US-60/Grand Avenue

Corridor Optimization, Access Management, and System Study (COMPASS)

Loop 303 to Interstate 10

Technical Memorandum 1
Existing Conditions

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List of Abbreviations

ACS	American Community Survey
ADA	Americans with Disabilities Act
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AFB	Air Force Base
AMP	Access Management Plan
APS	Arizona Public Service
COMPASS	Corridor Optimization, Access Management Plan, and System Study
D&R	Dial-A-Ride
DAR+	Dial-A-Ride Plus
DEUR	Declaration of Environmental Use Restriction
DU	Dwelling Unit
dnl	decibel noise level
El Mirage	City of El Mirage
FCDMC	Flood Control District of Maricopa County
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
GL	Grand Avenue Limited
Glendale	City of Glendale
GUS	Glendale Urban Shuttle
I-10	Interstate 10 Papago Freeway
I-17	Interstate 17 Black Canyon Freeway
IPaC	Information, Planning, and Conservation System
ITS	Intelligent Transportation System
LOS	Level of Service
LQG	Large Quantity Generators
MAG	Maricopa Association of Governments
MOC	Municipal Operating Center
MP	Milepost
NEPA	National Environmental Policy Act
NHS	National Highway System
NRHP	National Register of Historic Places
Peoria	City of Peoria
Phoenix	City of Phoenix
Q/LOS	Quality/Level of Service
QOS	Quality of Service
RIRO	Right-In Right-Out Only
RPTA	Regional Public Transportation Authority
SR-101L	State Route 101 Loop Agua Fria Freeway

SR-303L	State Route 303 Loop Bob Stump Memorial Parkway
SRP	Salt River Project
Surprise	City of Surprise
SMART	Systematically Managed Arterial
TI	Traffic Interchange
US-60	United States Route 60
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
Youngtown	Town of Youngtown

1.0 Introduction

The US-60/Grand Avenue COMPASS – Loop 303 to Interstate 10 is being conducted by the Maricopa Association of Governments in order to identify a long-term solution for accommodating travel demand and adjacent property access, establish operating principles to improve the effectiveness of traffic operations, and prepare an Access Management Plan that will provide a detailed milepost-by-milepost description of adjacent property access along the US-60/Grand Avenue corridor.

A Partnering Charter was signed on February 22, 2012, by the political leadership of the communities within the US-60/Grand Avenue COMPASS corridor. The outcomes of this technical study will address the following goals that were identified in the charter:

- Cooperatively create an overall vision for the US-60/Grand Avenue Corridor that embraces the important regional function of Grand Avenue as a significant high capacity, multimodal corridor and that can recognize the unique character of different sections of the corridor and the communities it passes through.
- Cooperatively define the operational character for the US-60/Grand Avenue Corridor that will enhance economic development, maintain accessibility to adjacent land uses, improve traffic operations, and reduce highway and rail conflicts.
- Establish an access management system that provides an efficient means to accommodate intersecting roadways and access to and from adjacent properties. After the system is recommended and agreed upon, each stakeholder will incorporate the principles and recommendations into their transportation, economic development and community development.
- Develop guidelines for signage, landscaping and aesthetic treatments along the corridor recognizing the different communities along the corridor.
- Work together to provide the affected stakeholders, including daily commuters, local residents, and adjacent property owners and users with information about the project and opportunity to contribute to the study's outcome and recommendations.

1.1. Purpose of This Paper

This paper is the first Technical Memorandum in a series of US-60/Grand Avenue COMPASS documents; it was prepared to identify and analyze existing conditions in order to assess study area needs, opportunities, and constraints. The majority of the research and evaluations performed for this Technical Memorandum were conducted in early 2013, at a time where plans and construction activities were underway in the US-60/Grand Avenue COMPASS corridor, which may affect the content of the information provided herein.

1.2. Study Area

The US-60/Grand Avenue COMPASS corridor begins at the TI with SR-303L in the City of Surprise, Arizona, at US-60 reference marker 138.051 (expressed in miles) and ends at the Willetta Street intersection in the City of Phoenix, Arizona, at US-60X reference marker 161.880 (expressed in miles). The corridor is oriented northwest-

southeast, and passes through portions of the City of Surprise, City of El Mirage, Town of Youngtown, City of Peoria, City of Glendale, City of Phoenix, and unincorporated Maricopa County.

US-60/Grand Avenue is a regionally significant six-lane roadway that is part of the NHS. It serves as a vital link connecting four important regional freeways: I-10, I-17, SR-101L, and SR-303L (***Figure 1***). US-60/Grand Avenue extends north to the Town of Wickenburg, where it turns west to western Arizona and California. In Wickenburg, US-60/Grand Avenue connects with US-93, which is the primary link to northwestern Arizona and Las Vegas from the Phoenix metropolitan area.

The US-60/Grand Avenue corridor includes the BNSF Railway. The BNSF Railway tracks run the full length of the corridor, parallel and adjacent to the roadway. They are situated along the roadway's southern edge south of Olive Avenue, and the northern edge to the north.

1.3. History of US-60/Grand Avenue*

US-60/Grand Avenue was first envisioned in 1887 by developer and Glendale founder, William J. Murphy. The first 18 miles of roadway connected 7th Avenue and Van Buren Street in Phoenix to the City of Glendale. Within a decade, Mr. Murphy exchanged right-of-way along Grand Avenue for construction of a rail line connecting Phoenix to Prescott, supporting the existing agricultural economy as well as enabling industrial growth. Grand Avenue was first paved in 1919.

In 1926, US-60 was commissioned as one of two transcontinental highways and its earliest Arizona segments included routes from Wickenburg to Phoenix. In 1927, Grand Avenue was approved as the West Valley alignment for US-60. US-60 was quickly established as one of Arizona's most important east-west transportation routes. For many decades, US-60 was the only route through Arizona to Los Angeles until the 1950s, when construction for I-10 would begin to syphon off Los Angeles-bound traffic.

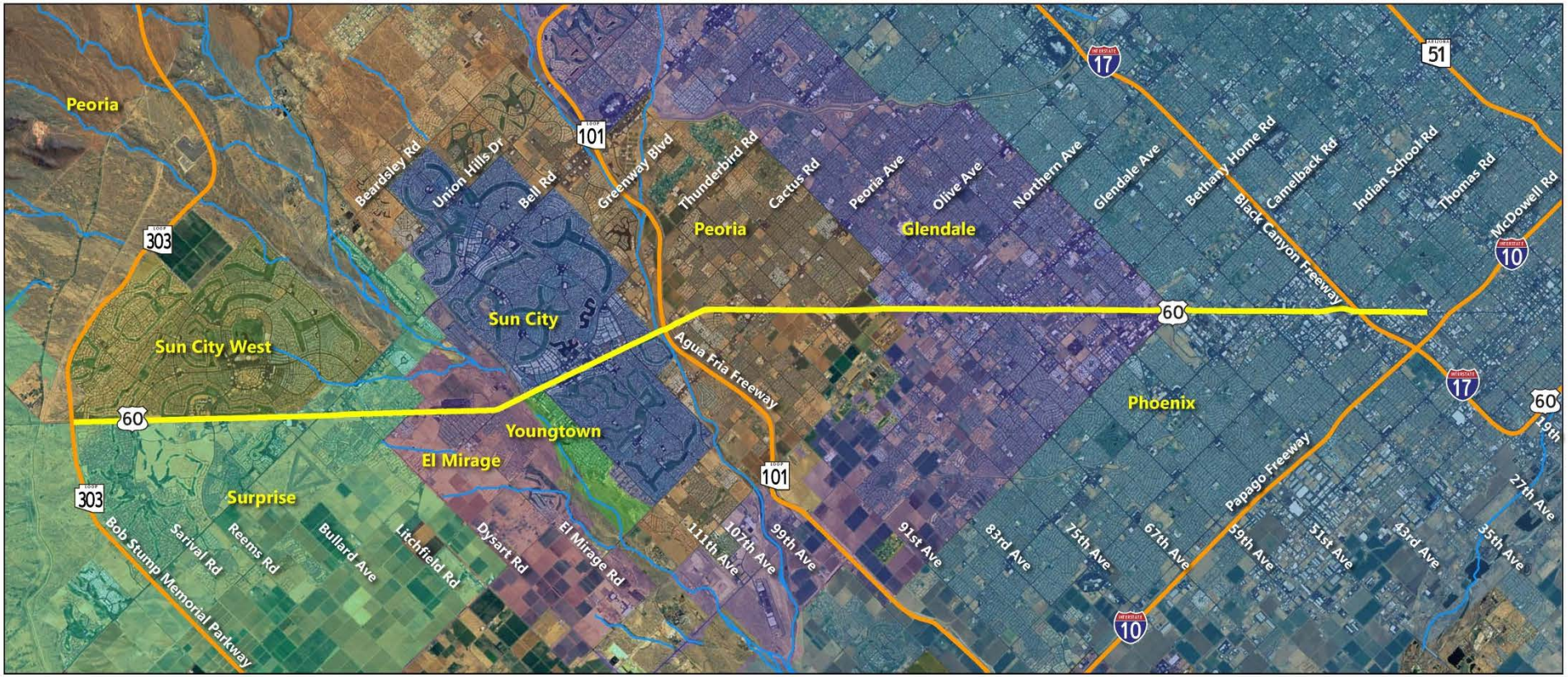
US-60/Grand Avenue is maintained by ADOT as part of the NHS. While US-60 no longer connects the Atlantic and Pacific oceans, as it terminates in western Arizona, it remains a valuable regional facility serving as the only major roadway connecting the downtown areas of Surprise, Sun City, El Mirage, Youngtown, Peoria, Glendale, and Phoenix. The corridor continues to serve multiple purposes, including local access, commuter travel and freight movement, and is a popular route to Las Vegas for residents from the Phoenix metropolitan area.

***Sources:**

City of Glendale, "Grand Avenue Corridor"; www.glendaleaz.com/planning/GrandAvenueCorridor.cfm (accessed October 21, 2014)

"U.S. Highway 60", Arizona's Historic Roads; https://www.azdot.gov/docs/default-source/historical-roads/us60_highwayhistoryEF602157047A.pdf?sfvrsn=2 (accessed October 21, 2014)

Figure 1 – Study Area



Legend
- US-60/Grand Ave COMPASS Corridor
- Freeway
- Streams/Washes

US-60/Grand Avenue: Loop 303 to Interstate 10
COMPASS
6/25/2013
0 1.5 3 6 Miles

2.0 Relevant Transportation Studies and Projects

Since 1998, there have been 54 completed studies and projects on this section of US-60/Grand Avenue, including 40 roadway related studies/projects and 24 transit related studies/projects; descriptions are presented in the US-60/Grand Avenue COMPASS Technical Memorandum 2, Review of Relevant Studies and Projects. A review of the relevant documents indicates a transportation atmosphere without a consistent direction to address corridor needs and values. However, the theme of US-60/Grand Avenue has consistently migrated over time as follows:

- During the 1980s - 1990s, the consistent view of US-60/Grand Avenue was related to freeway type mobility focusing on auto oriented travel behavior.
- During the 1990s - 2000s, the view shifted from freeway oriented traffic movement to expressway oriented traffic movement, still focusing on auto oriented travel behavior.
- During the 2000s – present, US-60/Grand Avenue shifted to an arterial focus, providing an environment to accommodate person mobility which includes transit and auto related mobility options.

The shift in focus over time of the US-60/Grand Avenue functionality directly affects how access is and should be managed for the corridor.

3.0 Characteristics of the Corridor

Grand Avenue is designated as US-60 through the greater part of the study area west of Thomas Road; however, the US-60 route designation follows a circuitous path from Grand Avenue to I-17 via ramp connections at 27th Avenue and Thomas Road to I-17. East of Thomas Road to Willetta Street, Grand Avenue carries the US-60X designation. Further east beyond the study area, Grand Avenue continues to its intersection with 7th Avenue and Van Buren Street in downtown Phoenix.

3.1. Roadway Characteristics

Roadway characteristics generally vary throughout the study area. Major elements are outlined below; greater detail is presented in the Existing Conditions Summary Map Book presented in ***Appendix TM1-1***. Reference information was catalogued and is presented in ***Appendix TM1-2***.

Posted Speed

Within the study area, US-60/Grand Avenue is classified as an Urban Principal Arterial with a posted speed limit of 45 mph, except as follows:

- 55 mph between SR-303L to RH Johnson Boulevard/Sunrise Boulevard;
- 35 mph between 87th Avenue and Cotton Crossing; and
- 35 mph south of 19th Avenue Willetta Street.

Cross Section

US-60/Grand Avenue is generally a six-lane roadway within the study area (three lanes in each travel direction), except as follows:

- Four-lanes through the TI with SR-303L;
- Four-lanes through the Thomas Road and 27th Avenue overpass; and
- Four-lanes east of 19th Avenue.

West of the study area, US-60/Grand Avenue is a four-lane divided highway. East of the study area, Grand Avenue is a four lane urban street.

Medians

US-60/Grand Avenue has various median treatments throughout the study area. Median treatments include flush, raised, depressed, landscaped, barrier, and split divider islands. Numerous median openings are provided to accommodate left-turns to crossroads of various functional classifications, as well as property access.

Intersections

The US-60/Grand Avenue southwest-northeast alignment is skewed relative to the Phoenix metropolitan north-south and east-west arterial street grid system throughout the length of the study area. The nature of the skew is relatively consistent throughout, except the segment roughly between 91st Avenue and Thunderbird Road. The corridor's general diagonal orientation creates a unique chain of complex intersections with the north-south and east-west arterial street grid system, especially through Peoria, Glendale, and Phoenix where the

intersections of the arterial street grid system are coincident with the arterial intersections with US-60/Grand Avenue. The result is five- and six-leg intersections, grade separated arterial interchanges, and a multitude of oblique, signalized and stop controlled intersections. These complex intersections include:

- *75th Avenue/Olive Avenue* – Six-leg at-grade signalized intersection with an Olive Avenue overpass.
- *67th Avenue/Northern Avenue* – Six-leg at-grade signalized intersection with an 67th Avenue overpass.
- *51st Avenue/Bethany Home Road* – Five-leg at-grade signalized intersection with a 51st Avenue overpass.
- *35th Avenue/Indian School Road* – Six-leg at-grade signalized intersection with an Indian School Road overpass.
- *19th Avenue/McDowell Road* – Six-leg at-grade signalized intersection.

Several roadway grade separations along the US-60/Grand Avenue corridor have been constructed to eliminate complex intersections. The following grade separations allow US-60/Grand Avenue traffic to flow uninterrupted:

- *BNSF Railway (between 75th Avenue and 71st Avenue)* – Eastbound US-60/Grand Avenue goes over the BNSF Railway and westbound US-60/Grand Avenue goes under the BNSF Railway.
- *59th Avenue/Glendale Avenue* – US-60/Grand Avenue is depressed (below grade) under the 59th Avenue and Glendale Avenue intersection.
- *Maryland Avenue* – Maryland Avenue goes over US-60/Grand Avenue.
- *43rd Avenue/Camelback Road* – US-60/Grand Avenue goes over the 43rd Avenue and Camelback Road intersection.
- *27th Avenue/Thomas Road* – Grand Avenue goes over 27th Avenue and Thomas Road. Directional ramps provide access to 27th Avenue for the segment along Thomas Road.

3.2. Access

Each access point along US-60/Grand Avenue was identified through reviewing available aerial mapping and performing site visits in early 2013. Each access point was then categorized into one of the following three access types:

1. RIRO – Only two traffic movements, right-in and right-out, are permitted with a side street or driveway. Intersections are typically controlled by either STOP or YIELD signs on the side street; driveways typically are not signed. RIRO access points along US-60/Grand Avenue commonly provide access to private properties.
2. Three-Quarter Intersections – Three-quarter intersections provide RIRO and left-in access only and are generally controlled by either STOP or YIELD signs.
3. Full Access Intersection – Full access intersections generally allow all traffic movements on all approaches. These intersections are either STOP controlled on both side street approaches or traffic signal controlled.

Each access point is illustrated in ***Appendix TM1-1*** and detailed in tabular form in ***Appendix TM1-3.*** Generally, the corridor was divided into the eastbound and westbound directions and reviewed based on direction between each major intersection. Intersection density, or spacing, was documented based on the

average distance between access points, which is also illustrated in ***Appendix TM1-1.*** General observations include:

1. Westbound US-60/Grand Avenue has nearly 150% more access points than the eastbound direction.
2. The BNSF Railway presence lowers access density on the side of the railroad.
3. RIRO access was the most prevalent access type.

Construction plans and activities in the corridor were underway at the time of this review, and are expected to affect some of the access points documented herein, including removals or changes of access type. Future documentation of this study is anticipated to reflect these changes.

3.2.1. Access Management

Access management is the careful control of the location, spacing, design, and operation of public intersections, private driveways, medians and median openings to a roadway. It involves roadway design applications such as median treatments, auxiliary turn lanes and the appropriate spacing of traffic signals. The contemporary practice of access management extends the concept of access design and location control to all roadways – not just limited access highways or freeways. Access management is particularly important along major arterial streets and other principal roads whose primary function is the safe and efficient movement of traffic. The overall benefits of access management include improved roadway operation and safety, preserves market area for businesses, and maintains more efficient freight movement. ***Appendix TM1-4*** provides a comprehensive assessment of the existing access management conditions in the study area. Key findings derived from the data in this appendix are presented below.

Traffic Signal Spacing

Traffic signal spacing is an important factor to achieve progressive traffic flow for both directions of traffic. For example, traffic signal spacing at about 1/2-mile intervals facilitates bi-directional traffic flow on major arterial streets. The existing traffic signal spacing on US-60/Grand Avenue is irregular with many signals located closely together, affecting operations and capacity.

Turn Lanes

While frequent left and right-turn opportunities provide a convenient and direct trip to a destination, these access points adversely affect major arterial street operations and safety.

The following left-turn observations were identified on US-60/Grand Avenue:

- Many left-turn lanes are under-designed by current standards, such as insufficient taper, deceleration and storage lengths, resulting in traffic backup into the inside through lane.
- Northwest of SR-101L most left-turn lanes are longer, ranging from 300 to 500 feet, whereas southeast of SR-101L many left-turn lanes are shorter.
- Many median section areas are narrow for the installed left-turn lanes.
- Left-turn bays are closely spaced with up to three left-turn bays in a 1/4 mile segment.
- U-Turn bays are short with insufficient deceleration and storage.
- Extra storage for left-turns delayed by train blockage needs to be evaluated at railroad crossing locations.
- Insufficient median widths to accommodate left-turns are found at uncontrolled access points.

Appendix TM1-5 exhibits an existing left turn storage length inventory for existing access points along the US-60/Grand Avenue corridor.

The following right-turn observations were identified on US-60/Grand Avenue:

- There is a high frequency of right-turn locations.
- Some right-turn lanes provided are short in length.
- Not all right-turn locations have a right-turn lane, full shoulder or taper, which affects through traffic by causing slowing and rear end crashes in the through traffic lane.

Driveways

The number of driveways directly affects the operation and safety of a roadway. There are several sections along US-60/Grand Avenue where driveways are frequent and closely spaced. All driveway locations should be well-spaced to help spread out the access related maneuvers and conflict points. Consolidating driveway connections and providing a safe and reasonable alternative route via a lower functional classification public street will generally yield positive results.

The driveway design generally found on US-60/Grand Avenue is a curb-cut. These types of driveways require very low speeds and have very small radii with usually narrow widths. Private driveway design can be improved to reduce impacts on the roadways. If the driveway is busy, the curb-cut design can be converted into a minor street intersection design with curb radius returns to accommodate the selected design.

Sight Distance

Sight distance is a critical element to roadway design. Several location of concern were observed through a field visit, and largely attributed to overgrown landscaping and fencing/barriers. A detailed engineering sight distance review of the corridor was not performed by this study.

Frontage Roads

There are parallel frontage road segments along US-60/Grand Avenue between Dysart Road and Thunderbird Road, and a few other short segments, including between 91st and 92nd Avenues. The roads that connect frontage roads and US-60/Grand Avenue create very closely spaced intersections. These connections provide limited capacity and have operational difficulties.

3.3. Railroad

The BNSF Railway has an active rail line adjacent to US-60/Grand Avenue throughout the study areas as follows:

- SR-303L through 75th Avenue – Tracks are on the north and east side of US-60/Grand Avenue.
- 75th Avenue to 71st Avenue – Tracks cross from the north and east side to the south and west side of US-60/Grand Avenue.
- 71st Avenue to McDowell Road – Tracks are on the south and west side of US-60/Grand Avenue.
- McDowell Road to the east – Tracks curve away from US-60/Grand Avenue and run north-south, paralleling the west side of 19th Avenue.

Several railroad related facilities are located in the study area. The El Mirage Vehicle Facility, owned and operated by the BNSF Railway, is located between Greenway Road and Thunderbird Road, on the north side of US-60/Grand Avenue. The Phoenix Intermodal Facility, located between Bethany Home Road and Camelback Road, serves several downtown Phoenix industrial business areas.

Several railroad spurs and parallel double tracks in connection with the main railway are located in the study area. Two spurs cross US-60/Grand Avenue within the study area. One spur crossing, the Ennis Wye, is located at Santa Fe Drive, adjacent to the El Mirage Vehicle Facility; the other is approximately 2,000 feet south of the 67th Avenue overpass.

Due to the BNSF Railway paralleling US-60/Grand Avenue, there are many at-grade railroad crossings next to US-60/Grand Avenue throughout the study area. The railroad, however, limits the number of access points along the railroad side of US-60/Grand Avenue to major arterial roadway. Due to the railroad proximity, most intersections have coordinated traffic signal pre-emption with the BNSF Railway track to clear traffic as a train approaches.

3.4. Utilities

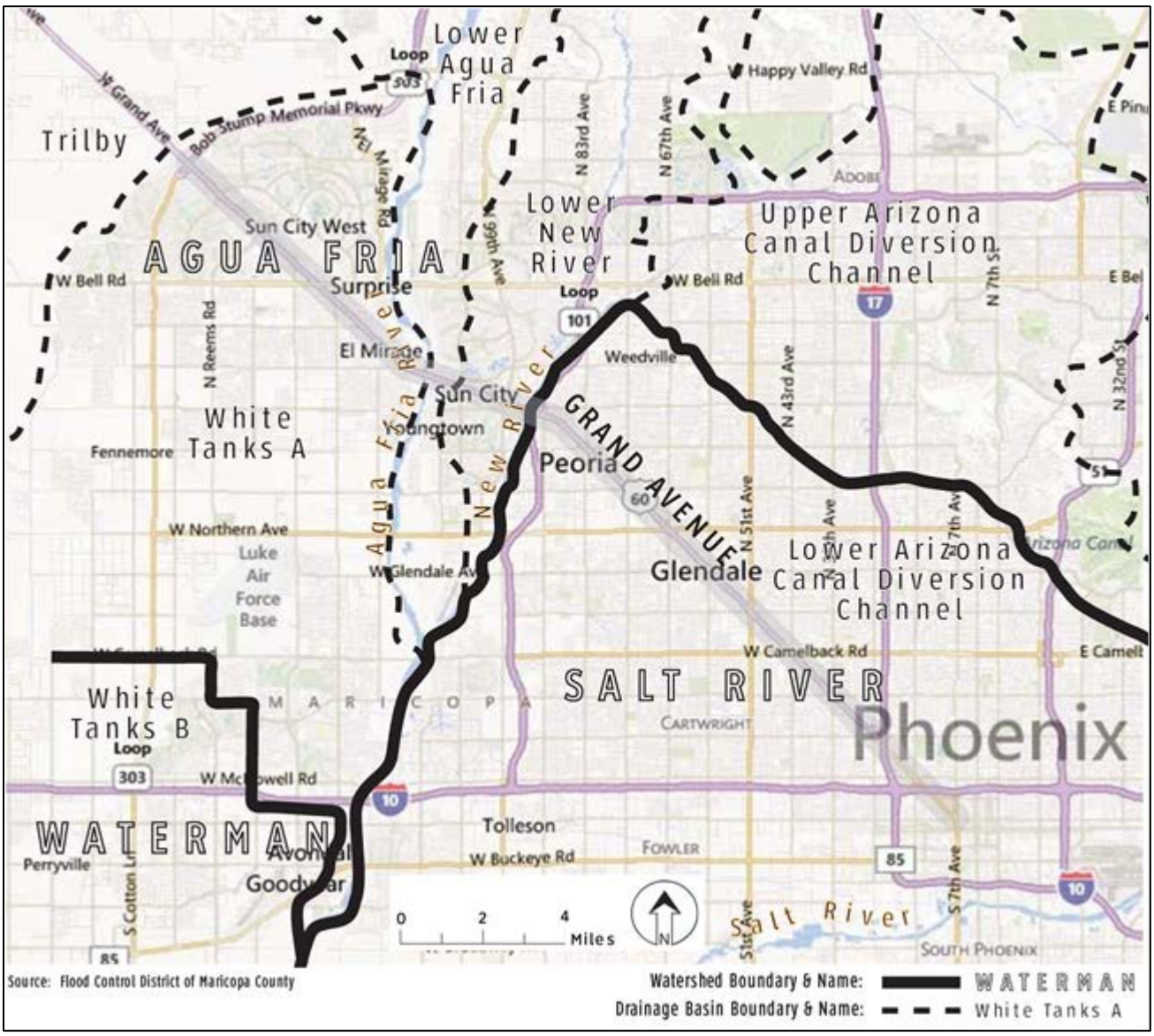
Numerous utilities are located throughout the study area and are summarized by owner in ***Table 1*** as provided by a Blue Stake review. An in-depth utility investigation was not performed as part of this study. Key utility considerations include: 1) Grand Canal located near Osborn Road; and 2) High voltage electrical lines paralleling the corridor.

Table 1 – Existing Utilities			
Utility Company	**Type**	**Contact Name**	**Telephone**
ADOT	Culverts, electric, fiber optic gas, irrigation, lighting, propane, sewer, storm drain, telephone, signals, water	Scott Vollrath	602-712-6665
ADOT	Culverts, storm drain	Irv Van Enwyck	928-684-2131
APS	Electric	Jolie Burow	602-493-4225
Arizona State University West	Electric, gas, telecom	David Plute	602-543-3215
AT&T	Fiber optic		800-241-3624
CenturyLink, Inc.	Coaxial, fiber optic		623-780-3350
City of El Mirage	Water, sewer	David Emon	623-876-4251
City of Glendale	Fiber	Casey Huskey	623-692-4892
City of Glendale	Water, sewer, flood irrigation, reclaimed water	Kevin Schell	623-930-2717
City of Glendale	Sprinklers	Joe Moreno	623-930-2687
City of Glendale	Traffic signals	Keith Robinson	623-853-6282
City of Peoria	Water, sewer, reclaimed water, fiber optic, storm drain, traffic signals	Dennis Whitney	623-773-7474
City of Phoenix Traffic Signals	Fiber optic, signals		602-262-6204
City of Phoenix Water Services Dept.	Water, sewer, reclaimed water		602-534-6979
City of Surprise	Water, sewer, reclaimed water, fiber optic, street lights, traffic signals		623-640-0221
Cox Communications	Cable TV, fiber optic	Gwendalyn Garcia	623-328-4073
El Paso Natural Gas	Natural gas	Dennis Randolph	602-980-0628
EPCOR Water	Water, sewer	Dave Ortiz	602-358-4458
FCDMC	Electric, storm drain, water	Rose Wiley	602-980-6142
Integra Telecom/Southwest Fiber Net	Fiber optic		888-267-1063
Level 3 Communications	Fiber optic	Judy Henry	877-366-8344
MCDOT	Traffic signals	Steve Poole	602-506-8660
Maricopa Water District	Irrigation	Chris Cain	623-546-8266
MCI	Fiber optic		800-624-9675
Peoria Unified School District #11	Communication, fiber, security	Amanda Goelz	320-963-2400 x2456
Peoria Water Users Association, Inc.	Irrigation		623-487-3808
Roosevelt Irrigation District	Irrigation	Ken Craig	623-386-2046
Salt River Project	Electric, irrigation, communication, fiber		602-236-8026
Southwest Gas	Natural gas	Rick Torres	623-780-3350
Southwest Gas High Pressure	High pressure gas	Andy Lugo	602-484-5345
Transwestern Pipeline Co.	Gas	Molly Carriere	832-668-1136

3.5. Drainage

The study area is located within two regional watersheds that generally drain from the northeast to the southwest: 1) Agua Fria River-Middle Gila River and 2) Salt River. ***Figure 2*** shows the boundaries of these two watersheds and drainage sub-basins recognized by the FCDMC. The portion of the study area north of SR-101L is affected by drainage associated with three sub-basins: 1) White Tanks A, 2) Lower Agua Fria, and 3) Lower New River. The southern portion of the study area is located within and affected by drainage in the Lower Arizona Canal Diversion Channel Sub-Basin. Key considerations affecting drainage within the study area include the Agua Fria River, New River, Grand Canal, BNSF Railway, three major detention/retention basins, and four major drainage channels. There is also one storm water pump station located in the study area at 75th Avenue and Olive Avenue. A comprehensive drainage overview is presented in ***Appendix TM1-6***.

Figure 2 – Watersheds and Drainage Sub-Basins Affecting the Study Area



3.6. Right-of-Way

The US-60/Grand Avenue corridor right-of-way varies throughout the study area, ranging from approximately 90 feet to over 600 feet at realigned grade separations. ***Table 2*** below lists an approximate right-of-way width found along segments of US-60/Grand Avenue. Approximate right-of-way widths are also depicted in ***Appendix TM1-1***.

Table 2 – Approximate Right-of-Way Widths

Segment of US-60 (Grand Avenue)	Approximate Right-of-Way Width
SR-303L to Dysart Road	170 feet
Dysart Road the Agua Fria River	215 feet
the Agua Fria River to 99th Avenue	110 feet to 140 feet (varies)
99th Avenue to SR-101L	133 feet
SR-101L to 91st Avenue	145 feet to 172 feet (varies)
91st Avenue to 83rd Avenue	120 feet
83rd Avenue to Cotton Crossing	165 feet
Cotton Crossing to 75th Avenue	120 feet to 143 feet (varies)
75th Avenue to 71st Avenue (BNSF Railway Underpass)	120 feet to 600 feet +/- (varies)
71st Avenue to 63rd Avenue	95 feet
63rd Avenue to Missouri Avenue	93 feet to 120 feet (varies)
Missouri Avenue to Camelback Road (43rd Avenue Overpass)	97 feet to 600 feet +/- (varies)
South of Camelback Road (43rd Avenue Overpass) to 39th Avenue	100 feet
39th Avenue to 31st Avenue	97 feet to 115 feet (varies)
31st Avenue to 29th Drive	179 feet to 194 feet (varies)
31st Avenue to 24th Avenue (27th Avenue Overpass)	194 feet to 600 feet +/- (varies)
24th Avenue to McDowell Road	108 feet

3.7. Structures

Arizona State Highway System Bridge Record information for existing bridge structures within the project limits is summarized in ***Table 3***.

Table 3 – Existing Bridge Structures

Structure Number	US-60 MP	Structure Name	Total Structure Length
2185	146.17	US-60 Bridge Over Agua Fria River	504'-0"
895	148.80	New River Bridge EB	360'-0"
314	148.80	New River Bridge WB	360'-0"
2047	148.91	Grand Avenue TI Overpass	188'-0"
1831	152.29	Peoria BNSF RR EB Overpass	332'-6"
2699	153.30	67th Avenue Underpass	786'-3"
2698	154.80	59th Avenue / Glendale Avenue Underpass	95'-6"
2707	155.30	Maryland Avenue Underpass	498'-0"
2650	156.18	51st Avenue Underpass	361'-1"
2651	157.25	Street Connector 43C Overpass	274'-8"
2652	157.50	Eastbound Viaduct (43rd Avenue/Camelback Road)	500'-6"
2653	157.50	Westbound Viaduct (43rd Avenue/Camelback Road)	603'-2"
178	159.55	Grand Canal Bridge	37'-2"
2723	160.20	Street Connector "C" Overpass	232'-9"
1695	160.24	BNSF Railway Overpass Eastbound	108'-9"
1948	160.24	BNSF Railway Overpass Westbound	108'-9"
2729	160.35	27th Avenue Overpass Eastbound	148'-11"
2730	160.35	27th Avenue Overpass Westbound	146'-8"
2690	160.44	Thomas Road Overpass Eastbound	141'-4"
2691	160.44	Thomas Road Overpass Westbound	140'-6"
1953	201.70 (*)	US-60 TI Underpass	403'-3"

(*) I-17 MP

3.8. Geotechnical Information

Based upon an existing document review, soils within the US-60/Grand Avenue study area vary, but typically do not require exceptional design considerations. An area of known subsidence is located southwest of US-60/Grand Avenue, from approximately Bell Road to Waddell Road, although it is not anticipated to impact potential improvements within the US-60/Grand Avenue study area. An in-depth geotechnical investigation was not performed as part of this study.

3.9. Lighting

Roadway lighting along US-60/Grand Avenue in the study area is non-continuous. Lighting is provided at 38 of the corridor's 39 signalized intersections (including one signalized intersection not in use). Intersection lighting is not provided at the signalized intersection of US-60/Grand Avenue and 113th Avenue. ***Table 4*** provides the spans of continuous lighting along the US-60/Grand Avenue and the placement of the roadway lighting. All illuminated sections are depicted on the Map Book in ***Appendix TM1-1***.

Table 4 – Existing Continuous Roadway Lighting Spans

US60/Grand Avenue Segments with Continuous Lighting	Lighting Placement
MP 140.8 to MP 141.3	South Side
Litchfield Road to Dysart Road	South Side
Sunny Lane to Primrose Street	South Side
91st Avenue to MP 151.6	Both Sides
Butler Drive to Northern Avenue	North Side
Northern Avenue to Myrtle Avenue	Both Sides
MP 154.5 to MP 154.9	Median
57th Drive to 55th Drive	Both Sides
55th Drive to MP 157	South Side
MP 157 to MP 157.5	Median
MP 157.5 to MP 160	Both Sides
MP 160 to MP 160.8	Median
MP 160.8 to Willetta Street	Both Sides

3.10. Intelligent Transportation System

The US-60/Grand Avenue study area includes 38 operating signalized intersections, summarized in ***Table 5.*** Twenty-seven of the signalized intersections use video detection. All intersections west of Cotton Crossing, inclusive, and the intersection at Myrtle Avenue, are equipped with the video detection. Sun City West, Surprise, El Mirage, Youngtown, Sun City, and Peoria have adopted the video detection systems. Loop detectors are widely used for Glendale and Phoenix intersections in the study area.

Table 5 – Signalized Intersections

Intersecting Street	Vehicle Detection
SR-303L Frontage Road	Video
Sunrise Boulevard/RH Johnson Boulevard	Video
Reems Road/Meeker Boulevard	Video
Parkview Place	Video
Surprise Pavilions	Video
Mountain View Boulevard	Video
Litchfield Road	Video
Towne Center Drive	Video
Bell Road	Video

Table 5 – Signalized Intersections	
Intersecting Street	**Vehicle Detection**
Belle Grande Drive	Video
132nd Avenue	Not In Use
Dysart Road	Video
Greenway St	Video
Primrose St	Video
Thompson Ranch Road	Video
113th Avenue	Video
111th Avenue	Video
107th Avenue/Del Webb Boulevard	Video
103rd Avenue	Video
99th Avenue	Video
SR-101L South On-Ramp	Video
SR-101L North Off-Ramp	Video
91st Avenue	Video
85th Avenue	Video
Peoria Avenue	Video
83rd Avenue	Video
Cotton Crossing	Video
75th Avenue and Olive Avenue SB Off-Ramp	Loop
Royal Palm	Loop
Northern Avenue	Loop
Myrtle Avenue	Video
57th Drive	Loop
Bethany Home Road	Loop
35th Avenue and Indian School Road NB Off-Ramp	Loop
33rd Avenue	Loop
31st Avenue	Loop
Osborn Road	Loop
Encanto Boulevard	Loop
McDowell Road and 19th Avenue	Loop

MAG's ITS Strategic Plan has identified Grand Avenue as a SMART corridor. SMART Corridors provide an arterial link through an urban area passing through multiple jurisdictions. The SMART corridor will include a range of traffic management devices, such as traffic signals, controllers, vehicle sensors, cameras, and electronic message boards, all operated and managed by controlling agencies.

ADOT, Phoenix, and Glendale currently manage the traffic signals along the corridor, while the intersecting arterial street network is managed by the adjacent cities. Peoria, Glendale, and Phoenix have operating traffic management centers and coordinate their respective traffic signals.

New traffic signal coordination timing plans were implemented in 2012 to improve the flow of traffic along US-60/Grand Avenue between 163rd Avenue and McDowell Road. The AM peak, PM peak, and off peak (midday) periods were analyzed favoring southeast progression in the AM, northwest progression in PM and balanced progression in both directions during the Off Peak periods. Changes to traffic signal cycle lengths, green times, offset values, and split lengths were made and resulted in reduced travel times and reduced number of stops, facilitating an increase in average speed as well as a reduction in total delay, fuel consumption, and emissions.

