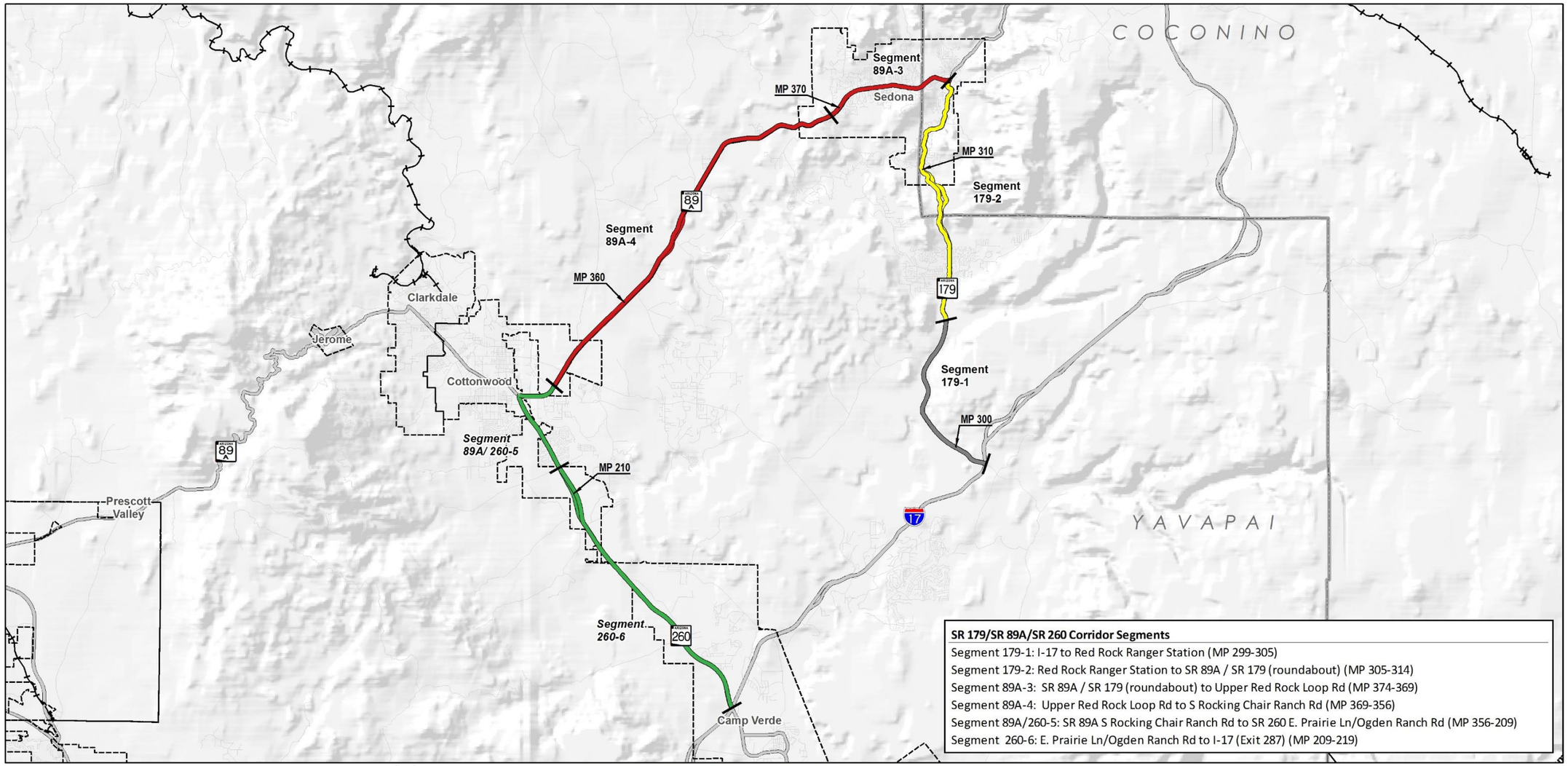
2 OR 3 LANE UNDIVIDED HIGHWAY SEGMENTS (179-1, 260-6)
- ABOVE AVERAGE PERFORMANCE (< 0.94)
- AVERAGE PERFORMANCE (0.94 - 1.06)
- BELOW AVERAGE PERFORMANCE (>1.06)
- INSUFFICIENT DATA

4 OR 5 LANE UNDIVIDED HIGHWAY SEGMENTS (89A-3, 89A/ 260-5)
- 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 (179-2, 89A-4)
- ABOVE AVERAGE PERFORMANCE (< 0.77)
- AVERAGE PERFORMANCE (0.77 - 1.23)
- BELOW AVERAGE PERFORMANCE (>1.23)
- INSUFFICIENT DATA

SAFETY HOT SPOT
- SAFETY HOT SPOT

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Directional Safety Index and Hot Spots
2011 - 2015 Data



N

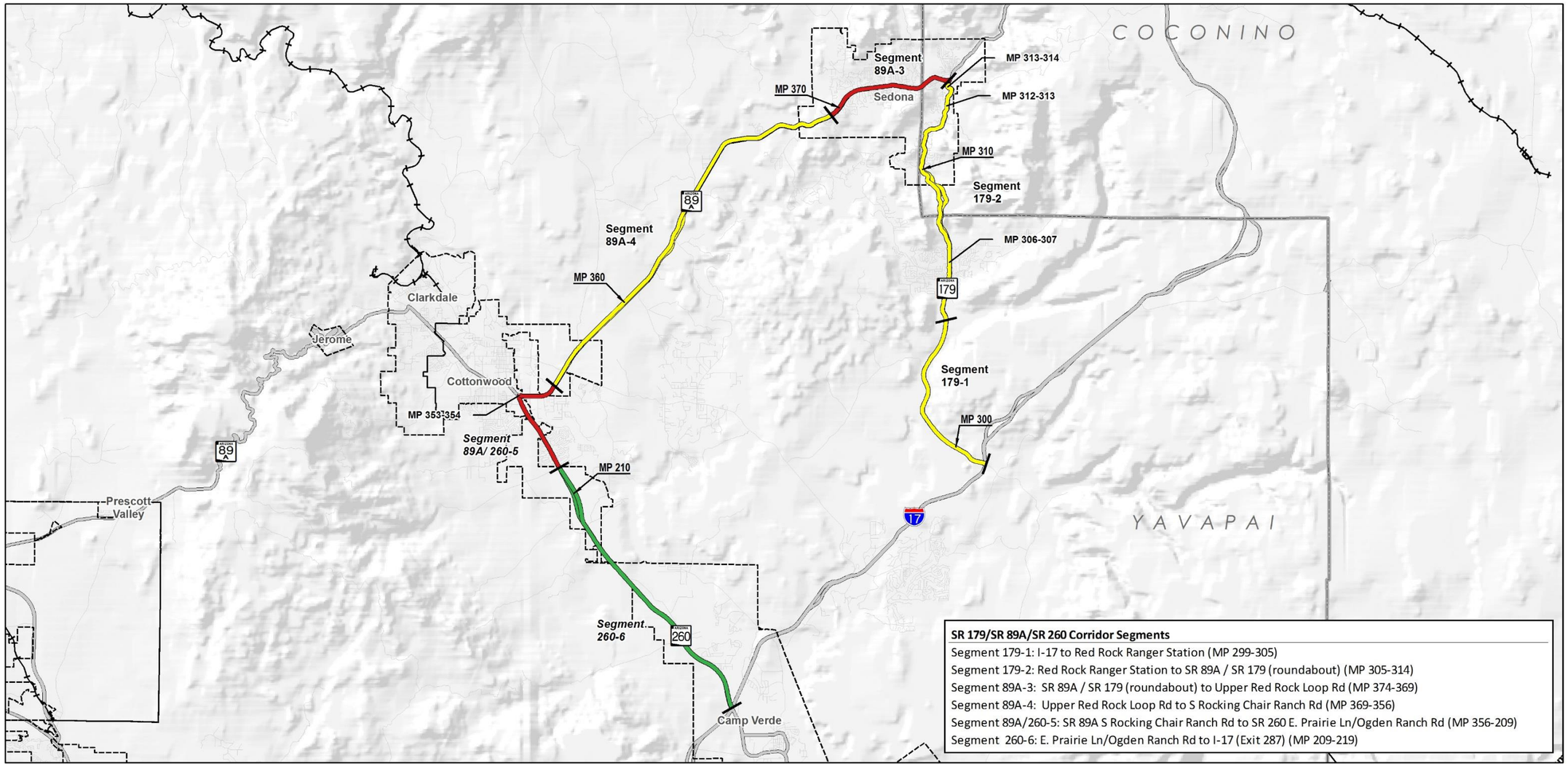
Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

CRASHES INVOLVING SHSP TOP 5 EMPHASIS AREAS BEHAVIORS

2 OR 3 LANE UNDIVIDED HIGHWAY SEGMENTS (179-1, 260-6)	*4 OR 5 LANE UNDIVIDED HIGHWAY SEGMENTS (89A-3, 89A/ 260-5)*	*2 OR 3 OR 4 LANE DIVIDED HIGHWAY SEGMENTS (179-2, 89A-4)*
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 (>55%)	BELOW AVERAGE PERFORMANCE (>51%)	BELOW AVERAGE PERFORMANCE (>54%)
INSUFFICIENT DATA	INSUFFICIENT DATA	INSUFFICIENT DATA

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Relative Frequency of Fatal + Incapacitating
Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors
Compared to the Statewide Average for Similar Segments
2011 - 2015 Data



N

Miles
0 2.5 5

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Freight Index and Hot Spots
2015 Data

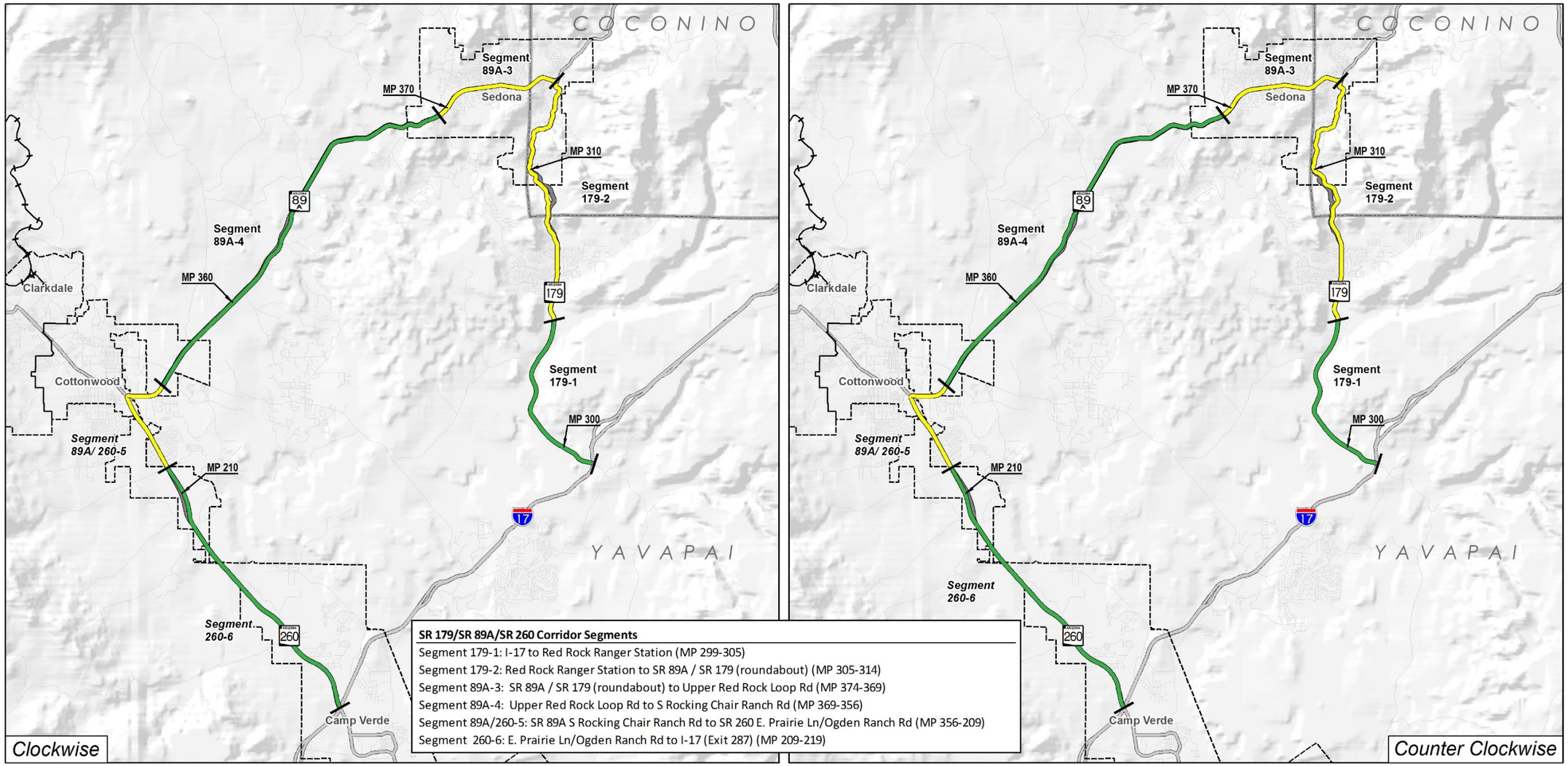
Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