4.0 Land Use

The US-60/Grand Avenue study area corridor traverses through six incorporated cities and unincorporated Maricopa County. The corridor plays a historic role in shaping land uses and this role is projected to change over time as redevelopment and future roadway improvements are implemented. ***Table 6*** shows the governmental entities with land use jurisdiction along the corridor (Maricopa County, Surprise, El Mirage, Youngtown, Peoria Glendale, and Phoenix).

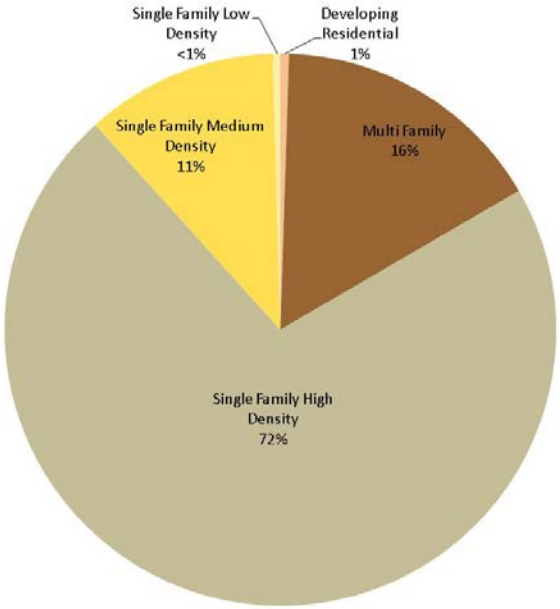
The corridor includes a mix of land uses within a half mile of the corridor, which are shown in ***Table 6***. Land use immediately adjacent to US-60/Grand Avenue is illustrated in ***Appendix TM1-1***. Depending on the location, the land uses change from industrial to commercial to residential. There are more residential uses in Surprise, and downtown uses in Glendale and Peoria transitioning to industrial and employment uses located along the railroad in the Phoenix portion. The corridor is primarily built out with approximately eight percent vacant land available for development. ***Table 6*** does not reflect the under-utilized land that will be transitioned over time as improvements are made to the corridor.

Table 6 - Land Use Within Half-Mile of Study Area

Land Use	Acres	Percentage
Active Open Space	189.7	1.2%
Agriculture	302	2.0%
Cemetery	104.2	0.7%
Developing Employment Generating	23.2	0.2%
Developing Residential	29.2	0.2%
Educational	337.5	2.2%
Golf Course	516.8	3.4%
Industrial	2100.3	13.7%
Institutional/Religious	128.6	0.8%
Medical/Nursing Home	322.2	2.1%
Multi Family	943.4	6.2%
Office	91.6	0.6%
Other Employment	102.5	0.7%
Passive/Restricted Open Space	139.6	0.9%
Public/Special Event/Military	538.5	3.5%
Retail High	210.6	1.4%
Retail Low	1003.5	6.5%
Single Family High Density	4194.1	27.4%
Single Family Low Density	25.5	0.2%
Single Family Medium Density	659.2	4.3%
Tourist Accommodations	54.4	0.4%
Transportation	1888.7	12.3%
Vacant	1275.8	8.3%
Water	150.4	1.0%
Grand Total	**15331.5**	**100%**

As shown in ***Figure 3***, Single family high density residential represents the largest portion of residential land use (72%) along the corridor. This is largely due to the master planned communities around the Surprise area. Single family medium density and multi-family residential constitute the majority of the remaining residential land uses.

Figure 3 - Residential Land Uses



As shown in ***Figure 4***, Industrial (54%) land use constitutes the majority of employment along the corridor, largely due to BNSF Railway access. Retail (31%) constitutes a large percentage of the corridor employment land uses. Small shops to support the employment uses, downtown type retail, and some large retail establishments are located along US-60/Grand Avenue.

Figure 4 - Employment Land Uses

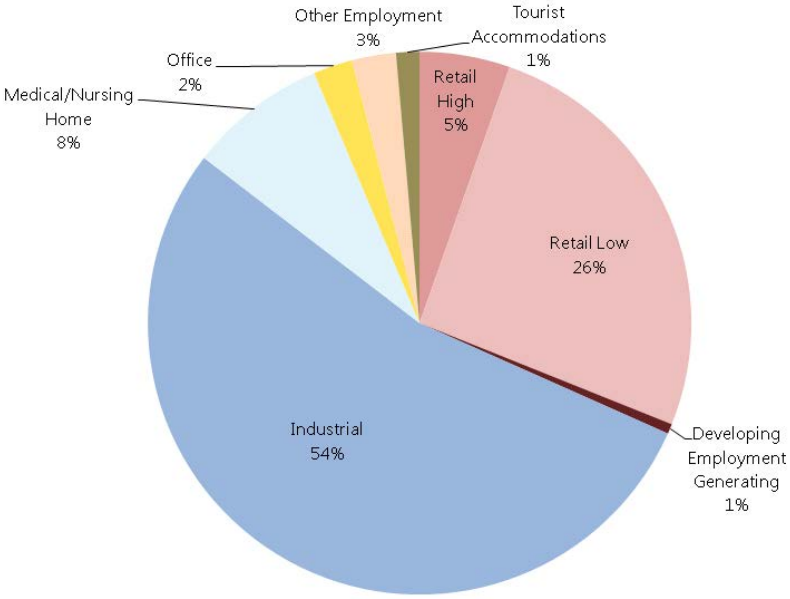
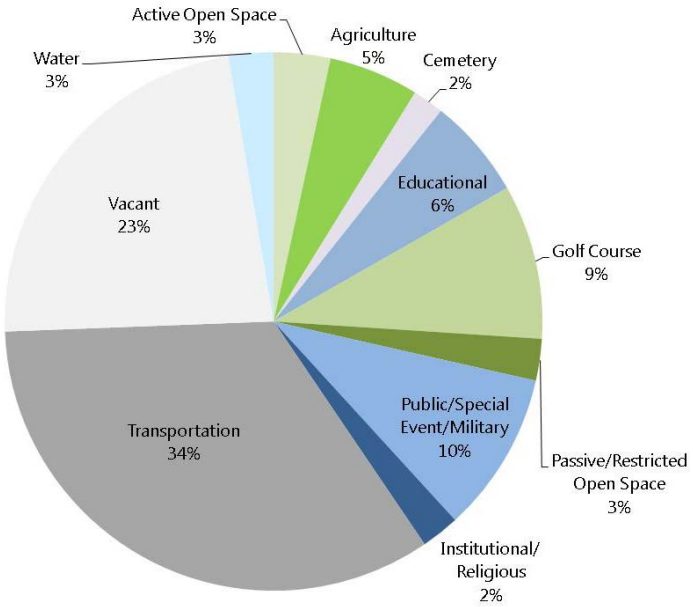


Figure 5 indicates the breakdown of the other corridor land uses. Transportation (which includes the BNSF Railway) constitutes 34% while vacant land is 23%. These two land uses comprise the majority of the "other land use" category.

Figure 5 - Other Land Uses



4.1. Surprise Land Use

4.1.1. Existing Land Use

Surprise is located in the northwest sector of the Phoenix Metropolitan Area along the US-60/Grand Avenue corridor. Surprise is the gateway to the greater metropolitan area for travelers coming from Las Vegas and other northwestern places. Sun City and Sun City West, both unincorporated, are adjacent to the eastern boundary of Surprise's planning area and along US-60/Grand Avenue.

The *Surprise General Plan 2035* is an update of the 2001 *General Plan 2020: "Imagine the Possibilities"* and was ratified by voters on November 5, 2013. An interim update (*General Plan 2030: One City, Many Choices*) had previously been adopted by council (2008) but was not ratified by voters.

The US-60/Grand Avenue planning area includes Surprise Villages 1 and 2. The existing land uses within Surprise along the US-60/Grand Avenue corridor are primarily commercial with some low density residential and employment uses. Village 1 is 5,805 acres and is bisected by US-60/Grand Avenue. It contains many underutilized and vacant parcels that could benefit from redevelopment as mixed-use projects. US-60/Grand Avenue and Bell Road are both corridors of intense commercial activity. Village 1 includes the Surprise Original Town Site that is bisected by US-60/Grand Avenue and Surprise Center just south of US-60/Grand Avenue, near Litchfield Road.

Village 2 is the central residential community within the Surprise planning area. The Village encompasses several different neighborhoods including (but not limited to) Sun City Grand. Most of the neighborhoods are

master planned communities that include private parks and clubs for each neighborhood. US-60/Grand Avenue is the northern boundary of Village 2 from Reems Road to SR-303L. The village is approximately 21,504 acres.

4.1.2. Future Land Use

Surprise's future planned land use from the *Surprise General Plan 2035* is shown in ***Figure 6***. Surprise urban form and character are dictated by the development of villages throughout the planning area. The intent of these villages is to create areas where residential, commercial, employment, and community uses are present. Higher densities may be allowed in the village core. Villages are connected with an integrated multimodal transportation system.

Over the next 25 years, Surprise Village 1 will undergo tremendous change according to the *Surprise Center Village* plan. Village 1 is and intended to remain the civic, economic, and cultural center of Surprise. The village also contains the Surprise Center District, which is home to the regional and municipal public and civic uses as well as world-class sports and recreational facilities. Surprise Center is projected to become a major mixed-use destination.

4.2. Maricopa County Land Use

4.2.1. Existing Land Use

The *Maricopa County 2020, Eye To The Future* is the County's comprehensive plan to guide decisions about growth and development. It defines the County's future vision and considers the relationship of planning activities over the entire unincorporated County. Within the US-60/Grand Avenue COMPASS study area, the only unincorporated land that falls under the jurisdiction of Maricopa County is primarily in Sun City and Sun City West. These age-restricted master planned residential communities are fully built out. The master plans include supportive commercial, office, recreation, and healthcare land uses.

4.2.2. Future Land Use

Planned land uses from *Maricopa County 2020, Eye To The Future* are shown in ***Figure 7***. The Sun City and Sun City West master plans are fully built out and the land uses are planned to remain constant.

Figure 6 – Surprise Future Land Use

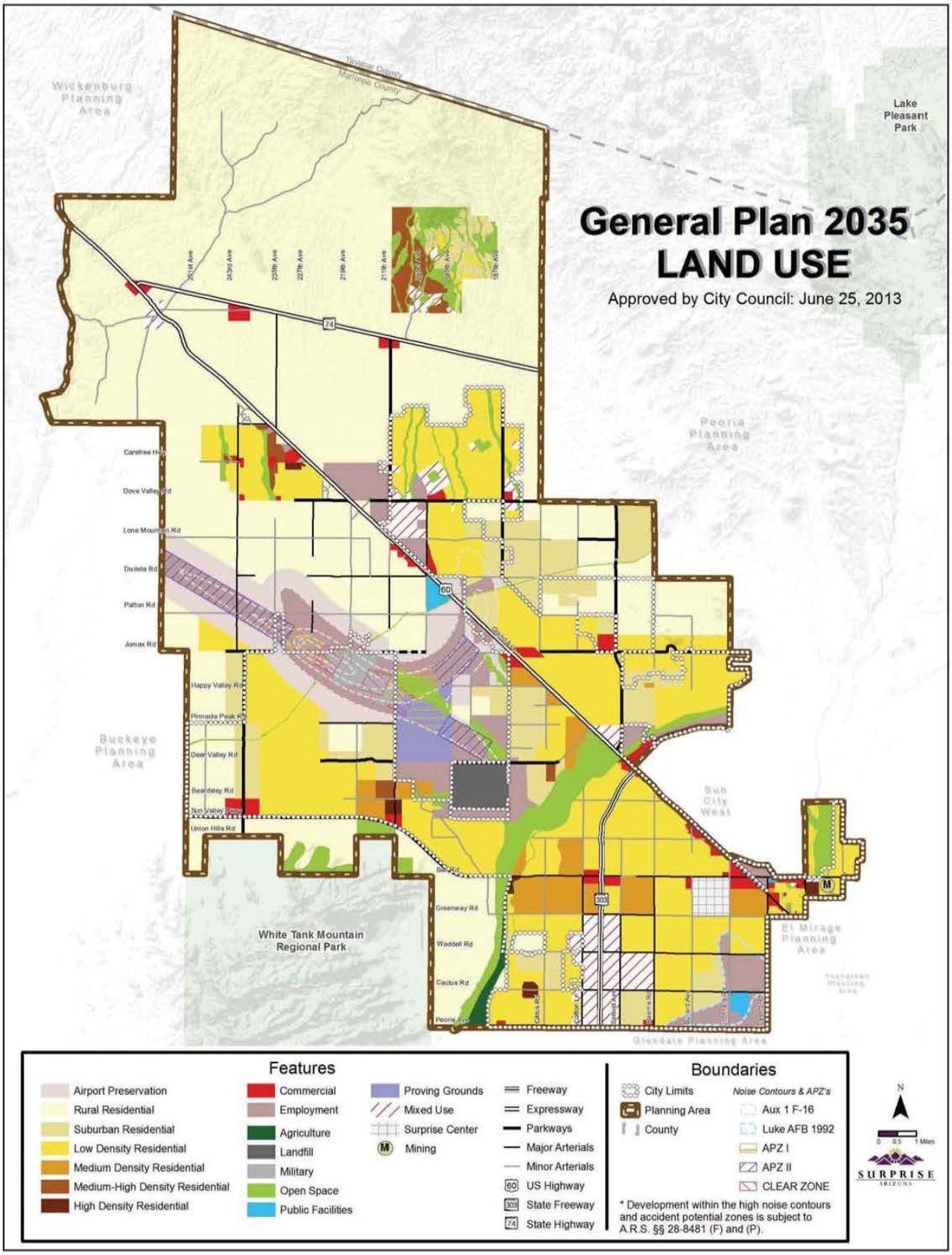
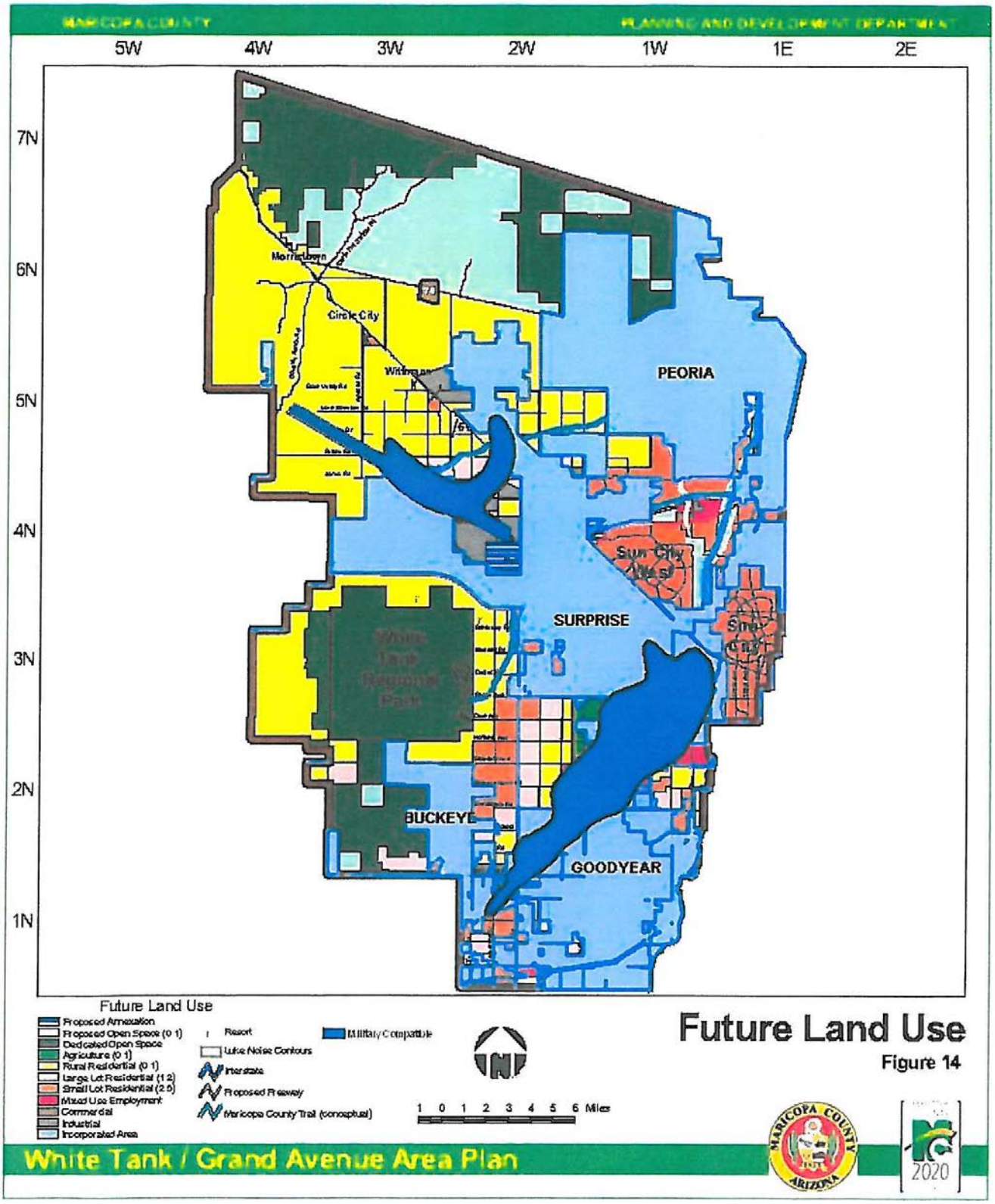


Figure 7 – Maricopa County Future Land Use



4.3. El Mirage Land Use

4.3.1. Existing Land Use

The *El Mirage General Plan* (December 28, 2009, amended in 2011) provides development and land use guidance. Current land uses along US-60/Grand Avenue are generally industrial on the north side of the corridor and primarily business on the south side. According to the General Plan, the BNSF Railway and US-60/Grand Avenue form a barrier, separating areas north and south of the corridor, which presents unique challenges for downtown. As a community that is land-locked, El Mirage must maximize its existing land uses. Luke AFB is an important economic driver in the West Valley but also impacts El Mirage. The General Plan describes mitigation measures that may allow El Mirage to minimize the impact while supporting the Base's mission and operations. US-60/Grand Avenue and Thompson Ranch Road are 4.5 nautical miles from Luke AFB's runway end, which requires a maximum allowable building height of 400 feet. The US-60/Grand Avenue corridor is just outside the Luke AFB 65 dnl noise contours and is not within any accident potential zones that might limit potential land uses.

Downtown El Mirage encompasses development on both sides of US-60/Grand Avenue. The area represents a mix of land uses with under-utilized land that could be redeveloped.

El Mirage's Vision Statement is:

> ***Our Oasis Vision -*** *A thriving desert jewel with a strong arts district, revenue generating uses, transit oriented development, high-wage employment opportunities, a well-defined river front, high-quality mixed-use neighborhoods and well defined parks system joined together by a cohesive, multiuse accessible trail system and carefully landscaped roadways offering access, alternative modes of transportation and enhanced mobility for people and goods; a sustainable community that serves as the gateway of the Northwest Valley and an economically vibrant destination offering a safe place to live, work and play; quality educational opportunities; engaging gathering places; world class entertainment; recreational and cultural amenities available for all; and a variety of economic opportunities for its workforce.*

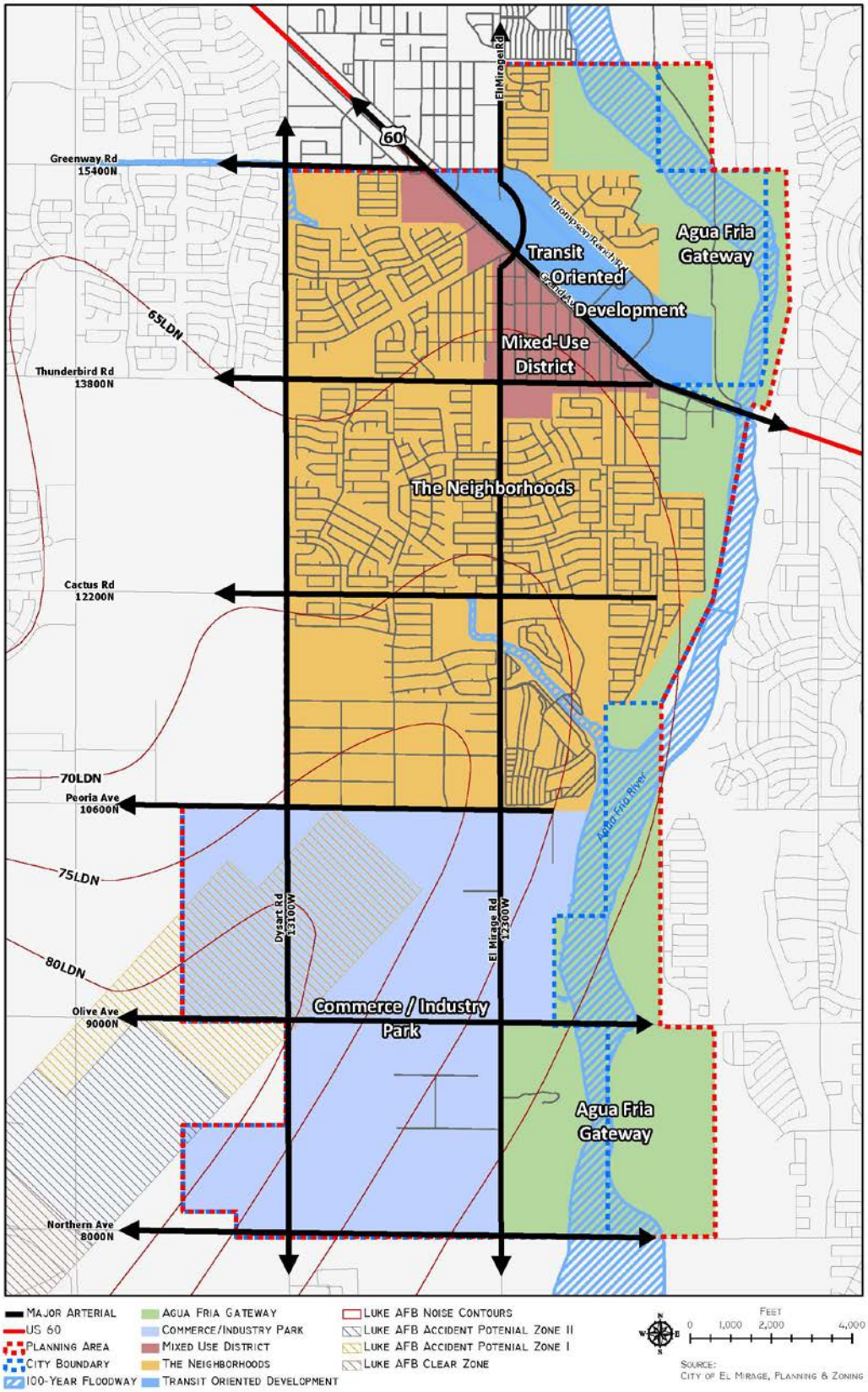
4.3.2. Future Land Use

El Mirage planned land use from the *El Mirage General Plan* (December 28, 2009, amended in 2011) is shown in ***Figure 8***. El Mirage's downtown is anticipated to develop as a mixed-use area that attracts 24-hour activity. There is prime vacant land located along the BNSF Railway corridor that can support future mixed-use development. With the realignment of El Mirage Road as the General Plan discusses, the north and south portions of downtown El Mirage will be better connected from a land use and pedestrian-orientation. It will also encourage transit-oriented development north of US-60/Grand Avenue.

Designating future growth areas is a critical component of municipal general plans and a state requirement. The north side of US-60/Grand Avenue is designated as "transit oriented development" and the southern portion is "Mixed-Use District." The El Mirage General Plan anticipates that most new development will occur in the area south of Peoria and north of US-60/Grand Avenue. Previous studies indicating commuter rail along US-60/Grand Avenue support the opportunity for the new mixed-use development pattern. The MAG High-Capacity Transit Study identified a commuter rail stop in El Mirage. While commuter rail is still many years from implementation, the General Plan recognized this opportunity to capture a unique regional transit service.

In addition, the General Plan identifies the Grand Avenue Character Area, which defines US-60/Grand Avenue as a boulevard, with a distinctive landscape and colorful, dominant gateways. The Character Area describes the specific design designations for the areas. The El Mirage General Plan discusses the importance of "placemaking" and designates key gateways on US-60/Grand Avenue. These gateways are intended to convey a sense of arrival that enhances the experience of the traveler. Through landscaping, architecture, and design these gateways define the entrances to El Mirage and the different planning areas within it.

Figure 8 – El Mirage Future Land Use



4.4. Youngtown Land Use

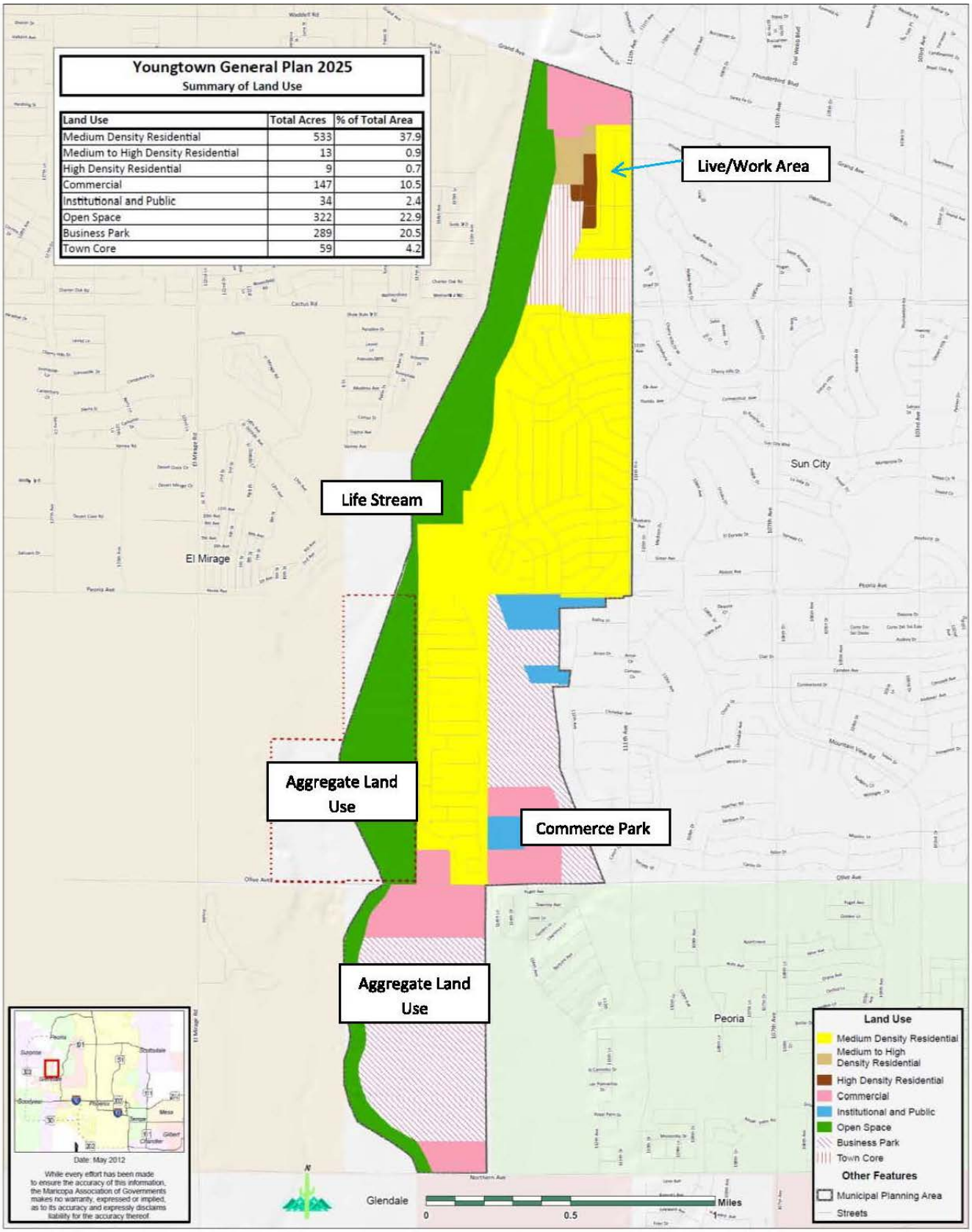
4.4.1. Existing Land Use

The *Youngtown General Plan* was completed in 2003 and is the policy guide for growth and development. US-60/Grand Avenue forms the northern boundary of Youngtown, with approximately one-half mile of frontage. Access to Youngtown from US-60/Grand Avenue is via signalized intersections at 111th and 113th Avenues. Youngtown adopted a general plan update in June 2014 (*Youngtown General Plan 2025*) that is awaiting voter ratification on November 4, 2014.

4.4.2. Future Land Use

Youngtown planned land use from the *Youngtown General Plan* is shown in ***Figure 9***. The General Plan identifies the 113th Avenue connection to US-60/Grand Avenue as an opportunity to focus commercial development and create a gateway to Youngtown. The Town is supportive of commuter rail service using the BNSF Railway tracks along US-60/Grand Avenue. The area along US-60/Grand Avenue, north of Wisconsin Avenue, is one of three growth areas identified within the Town. Along with greater visibility, desired development consists of "higher intensity retail uses, supermarkets, large retail, strip center, entertainment uses, regional or community retail uses."

Figure 9 – Youngtown Future Land Use



Land Use	Total Acres	% of Total Area
Medium Density Residential	533	37.9
Medium to High Density Residential	13	0.9
High Density Residential	9	0.7
Commercial	147	10.5
Institutional and Public	34	2.4
Open Space	322	22.9
Business Park	289	20.5
Town Core	59	4.2

4.5. Peoria Land Use

4.5.1. Existing Land Use

The *2011 General Plan* provides the policy guidance for Peoria's long-range growth and development. Old Town Peoria, the original town site and historic heart of Peoria, straddles US-60/Grand Avenue and the BNSF Railway tracks. The area's existing small, rural town structures and small-block grid system is reminiscent of Peoria's early development. Many of structures are still occupied and good candidates for restoration. The area surrounding US-60/Grand Avenue and the BNSF Railway is a mix of land uses including the Peoria City Hall, schools, Osuna Park, older neighborhoods, and small commercial and industrial uses. There are several vacant parcels interspersed in the area.

Old Town Peoria is showing signs of recovery from an extended period of economic decline. The Peoria Center for the Performing Arts was established in 2007 and is a cornerstone within the core area. US-60/Grand Avenue has been identified as divisive to community building efforts and provides limited access to the Old Town area. The SR-101L is located approximately 1.5 miles to the west and provides excellent consumer access to larger and newly constructed shopping opportunities in North Peoria and Glendale. Unfortunately, SR-101L has become a constraint by effectively bypassing Old Town. Additionally, rapid residential development has occurred predominantly in north Peoria.

The Grand Avenue Gateway was designated as a "Growth Area" in the General Plan. This growth area is oriented along the US-60/Grand Avenue corridor from Old Town Peoria to neighboring Glendale. The area south of US-60/Grand Avenue is largely designated and zoned for light industrial and business park uses. Although the area is largely vacant and/or underutilized, some of the land uses include the Municipal Operations Center, Peoria Industrial Park, SRP Steam Plant and the Navajo Asphalt Plant. The area north of US-60/Grand Avenue contains a mix of commercial, light industrial and older low-density single-family neighborhoods.

Peoria's Municipal Campus is in close proximity to the study area. The campus serves nearly all of Peoria's needs. Its design incorporates amenities such as gardens, an amphitheater, a public library and public gathering spaces. The Municipal Campus also contains much of the off-street public parking to support the area.

4.5.2. Future Land Use

Enhancing the development of the City Center is important to Peoria. Peoria has adopted several downtown plans, including the most recent *Old Town Specific Area Plan* in 2011. These plans provide direction for the redevelopment of the city core that is within the US-60/Grand Avenue study area. Land use designations along the US-60/Grand Avenue COMPASS corridor include future mixed-use centers, cluster housing, a transit center, and attractive warehouse center. Planned future land use in Peoria per the *2011 General Plan* is shown in ***Figure 10***. Peoria land uses are intended to reduce automobile dependency by promoting a higher density mixed-use development pattern that is tied to transit and is pedestrian-friendly.

The Grand Avenue Corridor District will support light industrial developments though a mix of land uses with an employment focus. Transit-oriented development is encouraged within the US-60/Grand Avenue study area, particularly in areas such as the former Wal-Mart/Zocalo site. US-60/Grand Avenue plays an important role within Peoria by carrying traffic into and through the core area. Gateways are identified along US-60/Grand

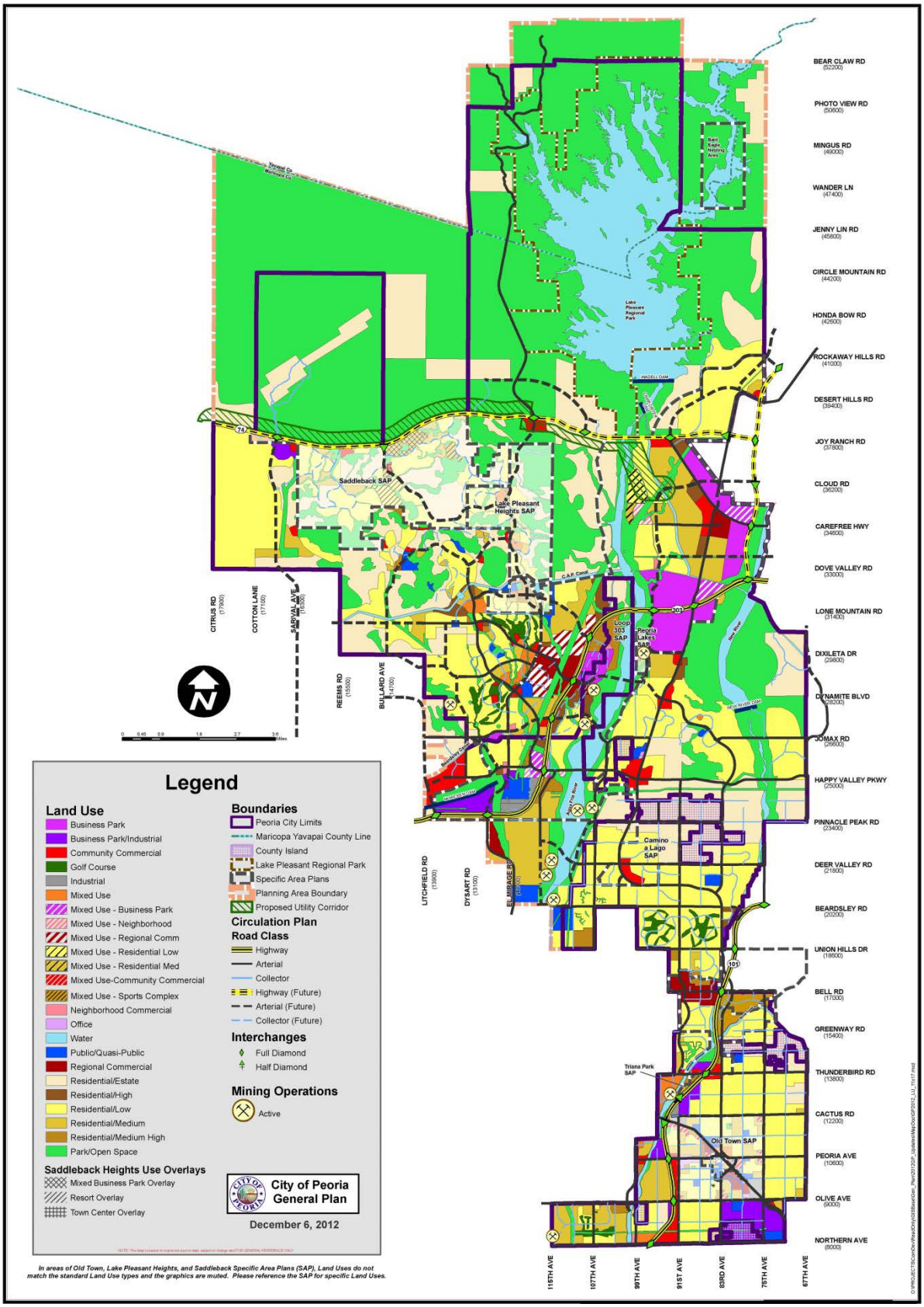
Avenue with the Old Town Gateway at 85th Avenue and Monroe Street. These areas serve as landmarks, providing a sense of arrival for the traveler.

US-60/Grand Avenue will continue to serve as a major regional artery, providing direct access to the greater Northwest Valley from downtown Glendale and Phoenix. Through recent improvements to the SR-101L, traffic on US-60/Grand Avenue now has direct access to SR-101L near 91st Avenue. This access enhances the service area for businesses located in the Grand Avenue Gateway Growth Area. As an added benefit, these trips pass through the heart of Peoria's Old Town, which provides the area with a steady supply of potential customers.

With the planned widening of Northern Avenue from 71st Avenue to the SR-101L, it is anticipated that this area will attract desirable office park and employment generating uses. Existing and future uses in this area will help establish this gateway as a vibrant employment center. Secondarily, it will increase the visibility of Old Town and will help capture the traffic needed to revitalize the area.

Peoria has an aggressive strategy for economic development. The Rovey Industrial Park that is located at the southwest corner of 75th Avenue and Grand/Olive Avenues is an important employment generating project. The park is 328 acres zoned for light industrial. Another key component of the economic development strategy is attracting higher educational institutions. Peoria Place is anticipated to become a college campus.

Figure 10 – Peoria Planned Future Land Use



4.6. Glendale Land Use

4.6.1. Existing Land Use

Glendale 2025: The Next Step General Plan was adopted on May 28, 2002 and ratified by voters; Glendale is currently updating its plan and anticipates adoption/ratification in 2016. The General Plan serves as the official policy statement that guides the physical development of Glendale. Existing employment land uses, including office and industrial sites, are somewhat limited and primarily focused along the US-60/Grand Avenue Corridor and downtown area. The traditional downtown core is bounded by 43rd to 67th Avenues/ Camelback Road to Northern Avenue, adjacent to the US-60/Grand Avenue corridor. The Civic Center includes many public buildings located adjacent to US-60/Grand Avenue. The downtown core area is largely pedestrian-oriented with small retail shops and park space located around the civic uses.

The *Glendale City Center Master Plan* (2002) suggests that the area west of US-60/Grand Avenue in City Center is perceived as needing special consideration in order to stabilize property values, eliminate blighting influences, and to promote more public and private investment. US-60/Grand Avenue is a physical barrier that is further complicated by the BNSF Railway. Particular attention is directed toward preserving residential affordability and value in and around the downtown. Traffic calming, as well as pedestrian and transit enhancements, are anticipated to be developed to encourage infill residential development.

Glendale's Vision Statement is:

> *The City of Glendale's Next Step, toward 2025 and beyond, is founded on dynamic community spirit, accountability for quality of living excellence and fiscal responsibility. The vision is to achieve all-encompassing balance in a community that is friendly, nurturing and safe for all citizens. Glendale's image is progressive, with emphasis on family values including: education, outdoor enjoyment, culture and economic vitality. The community supports economic and social diversity from well-maintained, clean, visually attractive urban neighborhoods to the spacious, outlying rural areas that is reminiscent of the community's agricultural heritage and strongly supports the mission of Luke AFB.*

4.6.2. Future Land Use

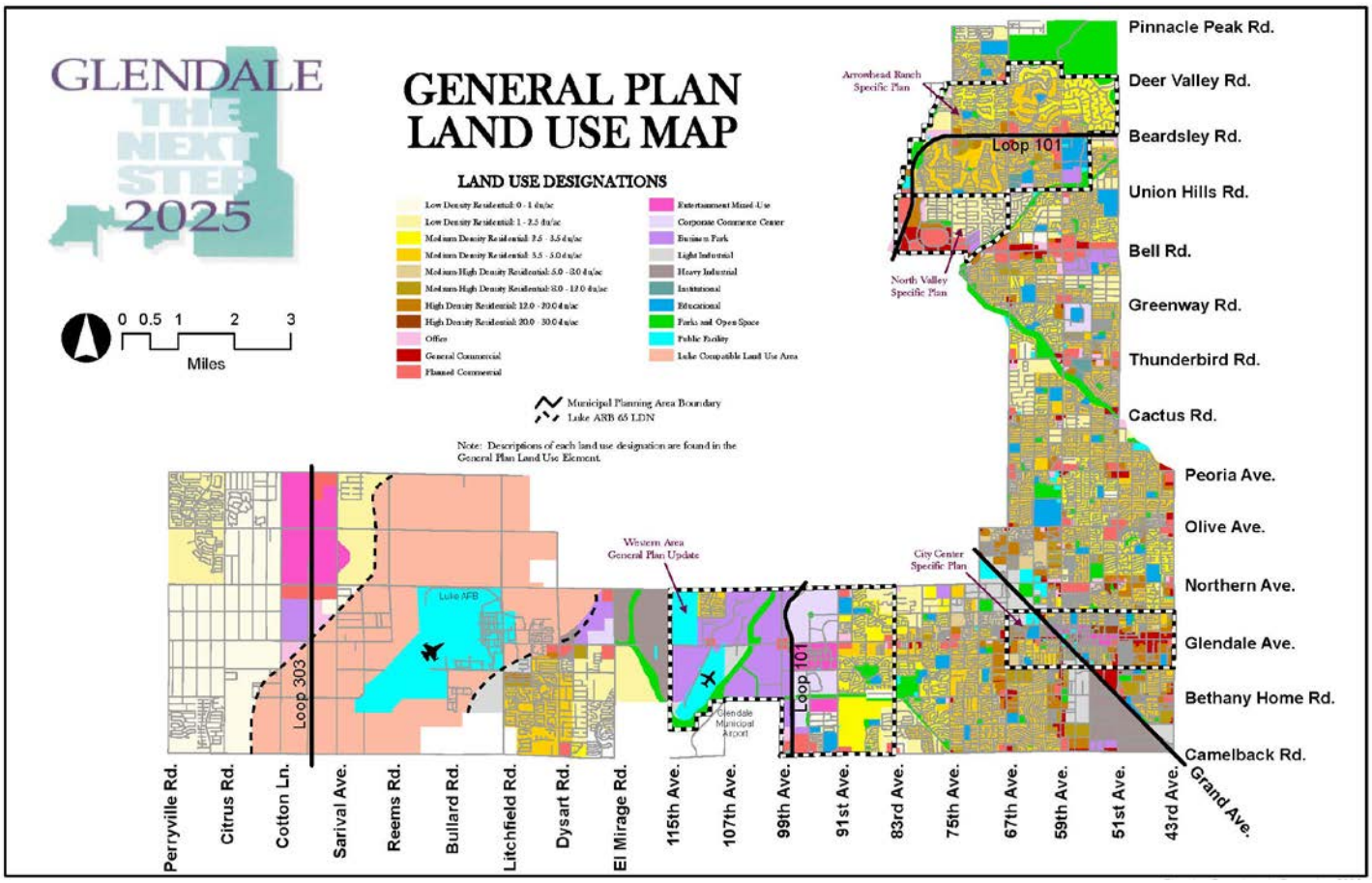
The City Center has been identified as a "Growth Area" within the *Glendale 2025: The Next Step* General Plan. The intent is for the City Center to become a vibrant, multi-cultural area where people are drawn from throughout the region for unique shopping, dining, cultural and entertainment experiences. It is anticipated to be a live and work area, with a diverse mix of businesses, new high quality residential developments and revitalized neighborhoods.

Details outlined in *Glendale City Center Master Plan* for this area include improving the land use mix, making transportation improvements, expanding retail and office functions, additional civic and cultural venues, more hospitality venues, and architectural and urban design guidelines. Glendale's future planned land use per the *Glendale 2025: The Next Step* is shown in ***Figure 11***. The civic center area also anticipates new infill housing to develop over time as new transportation improvements are made and employment developed.

Proposed improvements to pedestrian and vehicular circulation include construction of pedestrian bridges over US-60/Grand Avenue to improve connectivity of areas on either side. Additionally, the projected plans include walking and biking improvements as well as enhanced transit. These multimodal transportation improvements

would support the redevelopment and infill development that is intended to occur along the US-60/Grand Avenue corridor.

Figure 11 – Glendale Planned Future Land Use



4.7. Phoenix Land Use

4.7.1. Existing Land Use

The *General Plan 2002* is the city's long-range policy for growth and development. Phoenix is currently in the process of updating the General Plan, which consists of 16 elements. The theme "Preserving Our Past, Choosing Our Future" reflects the vision for Phoenix. It will remain a large and growing city with a dynamic, sustainable economy.

The US-60/Grand Avenue COMPASS study area encompasses two Phoenix villages – Alhambra Village and Maryvale Village. US-60/Grand Avenue is the southern boundary of the Alhambra Village from 43rd Avenue to I-17. The majority of the land uses within this area are commercial and industrial, with a small amount of public uses and vacant land. The Maryvale Village is south of US-60/Grand Avenue between Camelback Road and I-17. The area has all industrial land uses along the BNSF Railway.

Just outside the US-60/Grand Avenue COMPASS study area, Phoenix initiated the *Greening Lower Grand Avenue (2012)* project. The purpose is to develop environmentally and economically sustainable designs to support area revitalization and serve as a model for streetscape improvements in arid regions. The study area is US-60/Grand Avenue between the I-10 overpass and the intersection at Van Buren Street and 7th Avenue. This area is a historic gateway to downtown Phoenix.

4.7.2. Future Land Use

Phoenix is divided into "Villages" that define urban form. Each village provides an opportunity for a wide range of housing, employment, shopping, entertainment, and recreation, creating a sense of community within a large city. A key goal of the concept is to promote an employment and housing balance within each village to create a live/work environment. According to the General Plan, the Alhambra Village planning area projects an intensification of commercial uses with some transition from commercial to industrial uses. Planned future land use in Phoenix is shown in ***Figure 12***. The Maryvale Village land uses are projected to remain the same.

4.8. Activity Centers

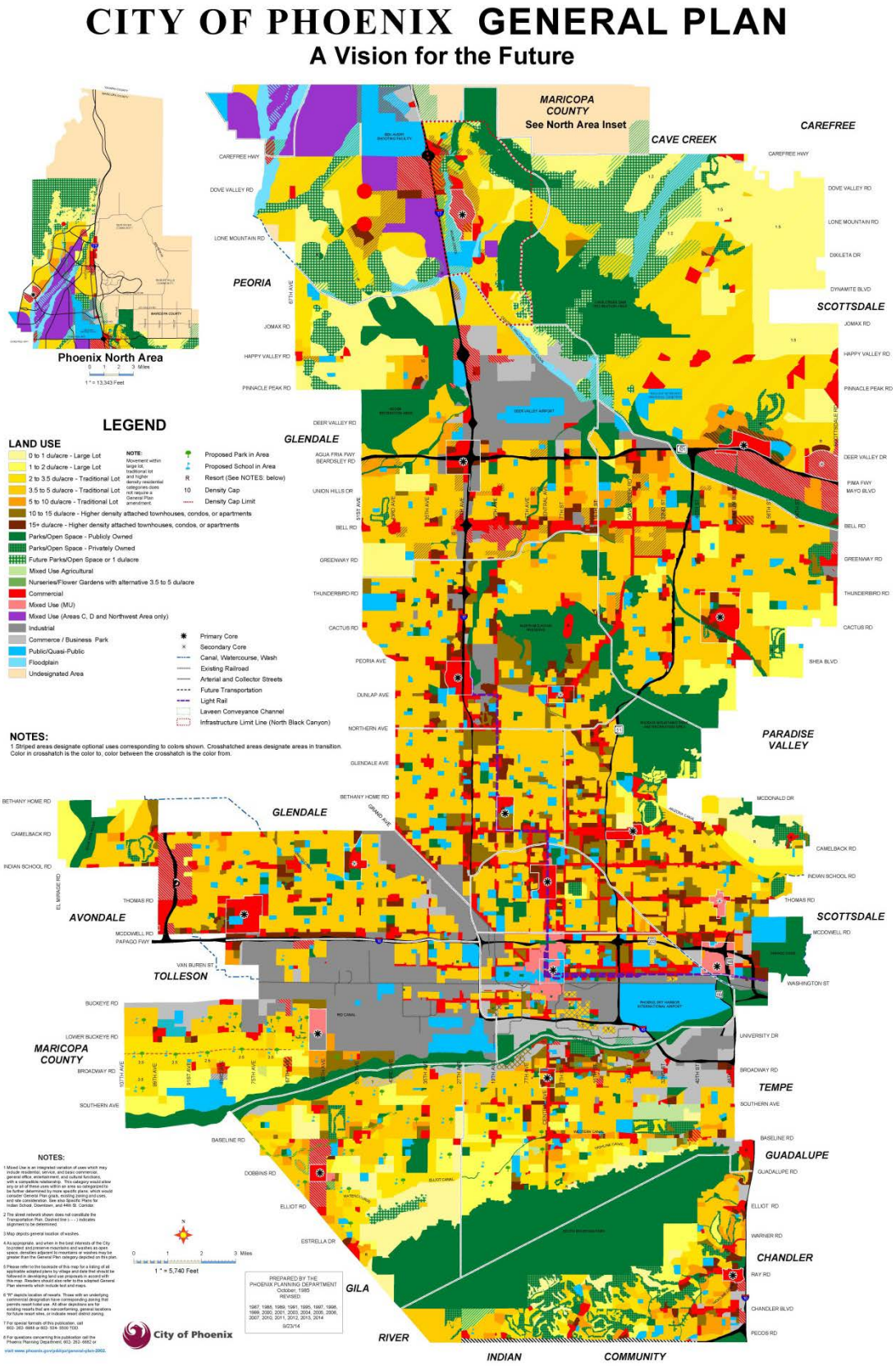
US-60/Grand Avenue is a unique transportation corridor because it connects the existing and future downtowns of Surprise, El Mirage, Youngtown, Peoria, and Glendale. Beyond the study area, US-60/Grand Avenue also connects to downtown Wickenburg and south to downtown Phoenix. The future success of these centers is dependent on the future development of US-60/Grand Avenue. There is no other major corridor within the Phoenix Metropolitan Area that connects that many downtown activity areas. The development of US-60/Grand Avenue offers tremendous opportunity to influence redevelopment efforts through these communities.

Additionally, there are key regional activity centers, including those listed in ***Table 7*** below, that can influence travel patterns as well as land use viability within the US-60/Grand Avenue study area, depending how the corridors develop.

Table 7 – Nearby Activity Centers

Education	Recreation/Cultural	Airports	Others
Glendale Community College Grand Canyon University Maricopa Community College (Surprise) Communiversity @ Surprise ASU West (not on the corridor but close)	Arizona State Fairgrounds Surprise sports venues Glendale stadium district Peoria sports complex Camelback Ranch	Glendale Luke AFB	State Capitol area SR-303L corridor Rail and industrial areas Downtowns (6) Hospitals (2) Sun Cities Lower Grand Avenue

Figure 12 – Phoenix Planned Future Land Use



5.0 Environmental Overview

This environmental overview provides data and analysis to facilitate early coordination of activities for when the necessary level of National Environmental Policy Act (NEPA) environmental documentation is determined. This summary is not a substitute for a formal NEPA analysis. The environmental overview section is divided into seven categories as follows:

1. Physical Conditions;
2. Natural Resources;
3. Cultural Resources;
4. Land Ownership;
5. Environmental Justice;
6. Irrigation Canals and Districts; and
7. Contaminated Sites.

5.1. Physical Conditions

An analysis of physical conditions provides details on the limitations of the natural environment and the potential impacts caused in development.

5.1.1. Topography

A slope analysis was conducted for the US-60/Grand Avenue COMPASS corridor to provide a better understanding of the topographic conditions present and determine the areas that are more or less compatible for urban development. Slope is determined by the ratio of change in elevation (rise) to a horizontal distance of endpoints (run). A steep slope would have a larger change in elevation (rise) and a shorter distance (run).

The extent of the US-60/Grand Avenue COMPASS corridor includes mostly flat or gradual slopes with topography rising from south to north. At the northern extent of the study area, the topographic elevation is 1,325 feet above sea level, and the southern extent of the study area is 1,081 feet above sea level. Given that the corridor length is approximately 23.7 miles (125,157 feet), this indicates that the full extent of the corridor study area has a slope percentage of less than 0.2%. The preliminary analysis of topographic conditions within the corridor did not identify any areas that are incompatible with development.

5.2. Natural Resources

A natural resources overview was conducted to understand the potential for wildlife, water resources, and wetlands in the potential area of impact. As areas continue to develop, impacts to natural resources should be avoided or minimized. However, there may be instances where other alternatives may not exist, in which case minimizing or mitigating impacts may be the necessary course of action. This natural resources analysis identifies potential impacts which can be used in refining the project development process.

5.2.1. Wildlife

Numerous State and Federal agencies and organizations, including ADOT, participated in a partnership to develop a statewide wildlife linkage assessment used in identifying important wildlife connections as well as associated threats. Arizona's Wildlife Linkages Assessment was created to promote and encourage

conservation and restoration of these linkages. The nearest wildlife linkage area is "*Linkage 151: Gila/Salt River Corridor: Granite Reef Dam – Gillespie Dam*" located south of the US-60/Grand Avenue COMPASS corridor. The study area is categorized as a "fracture zone," which are developed zones that create barriers between "habitat blocks." Most fracture zones would require considerable restoration to function as wildlife linkages.

The USFWS provides an environmental conservation online system, also known as the IPaC. IPaC is used in streamlining environmental review for areas protected under the Endangered Species Act, National Wildlife Refuges Program, National Migratory Bird Program, and National Wetlands Inventory. IPaC did not identify any potential protected endangered species in their system (accessed April, 2013).

USFWS National Wildlife Refuges. There are no identified National Wildlife Refuges within the study area.

USFWS Migratory Bird Program. The IPaC review indicated the study area may contain birds protected under the Migratory Bird Program. The statement below is from the IPaC website regarding the Migratory Bird Program:

> *Most species of birds, including eagles and other raptors, are protected under the Migratory Bird Treaty Act (16 U.S.C. 703). Bald eagles and golden eagles receive additional protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668). The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).*

5.2.2. Water Features

According to FEMA, floodplains are present within the study area at several locations. Those areas are categorized into flood zones which are defined by FEMA based upon flood risk. The categories present within the study area include zones A, AE, AH, and AO, which are further described in ***Table 8***. Zones categorized as AE are within the 100-year floodplain and would be of most concern outside of the floodway.

Table 8 - Flood Zone Descriptions

A*	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE*	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
AH*	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO*	River or stream flood hazard areas and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
Floodway**	A floodway is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood.

* SOURCE: FEMA. http://www.fema.gov/national-flood-insurance-program-2/flood-zones
** SOURCE: Maricopa County. http://www.fcd.maricopa.gov/home/faq.aspx

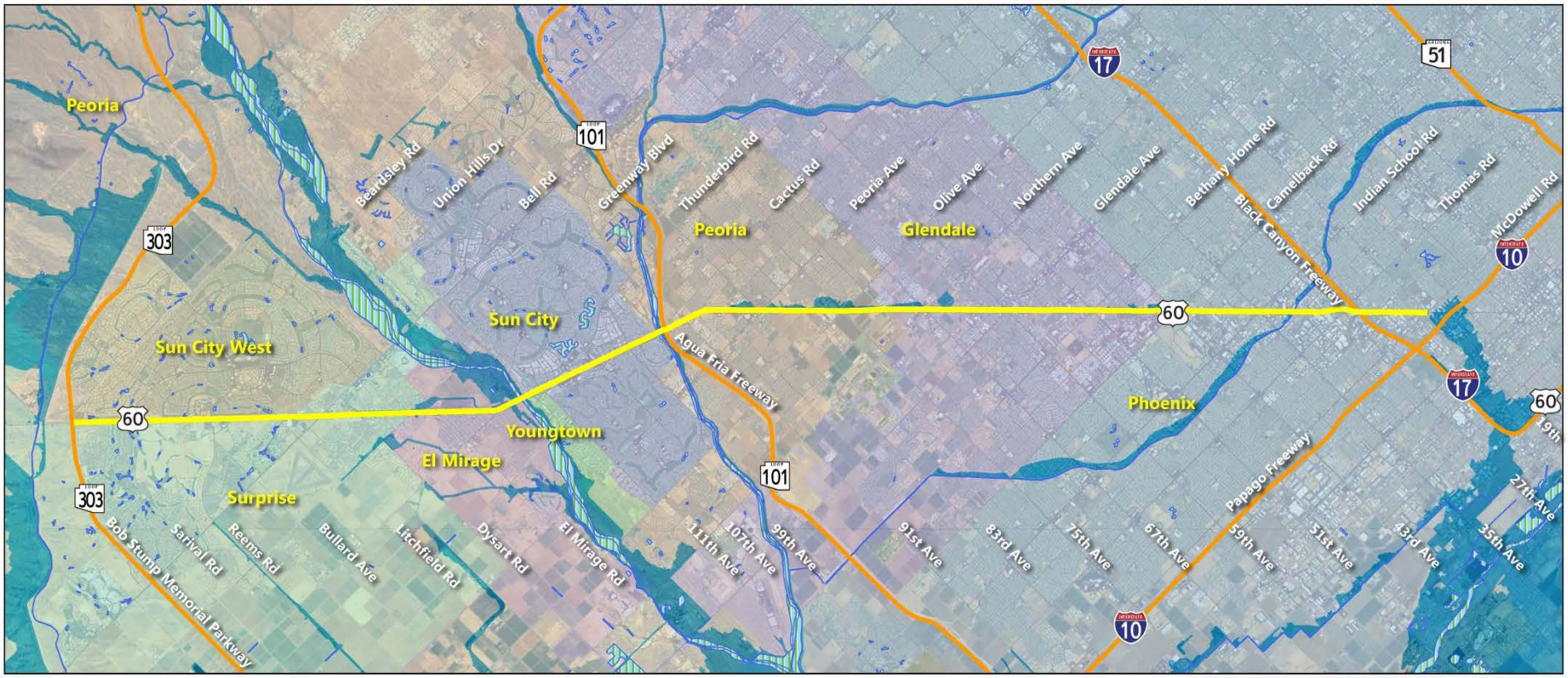
The entire study area is within the 500-year flood zone area, meaning that it has a 0.2% annual chance of flooding. Additionally, specific flood zone areas are within the 100-year flood zone area. Specific flood zone areas with approximate locations include:

- Portions of the area between Dysart Road and the Agua Fria River are categorized as flood zones A and AE. A small tributary of the Agua Fria River extends along the north side of US-60/Grand Avenue and is categorized as flood zone AE. The Agua Fria River is surrounded by both floodway and flood zone AE.
- New River is located north of the SR-101L TI with US-60/Grand Avenue. New River south of US-60/Grand Avenue is categorized as flood zone A, and north of US-60/Grand Avenue, it is categorized as flood hazard zone AE along with a small portion that is categorized as floodway.
- In the vicinity of where US-60/Grand Avenue and I-17 meet, there is an area categorized as flood zone A that extends south of the study area.

5.2.3. Wetlands

An understanding of the wetlands in the vicinity of the study area is required to determine areas that may be protected by federal statute. The IPaC website indicated more than 1,668 acres of wetlands to be considered upon further environmental review during project development. These wetlands include lakes (92.5 acres), freshwater ponds (157.6 acres), riverines (816.6 acres), and freshwater forested/shrub wetlands (601.5 acres). ***Figure 13*** depicts the understood floodplains and wetlands classified by FEMA and the U.S. Fish and Wildlife Service (accessed May 10, 2013).

Figure 13 – Wetlands and 100-Year Flood Zones



Legend
- US-60/Grand Ave COMPASS Corridor
- Freeway
- Wetlands
- 100 Year Flood Zones

US-60/Grand Avenue: Loop 303 to Interstate 10

COMPASS

6/25/2013

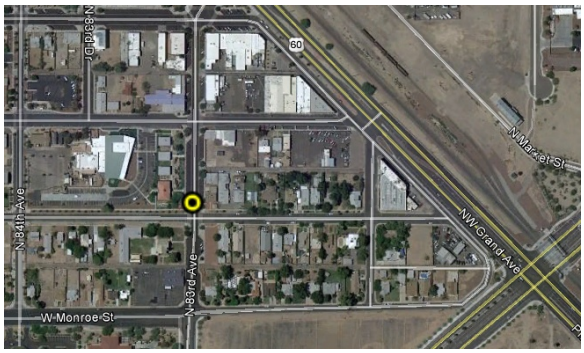
0 1.5 3 6 Miles

5.3. Cultural Resources

5.3.1. Historic Properties and Districts

The Department of Interior's NRHP provides a detailed database on properties listed on the historic register. Several properties within or adjacent to the study area are listed on the NRHP, and are summarized in ***Table 9***. This list represents an initial investigation of the best available information, and does not substitute for a formal study.

Table 9 – Historic Properties and Districts

Historic Name	Address / Boundary	City	Reference Number	Date Listed	Context
Central School	10304 N. 83rd Ave.	Peoria	82002080	5/12 1982	
Glendale High School Auditorium	6216 W. Myrtle Ave.	Glendale	06000326	5/02 2006	
Tinker, C.H., House	6838 N. 59th Dr.	Glendale	05001504	1/11 2006	
Floralcroft Historic District*	Myrtle St, State St, 59th Ave, Grand Ave, 61st Ave.	Glendale	05001505	4/06 2006	
McNair, Jonas, House	5916 W. Myrtle Ave.	Glendale	06000768	9/06 2006	
First Methodist Episcopal Church of Glendale Sanctuary	7102 N. 58th Dr.	Glendale	05001502	1/11 2006	
First National Bank of Glendale Building	6838 N. 58th Dr.	Glendale	83002991	8/25 1983	

* National Historic Districts have boundaries and not specific street addresses.

5.3.2. Trails

The Sun Circle Trail, located west of SR-101L and adjacent to the New River, provides an off-street route for pedestrians and bicyclists to connect from the US-60/Grand Avenue to numerous communities in Phoenix. The

Sun Circle Trail is operated and maintained by Maricopa County Parks and Recreation. A future trail is planned just west of SR-303L.

The Grand Canal is located south of Indian School Road, which includes the Grand Canal Trail. The Grand Canal Trail is a 23 mile long off-street route extending into portions of Glendale and Phoenix. The western terminus of the trail ends at the New River and the eastern terminus ends near the Salt River.

5.4. Land Ownership

5.4.1. State Trust Lands

Most land directly adjacent to US-60/Grand Avenue is privately held and not within the State Trust Land System; the one exception is a small portion of land located directly west of the intersection of US-60/Grand Avenue and SR-303L which is held by the State Land Trust for Agricultural Leasing.

5.4.2. Public Space

The location of schools, medical centers, and parks space is important in understanding the characteristics of transportation in an area. The following public and semi-public spaces are located adjacent to the study area:

- Desert Springs Golf Course (19900 N Remington Drive, Surprise);
- Banner Del E Webb Medical Center (14502 W Meeker Boulevard, Sun City West);
- Eternal Valley Memorial Park (N Sunset Road, El Mirage);
- Granite Run HOA Park (Cherry Hills Drive, Peoria);
- Silver Creek HOA Park (N 87th Avenue, Peoria);
- Cheyenne Elementary School (11806 N 87th Avenue, Peoria);
- Peoria High School (11200 N 83rd Avenue, Peoria);
- Santa Fe Elementary School (9880 N 77th Avenue, Peoria);
- Westside Head Start (7400 W Olive Avenue, Peoria);
- Osuna Park (W. Washington Street, Peoria);
- Glendale Municipal Airport (6801 N Glen Harbor Boulevard, Glendale);
- Northern Horizon Park (W Northern Avenue, N 63rd Avenue, Glendale);
- Velma Teague Library (7010 N 58th Avenue, Glendale);
- Imes School (N 59th Avenue, Glendale);
- Carol G Peck Elementary School (5810 N 49th Avenue, Glendale); and
- Alhambra Elementary School District (4510 N 37th Avenue, Phoenix).

5.5. Environmental Justice

Environmental Justice is a concept borne from the desire to assure fair treatment and meaningful involvement of all people during the planning, development, evaluation, and implementation of federally-sponsored programs and activities. The scope and intent of Environmental Justice, relating with Federal programs and activities, has increased with time. This section provides a brief overview of the Environmental Justice concept and identifies the presence of sensitive population communities relative to the US-60/Grand Avenue COMPASS corridor.

The demographic composition of the US-60/Grand Avenue COMPASS corridor was determined from Census Tract and data reflecting the results of the latest 2010 census of the United States. Information was obtained

from the American FactFinder and ACS, two websites operated and maintained by U.S. Census Bureau, U.S Department of Commerce. A total of 51 Census Tracts, which are depicted in ***Figure 14***, were identified that are coincident with study area or within one mile of the corridor. Census Tract data was used to evaluate the presence and concentration of potentially affected populations relative to their overall presence and concentration in the potentially affected area. All population characteristics of interest are not reported in the same way, and information relating to disabilities was not yet developed for 2010 at the time the Technical Memorandum was prepared. The data reported in the tables is primarily direct reporting from the 2010 Census of Population; however, some data may reflect 2011 estimates prepared by the U.S. Census Bureau. The 2000 Census data was used for disability information analysis.

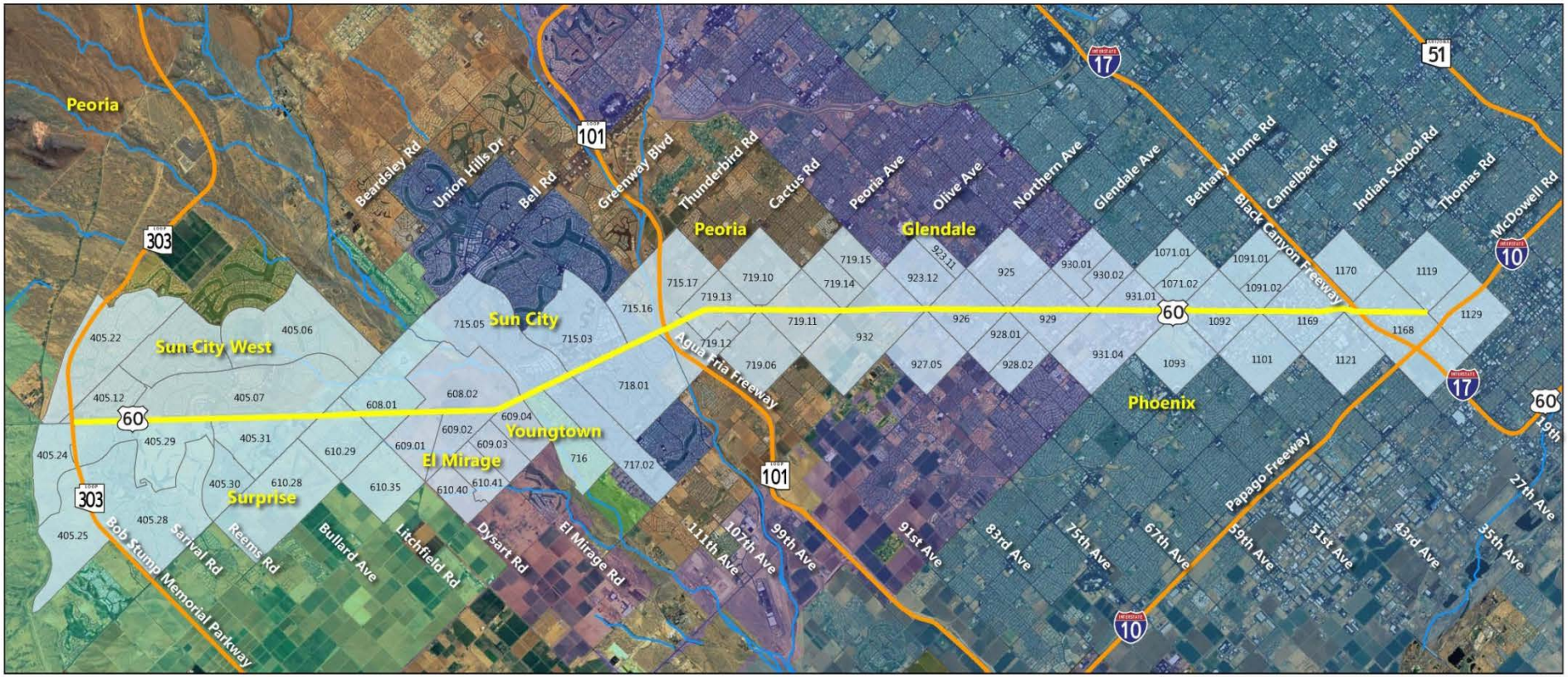
Generally, there are no specific criteria or guidelines upon which to make judgment as to whether a protected population community may or may not be affected by proposed improvements. The typical approach is to assess if concentrations of these communities exist in the study area to provide a basis of potential impact. The FHWA guidance defines "low-income" as "a person whose household income is at or below the Department of Health and Human Services poverty guidelines." FHWA recommends the U.S. Department of Health and Human Services poverty guidelines (***Table 10***), used as eligibility criteria for the Community Services Block Grant Program and a number of other Federal programs, be employed for this evaluation.

Table 10 – Poverty Guidelines

Persons in Family/Household	Poverty Guideline
1	$11,490
2	$15,510
3	$19,530
4	$23,550
5	$27,570
6	$31,590
7	$35,610
8	$39,630
For families/households with more than 8 persons, add $4,020 for each additional person	

Source: 2013 Poverty Guidelines, Office of The Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services.

Figure 14 – US-60/Grand Avenue Census Tracts



Legend
- US-60/Grand Ave COMPASS Corridor
- Freeway
- Streams/Washes
- US-60/Grand Ave Census Tracts

US-60/Grand Avenue: Loop 303 to Interstate 10

COMPASS

6/25/2013

0 1.5 3 6 Miles

Table 11 summarizes the presence of the protected population community is higher than the average for the study area. Therefore, the potential for impacts from improvements, should they be proposed for the Census Tract, should be examined in greater detail during an environmental investigation. A detailed listing of the data used for this evaluation is included in ***Appendix TM1-7.***

Table 11 – Environmental Justice Summary	
Classification	**Number of Census Tracts with Higher than Average Population Concentrations**
Elderly	20 out of 51 (39%)
Female Head of Household	35 out of 51 (68%)
Low Income	0 out of 51 (0%)
Minorities	40 out of 51 (78%)
Persons with Disabilities	10 out of 51 (19%)
Limited English Proficiency	29 out of 51 (59%)

5.5.1. Socioeconomic Characteristics

Appendix TM1-7 provides information relating to the social and economic status of the US-60/Grand Avenue corridor. Conclusions derived from the data in this appendix are presented below.

Housing

- On average, the corridor has a slightly smaller share of total housing identified as "Occupied" compared to Maricopa County as a whole; however, the percentage of owner-occupied housing is slightly higher than the County.
- Vacant DUs account for 17.3% of all housing in the corridor; Maricopa County has only 13.9% vacant. A number of Census Tracts have very little vacant housing; however, numerous tracts reveal vacancy well above the average for the corridor.

Population and Civilian Work Force

- The Civilian Work Force in the corridor, defined as persons 16 years of age or older, has an unemployment rate of 11.7%, compared to 8.3% in Maricopa County as a whole.
- Unemployment rates are highest in the southern portion of the corridor.

Commute to Work

- The working population in the US-60/Grand Avenue corridor appears to be more likely to use alternative transportation modes than the population of Maricopa County as a whole.
- Workers who drive alone to their place of employment account for 71.8% of the Total Workers, whereas 75.8% of all workers in Maricopa County drive alone.
- More than 16% of Total Workers commute with others, compared to 12.3% of all Maricopa County workers.
- There are fewer "Work at Home" workers in the study area than across Maricopa County.

Employment

- The largest employment group is Educational Services, Health Care, and Social Assistance.
  There are a relatively small number of workers employed in Agriculture, Forestry, Fishing, Hunting, and Mining.

5.6. Irrigation Canals and Districts

Irrigation districts are municipal corporations to provide their district with water, electricity, and other public conveniences and necessities generally provided by municipalities. The Maricopa Water District is located at the northern extent of the study area. The District's boundaries include portions that directly touch US-60/Grand Avenue in the vicinity of Surprise. The Salt River Valley Water Users Association irrigation district is located south of New River and extends into Phoenix. This district covers a wide area stretching on both sides of US-60/Grand Avenue. The Grand Canal is located south of Indian School Road and crosses US-60/Grand Avenue. The 23 mile canal was originally constructed in 1878 by the Grand Canal Company and connects the Salt River to the New River.

5.7. Contaminated Sites

The ADEQ online mapping tool was used in determining sites that may be contaminated. ***Figure 15*** displays the results of the contaminated sites query using the ADEQ online mapping tool. ***Figure 16*** displays the results of the underground storage tank query from the ADEQ online mapping tool. This information represents the best available data at this level of analysis and should be further analyzed prior to final design. Listed below are the categories and location descriptions of contaminated sites within the study area:

- Brownfield Grant Site:
  - South of US-60/Grand Avenue on 113th Avenue.

- DEUR Site:
  - South of US-60/Grand Avenue at Camelback Road.

- Hazardous Waste – LQG:
  - 14502 W Meeker, Sun City West;
  - 10401 W Thunderbird, Sun City;
  - 7741 N 68th Avenue, Glendale;
  - 4316 N 39th Avenue, Phoenix; and
  - 2525 N 27th Avenue, Phoenix.

- Superfund Site:
  - West Central Phoenix North Plume (43rd Avenue, Indian School Road, US-60/Grand Avenue);
  - West Central Phoenix North Canal Plume (Indian School Road, 40th Avenue, Osborn Road, US-60);
  - West Central Phoenix West Grand Avenue (Flower Street, 33rd Avenue, 34th Drive);
  - West Central Phoenix East Grand Avenue (Whitton Ave, 33rd Avenue, Catalina Drive, 29th Avenue); and
  - West Central Phoenix West Osborn Complex (Whitton Avenue, 50th Lane, McDowell Road, 33rd Avenue).

- UST – Leaking:
  - Numerous locations throughout the US-60/Grand Avenue corridor study area.