FREIGHT INDEX

UNINTERRUPTED (SEGMENTS NONE)
- GOOD (<0.77)
- FAIR (0.67 - 0.77)
- POOR (>0.67)

INTERRUPTED (SEGMENTS 179-1, 179-2, 89A-3 89A-4, 89A/260-5, 260-6)
- GOOD (<0.33)
- FAIR (0.17 - 0.33)
- POOR (>0.17)

FREIGHT HOT SPOT
- BRIDGE VERTICAL CLEARANCE LESS THAN 16.25 FEET AND NO RAMP AROUND



SR 179/SR 89A/SR 260 Corridor Segments

Segment 179-1: I-17 to Red Rock Ranger Station (MP 299-305)
Segment 179-2: Red Rock Ranger Station to SR 89A / SR 179 (roundabout) (MP 305-314)
Segment 89A-3: SR 89A / SR 179 (roundabout) to Upper Red Rock Loop Rd (MP 374-369)
Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

N

Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

TRUCK TRAVEL TIME INDEX

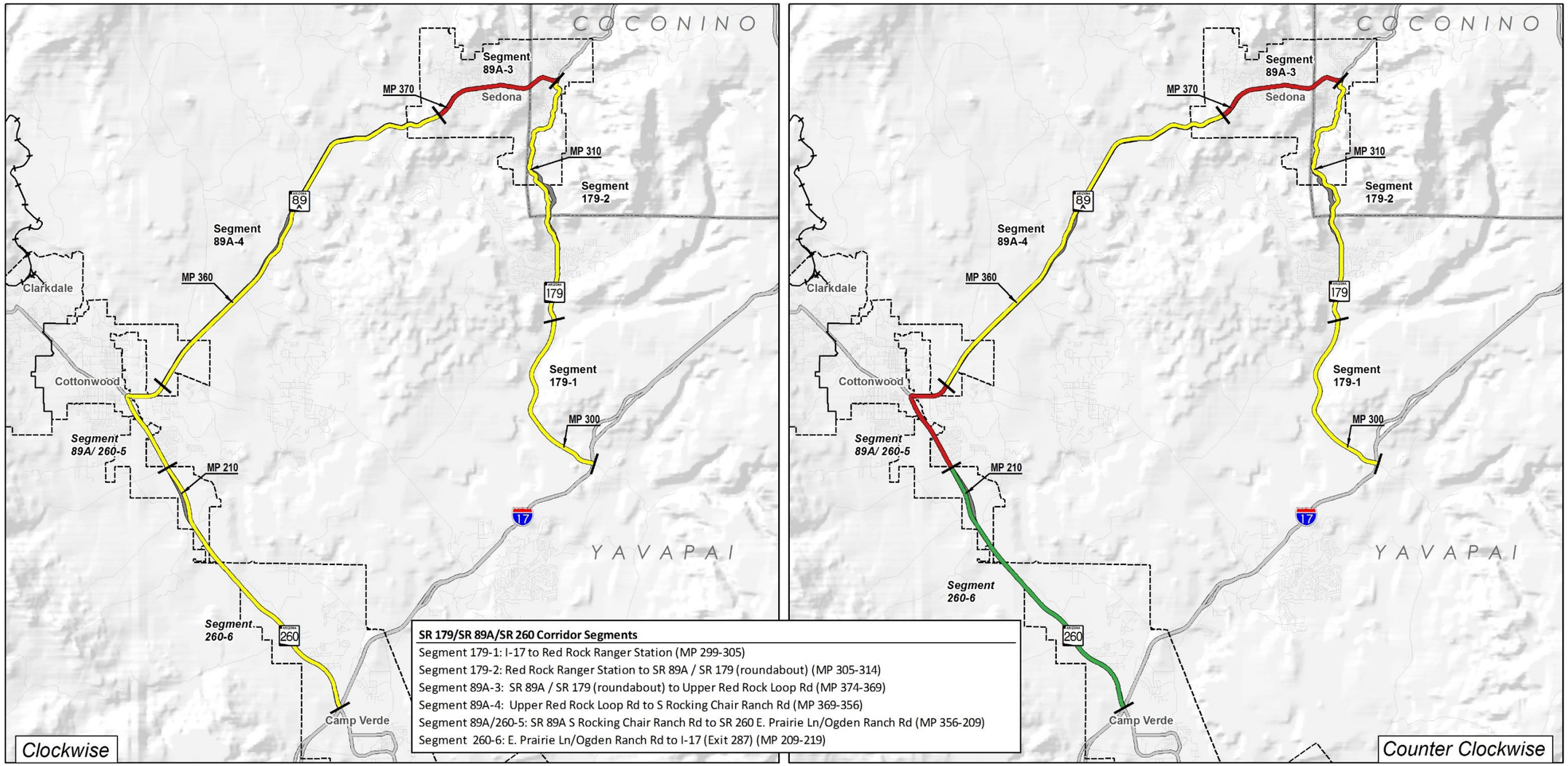
UNINTERRUPTED (SEGMENTS NONE)

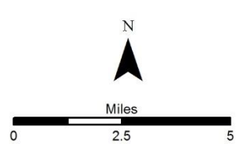
GOOD (<1.15)
FAIR (1.15 - 1.33)
POOR (>1.33)

INTERRUPTED (SEGMENTS 179-1, 179-2, 89A-3 89A-4, 89A/260-5, 260-6)

GOOD (<1.3)
FAIR (1.3 - 2.0)
POOR (>2.0)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Truck Travel Time Index
2015 Data



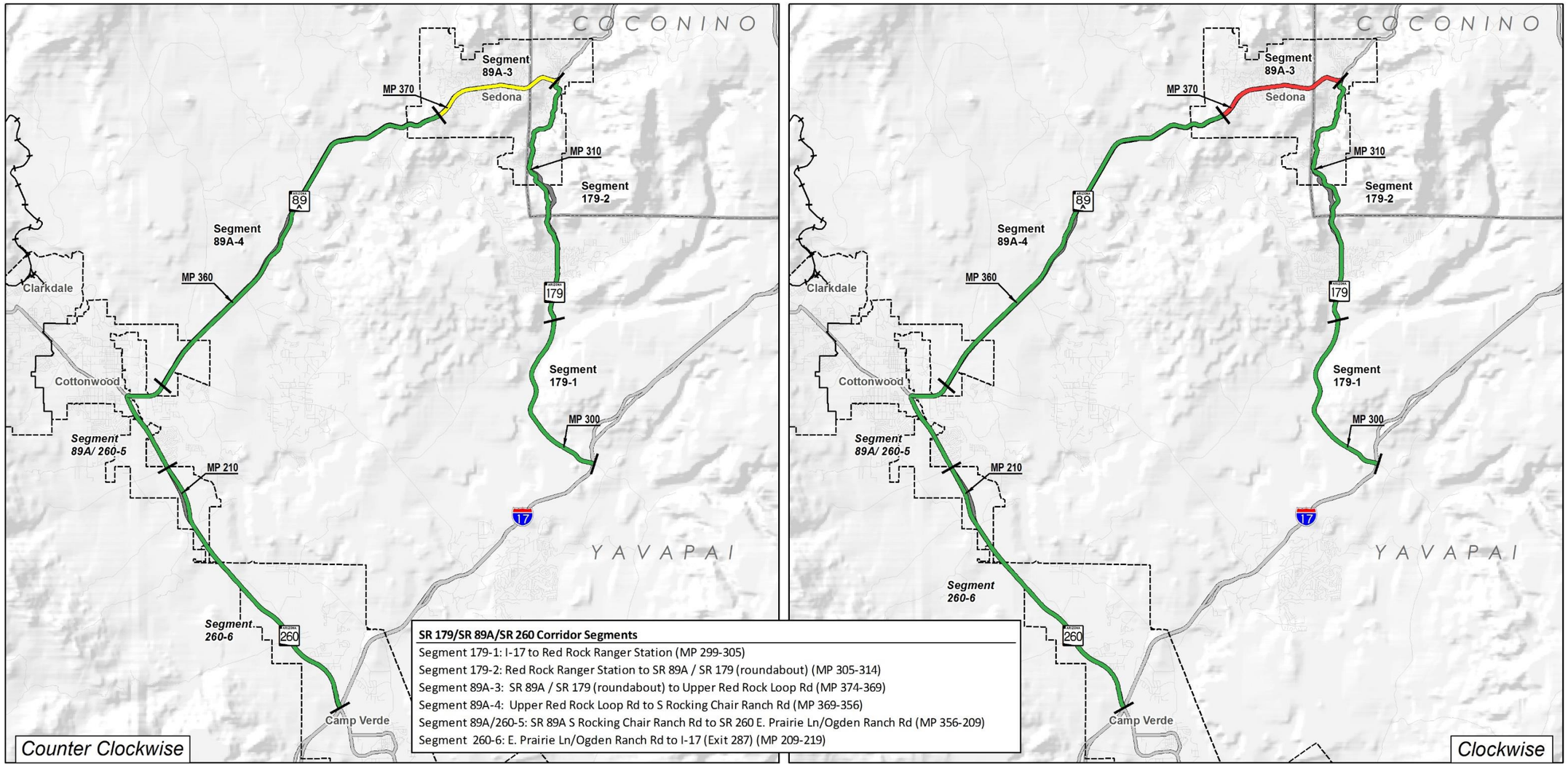


Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

TRUCK PLANNING TIME INDEX

UNINTERRUPTED (SEGMENTS NONE)	***INTERRUPTED (SEGMENTS 179-1, 179-2, 89A-3 89A-4, 89A/260-5, 260-6)***
GOOD (<1.3)	GOOD (<3.0)
FAIR (1.3 - 1.5)	FAIR (3.0 - 6.0)
POOR (>1.5)	POOR (>6.0)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Truck Planning Time Index
2015 Data



SR 179/SR 89A/SR 260 Corridor Segments

Segment 179-1: I-17 to Red Rock Ranger Station (MP 299-305)
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Segment 89A-4: Upper Red Rock Loop Rd to S Rocking Chair Ranch Rd (MP 369-356)
Segment 89A/260-5: SR 89A S Rocking Chair Ranch Rd to SR 260 E. Prairie Ln/Ogden Ranch Rd (MP 356-209)
Segment 260-6: E. Prairie Ln/Ogden Ranch Rd to I-17 (Exit 287) (MP 209-219)

N

Miles
0 2.5 5

Corridor Segment
County Boundary
Interstate/Highway
City Boundary
Railroad

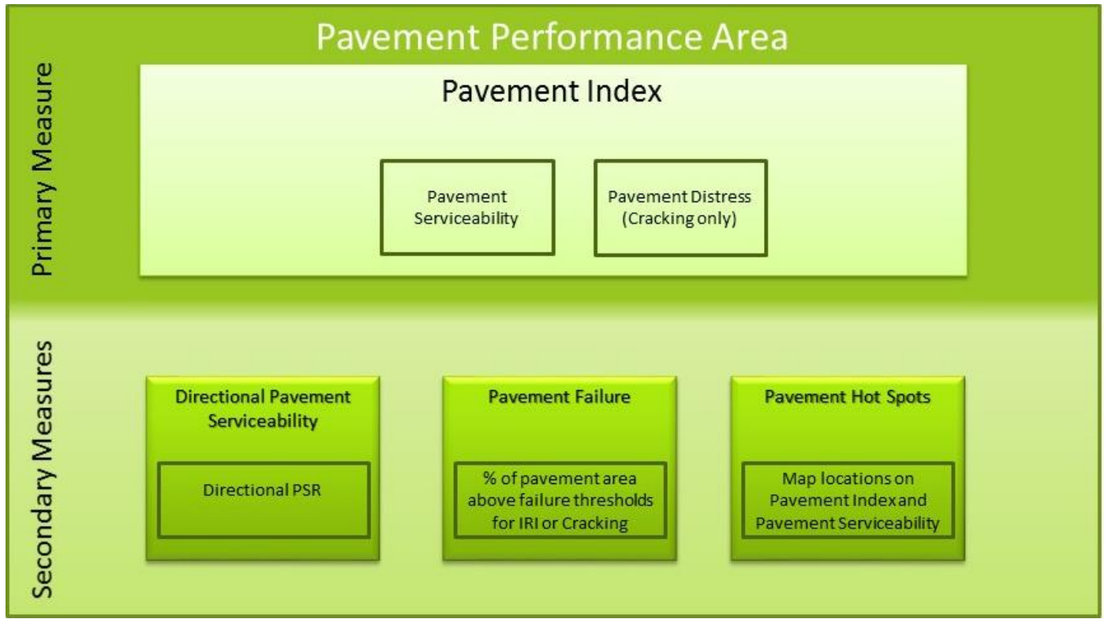
MINUTES OF CLOSURE DURATION
GOOD (< 44.18)
FAIR (44.18 - 124.86)
POOR (> 124.86)