Figure 15 – ADEQ Identified Contaminated Sites

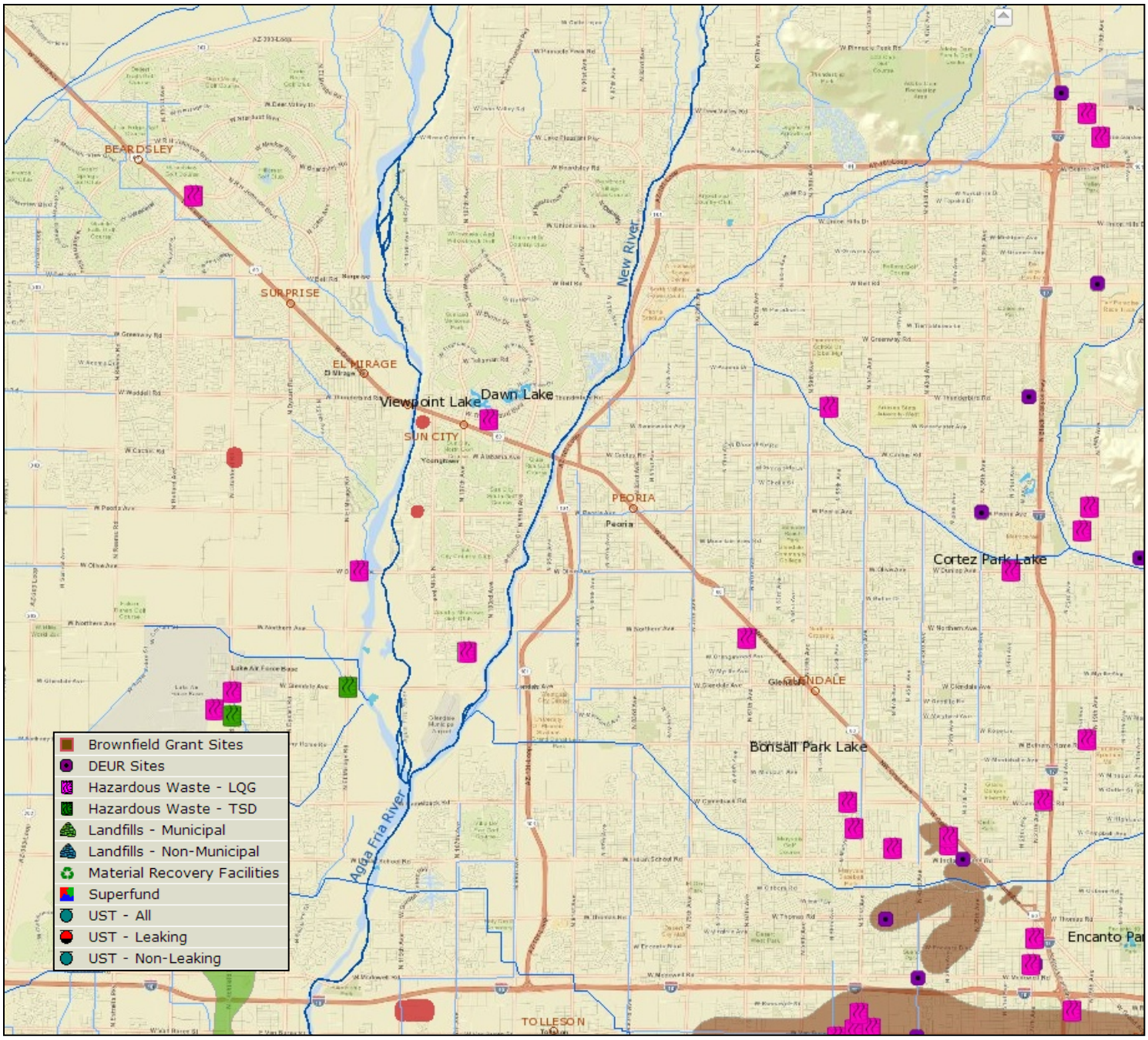
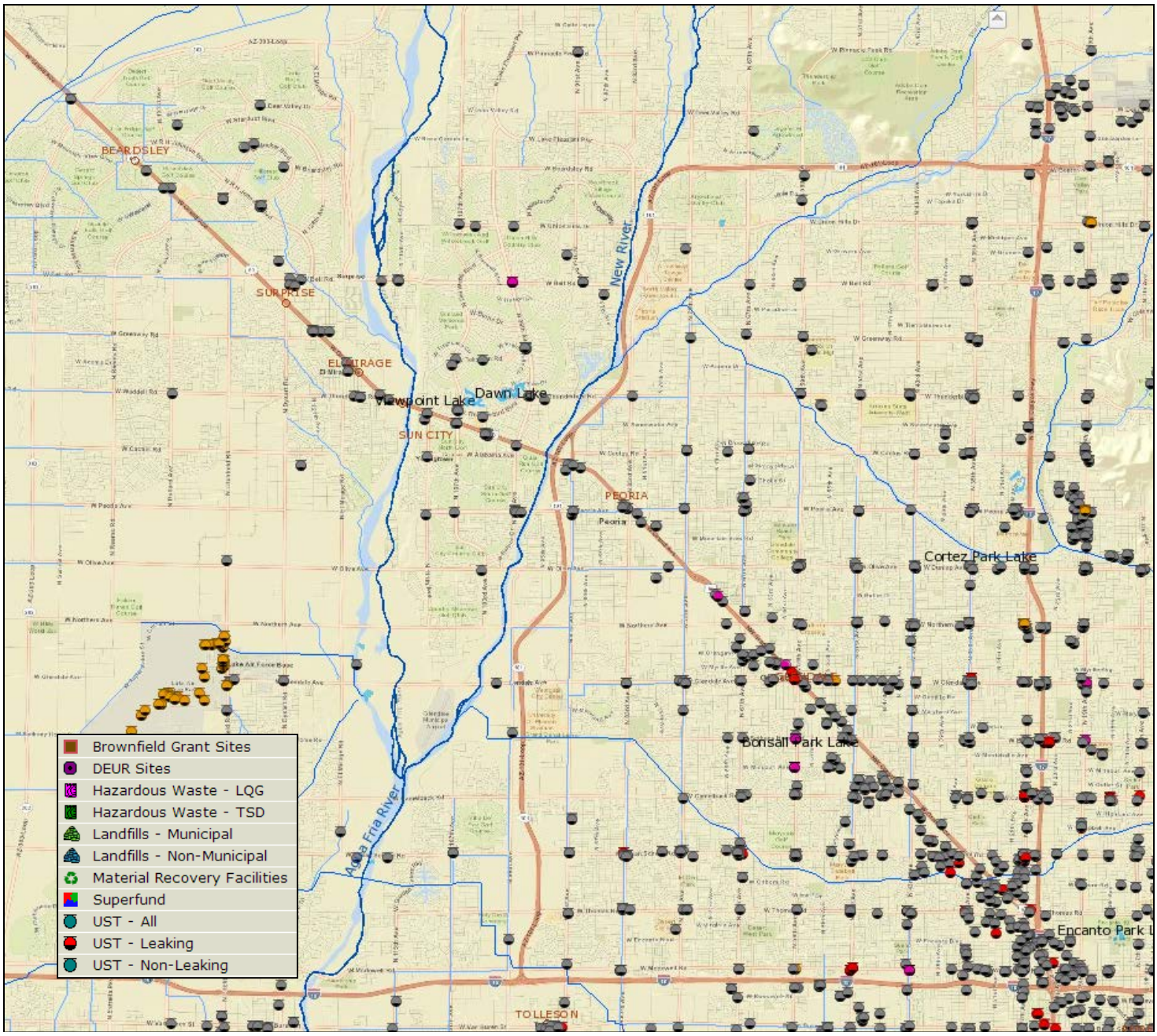


Figure 16 – ADEQ Identified Underground Storage Tanks



6.0 Traffic Operations

6.1. Quality/Roadway Segment Level of Service

Travel demand modeling results were prepared and provided by MAG. Three data sets were available from MAG and further used for evaluation.

- 2008 conformity run.
- 2035 projected population using the 2026 RTP network.
- 2035 adjusted 8 million population using the 2026 RTP network.

FDOT developed the *2013 Quality/Level of Service Handbook,* which is a tool that can be used to quantify transportation service at a generalized and conceptual planning level. As defined in the handbook:

- Quality of Service is a traveler-based perception of how well a transportation service of facility operates.
- Level of Service is a quantitative stratification of quality of service into six letter grades.
- Quality/Level of Service integrates these two concepts and presents maximum service volumes for a given LOS. The analysis techniques of the Q/LOS are focused at the HCM facility level.

Presented in ***Appendix TM1-8***, the Generalized Annual Average Daily Volumes for Florida's Urbanized Areas Interrupted Flow Facilities, Table 1 within the handbook, was applied to the existing 24-hour traffic volumes along US-60/Grand Avenue. Using this methodology, based on the 2008 Conformity Run, the US-60/Grand Avenue corridor operates at a Q/LOS C throughout the majority of the study area with the exception of the following segments:

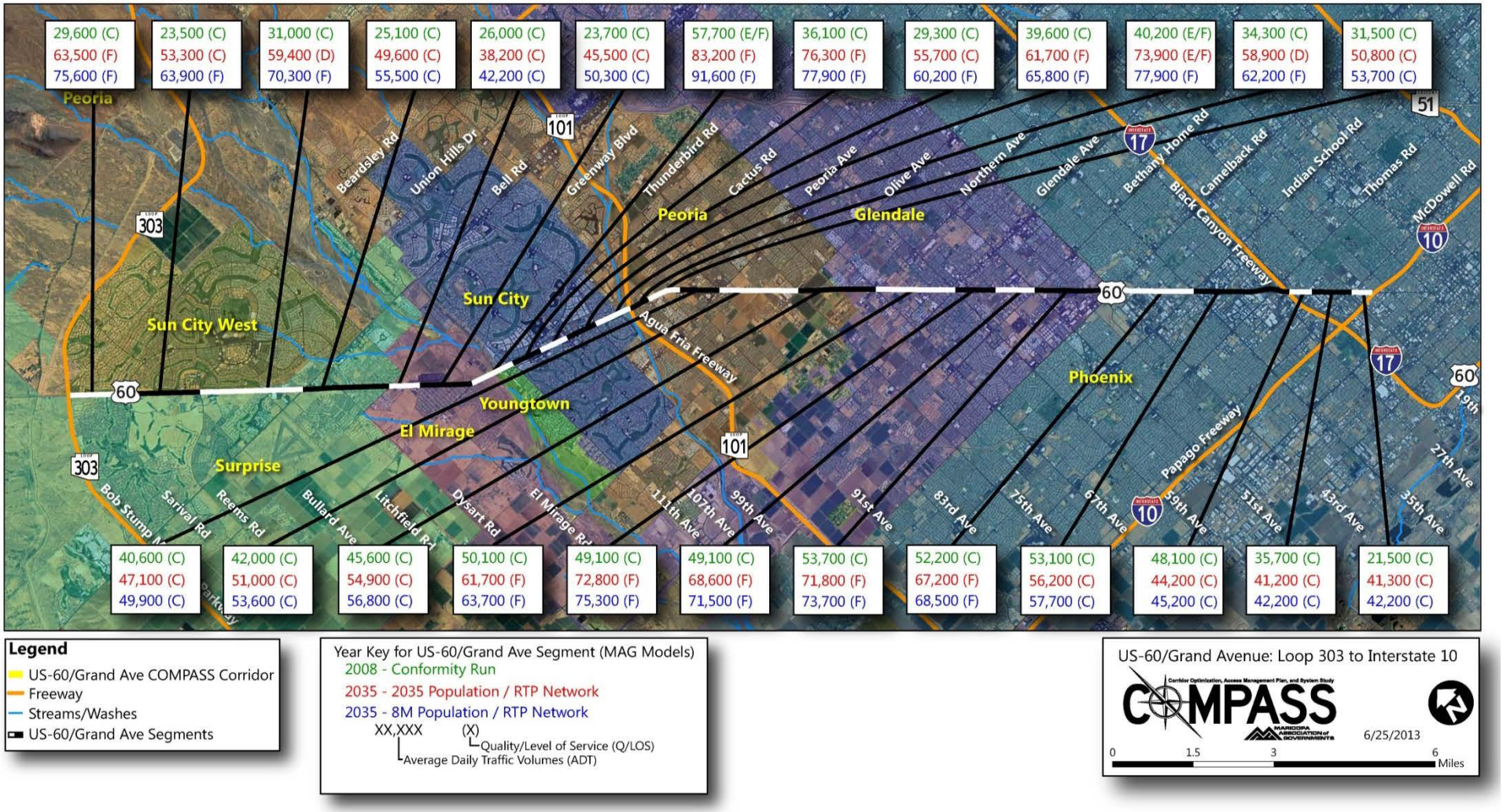
- Thunderbird Road to 111th Avenue – Operates at a Q/LOS F; and
- 99th Avenue to SR-101L – Operates at a Q/LOS F.

Future volumes substantially increase throughout the corridor for both 2035 scenarios, in some places by a factor of approximately 200%. The resulting Q/LOS evaluation results also change accordingly, with segments in the corridor operating at Q/LOS F. Key segments include:

- SR-303L to Bell Road;
- Thunderbird Road to SR-101L; and
- Northern Avenue to Indian School Road.

The modeling and Q/LOS evaluation results for the US-60/Grand Avenue corridor are shown in ***Figure 17***.

Figure 17 – Travel Demand Volumes and Quality/Level of Service



6.2. Intersection Level of Service Volumes

Intersection LOS modeling results were prepared and provided by MAG for the AM and PM peak periods. Two data sets were available from MAG and further used in this evaluation.

- 2012 model run.
- 2035 socio-economic data using the 2025 network.

The LOS analysis was completed by MAG for planning purposes; therefore, longer durations were used, including 6AM to 9AM for AM peak period and 2PM to 6PM for PM peak period. These intersection LOS criteria are based upon volume to capacity ration weighted by flow along its approaches.

The 2012 analyses indicate that half of the intersections (twelve out of twenty-four) within the study corridor of US-60/Grand Avenue operate at LOS D or better during both AM and PM peak periods. With the exception of Dysart Road intersection, the eight intersections falling within the northeast portion of the study segment (between Sunrise Boulevard and Primrose Street) performed at LOS D or better. Moving southwest, the next four intersections, located near the Sun City development, i.e. Thunderbird Road, 111th Avenue, 107th Avenue, and 99th Avenue, performed at a poor LOS E and F. The remaining southwest portion of US-60/Grand Avenue study segment performed at an unacceptable LOS E or F with the exception of the following intersections:

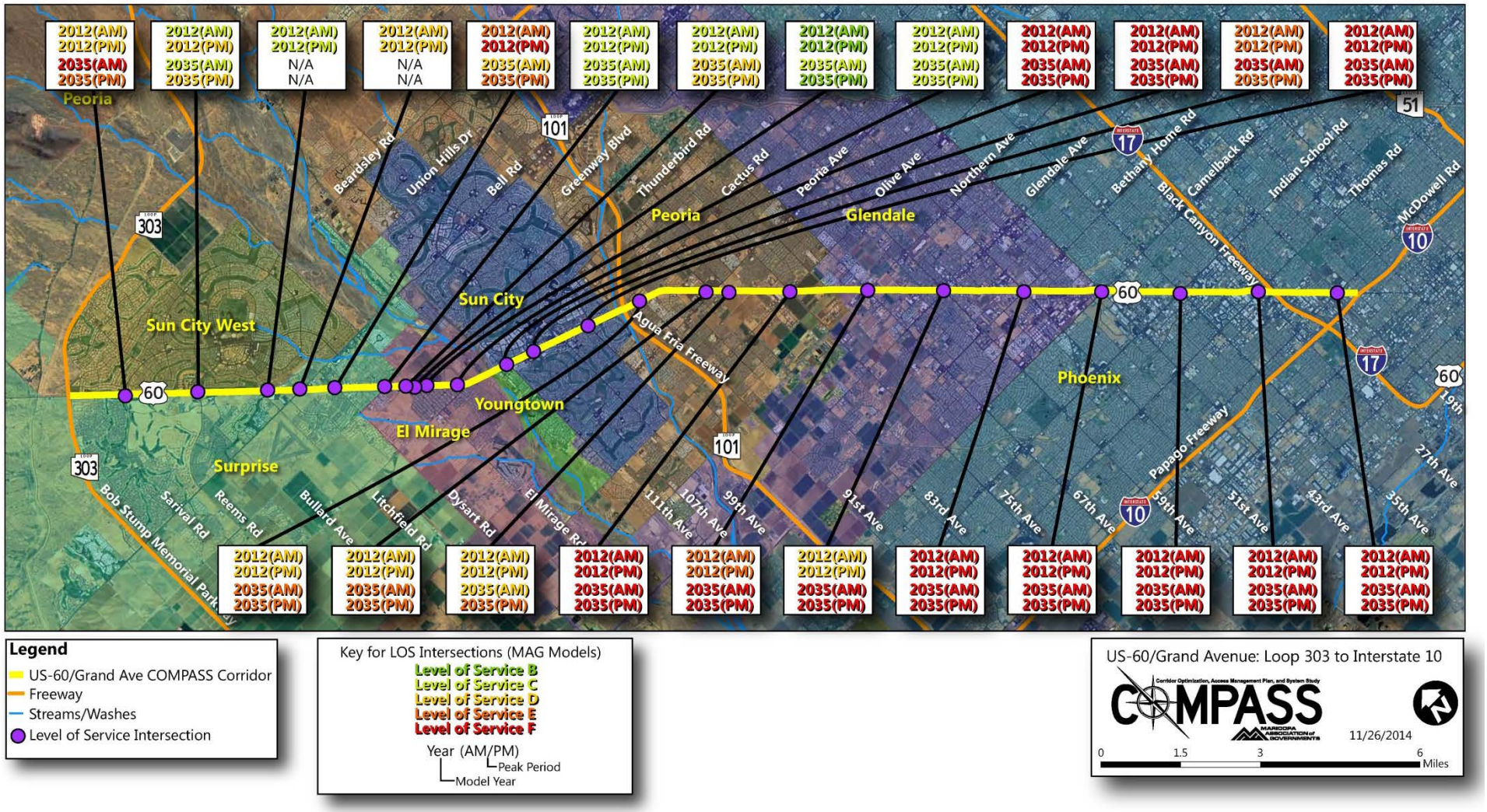
- 91st Avenue (City of Peoria) - Operates at LOS D during AM and PM;
- Peoria Ave (City of Peoria) - Operates at LOS D during AM and PM;
- Cotton Crossing (City of Peoria) - Operates at LOS D during AM and PM;
- Glendale Avenue (City of Glendale) - Operates at LOS D during AM and PM.

As forecast volumes increase throughout the corridor for both 2035 AM and PM peak period scenarios, the resulting LOS evaluation results decrease, with all intersections operating at LOS E or F, except the following:

- Reems Road (City of Surprise/Sun City West) - Operates at LOS C during AM and LOS D during PM;
- Greenway Blvd (City of El Mirage/City of Surprise) - Operates at LOS C during AM and PM;
- Acoma Drive (City of El Mirage) - Operates at LOS D during AM and PM;
- Santa Fe Drive (City of El Mirage) - Operates at LOS C during AM and LOS B PM;
- Primrose Street (City of El Mirage) - Operates at LOS D during AM and PM;

The modeling LOS evaluation results for the US-60/Grand Avenue corridor are shown in ***Figure 17***.

Figure 18 – Intersection Quality/Level of Service



6.2.1. Travel Demand Model Select Link Analysis

A select link analysis was conducted to evaluate trip origin and destination travel through roadway segments. Travel demand modeling results were provided by MAG. The data was analyzed for fourteen locations for 2011 (existing) and 2035 (future) AM and PM peak periods. Mapping generated to display the modeling results is included in ***Appendix TM1-9***.

The analysis indicated that although US-60/Grand Avenue serves commuter travel (longer trips), the facility processes high levels of local travel. Major transportation corridors, including SR-303L, SR-101L, I-17, and I-10 handle a substantial share of commuter travel in the area. Key connecting roads that have a notable effect on traffic along the US-60/Grand Avenue corridor include:

- SR-303L;
- Bell Road (via RH Johnson Boulevard);
- 99th Avenue/Lake Pleasant Parkway;
- SR-101L;
- Northern Avenue;
- Camelback Road; and
- Indian School Road.

Future development and land use along these roadways will impact traffic patterns along US-60/Grand Avenue.

6.2.2. Trip Reduction Survey

Maricopa County collects data annually for the Trip Reduction Program, which was initiated in the late 1980s to reduce automotive air pollution. Data is compiled by surveying businesses and schools with fifty or more driving-age persons and is used to determine commute origin and destination. The ultimate goal of the program is to reduce single occupant vehicle trips or miles traveled to or from employer/school sites by 40%. Trip reduction survey information data for the US-60/Grand Avenue COMPASS corridor was processed and mapped by MAG and is included in ***Appendix TM 1-10***.

The analysis found that people who live in the municipalities along the corridor primarily work near where they live or they generally commute to one of three primary locations: downtown Phoenix, Deer Valley, or the Scottsdale Airpark. As such, US-60/Grand Avenue primarily serves local trips, which is consistent with the select link analysis. Longer trips, such as those between the corridor ends and to areas outside of the corridor, typically use SR-101L.

This data illustrates that approximately one-quarter of the people living within 1/2 mile of US-60/Grand Avenue work in downtown Phoenix, and the people that work within 1/2 mile of US-60/Grand Avenue live scattered through Glendale, El Mirage, Surprise, and other communities in the west valley.

6.3. Crash History

Crash data was provided by ADOT for the years 2009, 2010, and 2011 for the US-60/Grand Avenue corridor. This data was analyzed to identify high-crash locations, referred to as "hot spots." Both intersection and roadway section hot spot locations were identified and summarized in ***Table 12***.

The study area as a whole had 2,319 crashes in the three year period. The yearly totals were steady from year to year, with 773 crashes in 2009, 774 in 2010, and 772 in 2011. Over 80% of the crashes in the study area occurred at intersections, with the majority of those at regular four-leg intersections. A downward trend was identified of non-intersection related crashes along the corridor and an upward trend of three, five, and six-leg intersection related crashes. No adverse lighting or weather patterns were identified, as 74% of the crashes in the study area were under daylight conditions, and 89% occurred under clear skies.

Table 12 – Corridor Intersection Type Summary

Intersection Type	2009	2010	2011	Total %
Non-Intersection	165	156	126	19
Interchange	18	21	11	2
3 Legs	124	120	173	18
4 Legs	347	331	305	42
5 or 6 Legs	119	146	157	18
Total	**773**	**773**	**772**	

Crash severity was also consistent across the three year period, with only 4% involving incapacitating or fatal injuries, which is lower than the most recent statewide average of 10%. A summary is provided below in ***Table 13.***

Table 13 – Crash Severity Summary

Crash Severity	2009	2010	2011	Total %
Fatal	5	4	4	1
Incapacitating Injury	23	19	17	3
Non-Incapacitating Injury	84	86	87	11
Possible Injury	130	137	132	17
Property Damage Only	531	528	532	69
Total	**773**	**773**	**774**	

There were a total of 20 rail related crashes along the US-60/Grand Avenue corridor, with no associated fatalities. The effect to which rail was involved in the crashes is not identified in the data, and further investigation of crash reports would be needed for this determination.

There were a total of 24 pedestrian and bicycle related crashes in the study area; two of which were fatalities with one in 2010 and the other in 2011. There were two incapacitating injuries, one in 2009 and other in 2011. These 44 crashes make up less than 2% of the total crashes in the study area and do not present a consistent crash pattern. Crashes involving rail, pedestrians, and bicycles are summarized in ***Table 14.***

Table 14 – Rail, Pedestrian, and Bicycle Related Crash Summary

Crash Type	2009	2010	2011
Rail Related	7	7	6
Pedestrian Related	3	1	4
Bicycle Related	5	4	7

6.3.1. Intersection Hot Spots

The following six signalized intersections with US-60/Grand Avenue were identified as hot spot locations:

- Bell Road (4 legs);
- Thompson Ranch Road (4 legs);
- 111th Avenue (4 legs);
- 91st Avenue (4 legs);
- 75th Avenue (6 legs); and
- Bethany Home Road (5 legs).

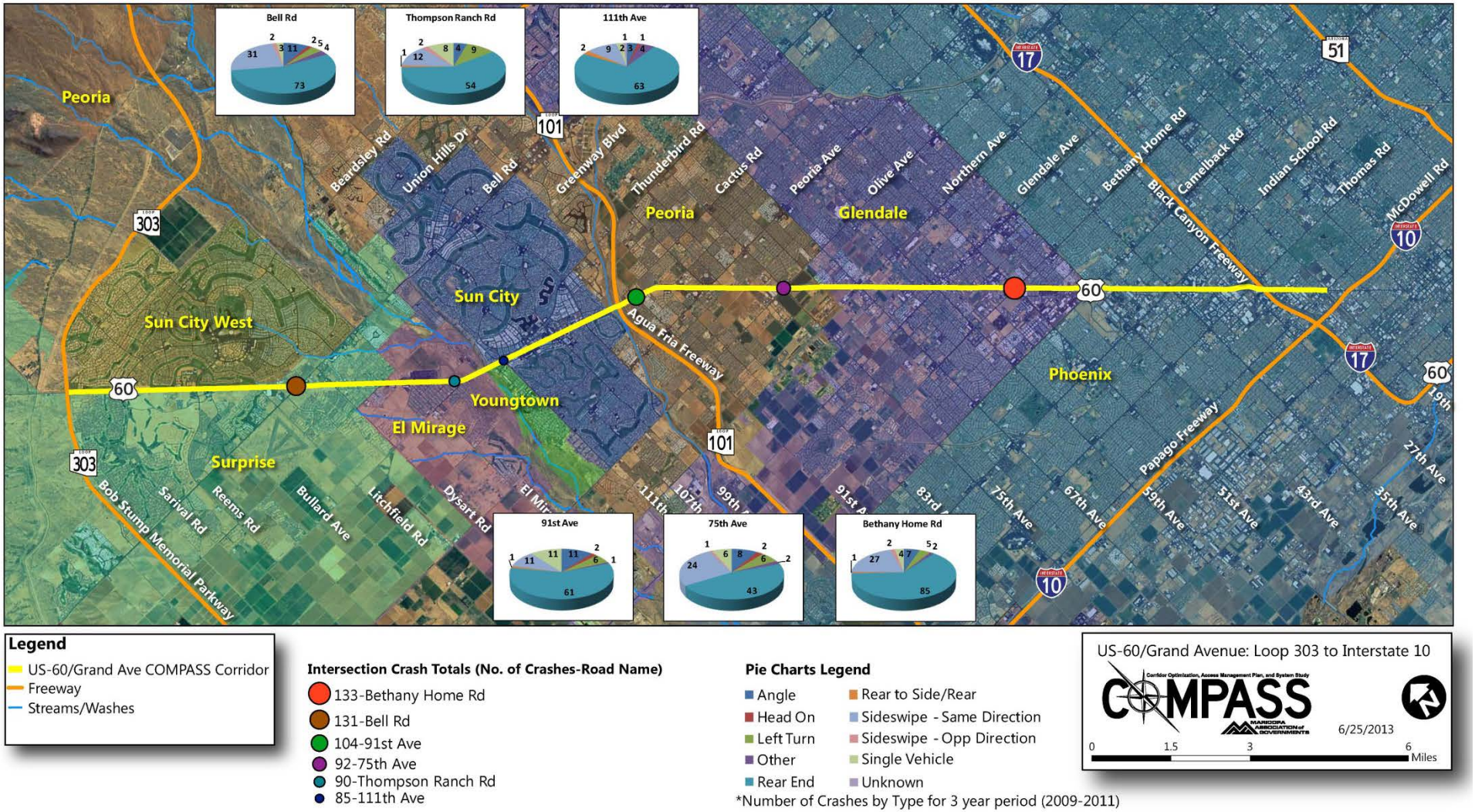
Each of these intersections had a total of 80 or more crashes in the three year period. The locations and crash types are shown in ***Figure 19***.

The primary crash type at these six intersections is rear-end crashes, accounting for almost 60% of the total intersection crashes. Many of these rear-ends noted that vehicles were stopped in traffic approaching the intersections, which can signify congestion along the corridor. Other typical contributing factors to rear-end crashes that may apply to this corridor include large number of turning vehicles at intersections or poorly coordinated signals.

The second leading crash type at these intersections with just under 18%, is same direction sideswipe crashes. Most of these crashes occurred when drivers were attempting to change lanes near an intersection. This also often signifies congestion problems, large number of turning vehicles, or confusing roadway configurations.

A few specific patterns at intersections with five or more legs compared with those with only four legs include the intersection at Bethany Home Road and 75th Avenue. The intersection at Bethany Home Road with five approaches has both the highest number and highest percentage of injury crashes among the hot spot intersections, most of those being noted as possible injuries. This intersection also has the highest number of rear-end crashes, often related to congestion or poor signal timing. The intersection at 75th Avenue had the highest percentage of sideswipe crashes among the hot spot intersections. This intersection has six approaches, which may be resulting in an increased number of lane changes which is a common cause of sideswipe crashes.

Figure 19 – Intersection Hot Spots



6.3.2. Section Hot Spots

Five one-mile sections have been identified as non-intersection hot spot locations. These sections each had a total of 30 or more crashes in the three year period, and are shown in ***Figure 20*** along with their crash types.

- Mile 141 (MP 141 to MP 142) – Reems Road to Litchfield Road;
- Mile 146 (MP 146 to MP 147) – Olive Street to 107th Avenue;
- Mile 147 (MP 147 to MP 148) – 107th Avenue to 101st Avenue;
- Mile 148 (MP 148 to MP 149) – 101st Avenue to SR-101L; and
- Mile 158 (MP 158 to MP 159) – 41st Avenue to 35th Avenue/Indian School Road.

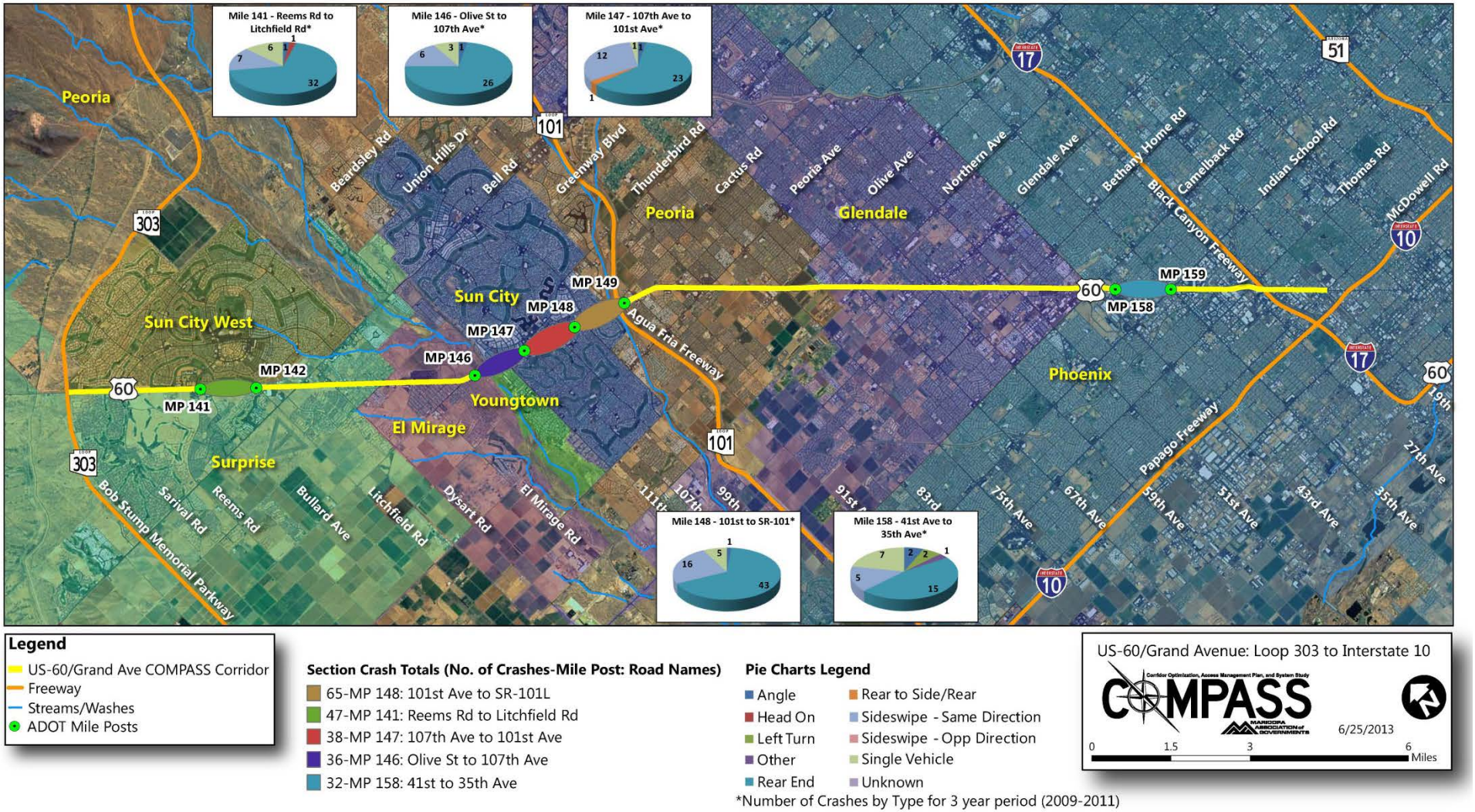
The primary crash type throughout these sections is rear-end crashes, accounting for almost 64% of the total crashes. This typically signifies either congestion or access management issues along the corridor.

Three of the sections have several closely spaced driveways and unsignalized intersections. Miles 141 and 146 have many driveway access points and almost 70% rear-end crashes each, likely indicating an access management issue. Mile 147 has three unsignalized intersections and numerous driveways at approaches to signalized intersections, which may signify a possible access management issue.

Mile 148 is a stretch of roadway with no driveways or unsignalized intersections, yet 66% of the total crashes are rear-end crashes. Many of these crashes cite that vehicles were stopped in traffic, which indicates congestion is a likely factor. Only about one-third of these crashes occurred during peak travel times, which may indicate either sporadic spurts of congestion or long periods of congestion.

Mile 158 has no signalized intersections, two minor unsignalized intersections, and a few driveways. Although this section had the highest percentage of single vehicle crashes, there is not an apparent crash pattern.

Figure 20 – Section Hot Spots



7.0 Multimodal Services

7.1. Existing Transit Services

Transit services available along the US-60/Grand Avenue study area are outlined below.

7.1.1. Valley Metro

Valley Metro is the identity of the RPTA in the Phoenix metropolitan area. Under the Valley Metro brand, a Valley-wide transit system is operated, maintained, and serves the US-60/Grand Avenue corridor communities. Operations are supported by Valley Metro through collaboration with member jurisdictions and public and private partnerships. Services provided by Valley Metro available to residents of and visitors to the US-60/Grand Avenue corridor include:

- Local, Fixed-Route Bus Service;
- Express Bus Service;
- Dial-A-Ride;
- Vanpool Service; and
- Online Carpool Matching.

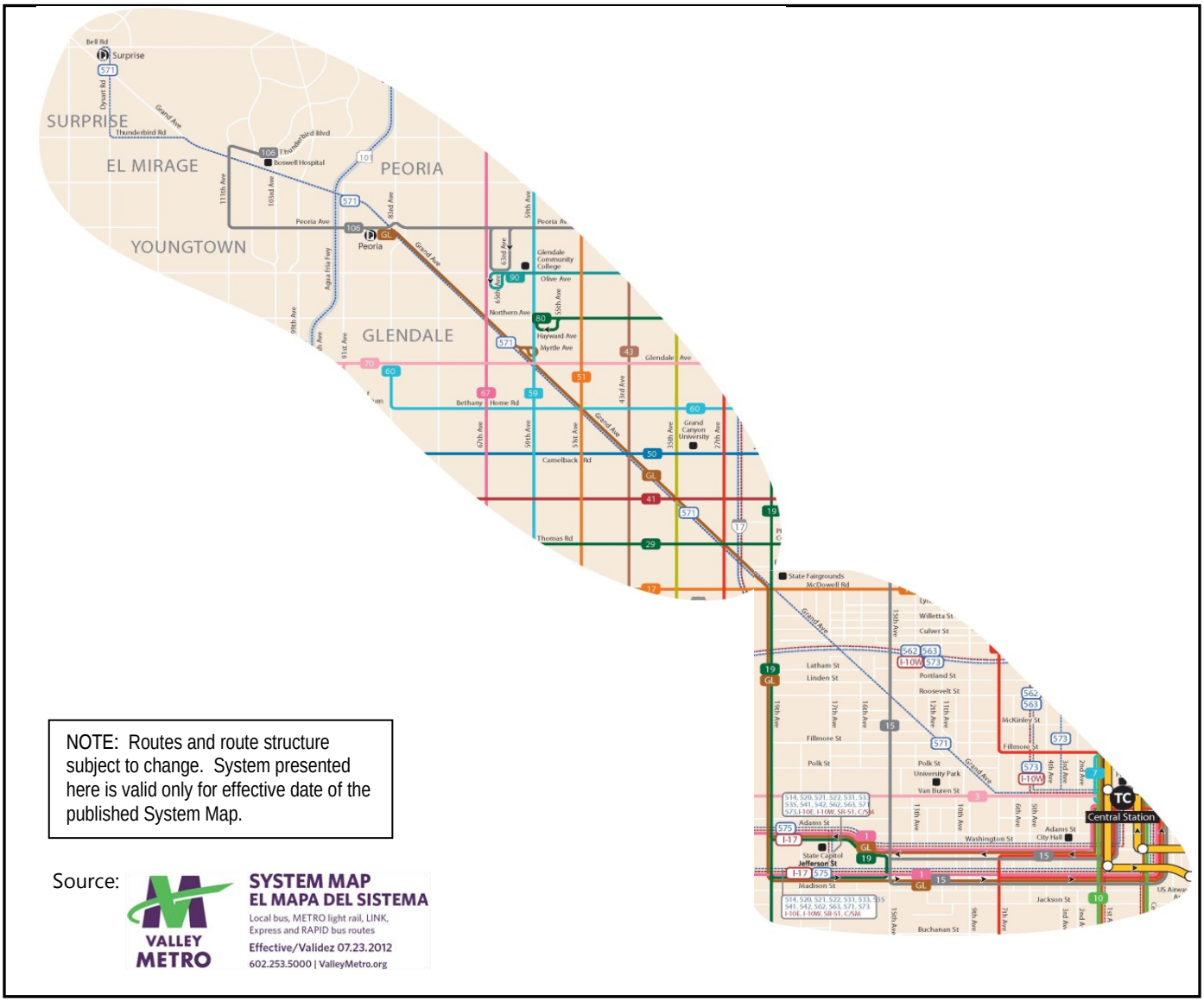
Local, fixed-route and Express Bus services are described below. ***Figure 21*** shows the US-60/Grand Avenue service areas extracted from the Valley METRO System Map from early 2013. These transit services are subject to change, as the system is reviewed and refined periodically in response to identified demand and available funding. Numerous route and service changes have occurred over the past several years in response to funding shortages. It is anticipated that many of these services will be restored as funding is identified; however, the System Map is the best representation of services at this time. D&R services are highlighted by city in the sections below. Vanpool and carpool services are specialized, even individualized services available through the Valley METRO Web site.

7.1.1.1. Park-and-Ride Facilities

There are three Park-and-Ride facilities located within the Grand Avenue Corridor:

- **Surprise Park-and-Ride**: Served by Route 571 – Surprise Express;
  Location: 13327 Bell Road (south of Bell Road, one block east of 134th Drive).
- **Peoria Park-and-Ride**: Served by GL;
  Location: Northeast corner of Jefferson Street and 84th Avenue.
- **Glendale City Lot**: Served by Grand Avenue Limited, Route 59 – 59th Avenue, GUS Routes I and II;
  Location: Northeast and southwest corners of 59th Avenue and Myrtle Avenue.

Figure 21 – Valley Metro Service Areas



7.1.1.2. Express Bus Service

There are two commuter-oriented Express Bus services operating along Grand Avenue within the study area.

Express Bus Route 571, the Surprise Express

The Surprise Express operates inbound during the AM peak period along US-60/Grand Avenue from Downtown Surprise to Downtown Phoenix. The route originates at the Surprise Park-and-Ride, which is on the south side of Bell Road, one block east of 134th Drive. The bus accesses US-60/Grand Avenue via Bell Road, Dysart Road and Thunderbird Road, terminating at 17th Avenue/Jefferson Street in Phoenix. The outbound PM peak period operation is a reverse of the AM peak period trip. The route has two "Exception Stops," where passengers may board and deboard:

- A designated public Park-and-Ride area at the Walmart at Thunderbird Road/129th Avenue.
- A designated stop at Thunderbird Road at Primrose Avenue.

Grand Avenue Limited

The GL service operates inbound in the AM peak period along US-60/Grand Avenue from Downtown Peoria to Downtown Phoenix. The route originates at the Peoria Park-and-Ride, which consists of a pair of lots located south of Peoria Avenue on 84th Avenue between Jefferson and Washington Streets. The service is classified as a local, limited-stop service with stops at the following locations during the AM and PM peak period runs:

- Peoria Park-and-Ride – A pair of lots located at northeast corner of Jefferson Street and 84th Avenue and the southwest corner of Washington Street and 84th Avenue; the Jefferson Street/84th Avenue lot is the designated pick-up/drop-off point.
- Peoria Avenue and 84th Avenue (westbound trips only).
- Glendale Park-and-Ride at 59th Avenue and Myrtle Avenue.
- 19th Avenue and McDowell Road.
- 19th Avenue and Van Buren Street (just south of the study area).

7.1.1.3. Local, Fixed-Route Bus Service

At the time of this study, transit service is operating through the following major intersections in the US-60/Grand Avenue Corridor as indicated below in ***Table 15***. Transit stops are designated within one-quarter mile of US-60/Grand Avenue on each of the routes identified in ***Table 15***. There is no local, fixed-route service provided along US-60/Grand Avenue to accommodate travel within the corridor.

Table 15 – Current Valley Metro Transit Service: Grand Avenue and Intersecting Arterials	
Express Bus Service	
Route 571 – Surprise Express – Serves Surprise P&R facility and other stops.	Grand Avenue Limited – Serves Peoria and Glendale P&R facilities
Local Fixed-Route Service	
East-West Routes	**North-South Routes**
Route 106 (Peoria Road/Shea Boulevard)	No service on 83rd Avenue
No service on Northern Avenue	Route 67 (67th Avenue)
Route 70 (Glendale Avenue/24th Street)	Route 59 (59th Avenue) – serves Glendale P&R
Route 60 (Bethany Home Road)	Route 51 (51st Avenue)
Route 50 (Camelback Road)	Route 43 (43rd Avenue)
Route 41 (Indian School Road)	Route 35 (35th Avenue)
Route 29 (Thomas Road)	Route 27 (27th Avenue)
Route 17 (McDowell Road)	Route 19 (19th Avenue)
No service on Roosevelt Street	Route 15 (15th Avenue)
Route 3 (Van Buren Street)	7th Avenue service routed along Fillmore Street 0.23 miles to the north

Source: System Map, Valley METRO, Effective 07.23.2012

Ridership data was obtained from Valley Metro for routes intersecting US-60/Grand Avenue listed in ***Table 16***. In general, this data indicates a low percentage of boardings (B) and alightings (A) at stops along US-60/Grand Avenue versus the average daily boardings (ADB) for each route.

Table 16 – Valley Metro Ridership for Routes Intersecting US-60/Grand Avenue

Route	Stop	Weekday			Saturday			Sunday		
		B	A	ADB	B	A	ADB	B	A	ADB
106	Peoria Avenue	1	1	2,873	1	1	1,557	*	*	*
70	Glendale Avenue	2	2	6,977	2	2	2,958	2	2	2,095
67	67th Avenue	2	2	2,749	2	2	1,161	2	2	870
60	Bethany Home	2	2	3,005	2	2	1,878	2	2	1,450
59	59th Avenue	2	1	2,881	2	1	1,122	2	1	841
51	51st Avenue	1	1	1,614	1	1	667	1	1	391
50	Camelback Road	2	2	6,825	2	2	2,086	2	2	1,369
43	43rd Avenue	2	2	2,890	2	2	1,228	2	2	776
41	Indian School Road	2	2	9,185	2	2	4,765	2	2	3,156
35	35th Avenue	2	2	6,721	2	2	3,561	2	2	2,642
29	Thomas Road	2	2	10,191	2	2	4,334	2	2	2,970
27	27th Avenue	2	2	4,971	2	2	2,612	2	2	1,836
19	19th Avenue	1	1	3,414	1	1	2,075	1	1	1,747
17	McDowell Road	2	2	7,993	2	2	3,755	2	2	2,546
15	15th Avenue	1	1	1,174	1	1	1,039	1	1	758
8	7th Avenue	1	1	2,453	1	1	1,431	1	1	927
3	Van Buren Street	2	2	6,072	2	2	2,768	2	2	1,860

*service terminates at 67th Avenue on Sunday

As shown, each stop typically experiences 1 or 2 boardings/alightings per weekday, while typical weekday boardings for these routes are roughly 1,500-10,000. Data for routes along US-60/Grand Avenue is included in ***Table 17.*** These routes are only operated on weekdays. Ridership for these routes is much lower than other routes in the area that intersect US-60/Grand Avenue.

Table 17 – Valley Metro Ridership for Routes along US-60/Grand Avenue

Route	Stop	Boardings	Alightings	Average Daily Boardings
571	Surprise Park & Ride	13	12	181
	Thunderbird and 129th Ave	12	10	
	Arizona State Capitol	10	7	
	Central Station	12	18	
Grand Avenue Limited	Peoria Park & Ride	23	16	73
	59th Avenue & Myrtle	16	14	
	Arizona State Capitol	4	3	
	Central Avenue & Van Buren	10	7	

7.1.2. Surprise

7.1.2.1. Surprise Park-and-Ride

Surprise has one Park-and-Ride facility located within the US-60/Grand Avenue corridor; it is on the south side of Bell Road, one block east of 134th Drive. This facility specifically accommodates commuters utilizing Valley METRO Express Bus service through Route 571.

7.1.2.2. Surprise Dial-a-Ride Service

Surprise is working with Valley METRO to transition their passengers to the Northwest Valley Dial-a-Ride service. Surprise began this partnership with the regional transit agency on October 1, 2012. Northwest Valley Dial-a-Ride serves seniors age 65 and over, as well as disabled residents, in El Mirage, Sun City, and Youngtown. The Surprise service also will include the general public.

7.1.2.3. ADA Paratransit Service

On October 1, 2012, Surprise residents were able to access ADA-compliant service contracted to Total Transit, the parent company of Discount Cab. Additional passenger benefits will include custom vehicles to accommodate specific travel needs of ADA clients, extended service hours, and unlimited ride bookings.

7.1.3. Peoria

7.1.3.1. Park-and-Ride Facilities

Peoria's Park-and-Ride facilities are located and designed to provide convenient access to Valley METRO transit services. Two Park-and-Ride facilities are located in the US-60/Grand Avenue COMPASS Corridor; specifically:

- Jefferson and Washington streets on 84th Avenue – This pair of lots – one at the northeast corner of Jefferson Street and the other at the southwest corner of Washington Street – serves commuters accessing the GL and Valley METRO 106.

7.1.3.2. Dial-A-Ride

Peoria's Dial-A-Ride service provides basic transportation services for the residents of Peoria and accommodates approximately 30,000 transports annually. The Dial-A-Ride and Paratransit services, provided in compliance with ADA requirements, use a shared ride concept that mixes elements of traditional bus service with characteristics of taxi cab service. As a supplement to this regular service, the DAR+ service transports Peoria residents to neighboring medical campuses in Sun City and Glendale.

7.1.4. Glendale

7.1.4.1. Park-and-Ride Facilities

Glendale has one Park-and-Ride facility serving the US-60/Grand Avenue COMPASS Corridor:

- Glendale City Lot at 59th and Myrtle avenues – Valley METRO Route 59, GUS 1 and 2, and GL.

7.1.4.2. GUS

GUS provides transit services for a 25 cent fare, with reduced fare (10 cents) for seniors, persons with disabilities, and Medicare card holders between 10 a.m. and 2 p.m. GUS Routes 1 and 2 serve the core areas of Glendale along Glendale Avenue and 59th and 55th Avenues. As shown in the accompanying graphic, the shuttle service straddles the US-60/Grand Avenue corridor. GUS ridership was provided by the City of Glendale and is shown in ***Table 18*** and ridership by route is shown in ***Table 19.***

Source: Transportation – Transit – GUS at http://www.glendaleaz.com/transit/GUS.cfm.

Table 18 – 2012-2013 GUS Ridership				
	Weekday	**Saturday**	**Sunday**	**TOTAL**
July-2012	7,340	821	977	**9,138**
August-2012	9,145	1,066	711	**10,922**
September-2012	7,787	1,398	1,267	**10,452**
October-2012	9,140	1,147	1,160	**11,447**
November-2012	7,570	1,153	1,458	**10,181**
December-2012	7,376	1,254	1,086	**9,716**
January-2013	7,584	960	1,181	**9,725**
February-2013	7,244	1,205	1,159	**9,608**
March-2013	8,027	1,361	1,064	**10,452**
April-2013	8,348	1,053	675	**10,076**
May-2013	8,083	1,108	851	**10,042**
June-2013	7,175	1,127	824	**9,126**
TOTAL	**94,819**	**13,653**	**12,413**	**120,885**
Number of Weekdays	**249**	**52**	**64**	**365**
Average Ridership	**381**	**263**	**194**	**331**

Table 19 – 2012-2013 GUS Ridership by Route				
	GUS 1	GUS 2	GUS 3	TOTAL
July-2012	6,523	1,521	1,094	**9,138**
August-2012	7,027	2,480	1,415	**10,922**
September-2012	7,098	2,181	1,173	**10,452**
October-2012	7,470	2,708	1,269	**11,447**
November-2012	6,959	2,254	968	**10,181**
December-2012	6,439	2,329	948	**9,716**
January-2013	6,287	2,367	1,071	**9,725**
February-2013	6,388	2,227	993	**9,608**
March-2013	7,717	1,605	1,130	**10,452**
April-2013	6,860	1,993	1,223	**10,076**
May-2013	7,074	1,746	1,222	**10,042**
June-2013	6,640	1,277	1,209	**9,126**
TOTAL	**82,482**	**24,688**	**13,715**	**120,885**

7.1.4.3. Dial-A-Ride

Glendale offers ADA mobility service to eligible persons who, because of a disability, cannot use regular fixed-route bus services offered through Valley METRO. Pick-up and drop-off services are accommodated within 3/4 of a mile of all Valley METRO fixed routes operated in Glendale and during the same hours.

7.1.4.4. Taxi Subsidy Program

Glendale offers a taxi-subsidy for persons with special transportation needs. The program assists people in making repetitive trips for medical treatments and therapies.

7.1.5. Phoenix

7.1.5.1. Dial-A-Ride/ADA Service

The Phoenix Public Transit Department operates the Phoenix Dial-a-Ride service. This is a reservation only, shared-ride public transportation service for people determined to be eligible under ADA regulations, who cannot use local bus service. This service is available whenever and wherever Valley METRO operates local, fixed-route bus service.

7.1.5.2. Phoenix Reserve-A-Ride

The Phoenix Reserve-A-Ride service provides specialized, door-to-door transportation for the elderly, age 60 and over; and certified disabled individuals, age 18 and over. Reserve-A-Ride's primary transportation function is to provide transportation to and from Phoenix's 15 senior centers. All vehicles are wheelchair accessible and ADA compliant.

7.1.5.3. Phoenix Alternative Transportation Programs

Phoenix allocates funding for taxicab subsidy programs to provide alternative transportation options for people with disabilities and senior citizens. The taxicab subsidy programs are aimed at providing more flexibility for eligible passengers, allowing them to plan trips based on their schedule. Four programs are in place:

- ADA Taxicab Vouchers.
- Senior Cab.
- Work Trip.
- Dialysis Trip.

7.2. Pedestrian and Bicycle Facilities

Existing pedestrian and bicycle facilities along the US-60/Grand Avenue corridor are minimal. Generally, accommodations for pedestrians exist on the roadway side opposite the BNSF Railway and at major intersections crossing US-60/Grand Avenue.

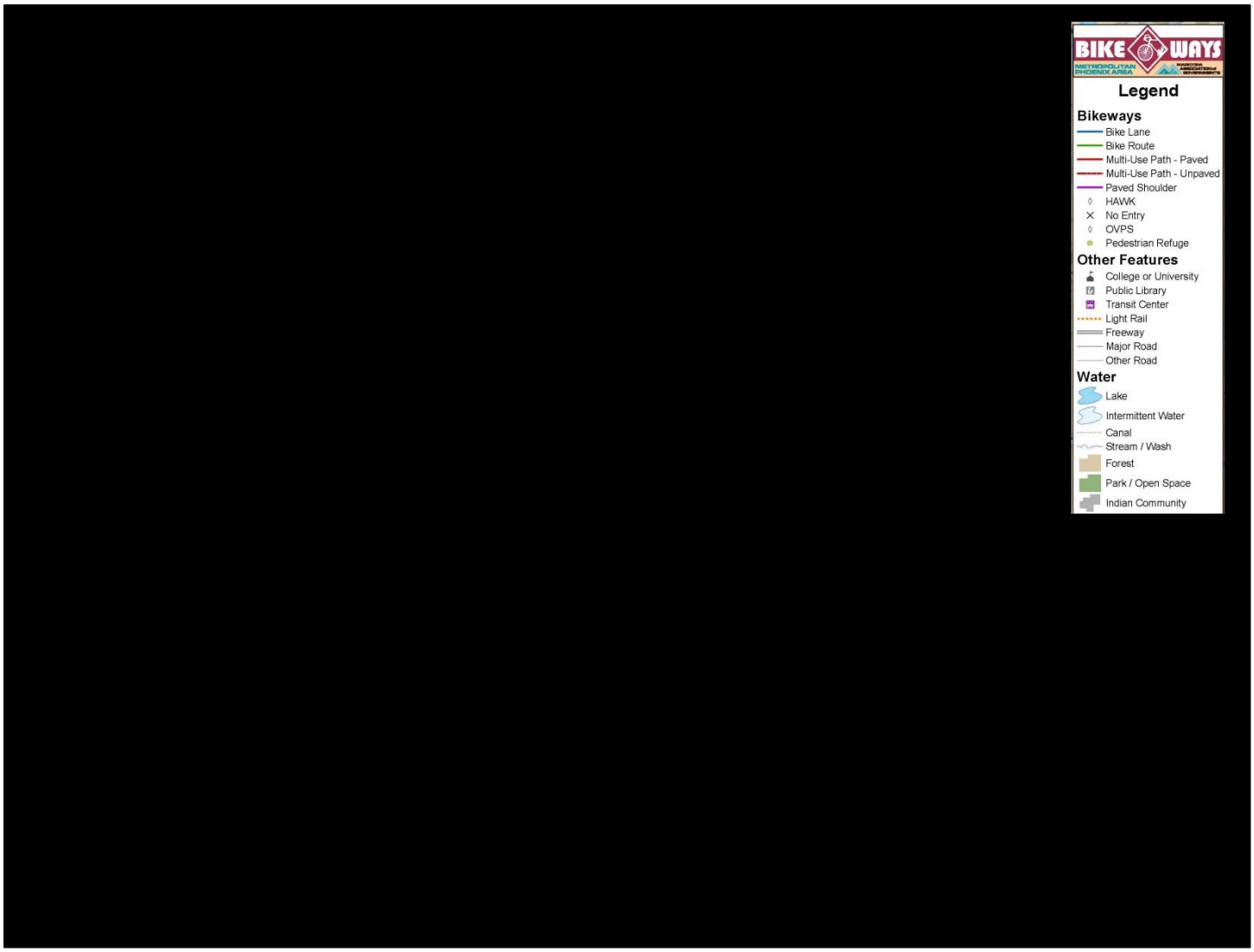
Sidewalks are located along Grand Avenue adjacent to commercial business frontage but are not continuous throughout the corridor. Pedestrian crosswalks and signal heads are installed at intersections with traffic signals. Bicycles are permitted on US-60/Grand Avenue; however, the existing pavement widths do not meet recommended minimum widths for bicycle traffic. Therefore, there are no signs or pavement markings suggesting dedicated bicycle paths or routes. The Map Book in ***Appendix TM1-1*** describes locations of sidewalk and crosswalks within the study area.

The New River (bicycle) Trail parallels the New River through Peoria. The trail crosses US-60/Grand Avenue along the river bank under the New River Bridges. The trail passes a number of communities, businesses, and parks and ultimately connects to the Arizona Canal Trail.

Glendale has a designated bike route along Maryland Avenue from 43rd Avenue to 67th Avenue crossing over US-60/Grand Avenue along the Maryland Avenue Underpass. The bike route consists of an on street widened shoulder width signed and marked as a designated bicycle/parking lane.

An excerpt from the MAG Bike Ways is shown in ***Figure 22*** and depicts bicycle routes within the corridor.

Figure 22 – MAG Bikeways



7.3. Golf Carts

The western portion of the study area, particularly Sun City, Sun City West, and Youngtown experience significant golf cart traffic. MCDOT staff indicated that there are significant golf cart crossings at RH Johnson Boulevard. Within Maricopa County, golf carts are allowed to share the road when posted speeds are 35 mph or less. Staff noted that improvements have been funded to grade-separate the 103rd Avenue/ US-60/Grand Avenue intersection, with 103rd Avenue as an overpass. These improvements will accommodate golf cart traffic. Recreation Centers and golf courses within Sun City are known to generate golf cart traffic. There are three golf courses south of US-60/Grand Avenue between 111th Avenue and SR-101L and two additional courses near US-60/Grand Avenue to the north. There are four recreation centers with close proximity to US-60/Grand Avenue.

Youngtown staff indicated 111th and 103rd Avenues as key golf cart crossing points on US-60/Grand Avenue. Staff also described the planned grade-separation at 103rd Avenue and noted that golf carts would use this route.

8.0 Conclusion

The US-60/Grand Avenue COMPASS study area is diverse in nearly every facet reviewed as part of this Technical Memorandum. While the functionality has evolved, US-60/Grand Avenue has long been a developed and highly utilized transportation corridor. The following fundamental elements should be considerations moving forward.

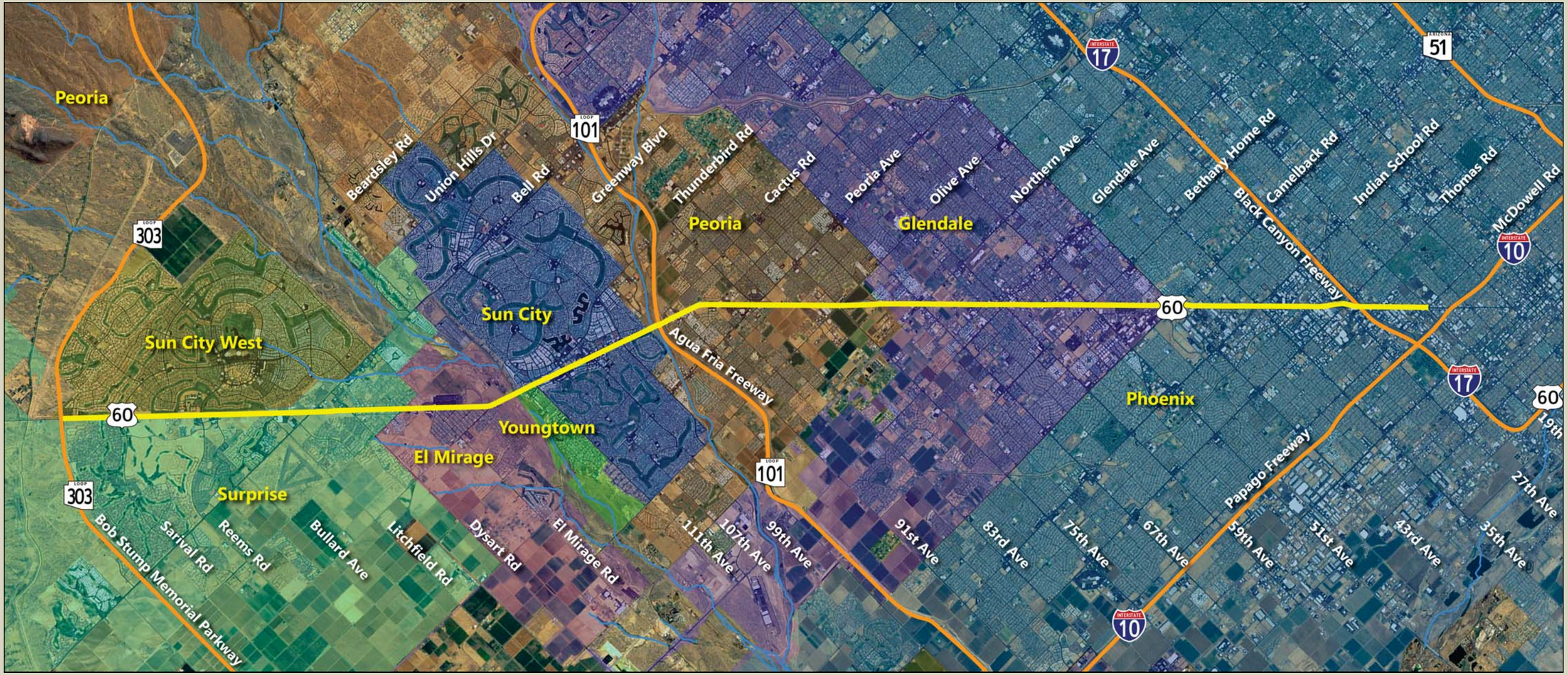
- The US-60/Grand Avenue COMPASS study area has been the subject of 54 completed studies and projects. There is substantial interest in the corridor, evidenced by the signing of the Partnering Charter at the outset of this study. The character of the corridor varies throughout, as does its current function and future documented interests.
- Roadway and traffic control elements are inconsistent throughout the corridor, where US-60/Grand Avenue is not configured with the priority of a regional route. For example, side streets are given priority at intersections and in traffic operations in many locations. Access varies throughout without an established access management plan. There are sections that resemble freeways while in other areas, there are numerous access points as would be expected on a collector or a local street.
- Railroad, utilities and right-of-way constraints will likely impact future recommendations.
- Land use varies with more residential uses in Surprise, and downtown uses in Glendale and Peoria transitioning to industrial and employment uses in the Phoenix portion. US-60/Grand Avenue connects six downtown areas, with land use plans having provisions for transit-oriented development. Current transportation patterns, however, are automobile intensive.
- Special consideration will be needed for potential environmental impacts, especially environmental justice, natural resources, contaminated sites, and underground storage tanks.
- Traffic operations will need to be addressed in future years, including the mobility of people and freight. Key locations to focus on include the segments from SR-303L to Bell Road, Thunderbird Road to SR-101L, and Northern Avenue to Indian School Road. Many of these same locations also exhibit higher crash rates than the remainder of the corridor.
- Travel data indicates commuter use of the corridor; however, the primary use of US-60/Grand Avenue appears to be local travel.
- Multimodal services are limited in the study area. Future additional transit services will need to consider potential connecting/supporting networks.

The history and uniqueness of US-60/Grand Avenue lend special opportunities for future improvements and development, but will be challenged by the numerous existing conditions. The development of an access management plan will remedy many of the existing operational issues and facilitate economic development. There are many areas that are under-developed or vacant along the corridor; redevelopment and revitalization of these areas is a focus of the local agencies and will be considered in the next steps of the planning process.

APPENDIX TM1-1

Existing Conditions Summary Map Book

Existing Conditions Summary Map Book



Legend
- US-60/Grand Ave COMPASS Corridor
- Freeway
- Streams/Washes

Corridor Optimization and Access Management Plan, and System Study
COMPASS
MARICOPA ASSOCIATION of GOVERNMENTS

US-60/Grand Avenue:
Loop 303 to Interstate 10

COMPASS

US-60/Grand Avenue:
Loop 303 to Interstate 10

Map Book Legend

CRASH HISTORY (2009-2011)	
Crash Hot Spots	Segment
	Intersection
LEVEL OF SERVICE	
Level of Service (2008)*	
ROADWAY FEATURES	
Total Approximate R/W Width	
WB	Lighting
	Access
	Sidewalk
	Shoulder
	No. Roadway Lanes
Median	Type
	Lighting
EB	No. Roadway Lanes
	Shoulder
	Sidewalk
	Access
	Lighting

Top 5 1-Mile Segments

Top 6 Intersections

Level of Service*: A, B, C, D, E, F

* 2008 Conformity Model Quality/Level of Service balanced directionally.

X FT ⟷ X FT — Width based upon available information

Lighting / No Lighting

>330′ / 330′ to 165′ / <165′ — Average distance between access points/density

Sidewalk / No Sidewalk

Shoulder / No Shoulder

Three Through Lanes

Two Through Lanes

Depressed
Depressed and Landscaped
Raised and Landscaped
Raised
Concrete Barrier
Separated

Lighting / No Lighting

8/8/2013

MAP BOOK INDEX

City	Map Book Page No.	US-60 Milepost Range
Surprise	1-13	138.50 - 144.28
El Mirage	13-17	142.76 - 146.20
Sun City	17-22	146.20 - 148.70
Youngtown	17-18	146.20 - 146.58
Peoria	22-31	148.70 - 152.72
Glendale	31-41	152.72 - 157.52
Phoenix	41-51	157.52 - 162.20

SYMBOLS

VIDEO	Signalized Intersection with Video Detection
LOOPS	Signalized Intersection with Loop Detection
STOP	Stop Controlled Intersection
	Pedestrian Crosswalk

Aerial Imagery was obtained from the Maricopa Association of Governments in August 2012

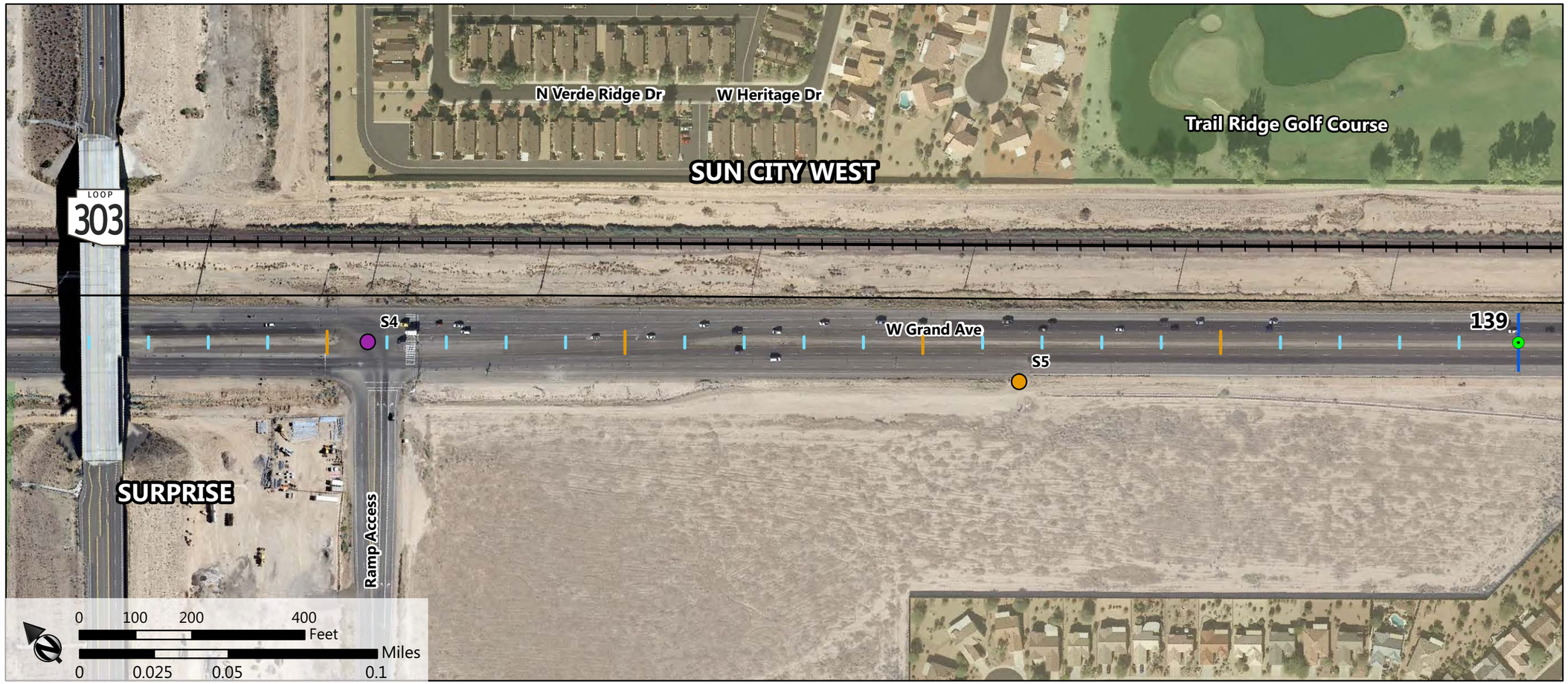
COMPASS
Corridor Optimization and Access Management Plan, and System Study
MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

- ADOT Mile Posts
- Railway
- City Boundary
- Driveway (US-60 ID Label)
- Intersection (US-60 ID Label)
- Single Family Low Density
- Single Family Medium Density
- Single Family High Density
- Multi Family
- Developing Residential
- Retail Low
- Retail High
- Office
- Other Employment
- Developing Employment Generating
- Industrial
- Educational
- Institutional/Religious
- Medical/Nursing Home
- Cemetery
- Public/Special Event/Military
- Active Open Space
- Passive/Restricted Open Space
- Golf Course
- Agriculture
- Tourist Accomodations
- Water
- Vacant



138.5 | 138.6 | 138.7 | 138.8 | 138.9 | MP 139.0

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		228 FT; 228 FT; 170 FT; 170 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	DEPRESSED; DEPRESSED AND LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	
	Sidewalk	
	Lighting	

VIDEO

COMPASS
Corridor Optimization and Access Management Plan, and System Study
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US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

- ADOT Mile Posts
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- Driveway (US-60 ID Label)
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- Passive/Restricted Open Space
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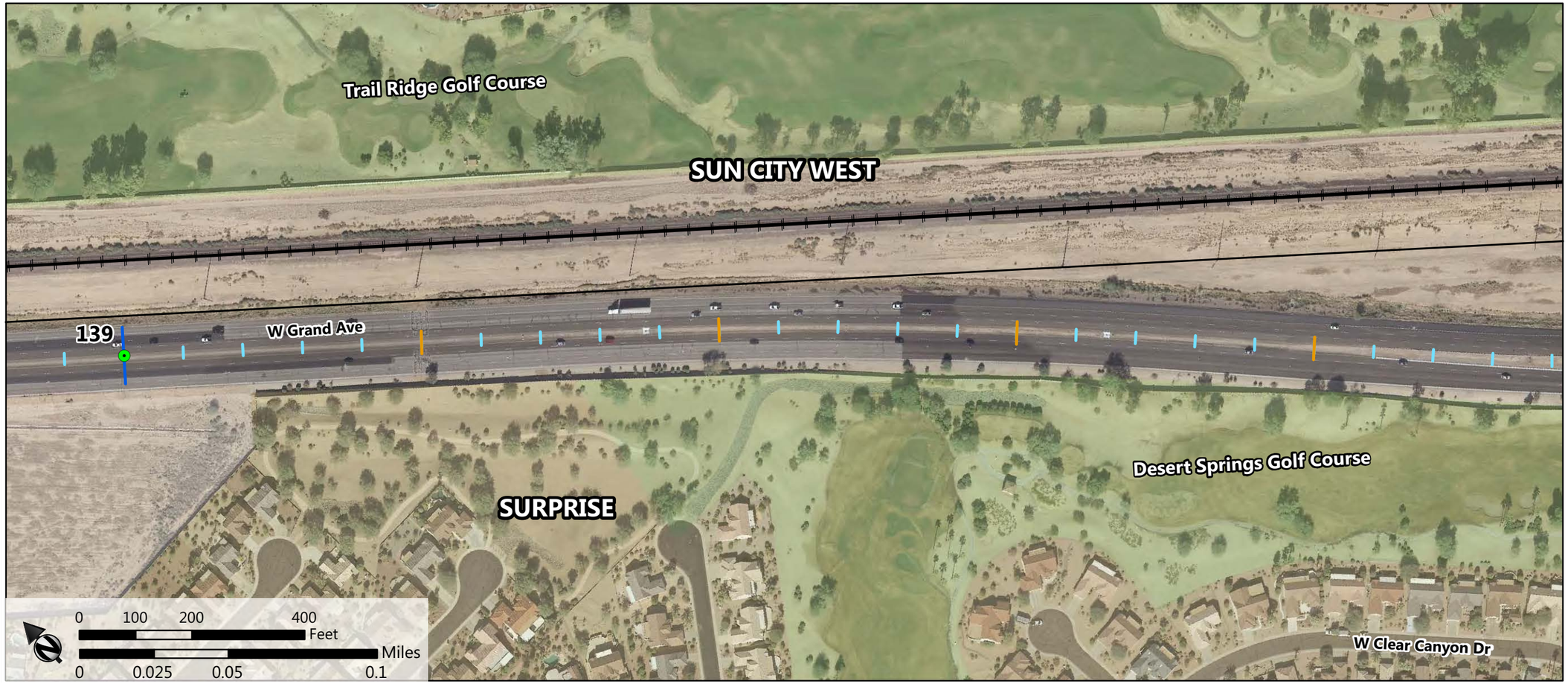
- Agriculture
- Tourist Accomodations
- Water
- Vacant



MP 139.0 139.1 139.2 139.3 139.4

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		170 FT ↔ 170 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	DEPRESSED AND LANDSCAPED / RAISED LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	
	Sidewalk	
	Lighting	