SR 179/SR 89A/SR 260 Corridor Profile Study: I-17 to I-17
Average Minutes Per Year Given Milepost Is Closed Per Segment Mile
2011-2015 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

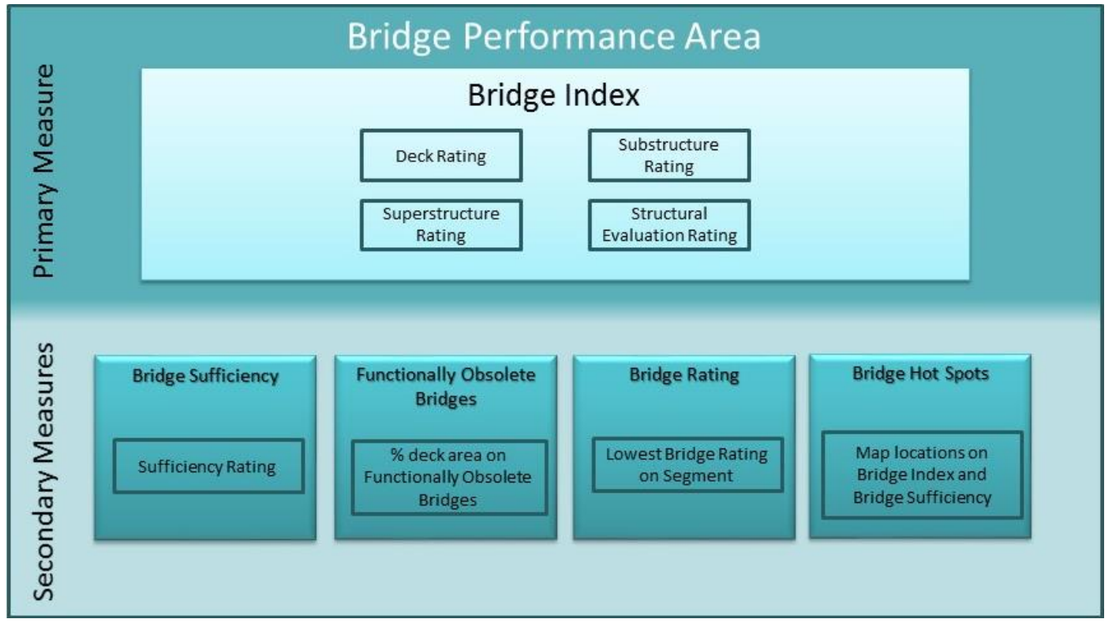
Performance Level	Pavement Index	
	Interstates	Non-Interstates
Good	>3.75	>3.5
Fair	3.2 - 3.75	2.9 - 3.5
Poor	<3.2	<2.9

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

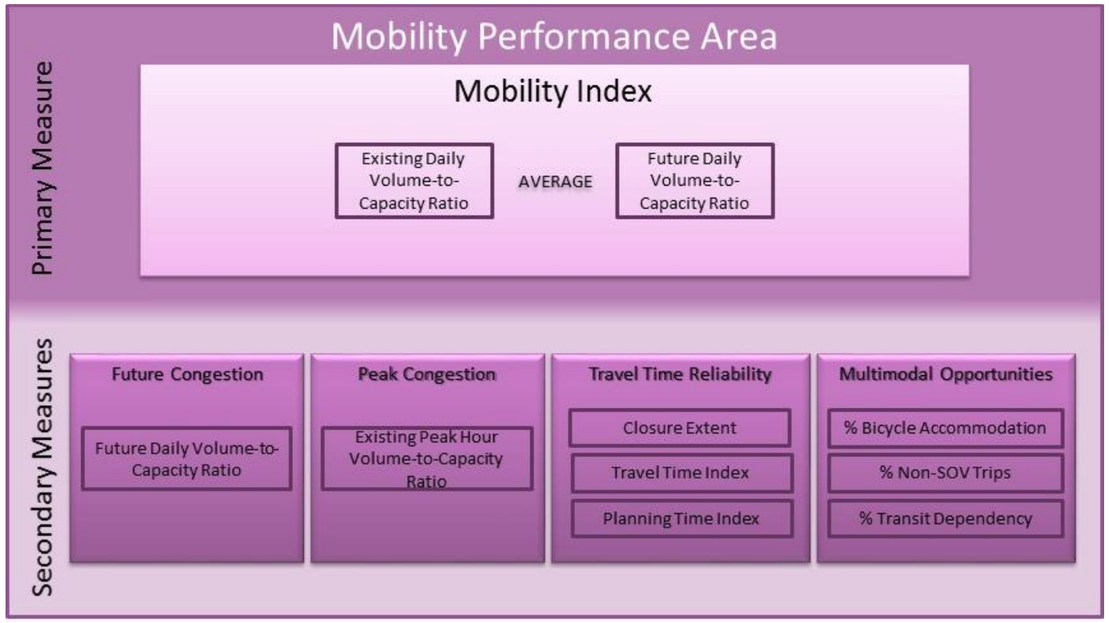
Performance Level	Sufficiency Rating
Good	>80
Fair	50-80
Poor	<50

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

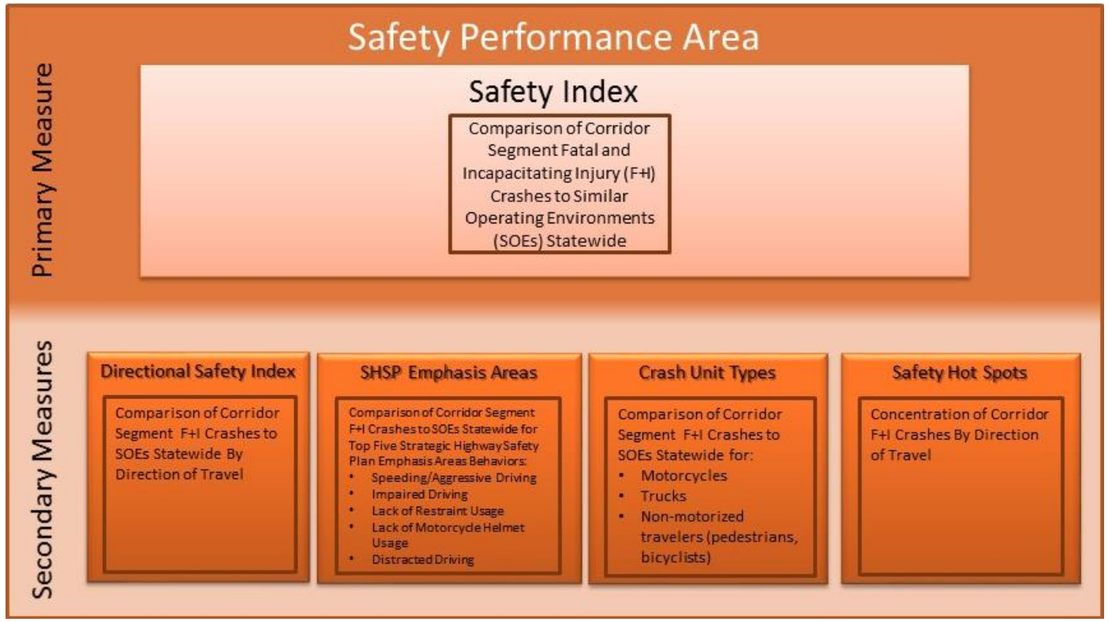
Performance Level	Percent Bicycle Accommodation
Good	≥ 90%
Fair	> 60% & ≤ 90%
Poor	< 60%

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

				Direction 1 ((SB/EB (179 N))			Direction 2 ((NB/WB (179 S))			Direction 1 ((SB/EB (179 N))		Direction 2 ((NB/WB (179 S))		Composite			% Pavement Failure	
				# of Lanes	IRI	Cracking	# of Lanes	IRI	Cracking	PSR	PDI	PSR	PDI	Dir 1 (SB/EB (179 North))	Dir 2 (NB/WB (179 South))	Pavement Index	Dir 1 (SB/EB (179 North))	Dir 2 (NB/WB (179 South))
Segment 1		***Interstate?***		**No**														
Milepost	299	to	300	1	139.08	0.10	1	139.08	0.10	2.95	-	2.95	-	2.95	2.95		0	0
Milepost	300	to	301	1	128.11	0.10	1	128.11	0.10	3.07	-	3.07	-	3.07	3.07		0	0
Milepost	301	to	302	1	124.08	0.10	1	124.08	0.10	3.12	-	3.12	-	3.12	3.12		0	0
Milepost	302	to	303	1	128.47	0.10	1	128.47	0.10	3.07	-	3.07	-	3.07	3.07		0	0
Milepost	303	to	304	1	71.83	0.10	1	71.83	0.10	3.81	-	3.81	-	3.81	3.81		0	0
Milepost	304	to	305	1	68.24	0.10	1	101.59	0.10	3.86	-	3.40	-	3.86	3.40		0	0
			Total	6			6											0
			Weighted Average							3.31	0.00	3.24	0.00	3.31	3.24			
			Factor							1.00		1.00						
			Indicator Score							**3.31**		**3.24**						**0.0%**
			Pavement Index													**3.27**		
Segment 2		***Interstate?***		**No**														
Milepost	305	to	306	1	87.07	0.10	1	97.86	0.10	3.59	-	3.45	-	3.59	3.45		0	0
Milepost	306	to	307	1	146.09	0.10	1	155.04	0.10	2.87	-	2.77	-	2.87	2.77		1	1
Milepost	307	to	308	1	70.59	0.10	1	81.50	0.10	3.82	-	3.67	-	3.82	3.67		0	0
Milepost	308	to	309	1	66.53	0.10	1	94.47	0.10	3.88	-	3.49	-	3.88	3.49		0	0
Milepost	309	to	310	1	78.21	0.10	1	90.95	0.10	3.71	-	3.54	-	3.71	3.54		0	0
Milepost	310	to	311	1	108.04	0.10	1	103.85	0.10	3.32	-	3.37	-	3.32	3.37		0	0
Milepost	311	to	312	1	98.98	0.10	1	110.50	0.10	3.43	-	3.29	-	3.43	3.29		0	0
Milepost	312	to	313	1	154.27	0.10	1	124.24	0.10	2.78	-	3.12	-	2.78	3.12		1	0
Milepost	313	to	314	1	175.24	0.10	1	149.94	0.10	2.57	-	2.83	-	2.57	2.83		1	1
			Total	9			9											5
			Weighted Average							3.33	0.00	3.28	0.00	3.33	3.28			
			Factor							1.00		1.00						
			Indicator Score							**3.33**		**3.28**						**27.8%**
			Pavement Index													**3.31**		
Segment 3		***Interstate?***		**No**														
Milepost	369	to	370	2	70.71	15.00	2	85.21	3.00	3.82	2.9	3.62	4.3	3.20	3.82		0	0
Milepost	370	to	371	2	72.04	2.00	2	74.01	4.00	3.80	4.5	3.77	4.1	4.00	3.88		0	0
Milepost	371	to	372	2	105.47	1.00	2	105.47	1.00	3.35	4.7	3.35	4.7	3.74	3.74		0	0
Milepost	372	to	373	2	113.92	4.00	2	113.92	4.00	3.24	4.1	3.24	4.1	3.51	3.51		0	0
Milepost	373	to	374	2	108.11	0.00	2	108.11	0.00	3.32	5.0	3.32	5.0	3.82	3.82		0	0

			Total	10		10											0
			Weighted Average						3.51	4.24	3.46	4.44	3.66	3.76			
			Factor						1.00		1.00						
			Indicator Score						**3.51**		**3.46**						**0.0%**
			Pavement Index												**3.71**		
Segment 4		***Interstate?***		**No**													
Milepost	356	to	357	2	61.30	1.00	2	59.48	2.00	3.96	4.7	3.99	4.5	4.17	4.13	0	0
Milepost	357	to	358	2	139.36	3.00	2	86.12	2.00	2.94	4.3	3.60	4.5	3.35	3.86	0	0
Milepost	358	to	359	2	114.82	6.00	2	73.51	3.00	3.23	3.9	3.78	4.3	3.42	3.93	0	0
Milepost	359	to	360	2	89.51	8.00	2	84.90	2.00	3.56	3.6	3.62	4.5	3.58	3.87	0	0
Milepost	360	to	361	2	61.68	8.00	2	69.11	4.00	3.96	3.6	3.85	4.1	3.73	3.93	0	0
Milepost	361	to	362	2	76.28	9.00	2	89.74	1.00	3.74	3.5	3.56	4.7	3.59	3.89	0	0
Milepost	362	to	363	2	66.32	2.00	2	92.55	7.00	3.89	4.5	3.52	3.8	4.06	3.59	0	0
Milepost	363	to	364	2	61.70	1.00	2	97.82	15.00	3.96	4.7	3.45	2.9	4.17	3.09	0	0
Milepost	364	to	365	2	67.91	1.00	2	69.74	6.00	3.86	4.7	3.84	3.9	4.10	3.85	0	0
Milepost	365	to	366	2	67.44	0.00	2	64.53	8.00	3.87	5.0	3.91	3.6	4.21	3.72	0	0
Milepost	366	to	367	2	74.16	5.00	2	68.07	2.00	3.77	4.0	3.86	4.5	3.84	4.04	0	0
Milepost	367	to	368	2	50.82	0.00	2	57.35	4.00	4.12	5.0	4.02	4.1	4.39	4.06	0	0
Milepost	368	to	369	2	69.73	2.00	2	78.27	0.00	3.84	4.5	3.71	5.0	4.02	4.10	0	0
			Total	26		26											0
			Weighted Average						3.75	4.30	3.75	4.17	3.89	3.85			
			Factor						1.00		1.00						
			Indicator Score						**3.75**		**3.75**						**0.0%**
			Pavement Index												**3.87**		
Segment 5		***Interstate?***		**No**													
Milepost	355	to	356	4	130.70	3.00	0	0.00	0.00	3.04	4.3	5.00	5.0	3.42	5.00	0	0
Milepost	206	to	207	4	75.61	0.00	0	0.00	0.00	3.75	5.0	5.00	5.0	4.13	5.00	0	0
Milepost	207	to	208	4	75.61	0.00	0	0.00	0.00	3.75	5.0	5.00	5.0	4.13	5.00	0	0
Milepost	208	to	209	4	66.45	0.00	0	0.00	0.00	3.88	5.0	5.00	5.0	4.22	5.00	0	0
			Total	16		0											0
			Weighted Average						3.61	4.82	#DIV/0!	#DIV/0!	3.97	#DIV/0!			
			Factor						1.00		1.00						
			Indicator Score						**3.61**		**#DIV/0!**						**0.0%**
			Pavement Index												**3.97**		
Segment 6		***Interstate?***		**No**													
Milepost	209	to	210	2	69.90	0.00	2	70.42	1.00	3.83	5.0	3.83	4.7	4.18	4.07	0	0
Milepost	210	to	211	2	58.62	4.00	2	50.65	0.00	4.00	4.1	4.12	5.0	4.04	4.39	0	0
Milepost	211	to	212	2	83.04	0.00	2	83.04	0.00	3.65	5.0	3.65	5.0	4.05	4.05	0	0
Milepost	212	to	213	1	78.78	3.00	2	78.78	3.00	3.71	4.3	3.71	4.3	3.88	3.88	0	0
Milepost	213	to	214	1	85.31	2.00	2	85.31	2.00	3.62	4.5	3.62	4.5	3.87	3.87	0	0
Milepost	214	to	215	1	62.89	7.00	1	62.89	7.00	3.94	3.8	3.94	3.8	3.81	3.81	0	0

Milepost	215	to	216	1	67.66	1.00	1	67.66	1.00	3.87	4.7	3.87	4.7	4.10	4.10		0	0
Milepost	216	to	217	1	63.43	5.00	1	63.43	5.00	3.93	4.0	3.93	4.0	3.95	3.95		0	0
Milepost	217	to	218	1	84.65	4.00	1	84.65	4.00	3.62	4.1	3.62	4.1	3.78	3.78		0	0
Milepost	218	to	219	2	157.14	7.00	2	95.40	7.00	2.75	3.8	3.48	3.8	2.75	3.56		2	0
			Total	14			16											2
			Weighted Average							3.65	4.36	3.76	4.43	3.82	3.96			
			Factor							1.00		1.00						
			Indicator Score							**3.65**		**3.76**						**6.7%**
			Pavement Index													**3.89**		

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												
Dry Beaver Creek Br	736	302.50	5843	59.90	5.00	7.00	6.00	6.00	5.0	5,843		
Total			5,843									
Weighted Average				59.90					5.00	100.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**59.90**						**100.00%**	**5**	
Bridge Index									**5.00**			
Segment 2												
Bell Rock Bridge	2849	308.89	7136	96.50	8.00	8.00	8.00	8.00	8.0	0		
HT Trail Bridge	2848	309.31	7418	96.50	8.00	8.00	8.00	8.00	8.0	0		
Oak Creek Bridge	2850	313.10	12320	82.90	8.00	8.00	8.00	8.00	8.0	0		
Total			26,874									
Weighted Average				90.27					8.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**90.27**						**0.00%**	**8**	
Bridge Index									**8.00**			
Segment 3												
No Bridges in Segment		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Segment 4												
Spring Creek Bridge NB	2535	361.70	12499	98.50	5.00	8.00	7.00	7.00	5.0	0		
Spring Creek Bridge SB	2536	361.70	12499	98.50	5.00	7.00	7.00	7.00	5.0	0		
Dry Creek Bridge SB	2534	366.40	21280	98.50	5.00	7.00	7.00	7.00	5.0	0		
Dry Creek Bridge NB	2054	366.69	20862	99.50	6.00	7.00	6.00	6.00	6.0	0		
Total			67,140									
Weighted Average				98.81					5.31	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**98.81**						**0.00%**	**5**	
Bridge Index									**5.31**			
Segment 5												
Verde River Bridge	2360	355.80	37840	84.00	7.00	7.00	7.00	7.00	7.0	0		
Total			37,840									
Weighted Average				84.00					7.00	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**84.00**						**0.00%**	**7**	

Bridge Index									**7.00**			
Segment 6												
Black Canyon Wash Br EB	758	209.88	6477	82.50	6.00	7.00	6.00	6.00	6.0	0		
Black Canyon BR WB	2568	209.88	16262	99.60	8.00	8.00	7.00	7.00	7.0	0		
Wilbur Canyon Br EB	781	210.55	9645	82.50	6.00	7.00	7.00	7.00	6.0	0		
Wilbur Canyon BR WB	2570	210.55	27014	99.60	8.00	8.00	8.00	8.00	8.0	0		
Cherry Creek Br WB	966	215.05	7110	60.20	7.00	7.00	7.00	5.00	5.0	0		
Total			66,508									
Weighted Average				91.24					6.95	0.00%		
Factor				1.00					1.00	1.00		
Indicator Score				**91.24**						**0.00%**	**5**	
Bridge Index									**6.95**			

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
179-1	299	304.73	5.76	Rural	Interrupted	Level	2	Rural Two-Lane, Non-Signalized	12.00	54	Undivided	1	0%	N/A
179-2	304.7	313.45	8.715	Fringe Urban	Interrupted	Rolling	2	Urban/Rural Single or Multilane Signalized	12.00	39	Divided	N/A	86%	N/A
89A-3	369.6	374.19	4.547	Fringe Urban	Interrupted	Rolling	4	Urban/Rural Single or Multilane Signalized	12.00	37	Undivided	N/A	0%	N/A
89A-4	356.6	369.64	13.04	Rural	Interrupted	Level	4	Urban/Rural Single or Multilane Signalized	12.00	62	Divided	N/A	0%	N/A
89A/260-5	352.6	356.5	3.891	Fringe Urban	Interrupted	Level	4	Urban/Rural Single or Multilane Signalized	12.00	45	Undivided	N/A	0%	N/A
260-6	209.1	218.6	9.534	Rural	Interrupted	Level	2	Urban/Rural Single or Multilane Signalized	12.00	55	Undivided	N/A	85%	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 – Clockwise

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
1	115N07393	1 AM Peak	Weekday	AZ-179	Southbound	47.4	43.1	21.8	16.8	53	53	53	1.12	1.23	2.44	3.16	1.17	1.25	2.81	3.16
1	115N07393	2 Mid Day	Weekday	AZ-179	Southbound	45.4	43.3	23.9	16.8	53	53	53	1.17	1.22	2.22	3.16				
1	115N07393	3 PM Peak	Weekday	AZ-179	Southbound	45.9	45.3	25.8	21.3	53	53	53	1.15	1.17	2.06	2.48				
1	115N07393	4 Evening	Weekday	AZ-179	Southbound	45.5	42.4	18.8	17.4	53	53	53	1.17	1.25	2.81	3.05				
2	115N07394	1 AM Peak	Weekday	AZ-179	Southbound	29.1	26.2	11.8	7.5	37	37	37	1.27	1.41	3.13	4.96	1.36	1.70	3.97	4.96
2	115N07394	2 Mid Day	Weekday	AZ-179	Southbound	28.4	26.3	11.3	8.7	37	37	37	1.30	1.40	3.28	4.25				
2	115N07394	3 PM Peak	Weekday	AZ-179	Southbound	27.7	25.7	9.3	7.5	37	37	37	1.34	1.44	3.97	4.96				
2	115N07393	1 AM Peak	Weekday	AZ-179	Southbound	47.4	43.1	21.8	16.8	53	53	53	1.12	1.23	2.44	3.16	1.17	1.25	2.81	3.16
2	115N07393	2 Mid Day	Weekday	AZ-179	Southbound	45.4	43.3	23.9	16.8	53	53	53	1.17	1.22	2.22	3.16				
2	115N07393	3 PM Peak	Weekday	AZ-179	Southbound	45.9	45.3	25.8	21.3	53	53	53	1.15	1.17	2.06	2.48				
2	115N07393	4 Evening	Weekday	AZ-179	Southbound	45.5	42.4	18.8	17.4	53	53	53	1.17	1.25	2.81	3.05				
3	115P07191	1 AM Peak	Weekday		Northbound	30.6	23.2	11.9	5.6	38	38	38	1.24	1.64	3.20	6.79	1.47	1.64	11.12	8.74
3	115P07191	2 Mid Day	Weekday		Northbound	27.1	24.7	7.1	5.6	38	38	38	1.40	1.54	5.35	6.79				
3	115P07191	3 PM Peak	Weekday		Northbound	25.9	23.4	3.4	4.4	38	38	38	1.47	1.62	11.12	8.74				
3	115P07022	1 AM Peak	Weekday		Northbound	53.5	47.4	32.8	28.6	55	55	55	1.03	1.16	1.67	1.92	1.12	1.22	2.81	4.12
3	115P07022	2 Mid Day	Weekday		Northbound	50.2	45.2	25.5	14.9	55	55	55	1.10	1.22	2.16	3.69				
3	115P07022	3 PM Peak	Weekday		Northbound	49.1	44.9	19.5	13.4	55	55	55	1.12	1.22	2.81	4.12				
3	115P07022	4 Evening	Weekday		Northbound	51.4	47.3	28.3	29.0	55	55	55	1.07	1.16	1.94	1.90				
4	115P07020	1 AM Peak	Weekday		Northbound	40.4	35.3	16.2	8.7	47	47	47	1.16	1.33	2.91	5.40	1.25	1.45	5.40	6.88
4	115P07020	2 Mid Day	Weekday		Northbound	38.6	34.4	11.8	9.9	47	47	47	1.22	1.37	3.98	4.73				
4	115P07020	3 PM Peak	Weekday		Northbound	37.5	32.5	8.7	6.8	47	47	47	1.25	1.45	5.40	6.88				
4	115P07020	4 Evening	Weekday		Northbound	40.3	36.7	13.7	11.8	47	47	47	1.17	1.28	3.44	3.98				
4	115P07021	1 AM Peak	Weekday		Northbound	62.3	55.8	48.2	35.4	64	64	64	1.03	1.15	1.33	1.81	1.06	1.18	1.49	2.15
4	115P07021	2 Mid Day	Weekday		Northbound	60.7	56.2	43.5	29.8	64	64	64	1.05	1.14	1.47	2.15				
4	115P07021	3 PM Peak	Weekday		Northbound	61.0	55.3	42.9	29.8	64	64	64	1.05	1.16	1.49	2.15				
4	115P07021	4 Evening	Weekday		Northbound	60.1	54.3	43.8	40.4	64	64	64	1.06	1.18	1.46	1.58				
4	115P07022	1 AM Peak	Weekday		Northbound	53.5	47.4	32.8	28.6	55	55	55	1.03	1.16	1.67	1.92	1.12	1.22	2.81	4.12
4	115P07022	2 Mid Day	Weekday		Northbound	50.2	45.2	25.5	14.9	55	55	55	1.10	1.22	2.16	3.69				
4	115P07022	3 PM Peak	Weekday		Northbound	49.1	44.9	19.5	13.4	55	55	55	1.12	1.22	2.81	4.12				
4	115P07022	4 Evening	Weekday		Northbound	51.4	47.3	28.3	29.0	55	55	55	1.07	1.16	1.94	1.90				
5	115P05996	1 AM Peak	Weekday	AZ-260	Westbound	35.8	29.2	14.9	3.7	45	45	45	1.26	1.54	3.02	12.07	1.35	1.55	5.17	12.07
5	115P05996	2 Mid Day	Weekday	AZ-260	Westbound	33.8	29.4	11.2	5.0	45	45	45	1.33	1.53	4.02	9.05				
5	115P05996	3 PM Peak	Weekday	AZ-260	Westbound	33.4	29.0	8.7	3.7	45	45	45	1.35	1.55	5.17	12.07				
5	115P05996	4 Evening	Weekday	AZ-260	Westbound	36.6	34.0	11.2	5.6	45	45	45	1.23	1.32	4.02	8.04				
5	115P07020	1 AM Peak	Weekday		Northbound	40.4	35.3	16.2	8.7	47	47	47	1.16	1.33	2.91	5.40	1.25	1.45	5.40	6.88