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Corridor Optimization and Access Management Plan, and System Study
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US-60/Grand Avenue: Loop 303 to Interstate 10

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- Water
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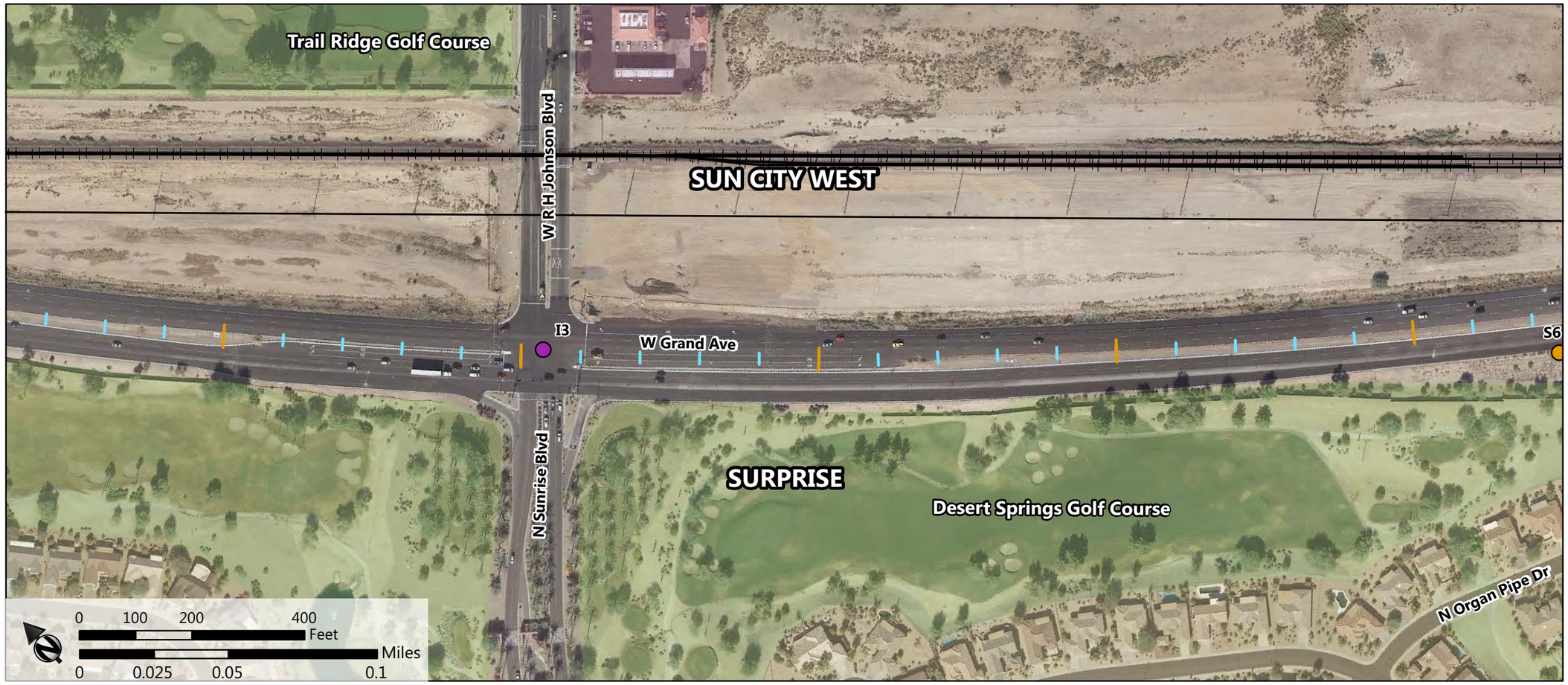

		139.5	139.6	139.7	139.8	139.9
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment					
	Intersection					
LEVEL OF SERVICE						
Level of Service (2008)		LOS C				
ROADWAY FEATURES						
Total Approximate R/W Width		170 FT				170 FT
WB	Lighting					
	Sidewalk					
	Access					
	Shoulder					
	No. Roadway Lanes					
Median	Type	RAISED AND LANDSCAPED	RAISED	RAISED	RAISED AND LANDSCAPED	
	Lighting					
EB	No. Roadway Lanes					
	Shoulder					
	Access					
	Sidewalk					
	Lighting					

VIDEO

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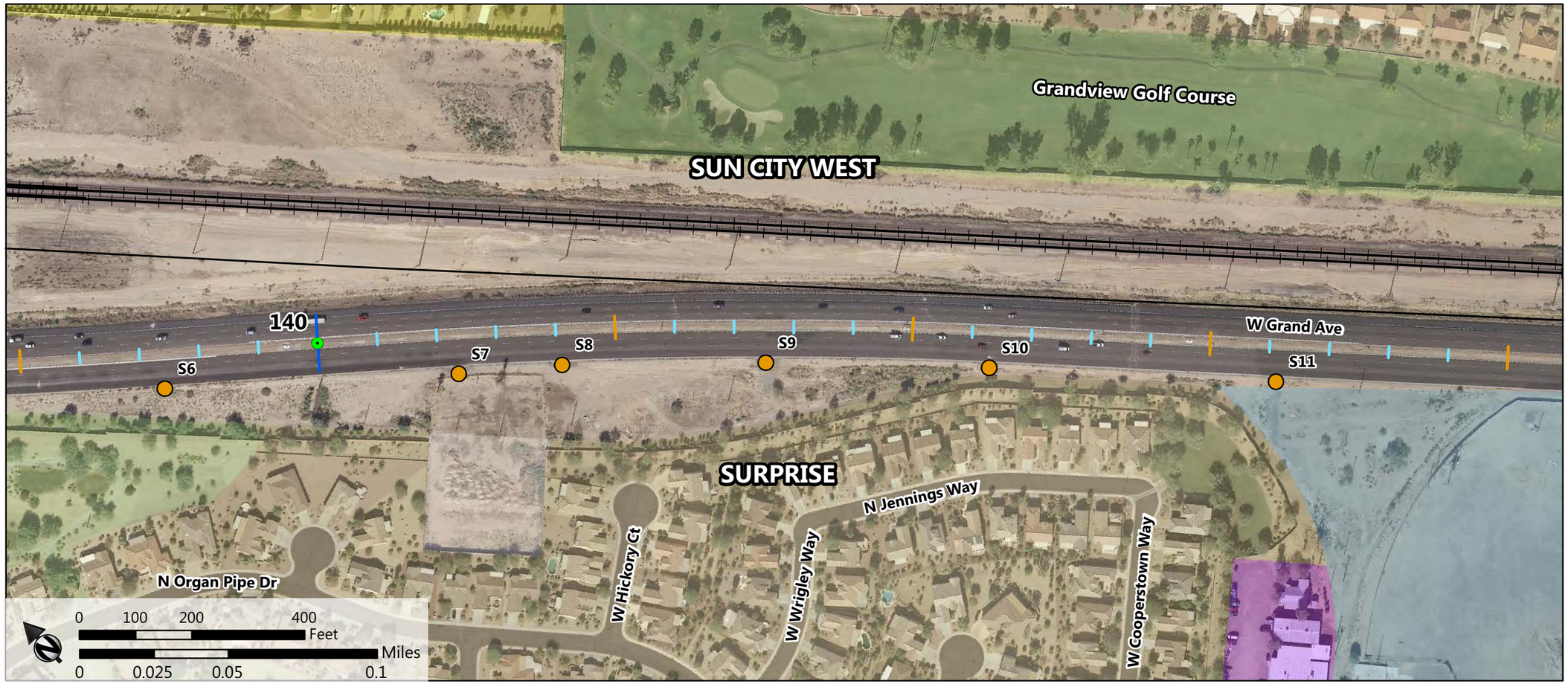

		139.9 … MP 140.0 … 140.1 … 140.2 … 140.3 … 140.4
CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		170 FT ← → 170 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	330' to 165'
	Sidewalk	
	Lighting	

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US-60/Grand Avenue: Loop 303 to Interstate 10

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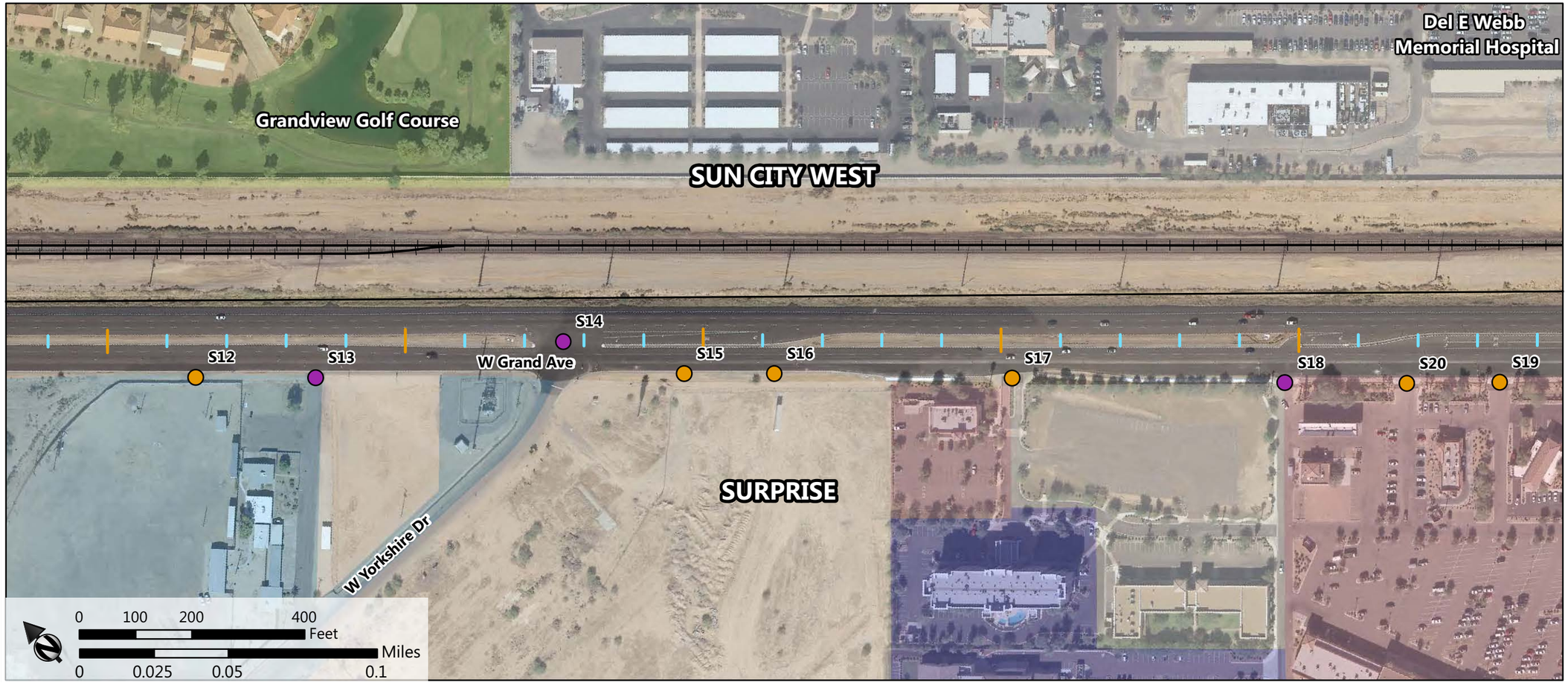

140.4 140.5 140.6 140.7 140.8

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		170 FT ← → 170 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED; RAISED; RAISED AND LANDSCAPED; RAISED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	330' to 165'; STOP; 330' to 165'; 330' to 165'; <165'; 330' to 165'
	Sidewalk	
	Lighting	

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US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

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- Golf Course
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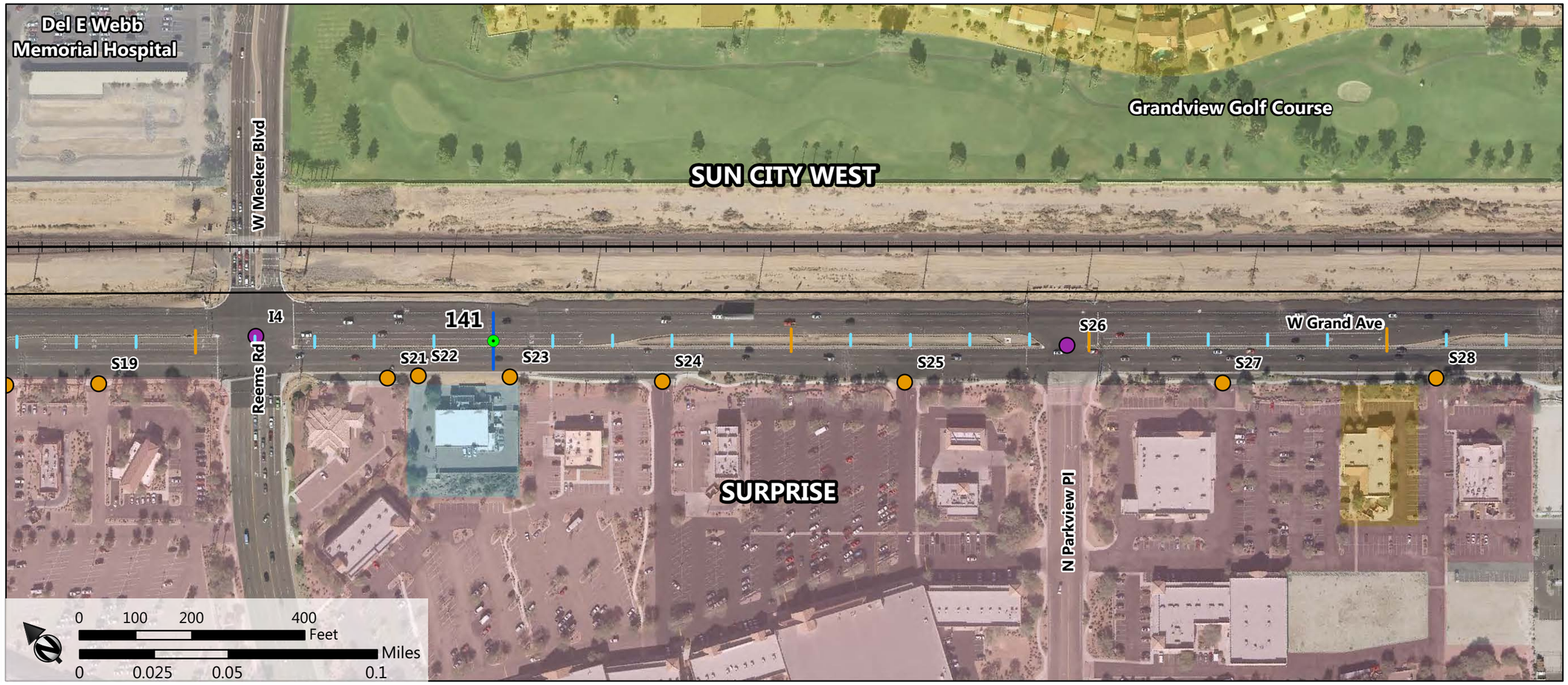
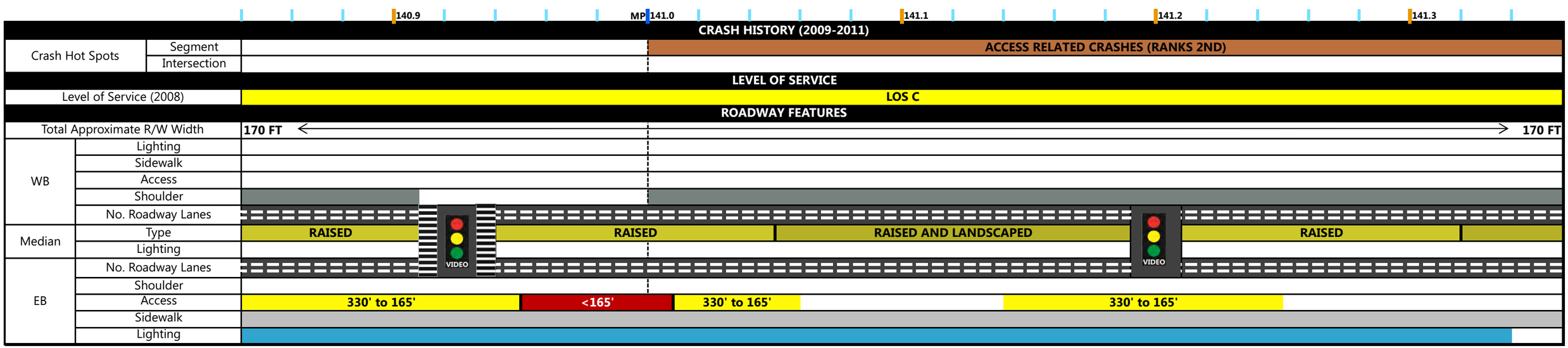
- Tourist Accomodations
- Water
- Vacant





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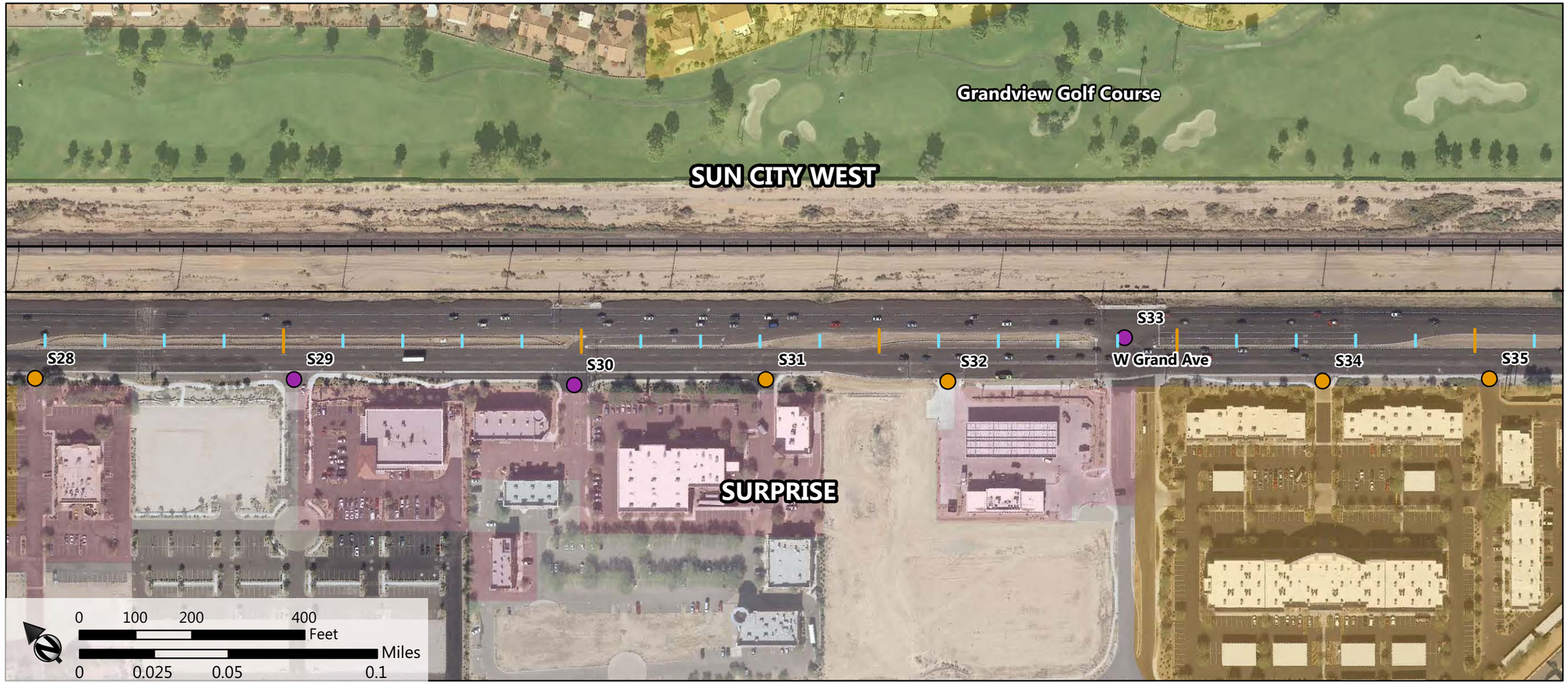

141.4 141.5 141.6 141.7 141.8

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	ACCESS RELATED CRASHES (RANKS 2ND)
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		170 FT ← → 170 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED; RAISED; RAISED; RAISED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	330' to 165'
	Sidewalk	
	Lighting	

VIDEO

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US-60/Grand Avenue: Loop 303 to Interstate 10

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- Golf Course
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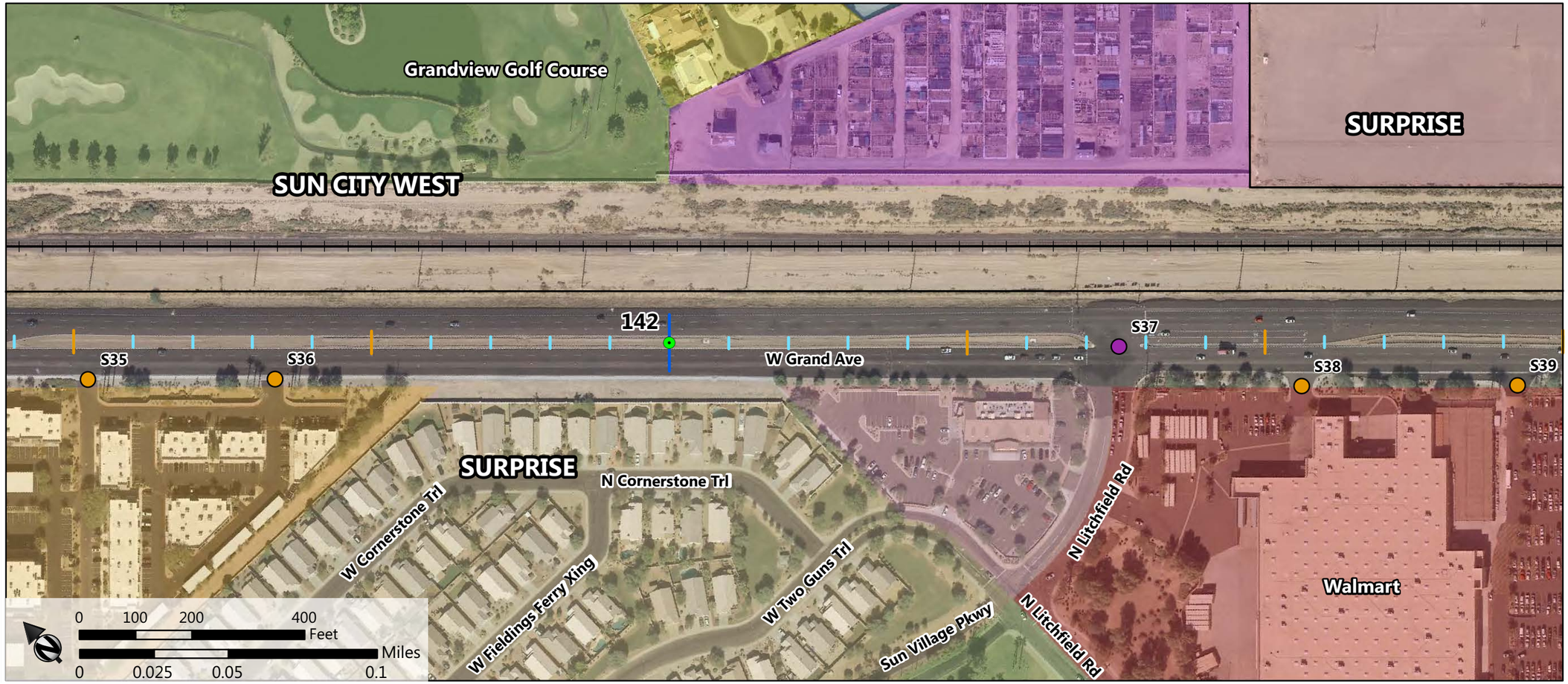

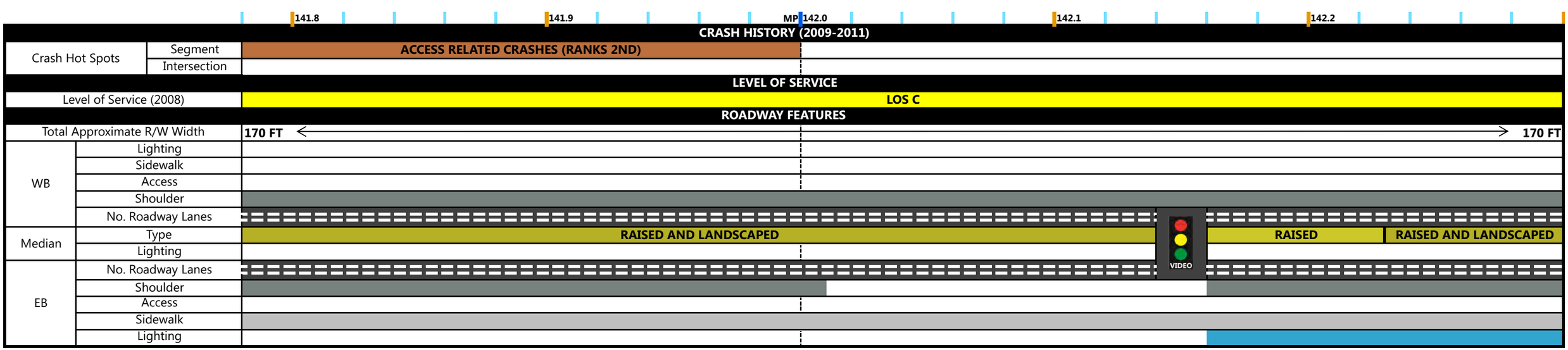

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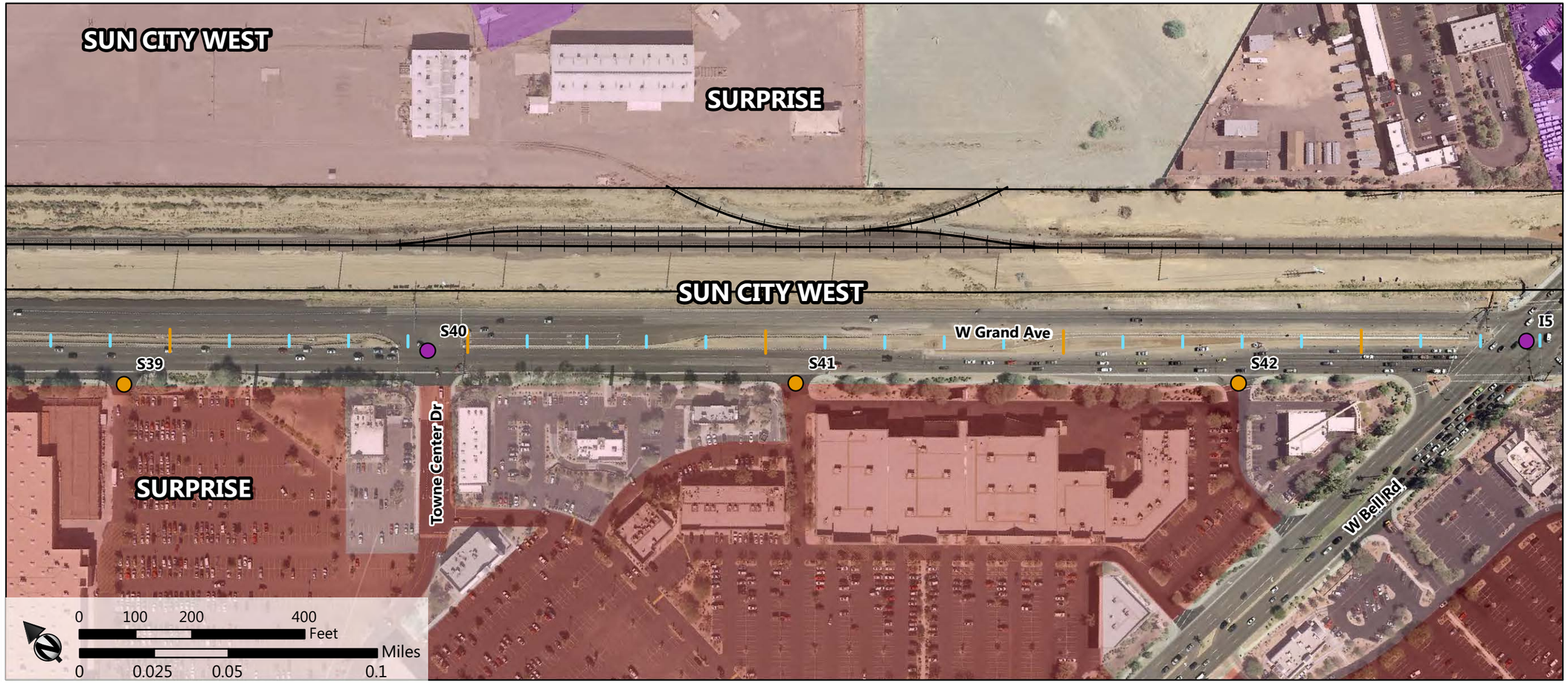

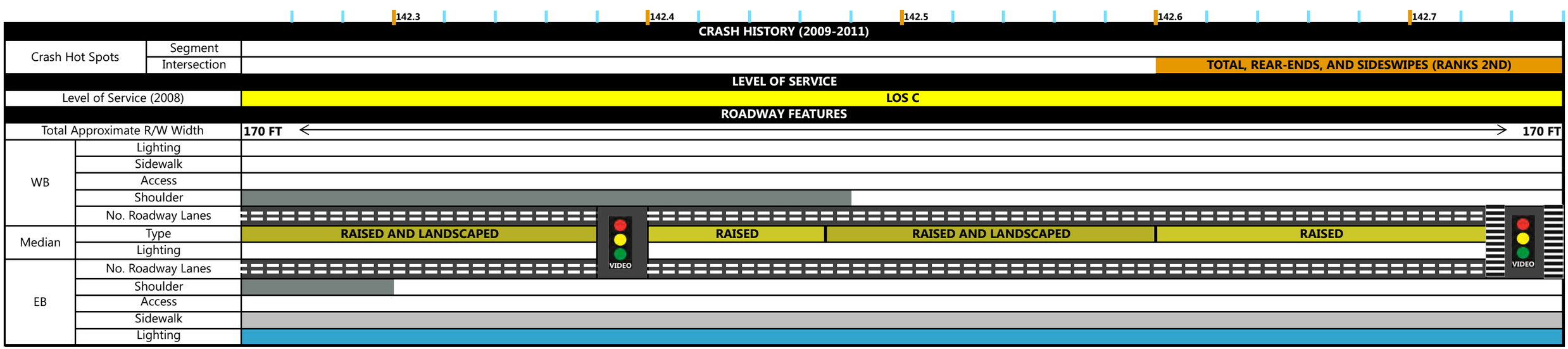

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Corridor Optimization and Access Management Plan, and System Study
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8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

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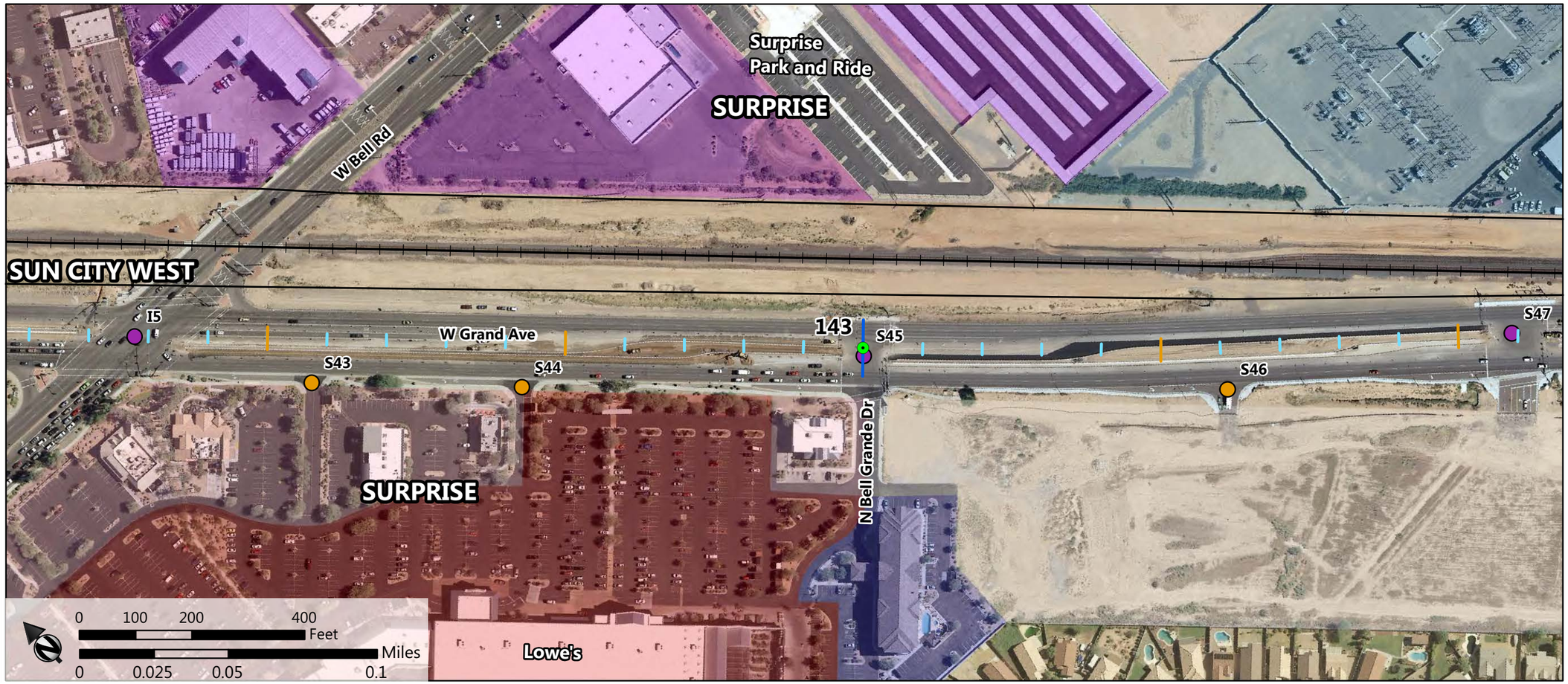

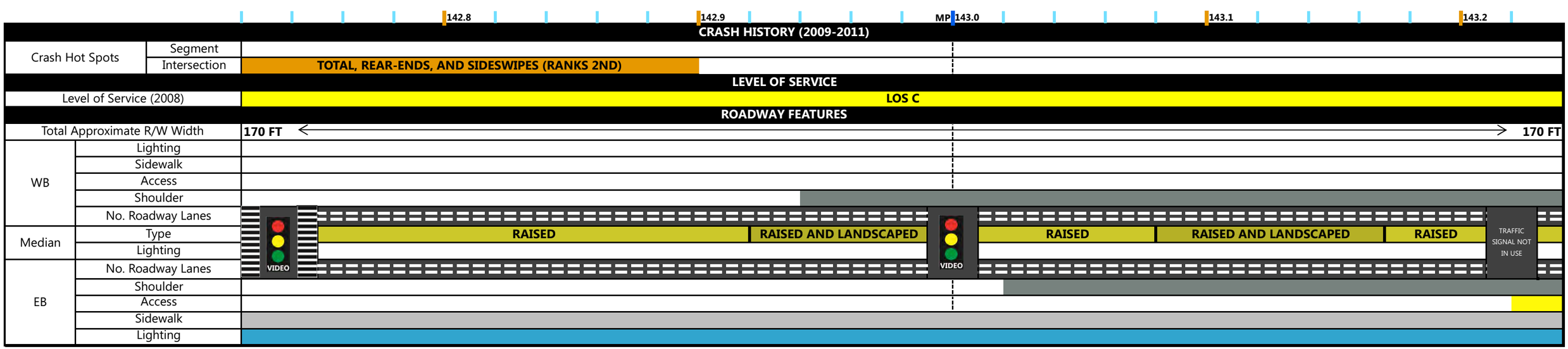

COMPASS

Corridor Optimization and Access Management Plan, and System Study

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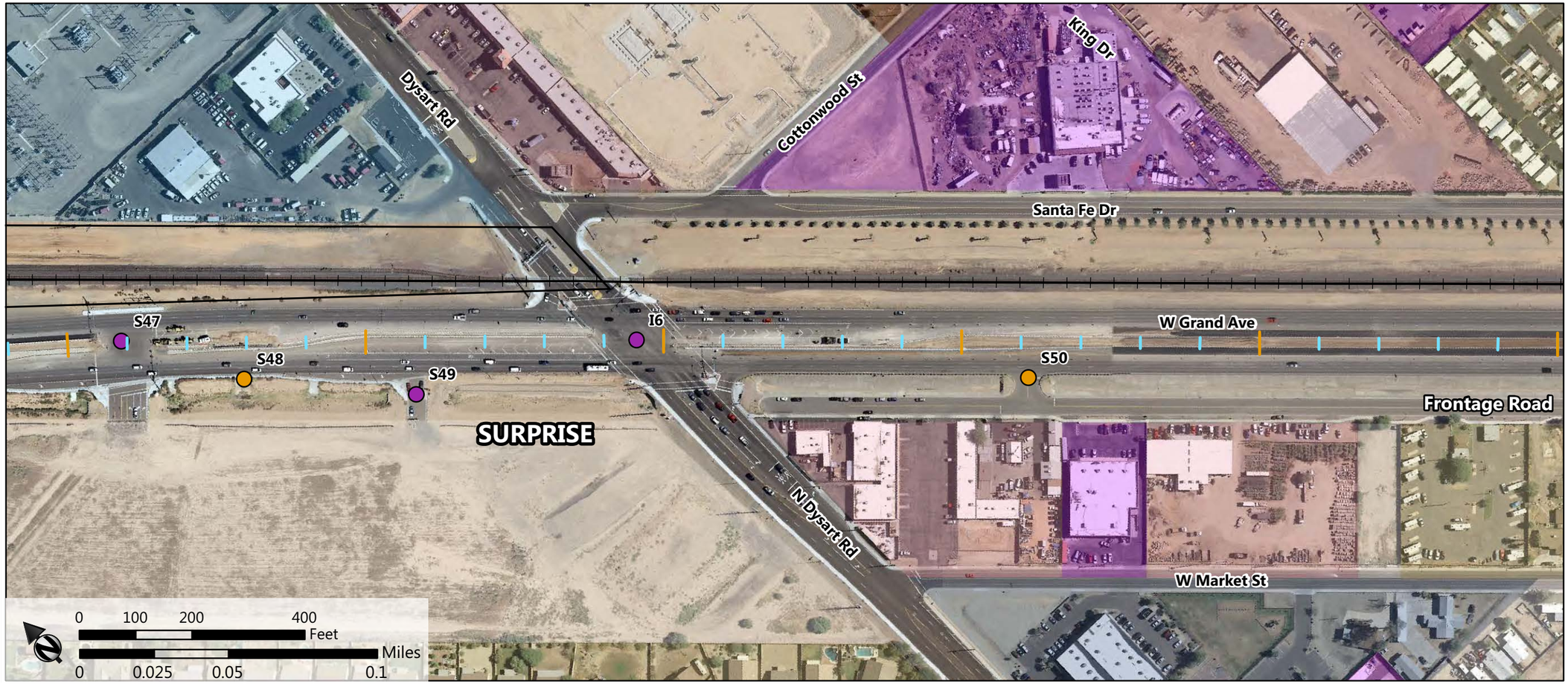

143.2 143.3 143.4 143.5 143.6

CRASH HISTORY (2009-2011)

Crash Hot Spots	Segment	
	Intersection	

LEVEL OF SERVICE

Level of Service (2008)	LOS C

ROADWAY FEATURES

Total Approximate R/W Width		170 FT ← → 170 FT; 215 FT ← → 215 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED; TRAFFIC SIGNAL NOT IN USE; RAISED; VIDEO; RAISED; RAISED AND LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	330' to 165'; STOP FRONTAGE ROAD (ADOT R/W)
	Sidewalk	
	Lighting	

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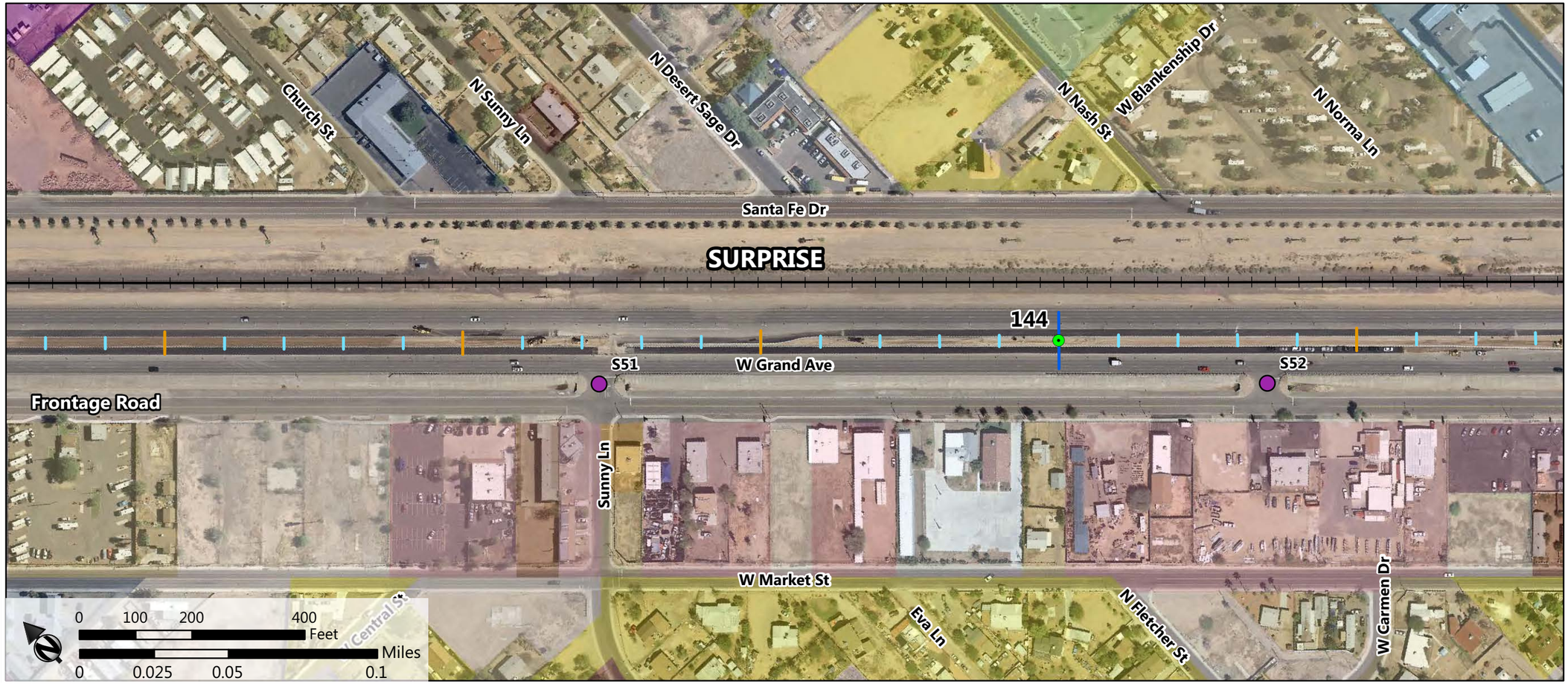

143.7 143.8 143.9 MP 144.0 144.1

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		215 FT ⟷ 215 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED; RAISED; RAISED AND LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	STOP — FRONTAGE ROAD (ADOT R/W) — STOP
	Sidewalk	
	Lighting	

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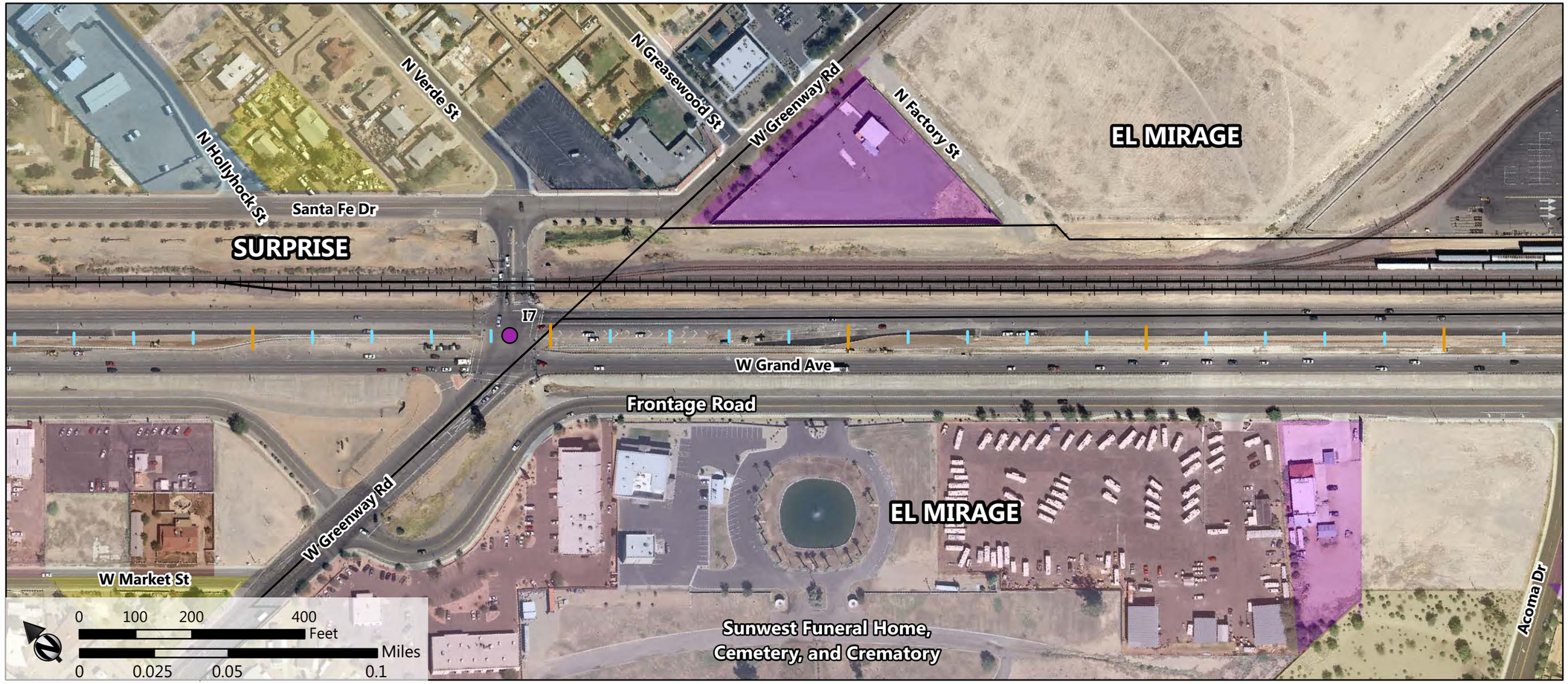

		144.2	144.3	144.4	144.5	144.6
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment					
	Intersection					
LEVEL OF SERVICE						
Level of Service (2008)		LOS C				
ROADWAY FEATURES						
Total Approximate R/W Width		215 FT				215 FT
WB	Lighting					
	Sidewalk					
	Access					
	Shoulder					
	No. Roadway Lanes					
Median	Type	RAISED AND LANDSCAPED	RAISED	RAISED	RAISED AND LANDSCAPED	
	Lighting					
EB	No. Roadway Lanes					
	Shoulder					
	Access	FRONTAGE ROAD (ADOT R/W)				
	Sidewalk					
	Lighting					

VIDEO

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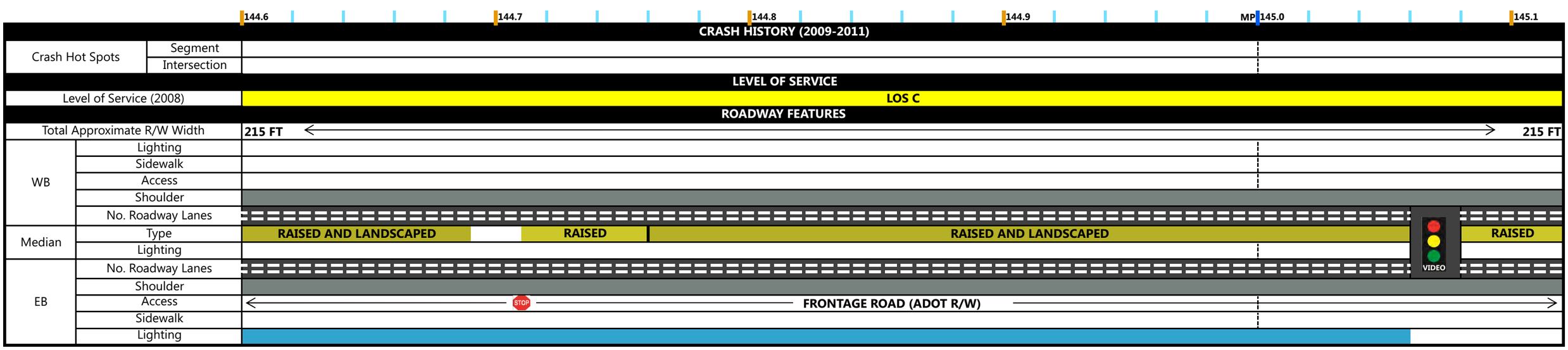

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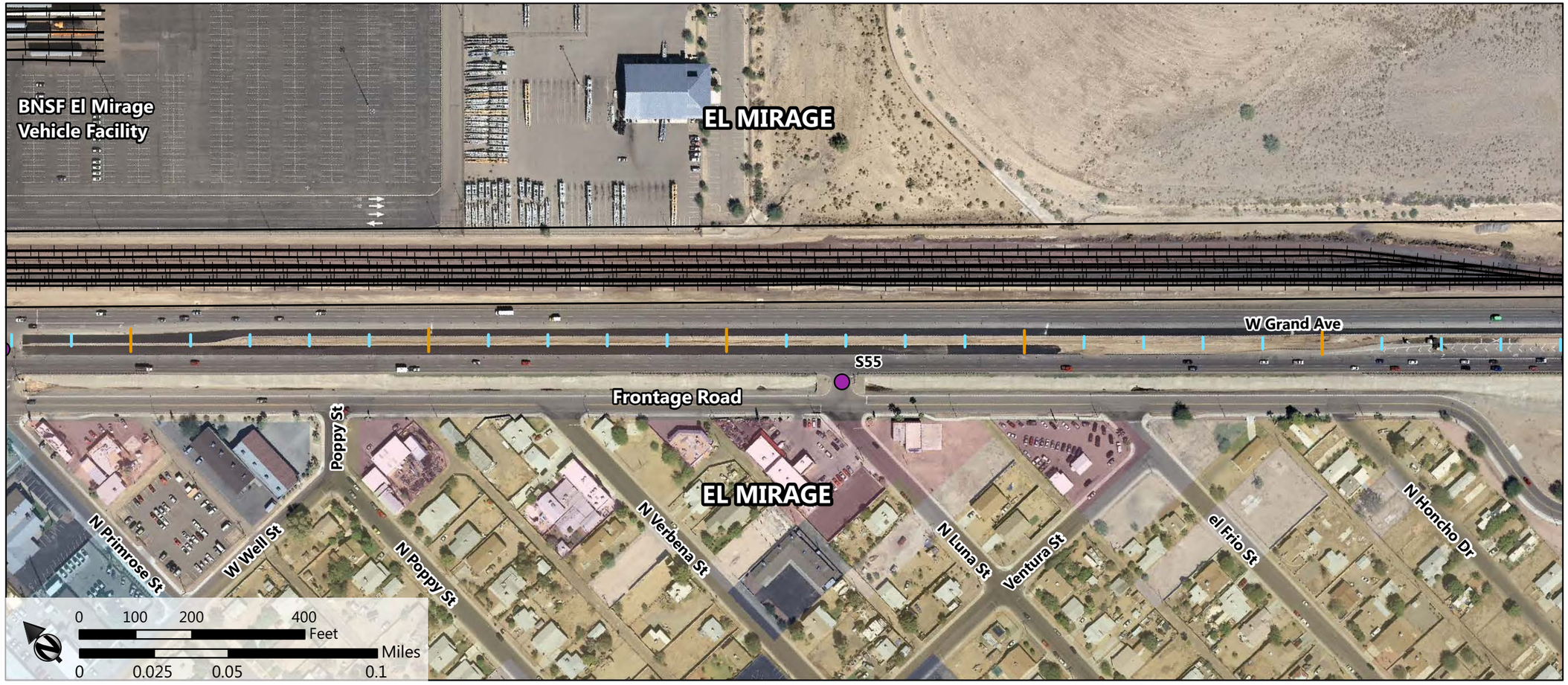


		145.1	145.2	145.3	145.4	145.5
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment					
	Intersection					REAR-ENDS AND INJURY
LEVEL OF SERVICE						
Level of Service (2008)		LOS C				
ROADWAY FEATURES						
Total Approximate R/W Width		215 FT				215 FT
WB	Lighting					
	Sidewalk					
	Access					
	Shoulder					
	No. Roadway Lanes					
Median	Type	RAISED	RAISED AND LANDSCAPED			RAISED
	Lighting					
EB	No. Roadway Lanes					
	Shoulder					
	Access	FRONTAGE ROAD (ADOT R/W)				
	Sidewalk					
	Lighting					

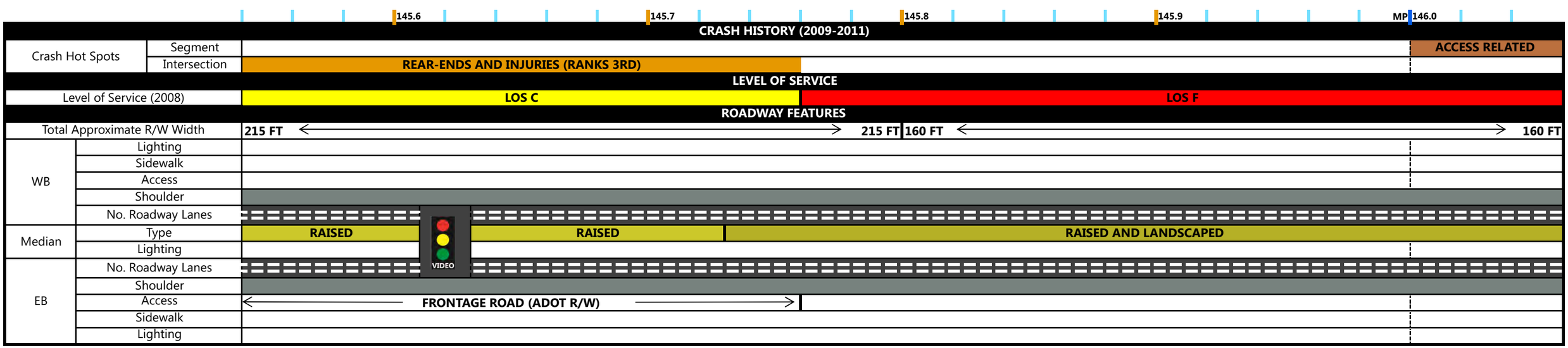
COMPASS
Corridor Optimization and Access Management Plan, and System Study
MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

- ADOT Mile Posts
- Railway
- City Boundary
- Driveway (US-60 ID Label)
- Intersection (US-60 ID Label)
- Single Family Low Density
- Single Family Medium Density
- Single Family High Density
- Multi Family
- Developing Residential
- Retail Low
- Retail High
- Office
- Other Employment
- Developing Employment Generating
- Industrial
- Educational
- Institutional/Religious
- Medical/Nursing Home
- Cemetery
- Public/Special Event/Military
- Active Open Space
- Passive/Restricted Open Space
- Golf Course
- Agriculture
- Tourist Accomodations
- Water
- Vacant



COMPASS
Corridor Optimization and Access Management Plan, and System Study
MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

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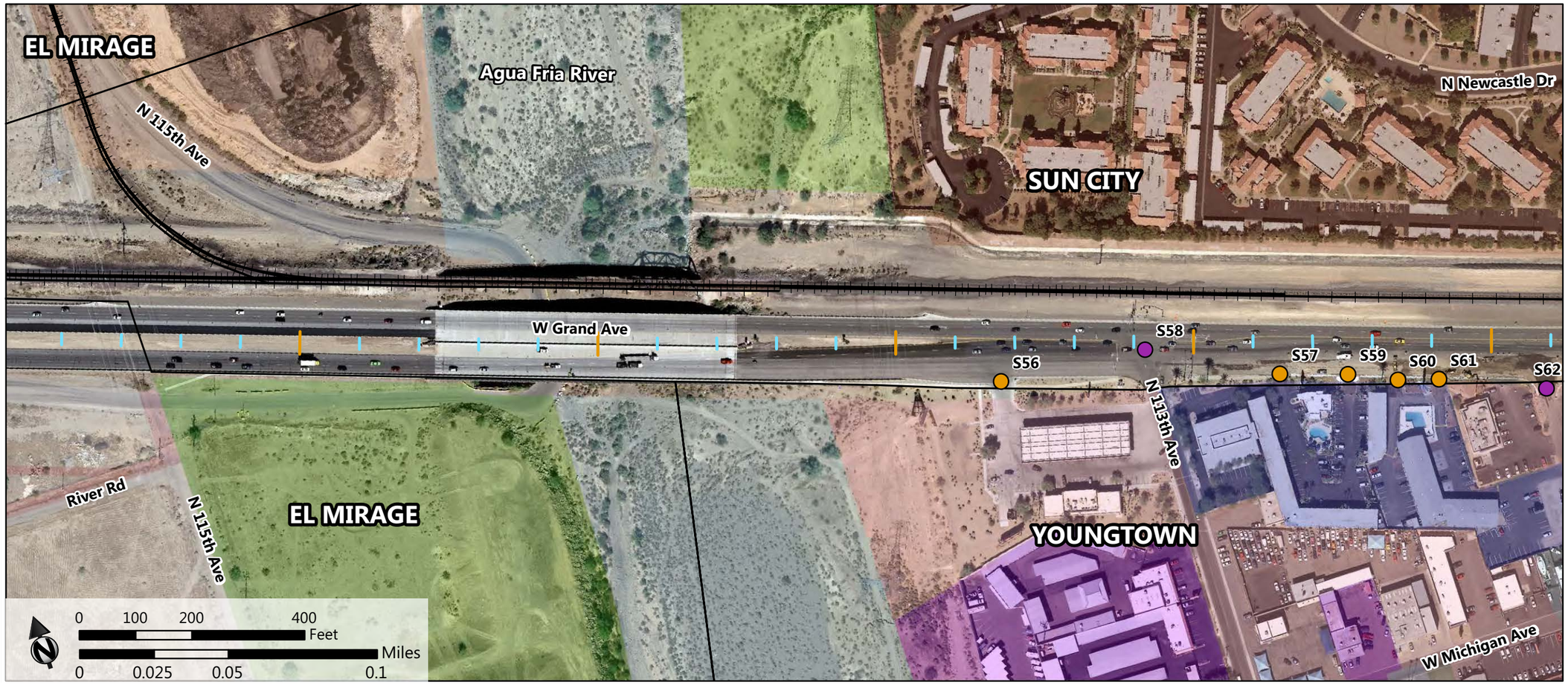

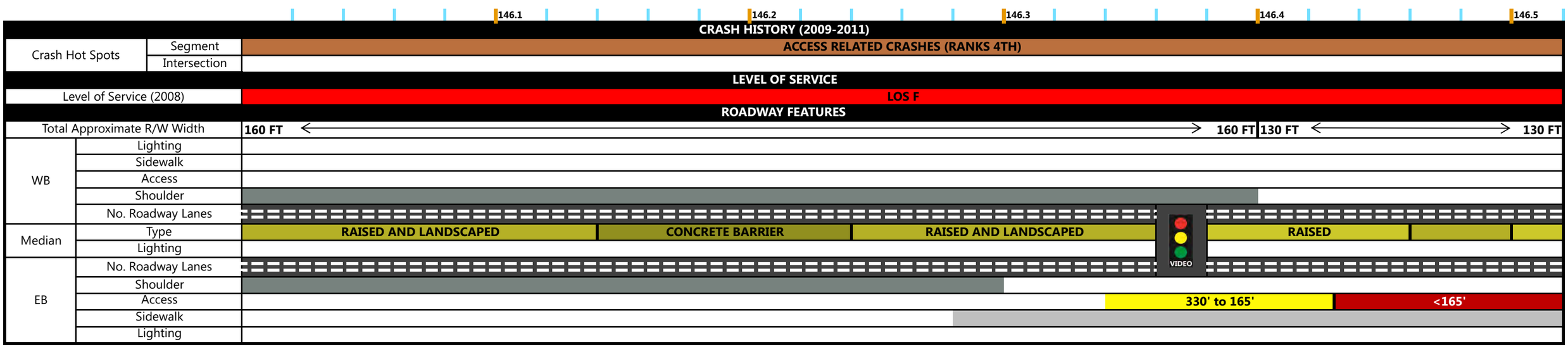

COMPASS
Corridor Optimization and Access Management Plan, and System Study
MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

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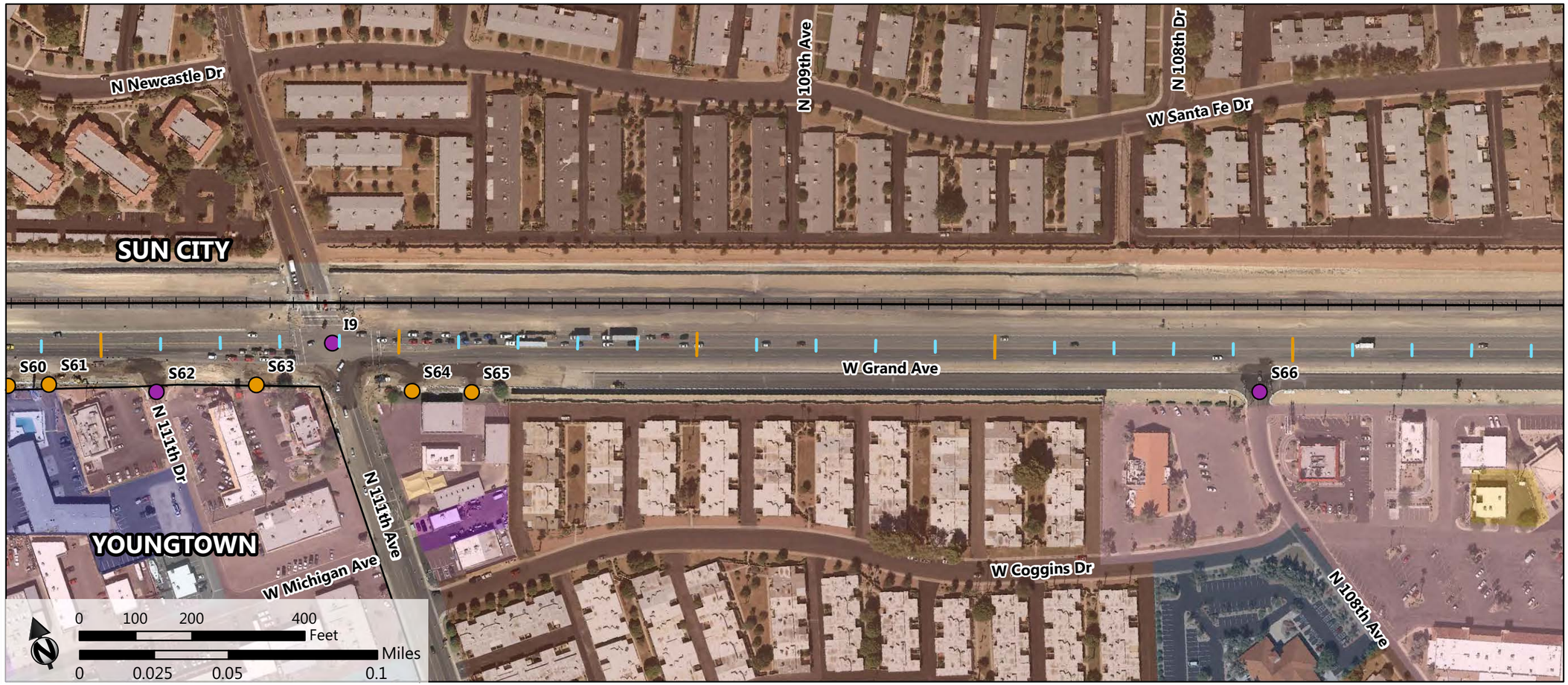

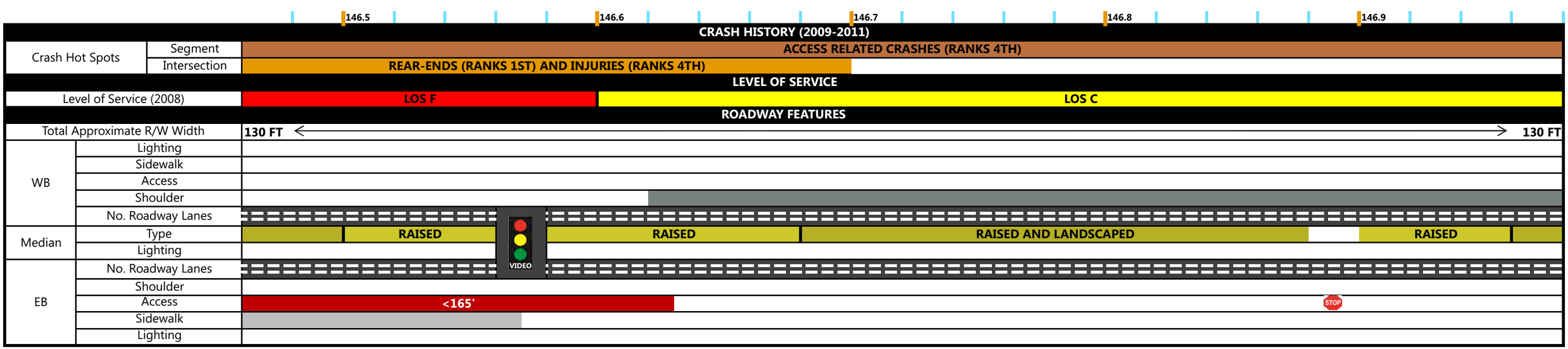

COMPASS
Corridor Optimization and Access Management Plan, and System Study
MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

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- Intersection (US-60 ID Label)
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- Retail Low
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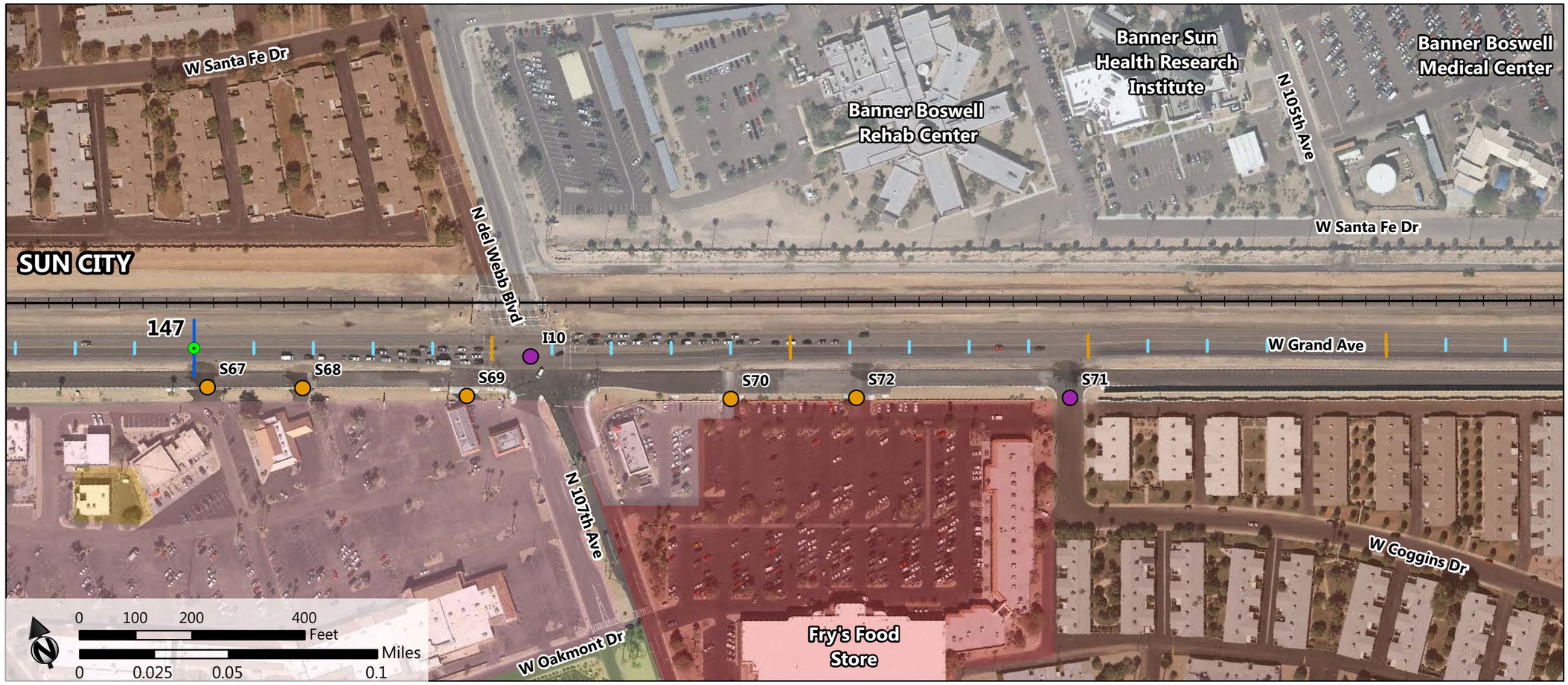

		MP 147.0 – 147.1	147.1 – 147.2	147.2 – 147.3	147.3 – 147.4
CRASH HISTORY (2009-2011)					
Crash Hot Spots	Segment	(CONT'D) ACCESS	CONGESTION RELATED CRASHES (RANKS 3RD)		
Crash Hot Spots	Intersection				
LEVEL OF SERVICE					
Level of Service (2008)		LOS C			
ROADWAY FEATURES					
Total Approximate R/W Width		130 FT			130 FT
WB	Lighting				
WB	Sidewalk				
WB	Access				
WB	Shoulder				
WB	No. Roadway Lanes				
Median	Type	RAISED AND LANDSCAPED	RAISED	RAISED / RAISED AND LANDSCAPED	RAISED / RAISED AND LANDSCAPED
Median	Lighting				
EB	No. Roadway Lanes				
EB	Shoulder				
EB	Access	<165' / 330' to 165'	<165' / 330' to 165'		
EB	Sidewalk				
EB	Lighting				

VIDEO

STOP

COMPASS

Corridor Optimization and Access Management Plan, and System Study

MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

- ADOT Mile Posts
- Railway
- City Boundary
- Driveway (US-60 ID Label)
- Intersection (US-60 ID Label)
- Single Family Low Density
- Single Family Medium Density
- Single Family High Density
- Multi Family
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- Institutional/Religious
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- Cemetery
- Public/Special Event/Military
- Active Open Space
- Passive/Restricted Open Space
- Golf Course
- Agriculture
- Tourist Accomodations
- Water
- Vacant

		147.5	147.6	147.7	147.8	147.9
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment	CONGESTION RELATED CRASHES (RANKS 3RD)				
	Intersection					
LEVEL OF SERVICE						
Level of Service (2008)		LOS C				
ROADWAY FEATURES						
Total Approximate R/W Width		130 FT	130 FT	130 FT - 140 FT	(VARIES)	130 FT - 140 FT
WB	Lighting					
	Sidewalk					
	Access					
	Shoulder					
	No. Roadway Lanes					
Median	Type	RAISED AND LANDSCAPED	RAISED	RAISED	RAISED AND LANDSCAPED	RAISED
	Lighting					
EB	No. Roadway Lanes					
	Shoulder					
	Access	STOP	330' to 165'	<165'	330' to 165' <165' STOP 330' to 165'	STOP
	Sidewalk					
	Lighting					

VIDEO

COMPASS
Corridor Optimization and Access Management Plan, and System Study
MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