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
5	115P07020	2 Mid Day	Weekday		Northbound	38.6	34.4	11.8	9.9	47	47	47	1.22	1.37	3.98	4.73				
5	115P07020	3 PM Peak	Weekday		Northbound	37.5	32.5	8.7	6.8	47	47	47	1.25	1.45	5.40	6.88				
5	115P07020	4 Evening	Weekday		Northbound	40.3	36.7	13.7	11.8	47	47	47	1.17	1.28	3.44	3.98				
6	115P06349	1 AM Peak	Weekday	AZ-260	Westbound	55.4	53.5	45.8	40.4	55	55	55	1.00	1.03	1.20	1.36	1.01	1.05	1.33	1.58
6	115P06349	2 Mid Day	Weekday	AZ-260	Westbound	54.5	53.0	41.6	38.9	55	55	55	1.01	1.04	1.32	1.41				
6	115P06349	3 PM Peak	Weekday	AZ-260	Westbound	54.7	52.2	41.5	34.8	55	55	55	1.01	1.05	1.33	1.58				
6	115P06349	4 Evening	Weekday	AZ-260	Westbound	54.3	53.9	41.3	42.9	55	55	55	1.01	1.02	1.33	1.28				

Car TTI and PTI/Truck TTTI and TPTI – Counter-Clockwise

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
1	115P07394	1 AM Peak	Weekday	AZ-179	Northbound	46.2	44.4	21.8	13.7	53	53	53	1.15	1.19	2.44	3.88	1.21	1.27	3.55	5.33
1	115P07394	2 Mid Day	Weekday	AZ-179	Northbound	43.9	41.8	15.3	9.9	53	53	53	1.21	1.27	3.46	5.33				
1	115P07394	3 PM Peak	Weekday	AZ-179	Northbound	44.8	42.9	14.9	15.5	53	53	53	1.18	1.23	3.55	3.41				
1	115P07394	4 Evening	Weekday	AZ-179	Northbound	44.8	42.0	16.8	12.4	53	53	53	1.18	1.26	3.16	4.26				
2	115P07394	1 AM Peak	Weekday	AZ-179	Northbound	46.2	44.4	21.8	13.7	53	53	53	1.15	1.19	2.44	3.88	1.21	1.27	3.55	5.33
2	115P07394	2 Mid Day	Weekday	AZ-179	Northbound	43.9	41.8	15.3	9.9	53	53	53	1.21	1.27	3.46	5.33				
2	115P07394	3 PM Peak	Weekday	AZ-179	Northbound	44.8	42.9	14.9	15.5	53	53	53	1.18	1.23	3.55	3.41				
2	115P07394	4 Evening	Weekday	AZ-179	Northbound	44.8	42.0	16.8	12.4	53	53	53	1.18	1.26	3.16	4.26				
2	115P07395	1 AM Peak	Weekday	AZ-179	Northbound	29.7	25.9	13.7	8.7	37	37	37	1.25	1.43	2.71	4.25	1.46	1.58	5.18	6.61
2	115P07395	2 Mid Day	Weekday	AZ-179	Northbound	26.1	23.4	9.1	5.6	37	37	37	1.42	1.58	4.08	6.61				
2	115P07395	3 PM Peak	Weekday	AZ-179	Northbound	25.4	24.3	7.1	7.5	37	37	37	1.46	1.52	5.18	4.96				
3	115N07022	1 AM Peak	Weekday		Southbound	26.0	26.3	3.9	11.8	35	35	35	1.34	1.33	9.01	2.96	1.37	1.45	9.01	11.26
3	115N07022	2 Mid Day	Weekday		Southbound	25.5	24.5	5.0	6.8	35	35	35	1.37	1.43	7.04	5.12				
3	115N07022	3 PM Peak	Weekday		Southbound	25.8	24.1	5.6	3.1	35	35	35	1.36	1.45	6.25	11.26				
3	115N07022	4 Evening	Weekday		Southbound	27.4	25.6	2.8	10.8	35	35	35	1.28	1.37	~~12.52~~	3.25				
3	115N07021	1 AM Peak	Weekday		Southbound	49.7	49.2	26.4	28.6	55	55	55	1.11	1.12	2.08	1.92	1.11	1.21	2.08	3.16
3	115N07021	2 Mid Day	Weekday		Southbound	52.0	46.8	30.6	20.5	55	55	55	1.06	1.17	1.79	2.68				
3	115N07021	3 PM Peak	Weekday		Southbound	53.4	45.3	31.1	17.4	55	55	55	1.03	1.21	1.77	3.16				
3	115N07021	4 Evening	Weekday		Southbound	51.2	48.8	28.8	31.7	55	55	55	1.07	1.13	1.91	1.73				
4	115N07020	1 AM Peak	Weekday		Southbound	61.3	58.8	38.2	36.7	64	64	64	1.04	1.09	1.68	1.75	1.04	1.10	1.68	3.12
4	115N07020	2 Mid Day	Weekday		Southbound	61.6	58.2	40.7	20.5	64	64	64	1.04	1.10	1.57	3.12				
4	115N07020	3 PM Peak	Weekday		Southbound	63.1	59.0	42.6	29.8	64	64	64	1.01	1.08	1.50	2.15				
4	115N07020	4 Evening	Weekday		Southbound	61.9	59.0	43.7	45.0	64	64	64	1.03	1.08	1.47	1.42				
4	115N07021	1 AM Peak	Weekday		Southbound	49.7	49.2	26.4	28.6	55	55	55	1.11	1.12	2.08	1.92	1.11	1.21	2.08	3.16
4	115N07021	2 Mid Day	Weekday		Southbound	52.0	46.8	30.6	20.5	55	55	55	1.06	1.17	1.79	2.68				
4	115N07021	3 PM Peak	Weekday		Southbound	53.4	45.3	31.1	17.4	55	55	55	1.03	1.21	1.77	3.16				
4	115N07021	4 Evening	Weekday		Southbound	51.2	48.8	28.8	31.7	55	55	55	1.07	1.13	1.91	1.73				
5	115N06349	1 AM Peak	Weekday	AZ-260	Eastbound	38.0	32.1	15.5	8.7	45	45	45	1.18	1.40	2.89	5.17	1.27	1.40	3.02	5.17
5	115N06349	2 Mid Day	Weekday	AZ-260	Eastbound	35.5	32.7	14.9	9.9	45	45	45	1.27	1.38	3.02	4.53				
5	115N06349	3 PM Peak	Weekday	AZ-260	Eastbound	35.7	33.7	15.5	10.6	45	45	45	1.26	1.33	2.89	4.26				
5	115N06349	4 Evening	Weekday	AZ-260	Eastbound	38.5	35.6	16.5	11.8	45	45	45	1.17	1.26	2.73	3.81				
6	115N05997	1 AM Peak	Weekday	AZ-260	Eastbound	51.3	50.1	30.4	19.9	55	55	55	1.07	1.10	1.81	2.77	1.07	1.14	1.97	3.16
6	115N05997	2 Mid Day	Weekday	AZ-260	Eastbound	51.3	49.3	32.6	19.9	55	55	55	1.07	1.12	1.69	2.77				
6	115N05997	3 PM Peak	Weekday	AZ-260	Eastbound	52.0	48.3	34.0	17.4	55	55	55	1.06	1.14	1.62	3.16				
6	115N05997	4 Evening	Weekday	AZ-260	Eastbound	51.8	50.5	28.0	19.9	55	55	55	1.06	1.09	1.97	2.77				

Closure Data

Segment	Length (miles)	# of closures	Total miles of closures		Average Occurrences/Mile/Year	
			NB SR 179/NB SR89A/WB SR 260	SB SR 179/SB SR89A/EB SR 260	NB SR 179/NB SR89A/WB SR 260	SB SR 179/SB SR89A/EB SR 260
179-1	6	3	364.0	0.0	12.13	0.00
179-2	9	5	188.0	979.0	4.18	21.76
89A-3	5	3	0.0	1221.0	0.00	48.84
89A-4	13	14	9457.8	481.0	145.51	7.40
89A/260-5	4	3	198.0	268.0	9.90	13.40
260-6	10	12	991.0	1399.0	19.82	27.98

Segment	ITIS Category Description											
	Closures		Incidents/Accidents		Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260
179-1	0	0	3	0	0	0	0	0	0	0	0	0
179-2	0	0	1	4	0	0	0	0	0	0	0	0
89A-3	0	0	2	0	0	0	1	0	0	0	0	0
89A-4	0	0	2	10	0	0	0	2	0	0	0	0
89A/260-5	0	0	2	1	0	0	0	0	0	0	0	0
260-6	0	0	6	4	0	0	0	2	0	0	0	0

HPMS Data

SEGMENT	MP_FROM	MP_TO	WEIGHTED AVERAGE NB/EB AADT	WEIGHTED AVERAGE SB/WB AADT	WEIGHTED AVERAGE AADT	NB/EB AADT	SB/WB AADT	2014 AADT	K Factor	D-Factor	T-Factor
179-1	298.87	304.73	3097	3052	6149	3276	3157	6434	10	51	10
179-2	304.73	313.45	5682	5662	11345	5498	5483	10982	9	50	4
89A-3	374.19	369.64	9779	9780	19559	11028	11198	22225	9	51	4
89A-4	369.64	356.50	6587	6716	13303	7053	6911	13965	8	51	6
89A/260-5	356.50	209.07	11018	10791	21810	11456	10788	22244	9	52	6
260-6	209.07	218.60	7435	7455	14891	8566	8566	17132	8	50	9

SEGMENT	Loc ID	BMP	EMP	Length	Pos Dir AADT	Neg Dir AADT	Corrected Pos Dir AADT	Corrected Neg Dir AADT	2015 AADT	K Factor	D-Factor	D-Factor Adjusted	T-Factor
179-1	101336	298.87	303.02	4.15	0	0	2811	2811	5622	10	56	50	11
	101337	303.02	304.73	1.71	4405	3998	4405	3998	8403	10	55	52	8
179-2	101338	305.66	306.23	0.57	5512	5619	5512	5512	11024	9	56	50	4
	101339	306.23	306.55	0.32	5222	6160	5222	6160	11382	10	57	54	3
	101340	306.55	306.95	0.40	6129	6091	6129	6091	12220	9	68	50	5
	101341	306.95	310.09	3.14	5471	1683	5471	5471	10942	8	55	50	5
	101342	310.09	310.55	0.46	6344	6264	6344	6264	12609	11	53	50	4
	101343	310.55	312.10	1.55	6203	5348	5378	5378	10755	10	55	50	4
	101344	312.10	313.09	0.99	6808	6551	5894	5894	11788	10	54	50	4
	101345	313.09	313.44	0.35	6973	6466	6466	6466	12932	11	54	50	4
	101337	304.73	305.66	0.93	4405	3998	4405	3998	8403	10	55	52	8
89A-3	101686	369.64	370.98	1.34	8072	8346	8072	8346	16418	9	65	51	5
	101687	370.98	371.62	0.64	11067	10928	11067	10928	21995	8	50	50	4
	101689	371.62	372.18	0.56	14820	13827	14820	13827	28647	9	51	52	4
	101690	372.18	372.46	0.28	0	14089	14089	14089	28178	9	51	50	4
	101691	372.46	373.07	0.61	13441	11948	12552	12552	25103	9	51	50	4
	101693	373.07	373.55	0.48	12313	12271	12313	12271	24585	10	52	50	3
	101695	373.55	374.17	0.62	10072	11795	10072	11795	21867	9	51	54	4
89A-4	101683	356.50	357.13	0.63	7468	7053	7468	7053	14521	9	53	51	6
	101684	357.13	362.57	5.44	6378	6251	6378	6251	12629	9	63	51	6
	101685	362.57	369.64	7.07	7536	7407	7536	7407	14943	8	64	50	6
89A/260-5	101681	355.20	356.11	0.91	11989	9645	11989	9645	21634	9	52	55	5
	102317	206.40	206.91	0.51	15602	15236	15602	15236	30838	9	58	51	5
	101483	206.98	207.80	0.82	12751	12610	12751	12610	25362	9	58	50	6
	101485	207.80	209.06	1.26	9758	9743	9783	9783	19566	9	57	50	6
	101683	356.11	356.50	0.39	7468	7053	7468	7053	14521	9	53	51	6
260-6	101487	209.06	215.96	6.90	6851	6799	9000	9000	18000	8	55	50	9
	101488	215.96	218.60	2.64	7431	9687	7431	7431	14862	7	52	50	8

Bicycle Accommodation Data

Segment	BMP	EMP	Divided or Non	NB/WB Right Shoulder Width	SB/EB Right Shoulder Width	NB/WB Left Shoulder Width	SB/EB Left Shoulder Width	NB/WB Effective Length of Shoulder	SB/EB Effective Length of Shoulder	% Bicycle Accommodation
179-1	298.97	304.73	Undivided	5.0	5.1	N/A	N/A	0.2	0.3	4%
179-2	304.73	313.445	Divided	6.5	6.6	2.3	1.1	7.4	7.1	83%
89A-3	369.64	374.187	Undivided	4.4	4.5	N/A	N/A	3.2	3.2	71%
89A-4	356.6	369.64	Divided	10.0	10.0	3.9	3.9	12.6	12.7	97%
89A/260-5	352.609	356.5	Undivided	2.4	2.2	N/A	N/A	1.2	1.1	29%
260-6	209.07	218.604	Undivided	8.0	7.2	N/A	N/A	8.7	8.3	90%

AZTDM Data

SEGMENT	Growth Rate	% Non-SOV
179-1	1.95%	17.1%
179-2	2.32%	17.0%
89A-3	2.71%	17.9%
89A-4	1.33%	18.0%
89A/260-5	1.73%	20.1%
260-6	1.51%	16.1%

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
179-1	4	Rural	Level	12.00	5.04	5.14	0.0	N/A	N/A	N/A	0.88	1.4	0.962	N/A	0.25	N/A	1	1.65	N/A	N/A	63.75	63.75	N/A	N/A	1205.50	22,962
179-2	3	Fringe Urban	Rolling	12.00	6.49	6.59	1.0	N/A	N/A	N/A	0.9	2	0.957	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	900.18	17,146
89A-3	3	Fringe Urban	Rolling	12.00	4.39	4.52	1.0	N/A	N/A	N/A	0.92	2	0.960	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1846.59	35,173
89A-4	3	Rural	Level	12.00	9.95	9.96	1.0	N/A	N/A	N/A	0.9	2	0.943	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1773.53	33,782
89A/260-5	3	Fringe Urban	Level	12.00	2.42	2.21	1.0	N/A	N/A	N/A	0.92	2	0.947	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1820.52	34,677
260-6	3	Rural	Level	12.00	7.98	7.23	1.0	N/A	N/A	N/A	0.9	2	0.921	N/A	N/A	0.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	866.46	16,504

Safety Performance Area Data

Segment	Operating Environment	Segment Length (miles)	NB/WB Fatal Crashes 2010-2014	SB/EB Fatal Crashes 2010-2014	NB/WB Incapacitating Injury Crashes	SB/EB Incapacitating Injury Crashes	Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors
179-1	2 or 3 Lane Undivided Highway	5.86	0	0	2	0	0
179-2	2 or 3 or 4 Lane Divided Highway	8.715	1	1	2	2	3
89A-3	4 or 5 Lane Undivided Highway	4.55	0	3	2	2	4
89A-4	2 or 3 or 4 Lane Divided Highway	13.14	2	7	4	5	10
89A/260-5	4 or 5 Lane Undivided Highway	3.89	4	0	8	3	4
260-6	2 or 3 Lane Undivided Highway	9.53	2	2	4	4	4

Segment	Operating Environment	Fatal + Incapacitating Injury Crashes Involving Trucks	Fatal + Incapacitating Injury Crashes Involving Motorcycles	Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Weighted 5-Year (2011-2015) Average NB/EB AADT	Weighted 5-Year (2011-2015) Average SB/WB AADT	Weighted 5-Year (2010-2014) Average Total AADT
179-1	2 or 3 Lane Undivided Highway	1	0	0	3097	3052	1
179-2	2 or 3 or 4 Lane Divided Highway	1	3	0	5682	5662	1
89A-3	4 or 5 Lane Undivided Highway	0	2	0	9779	9780	0
89A-4	2 or 3 or 4 Lane Divided Highway	1	2	1	6587	6716	1
89A/260-5	4 or 5 Lane Undivided Highway	2	1	2	11018	10791	2
260-6	2 or 3 Lane Undivided Highway	2	1	0	7435	7455	2

HPMS Data

2010-2014 Weighted Average						2015			2014			2013			2012			2011		
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	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
179-1	298.87	304.73	3097	3052	6149	3276	3157	6434	3148	3098	6247	3168	3168	6337	3092	3091	6183	2798	2745	5544
179-2	304.73	313.45	5682	5662	11345	5498	5483	10982	5609	5568	11177	5880	5877	11757	5785	5725	11510	5639	5658	11297
89A-3	374.19	369.64	9779	9780	19559	11028	11198	22225	10595	10445	21041	9211	9211	18423	9028	9013	18041	9032	9032	18063
89A-4	369.64	356.50	6587	6716	13303	7053	6911	13965	6511	6866	13378	6784	6784	13569	6440	6807	13247	6148	6210	12358
89A/260-5	356.50	209.07	11018	10791	21810	11456	10788	22244	10799	10541	21341	11719	11700	23420	11636	11275	22912	9481	9652	19135
260-6	209.07	218.60	7435	7455	14891	8566	8566	17132	9929	10278	20206	6195	6195	12390	6104	5988	12093	6383	6249	12633

Freight Performance Area Data

Segment	Length (miles)	# of closures	Total miles of closures		Average Occurrences/Mile/Year	
			NB SR 179/NB SR89A/WB SR 260	SB SR 179/SB SR89A/EB SR 260	NB SR 179/NB SR89A/WB SR 260	SB SR 179/SB SR89A/EB SR 260
179-1	6	3	364.0	0.0	12.13	0.00
179-2	9	5	188.0	979.0	4.18	21.76
89A-3	5	3	0.0	1221.0	0.00	48.84
89A-4	13	14	9457.8	481.0	145.51	7.40
89A/260-5	4	3	198.0	268.0	9.90	13.40
260-6	10	12	991.0	1399.0	19.82	27.98

Segment	ITIS Category Description											
	Closures		Incidents/Accidents		Incidents/Crashes		Obstruction Hazards		Winds		Winter Storm Codes	
	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260	NB SR 179/SB SR89A/EB SR 260	SB SR 179/NB SR89A/WB SR 260
179-1	0	0	3	0	0	0	0	0	0	0	0	0
179-2	0	0	1	4	0	0	0	0	0	0	0	0
89A-3	0	0	2	0	0	0	1	0	0	0	0	0
89A-4	0	0	2	10	0	0	0	2	0	0	0	0
89A/260-5	0	0	2	1	0	0	0	0	0	0	0	0
260-6	0	0	6	4	0	0	0	2	0	0	0	0

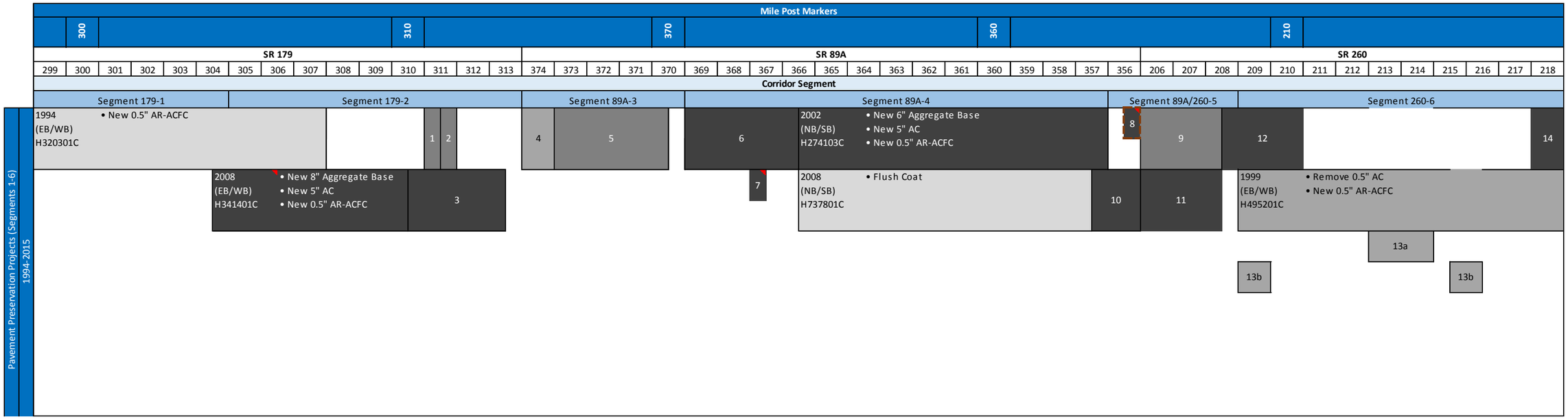
See the **Mobility Performance Area Data** section for other Freight Performance Area related data.

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
179-1	5.76	299-305	Low	Low	Low	Low	
179-2	8.715	305-314	Low	Low	Low	Low	Hot spots: MP 306-307; MP 313-314; SB MP 312-313
89A-3	4.547	374-369	None	Low	Low	Low	
89A-4	13.04	369-356	None	Low	Low	Low	
89A/260-5	3.891	356-209	None	Medium	High	High	
260-6	9.534	209-219	Low	Low	Medium	Low	Hot spot SB/EB MP 218-219

Pavement History



Pavement Treatment Reference Numbers

1. 2004 (NB/SB) H662301C: 2" AC	**9. 2009 (EB/WB) H657501C:** Remove 3", 3" AC, 0.5" AR-ACFC
2. 2000 (NB/SB) H570701C: 3" AC, 0.6" Seal Coat	**10. 2000 (NB/SB) H274101C:** 4" Aggregate Subbase, 7" AC, 0.5" AR-ACFC
3. 2010 (NB/SB) H341403C: 8" Aggregate Subbase, 6" AC, 0.5" AR-ACFC	**11. 1998 (EB/WB) H317001C:** 10.5" Aggregate Subbase, 5" AC, Flush Coat
4. 1999 (NB/SB) H404401C: Remove 0.5" AC, 1" AR-ACFC	**12. 2009 (EB/WB) H386802C:** 12" Aggregate Subbase, 6" AC, 0.5" AR-ACFC
5. 1998 (NB/SB) H380901C: 1.5" AR-ACFC	**13a. 2003 (EB) H625201C:** Remove 4" AC, 4" AC
6. 2005 (NB/SB) H274102C: 6" Aggregate Subbase, 5" AC, 0.5" AR-ACFC	**13b. 2003 (WB) H625201C:** Remove 4" AC, 4" AC
7. 2012 (NB) H755401C: 6" Aggregate Subbase, 5" AC, 0.5" AR-ACFC	**14. 2006 (EB/WB) H386803C:** 11" Aggregate Subbase, 6" AC, 0.5" AR-ACFC
8. 1998 (NB) H317001C: 8" PC, 7" AC, Flush Coat	

Legend

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

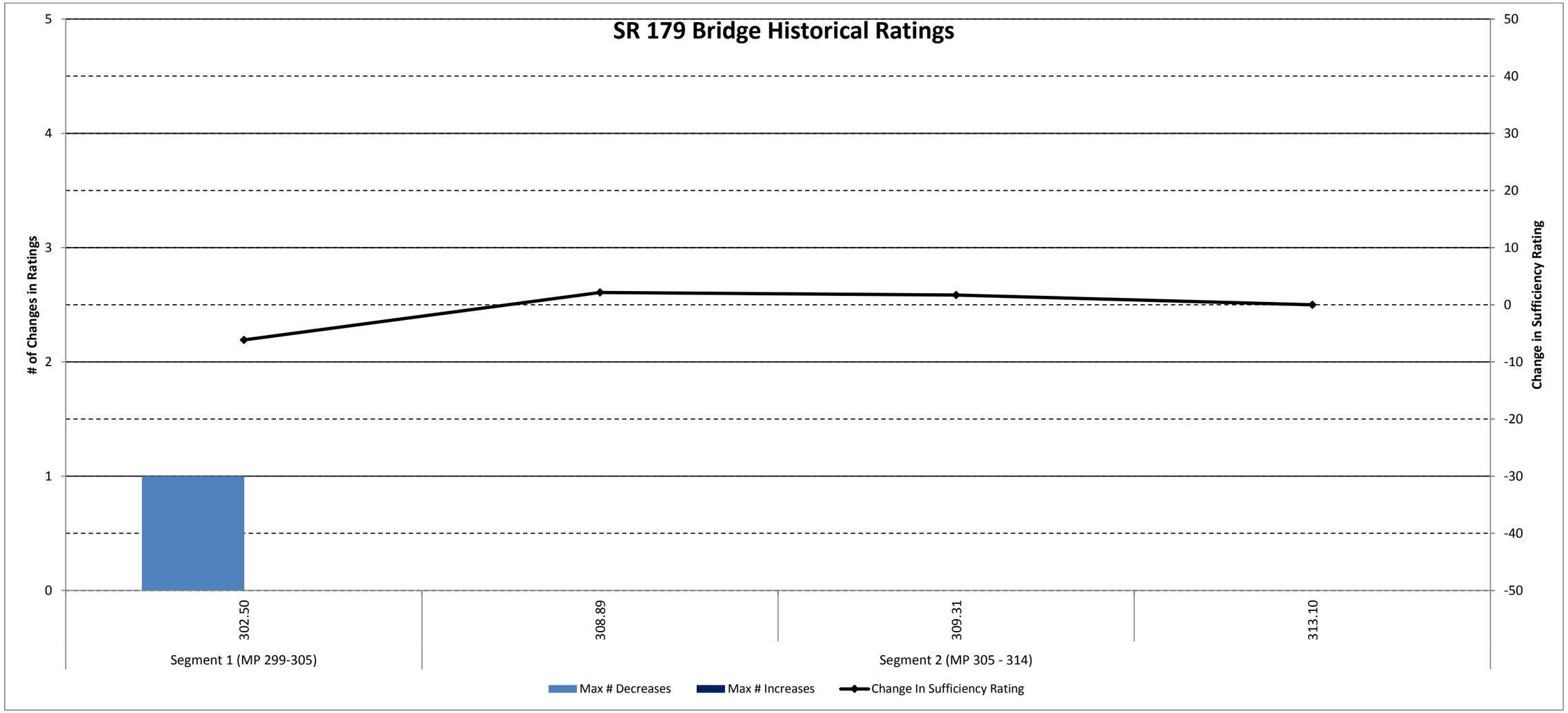
Value	Level	Segment Number											
		1		2		3		4		5		6	
		Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir	Uni-Dir	Bi-Dir
1	L1		100%		33%				69%				
1													
1													
1													
3	L2						20%					10%	100%
3												10%	
3												20%	
3													
3													
3													
4	L3				2%		70%				63%		
4					2%								
4													
4													
6	L4	8%		61%				4%	4%	8%		20%	
6				33%				27%		13%		10%	
6								73%		25%			
6										63%			
6													
6													
Sub-Total		0.5	1.0	5.7	0.5	0.0	3.4	6.2	0.9	6.5	2.5	3.0	3.0
Total		**1.3**		**3.3**		**3.4**		**4.0**		**5.7**		**4.5**	

Value	Level	Segment Number					
		1	**2**	**3**	**4**	**5**	**6**
1	L1	1.0	0.3	0.0	0.7	0.0	0.0
3	L2	0.0	0.0	0.6	0.0	0.0	3.6
4	L3	0.0	0.1	2.8	0.0	2.5	0.0
6	L4	0.3	2.8	0.0	3.3	3.2	0.9
Total		1.3	3.3	3.4	4.0	5.7	4.5

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	
179-1	5.76	299-305	1	1	High	Dry Beaver Creek Br (#736)(MP 302.5)	2015 Current Deck Rating of 5	Bridge has no historical issues	
179-2	8.715	305-314	3	None	None	No bridges with current ratings less than 6 and no historical issues			
89A-3	4.547	374-369	0	None	None	No bridges with current ratings less than 6 and no historical issues			
89A-4	13.04	369-356	4	None	Medium	Spring Creek Bridge NB (#2535)(MP 361.70) Spring Creek Bridge SB (#2536)(MP 361.70) Dry Creek Bridge SB (#2534) (MP 366.40)	2015 Current Deck Rating of 5 2015 Current Deck Rating of 5 2015 Current Deck Rating of 5	Dry Creek Bridge SB and Dry Creek Bridge NB both identified in the Historical Review.	
89A/260-5	3.891	356-209	1	None	None	No bridges with current ratings less than 6 and no historical issues			
260-6	9.534	209-219	5	None	Low	No bridges with current ratings less than 6 and no historical issues		Black Canyon Wash Br EB identified in the Historical Review.	

Bridge Ratings History

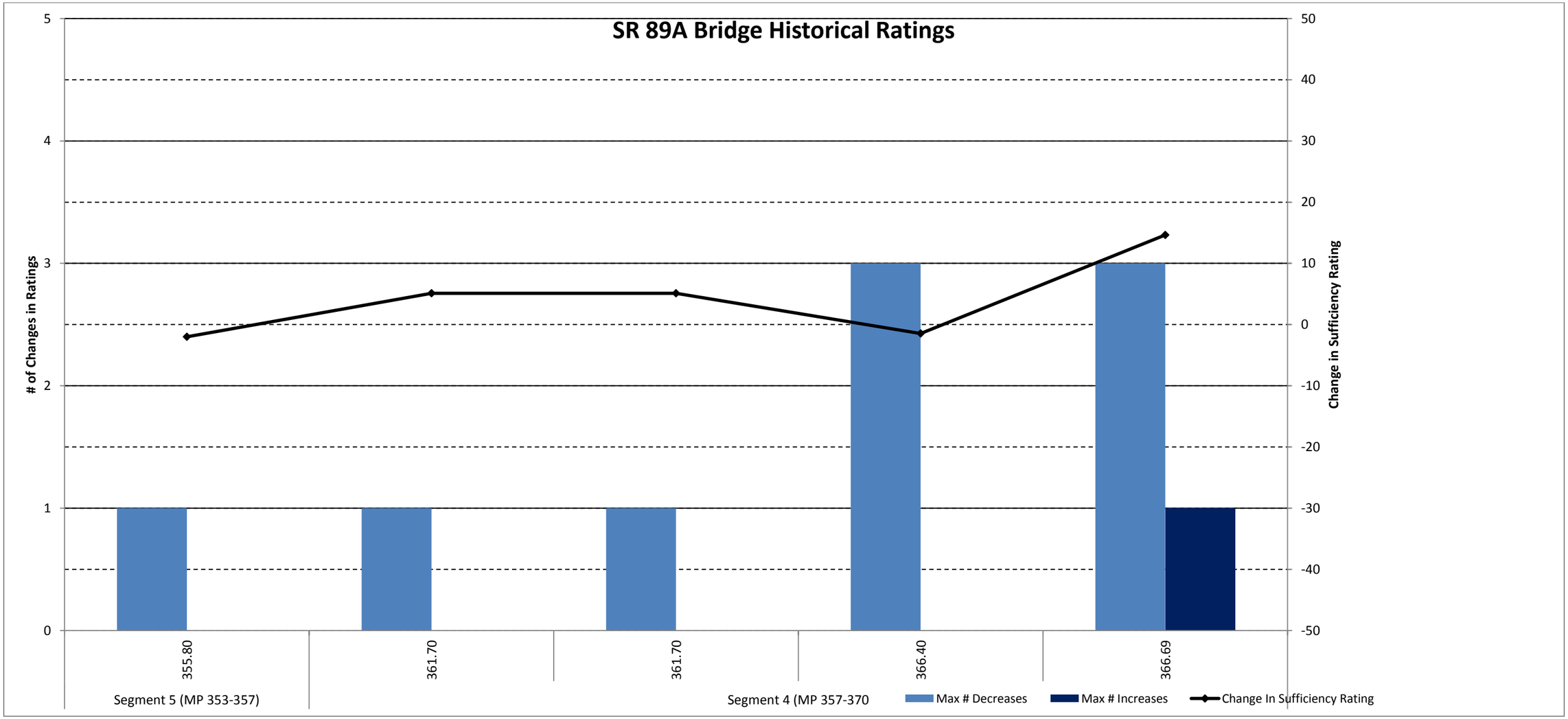


O identifies the bridge indicated is of concern from a historical ratings perspective

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

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

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

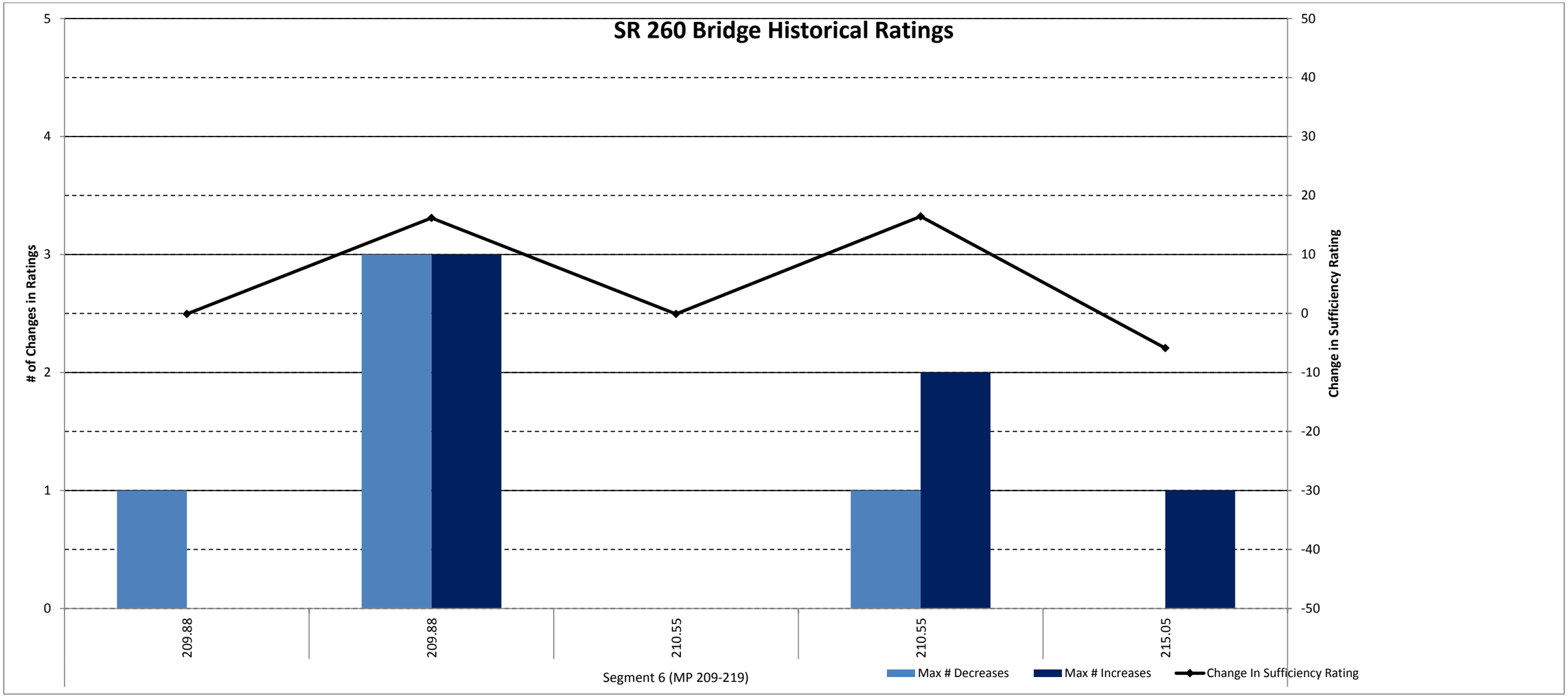


O_identifies the bridge indicated is of concern from a historical ratings perspective

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**

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)	
179-1	299-305	6	Low	State Highway	Rural	Level	2	45-55	No	Non-Divided	0%	A/B	A/B	10%	1.64	2.35	
179-2	305-314	9	High	State Highway	FringeUrban	Rolling	2	25-55	No	Both	86%	A-C	E/F	4%	2.12	3.03	multiple roundabouts in this segment
89A-3	374-369	5	High	State Highway	FringeUrban	Level	4	35-40	No	Both	0%	A-C	E/F	4%	5.67	4.31	
89A-4	369-356	13	Low	State Highway	Rural	Level	4	40-65	No	Divided	0%	A/B	A/B	6%	2.09	0.80	Traffic Signal at SR 89A/Cornville rd Intersection
89A/260-5	356-209	4	Low	State Highway	FringeUrban	Level	4	45	No	Non-Divided	0%	A-C	E/F	6%	3.99	1.75	Five Traffic signals
260-6	209-219	10	High	State Highway	Rural	Level	2	55	No	Both	85%	C	D-F	9%	0.32	0.89	Traffic signal at SR 260/ Foresr Route Intersection

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			
179-1	299-305	6	Low	3	3	100%	0	0%	0	0%			Percentage of closures to incidents/accidents above the statewide average (100% to 96%)
179-2	305-314	9	High	5	5	100%	0	0%	0	0%			Percentage of closures to incidents/accidents above the statewide average (100% to 96%)
89A-3	374-369	5	High	3	2	67%	1	33%	0	0%			Percentage of closures to obstructions/hazards above the statewide average (33% to 3%)
89A-4	369-356	13	Low	14	12	86%	2	14%	0	0%			Percentage of closures to obstructions/hazards above the statewide average (14% to 3%)
89A/260-5	356-209	4	Low	3	3	100%	0	0%	0	0%			Percentage of closures to incidents/accidents above the statewide average (100% to 96%)
260-6	209-219	10	High	12	10	83%	2	17%	0	0%			Percentage of closures to obstructions/hazards above the statewide average (17% to 3%)

Safety Performance Needs Analysis

Segment Number	179-1	179-2	89A-3	89A-4	89A/260-5	260-6	Corridor-Wide Crash Characteristics
Segment Length (miles)	6	9	5	13	4	10	
Segment Milepost (MP)	299-305	305-314	374-369	369-356	356-209	209-219	
Final Need	None	Low	High	High	High	High	
Segment Crash Overview	0 Crashes were fatal 3 Crashes had incapacitating injuries 1 Crashes involve trucks 0 Crashes involve Motorcycles	2 Crashes were fatal 4 Crashes had incapacitating injuries 1 Crashes involve trucks 3 Crashes involve Motorcycles	3 Crashes were fatal 4 Crashes had incapacitating injuries 0 Crashes involve trucks 2 Crashes involve Motorcycles	9 Crashes were fatal 9 Crashes had incapacitating injuries 1 Crashes involve trucks 2 Crashes involve Motorcycles	4 Crashes were fatal 11 Crashes had incapacitating injuries 2 Crashes involve trucks 0 Crashes involve Motorcycles	4 Crashes were fatal 8 Crashes had incapacitating injuries 2 Crashes involve trucks 1 Crashes involve Motorcycles	22 Crashes were fatal 38 Crashes had incapacitating injuries 7 Crashes involve trucks 8 Crashes involve Motorcycles
Segment Crash Summaries (Fatal and Serious Injury Crashes): First Harmful Event Type	N/A - Sample size too small	67% Involve Other Non-Collision 17% Involve Collision with Fixed Object 17% Involve Collision with Motor Vehicle	71% Involve Collision with Motor Vehicle 14% Involve Other Non-Collision 14% Involve Collision with Fixed Object	50% Involve Overturning 17% Involve Collision with Motor Vehicle 17% Involve Other Non-Collision	77% Involve Collision with Motor Vehicle 15% Involve Collision with Pedestrian 8% Involve Overturning	67% Involve Collision with Motor Vehicle 25% Involve Collision with Fixed Object 8% Involve Overturning	51% Involve Collision with Motor Vehicle 18% Involve Overturning 15% Involve Other Non-Collision
Segment Crash Summaries (Fatal and Serious Injury Crashes): Collision Type	N/A - Sample size too small	83% Involve Single Vehicle 17% Involve Angle	29% Involve Head On 29% Involve Single Vehicle 14% Involve Angle	78% Involve Single Vehicle 11% Involve Left Turn 6% Involve Head On	38% Involve Left Turn 15% Involve Head On 15% Involve Other	25% Involve Rear End 25% Involve Head On 25% Involve Single Vehicle	43% Involve Single Vehicle 16% Involve Left Turn 13% Involve Head On
Segment Crash Summaries (Fatal and Serious Injury Crashes): Violation or Behavior	N/A - Sample size too small	33% Involve Failure to Keep in Proper Lane 33% Involve Speed too Fast for Conditions 17% Involve Other Unsafe Passing	29% Involve Failure to Yield Right-of-Way 14% Involve Unsafe Lane Change 14% Involve Exceeded Lawful Speed	22% Involve Speed too Fast for Conditions 22% Involve Unknown 17% Involve Failure to Yield Right-of-Way	23% Involve Failure to Yield Right-of-Way 15% Involve Unknown 8% Involve No Improper Action	17% Involve Made Improper Turn 17% Involve Failure to Keep in Proper Lane 17% Involve Drove in Opposing Lane	15% Involve Failure to Yield Right-of-Way 13% Involve Speed too Fast for Conditions 13% Involve Speed too Fast for Conditions
Segment Crash Summaries (Fatal and Serious Injury Crashes): Lighting Conditions	N/A - Sample size too small	67% Occur in Daylight Conditions 33% Occur in Dark-Unlighted Conditions	71% Occur in Daylight Conditions 29% Occur in Dark-Lighted Conditions	78% Occur in Daylight Conditions 22% Occur in Dark-Unlighted Conditions	46% Occur in Daylight Conditions 31% Occur in Dark-Unlighted Conditions 15% Occur in Dark-Lighted Conditions	75% Occur in Daylight Conditions 25% Occur in Dark-Unlighted Conditions	70% Occur in Daylight Conditions 21% Occur in Dark-Unlighted Conditions 7% Occur in Dark-Lighted Conditions
Segment Crash Summaries (Fatal and Serious Injury Crashes): Surface Conditions	N/A - Sample size too small	83% Involve Dry Conditions 17% Involve Mud, Dirt, Gravel Conditions	100% Involve Dry Conditions	100% Involve Dry Conditions	85% Involve Dry Conditions 15% Involve Wet Conditions	92% Involve Dry Conditions 8% Involve Wet Conditions	93% Involve Dry Conditions 5% Involve Wet Conditions 2% Involve Mud, Dirt, Gravel Conditions
Segment Crash Summaries (Fatal and Serious Injury Crashes): First Unit Event	N/A - Sample size too small	33% Involve Other Non-Collision 33% Involve a first unit event of Ran Off the Road (Right) 17% Involve a first unit event of Ran Off the Road (Left)	57% Involve a first unit event of Motor Vehicle in Transport 14% Involve a first unit event of Ran Off the Road (Left) 14% Involve a first unit event of Other Non-Collision	56% Involve a first unit event of Ran Off the Road (Left) 22% Involve a first unit event of Motor Vehicle in Transport 22% Involve a first unit event of Ran Off the Road (Right)	69% Involve a first unit event of Motor Vehicle in Transport 15% Involve a first unit event of Crossed Centerline 8% Involve a first unit event of Crossed Median	42% Involve a first unit event of Motor Vehicle in Transport 17% Involve a first unit event of Ran Off the Road (Right) 17% Involve Crossed Centerline	41% Involve a first unit event of Motor Vehicle in Transport 20% Involve a first unit event of Ran Off the Road (Left) 15% Involve a first unit event of Ran Off the Road (Right)
Segment Crash Summaries (Fatal and Serious Injury Crashes): Driver Physical Condition	N/A - Sample size too small	33% No Apparent Influence 17% Other 17% Illness	43% No Apparent Influence 29% Unknown 14% Medications	44% No Apparent Influence 28% Under the Influence of Drugs or Alcohol 22% Unknown	46% No Apparent Influence 46% Other 8% Fatigued/Fell Asleep	42% No Apparent Influence 33% Unknown 17% Under the Influence of Drugs or Alcohol	46% No Apparent Influence 30% Unknown 13% Under the Influence of Drugs or Alcohol
Segment Crash Summaries (Fatal and Serious Injury Crashes): Safety Device Usage	N/A - Sample size too small	33% Shoulder And Lap Belt Used 33% Helmet Used 17% Unknown	57% Shoulder And Lap Belt Used 14% Helmet Used 14% Not Applicable	56% None Used 22% Shoulder And Lap Belt Used 22% Air Bag Deployed/Shoulder-Lap Belt	38% Shoulder And Lap Belt Used 23% Air Bag Deployed/Shoulder-Lap Belt 15% None Used	33% Unknown 25% Shoulder And Lap Belt Used 25% None Used	36% Shoulder And Lap Belt Used 28% None Used 13% Air Bag Deployed/Shoulder-Lap Belt
Hot Spot Crash Summaries		MP 306-307; MP 312-314			MP 353-354		
Previously Completed Safety-Related Projects					Add turn lane, MP 355.2 (2013)	Construct erosion control features, MP 210.0 (Wilbur Canyon), (2014); Construct improvements, MP 211.0 (Thousand Trails-I-17 Junctions), (2016)	
District Interviews/Discussions			5-lane section, access management	High speeds descending down the hill to Cottonwood			
Contributing Factors			Access management	Pave Springs intersection			

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)	
179-1	299-305	5.76	Low	State Highway	Rural	Level	2	45-55	No	Non-Divided	0%	A-C	A-C	10%	1.91	4.06	
179-2	305-314	8.71	Medium	State Highway	Fringe Urban	Rolling	2	25-55	No	Both	86%	A-C	E/F	4%	2.58	4.55	multiple roundabouts in this segment
89A-3	374-369	4.55	High	State Highway	Fringe Urban	Level	4	35-40	No	Both	0%	A-C	E/F	4%	5.00	5.88	
89A-4	369-356	13.04	Low	State Highway	Rural	Level	4	40-65	No	Divided	0%	A-C	A-C	6%	3.10	1.98	Traffic Signal at SR 89A/Cornville rd Intersection
89A/260-5	356-209	3.89	High	State Highway	Fringe Urban	Level	4	45	No	Non-Divided	0%	A-C	E/F	6%	7.97	3.77	Five Traffic signals
260-6	209-219	9.53	None	State Highway	Rural	Level	2	55	No	Both	85%	D	E/F	9%	0.53	2.02	Traffic signal at SR 260/ Foresr Route Intersection

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			
179-1	299-305	5.76	Low	3	3	100%	0	0%	0	0%			Percentage of closures to incidents/accidents above the statewide average (100% to 96%)
179-2	305-314	8.71	Medium	5	5	100%	0	0%	0	0%			Percentage of closures to incidents/accidents above the statewide average (100% to 96%)
89A-3	374-369	4.55	High	3	2	67%	1	33%	0	0%			Percentage of closures to obstructions/hazards above the statewide average (33% to 3%)
89A-4	369-356	13.04	Low	14	12	86%	2	14%	0	0%			Percentage of closures to obstructions/hazards above the statewide average (14% to 3%)
89A/260-5	356-209	3.89	High	3	3	100%	0	0%	0	0%			Percentage of closures to incidents/accidents above the statewide average (100% to 96%)
260-6	209-219	9.53	None	12	10	83%	2	17%	0	0%			Percentage of closures to obstructions/hazards above the statewide average (17% to 3%)

Needs Summary Table

Performance Area	179-1	179-2	89A-3	89A-4	89A/260-5	260-6
	MP 299 – 305	MP 305 – 314	MP 374 – 369	MP 369 – 356	MP 356 – 209	MP 209 – 219
Pavement	Low	Low	None	None	None	Low
Bridge	High	None	None	Medium	None	Low
Mobility*	Low	High	High	Low	Low	High
Safety*	None	Low	High	High	High	High
Freight*	Low	Medium	High	Low	High	None
Average Need	**1.08**	**1.46**	**1.85**	**1.38**	**1.38**	**1.77**

* 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