- ADOT Mile Posts
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- City Boundary
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- Intersection (US-60 ID Label)
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- Single Family High Density
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- Cemetery
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- Golf Course
- Agriculture
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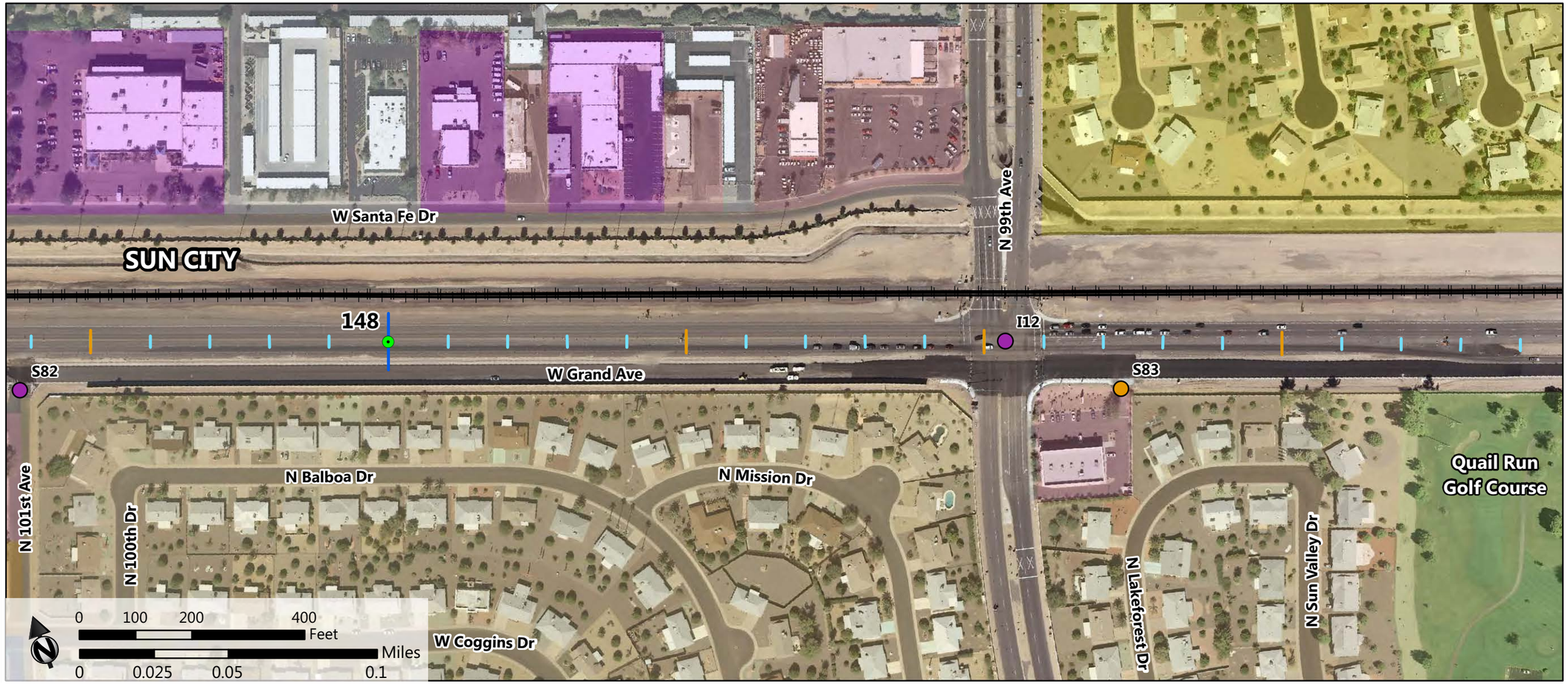
- Water
- Vacant



		147.9 — MP 148.0 — 148.1 — 148.2 — 148.3
CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	CONGESTION RELATED CRASHES (RANKS 3RD) / ACCESS RELATED CRASHES (RANKS 1ST)
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C / LOS F
ROADWAY FEATURES		
Total Approximate R/W Width		130 FT - 140 FT ← (VARIES) → 130 FT - 140 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED / RAISED AND LANDSCAPED / RAISED / RAISED / RAISED AND LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	VIDEO
	Shoulder	
	Access	STOP / 330' to 165'
	Sidewalk	
	Lighting	

COMPASS
Corridor Optimization and Access Management Plan, and System Study
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8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

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- City Boundary
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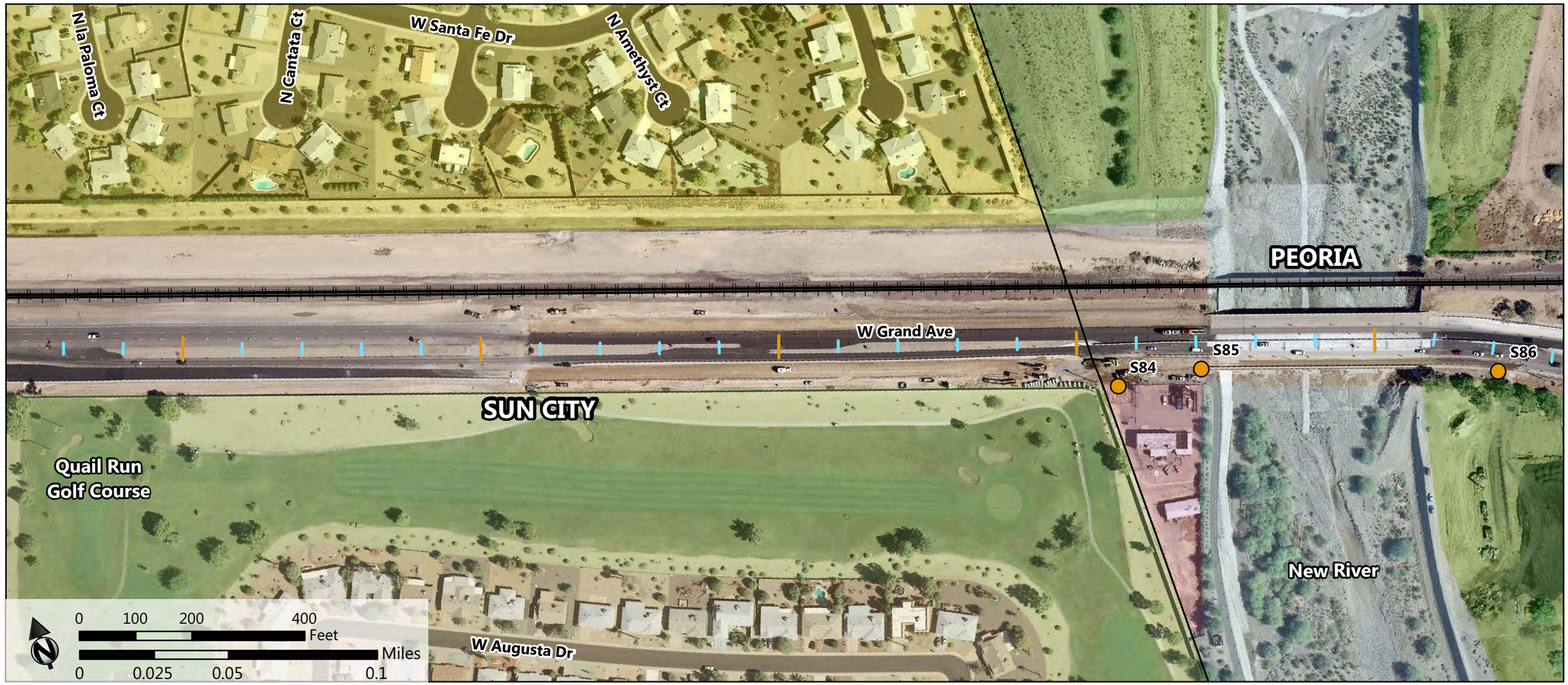

148.4 148.5 148.6 148.7 148.8

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	ACCESS RELATED CRASHES (RANKS 1ST)
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS F
ROADWAY FEATURES		
Total Approximate R/W Width		130 FT - 140 FT ← (VARIES) → 130 FT - 140 FT; 145 FT - 172 FT ← (VARIES) → 145 FT - 172 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED; RAISED AND LANDSCAPED; CONCRETE BARRIER
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	<165'; 330' to 165'
	Sidewalk	
	Lighting	

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Corridor Optimization and Access Management Plan, and System Study
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US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

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- Golf Course
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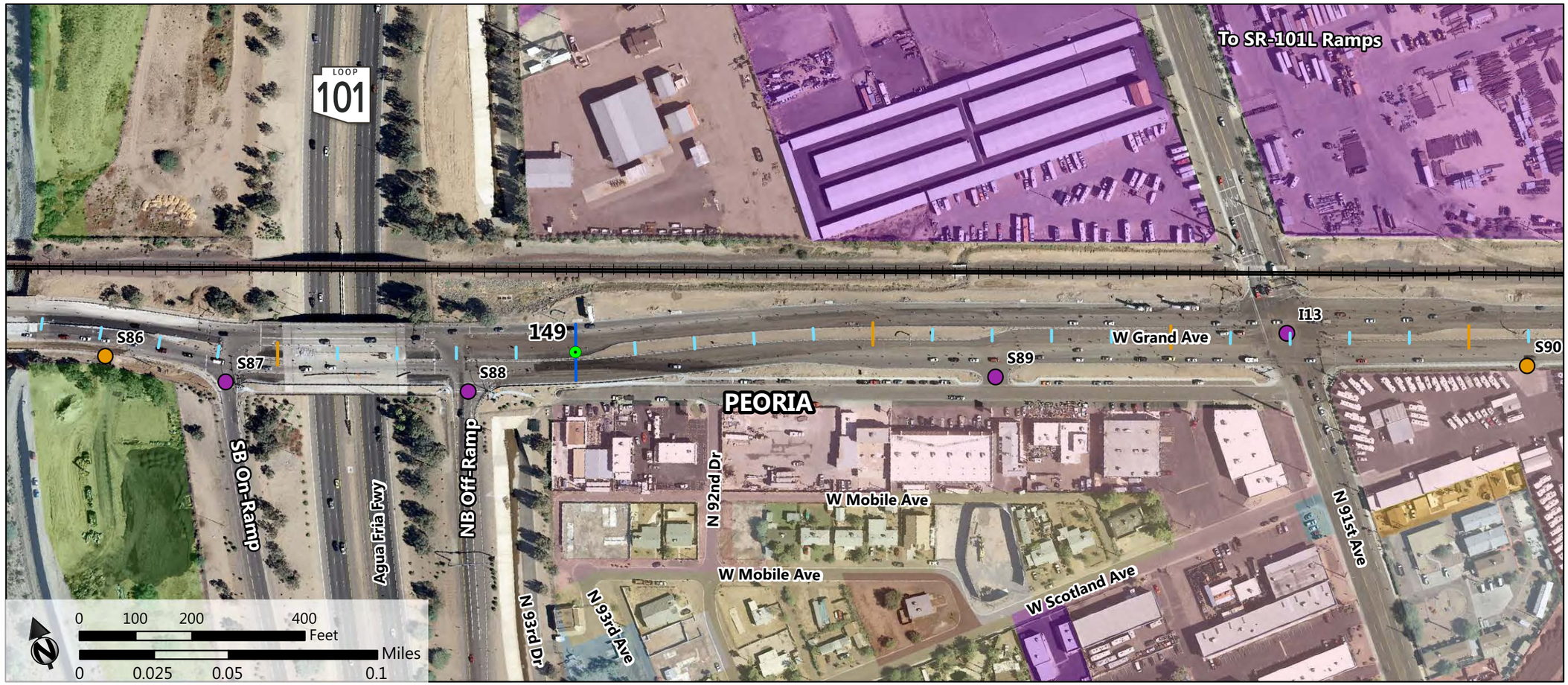
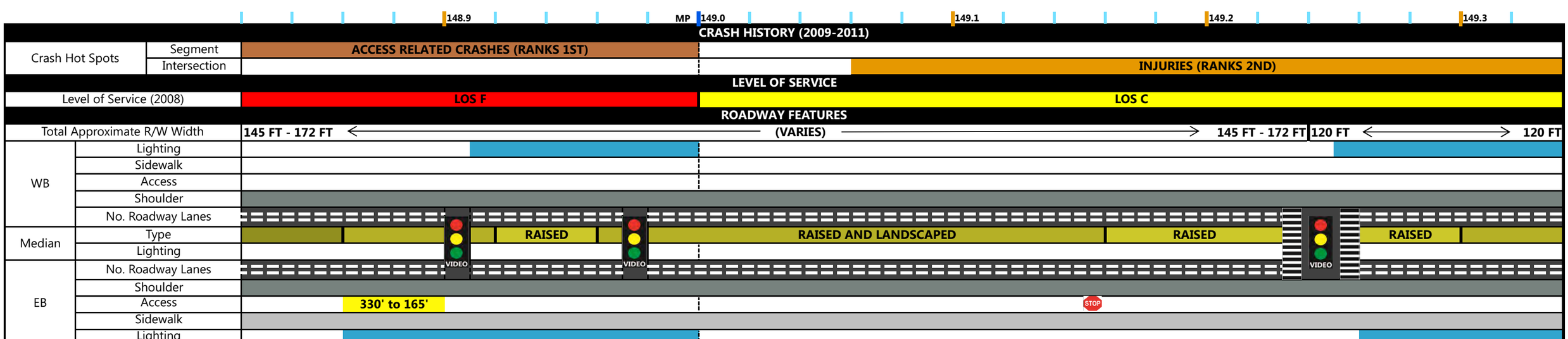
- Vacant





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Corridor Optimization and Access Management Plan, and System Study
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8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

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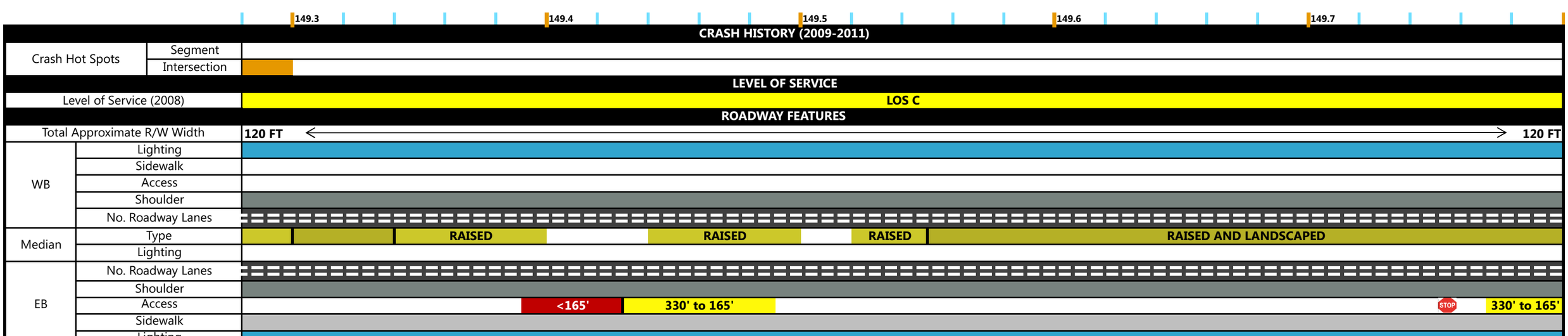

COMPASS

Corridor Optimization and Access Management Plan, and System Study

MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

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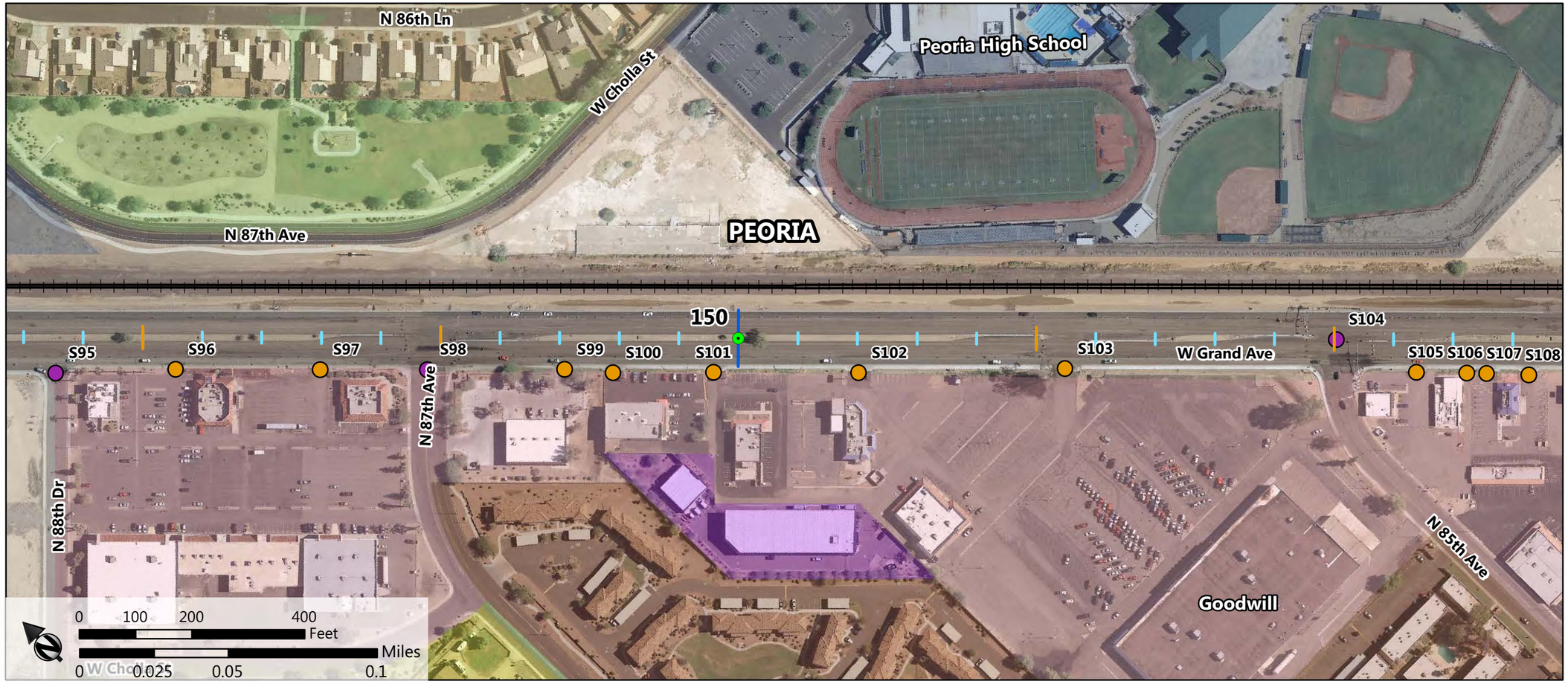

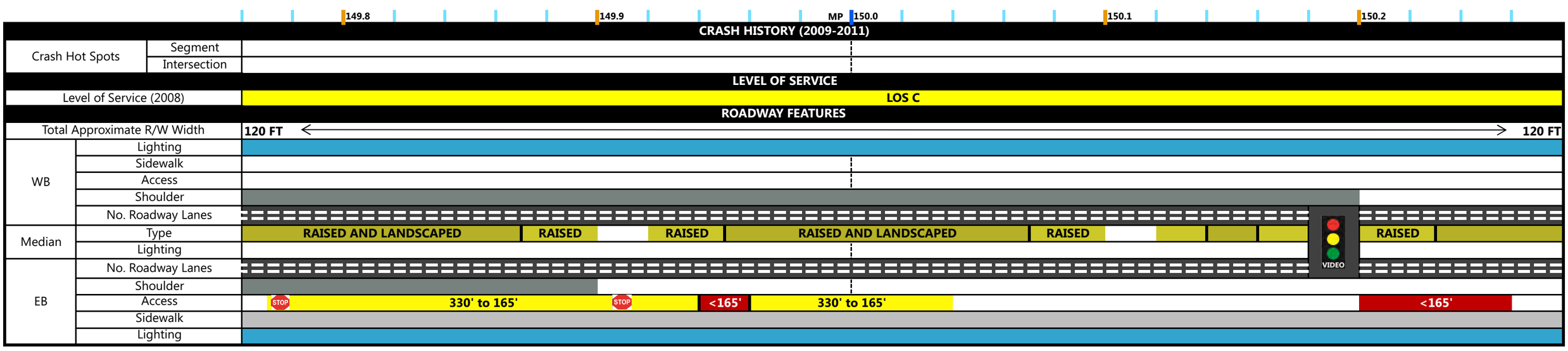

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MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

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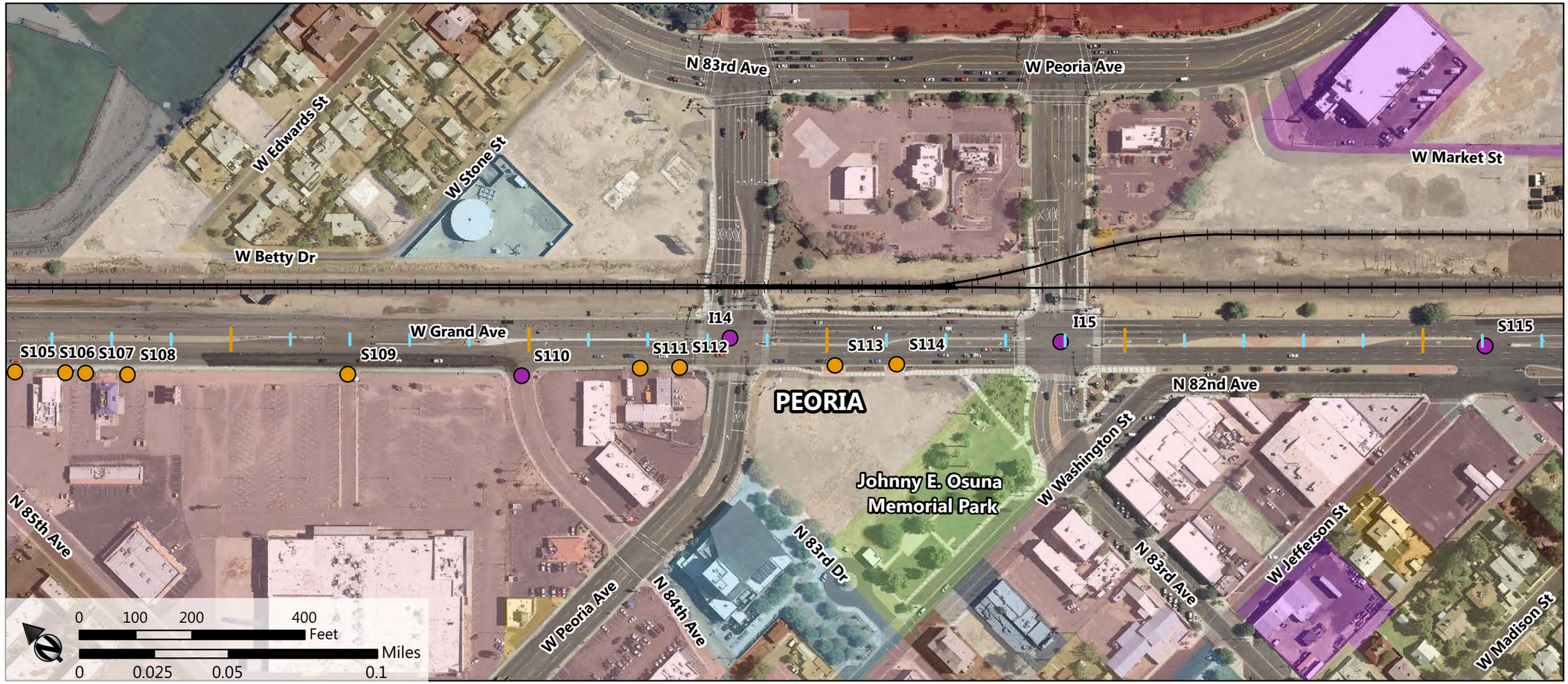

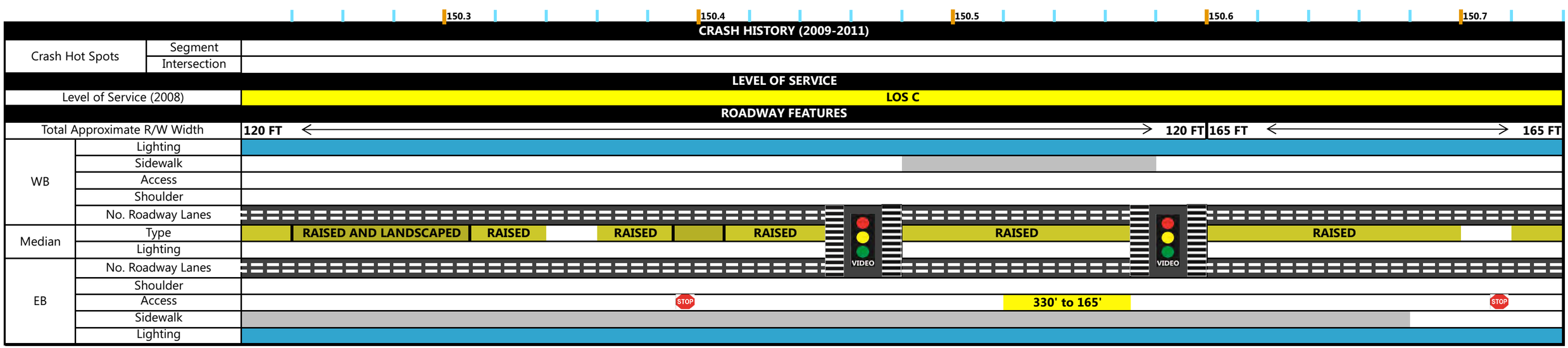

COMPASS

Corridor Optimization and Access Management Plan, and System Study

MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

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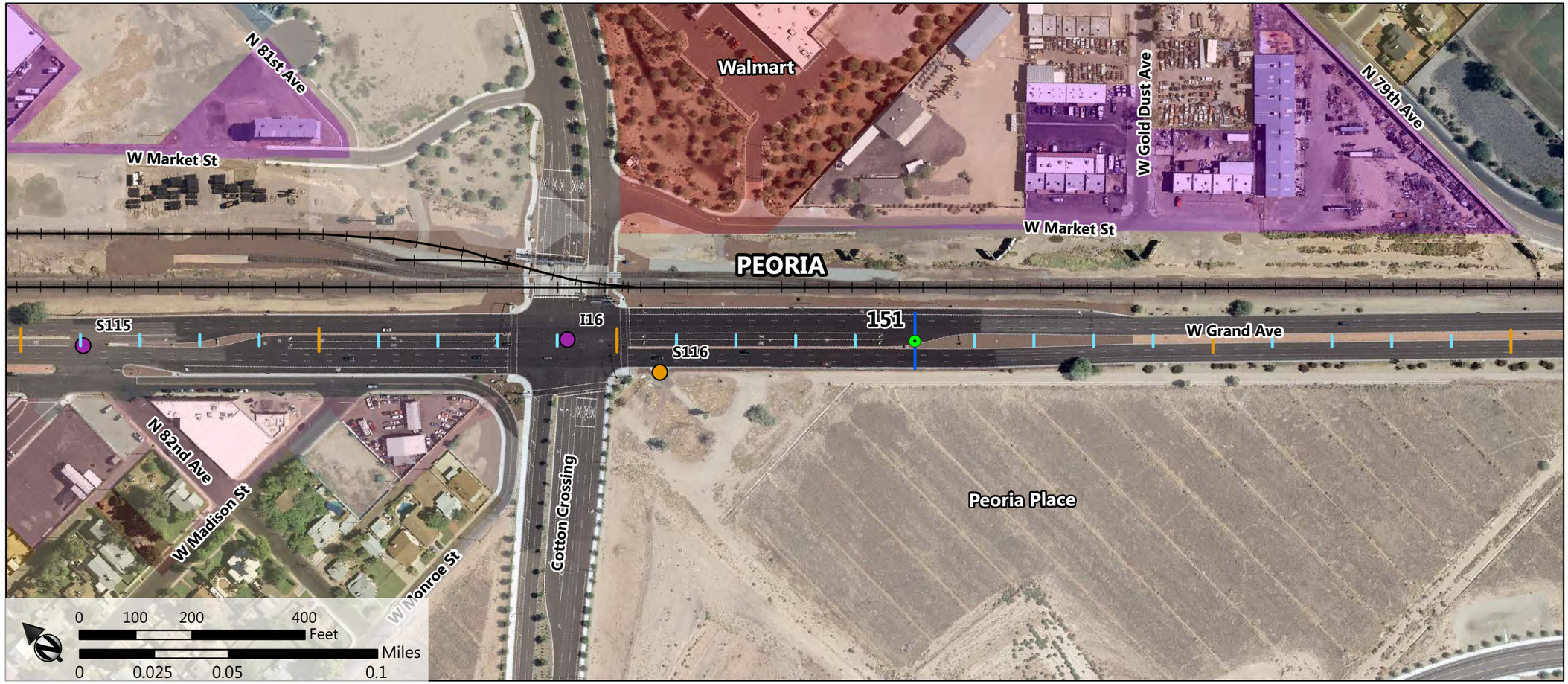

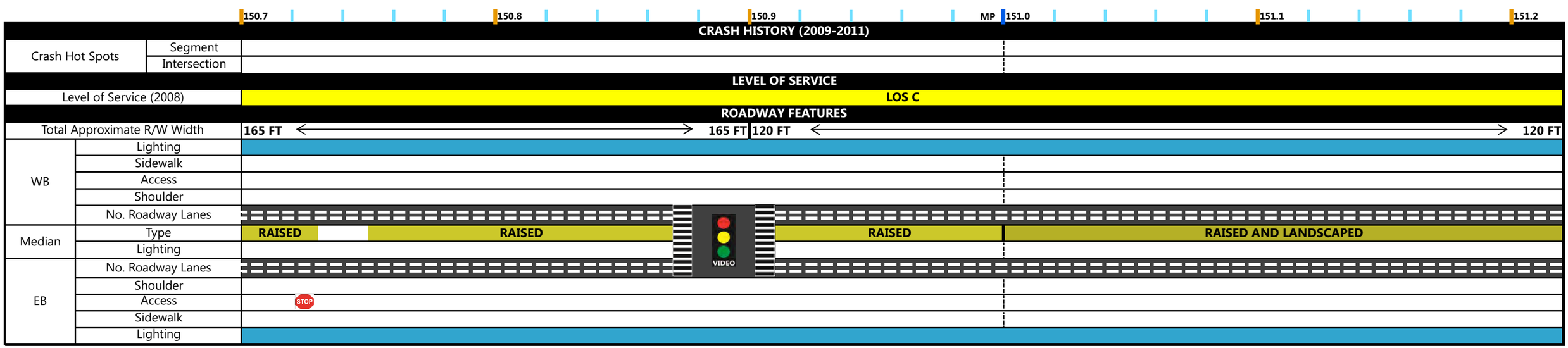

COMPASS
Corridor Optimization and Access Management Plan, and System Study
MARICOPA ASSOCIATION of GOVERNMENTS

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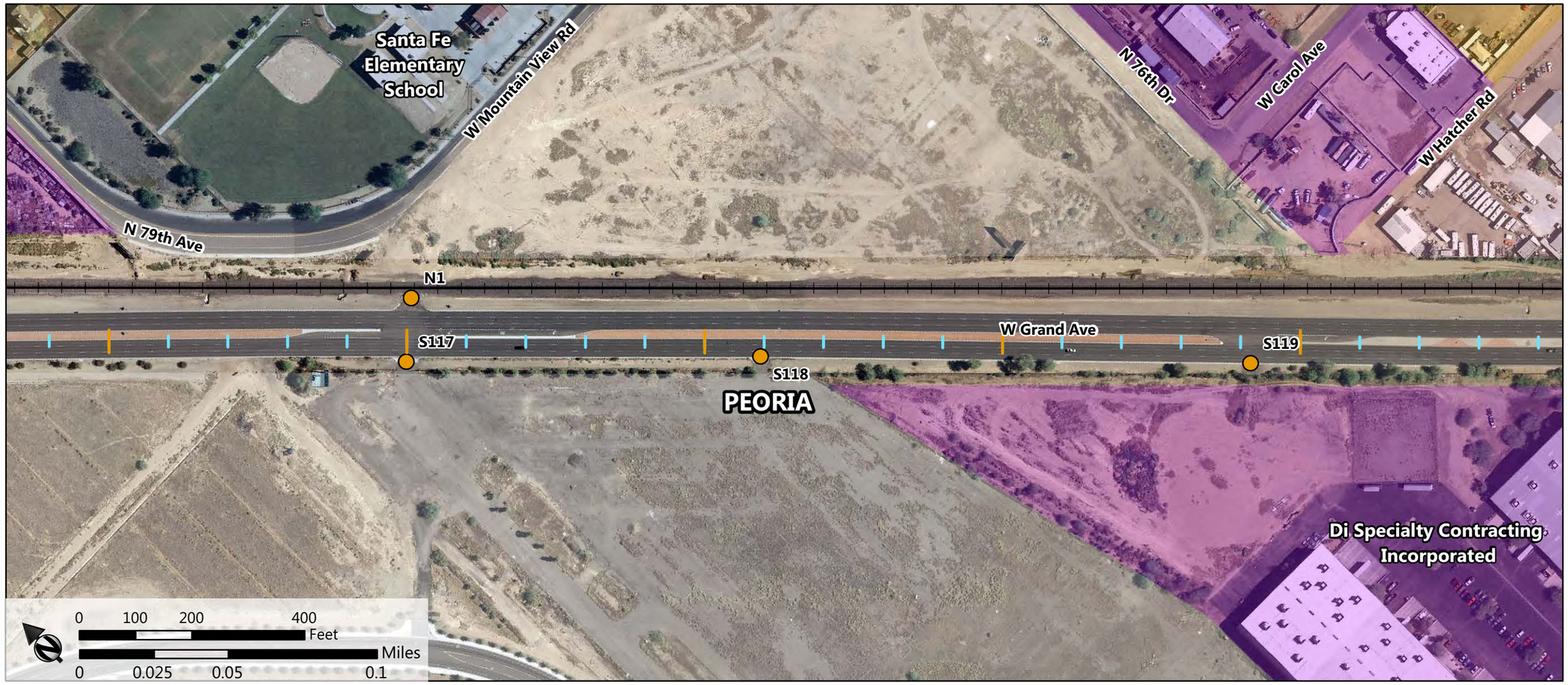

151.2 151.3 151.4 151.5 151.6

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		120 FT ↔ 120 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED; RAISED; RAISED; RAISED AND LANDSCAPED; RAISED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	
	Sidewalk	
	Lighting	

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Corridor Optimization and Access Management Plan, and System Study
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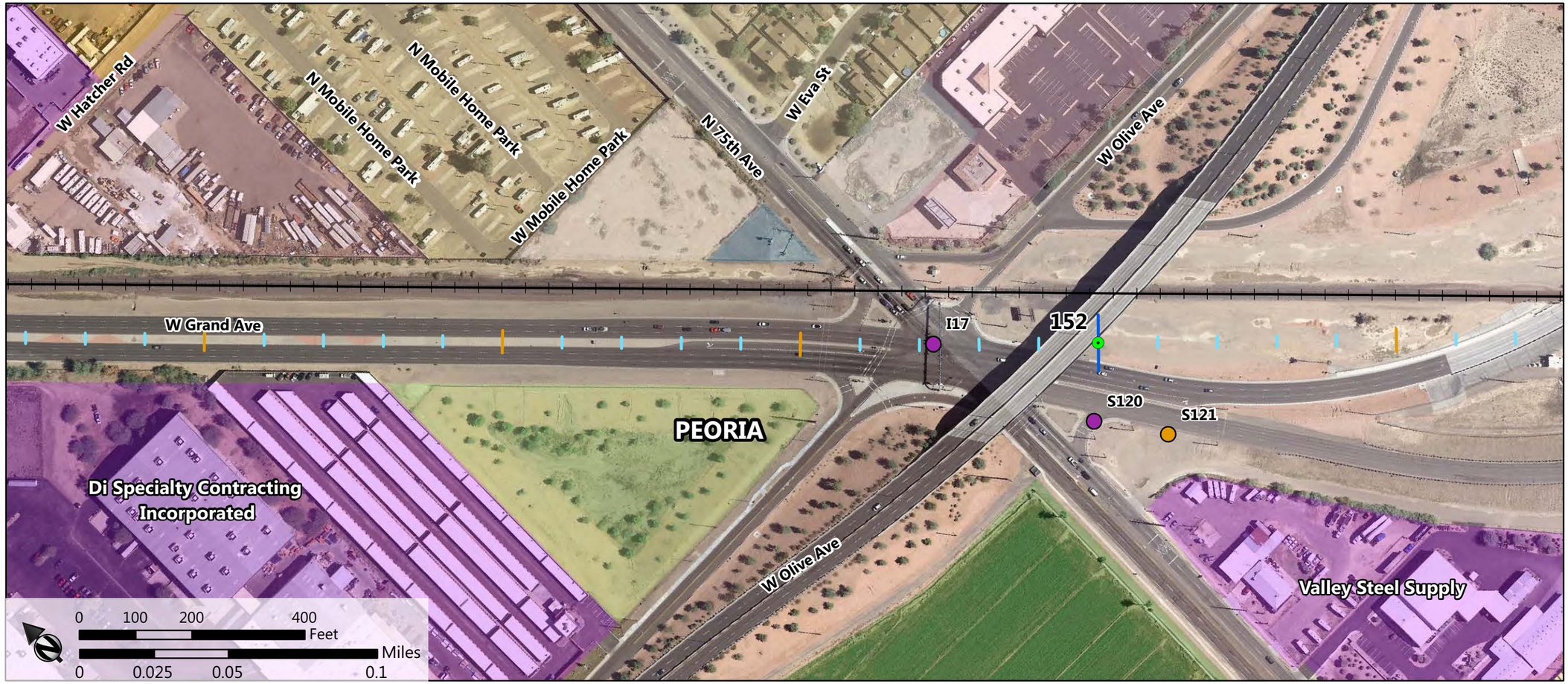

		151.7	151.8	151.9	MP 152.0	152.1
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment					
	Intersection			SIDESWIPES - 6 LEGGED INTERSECTION (RANKS 1ST)		
LEVEL OF SERVICE						
Level of Service (2008)		LOS C				
ROADWAY FEATURES						
Total Approximate R/W Width		120 FT	120 FT / 143 FT	143 FT / 120 FT - 600 FT +/-	(VARIES)	120 FT - 600 FT +/-
WB	Lighting					
	Sidewalk					
	Access					
	Shoulder					
	No. Roadway Lanes					
Median	Type	RAISED			RAISED	SEPARATED
	Lighting					
EB	No. Roadway Lanes					
	Shoulder					
	Access				<165'	
	Sidewalk					
	Lighting					

LOOPS

COMPASS

Corridor Optimization and Access Management Plan, and System Study

MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

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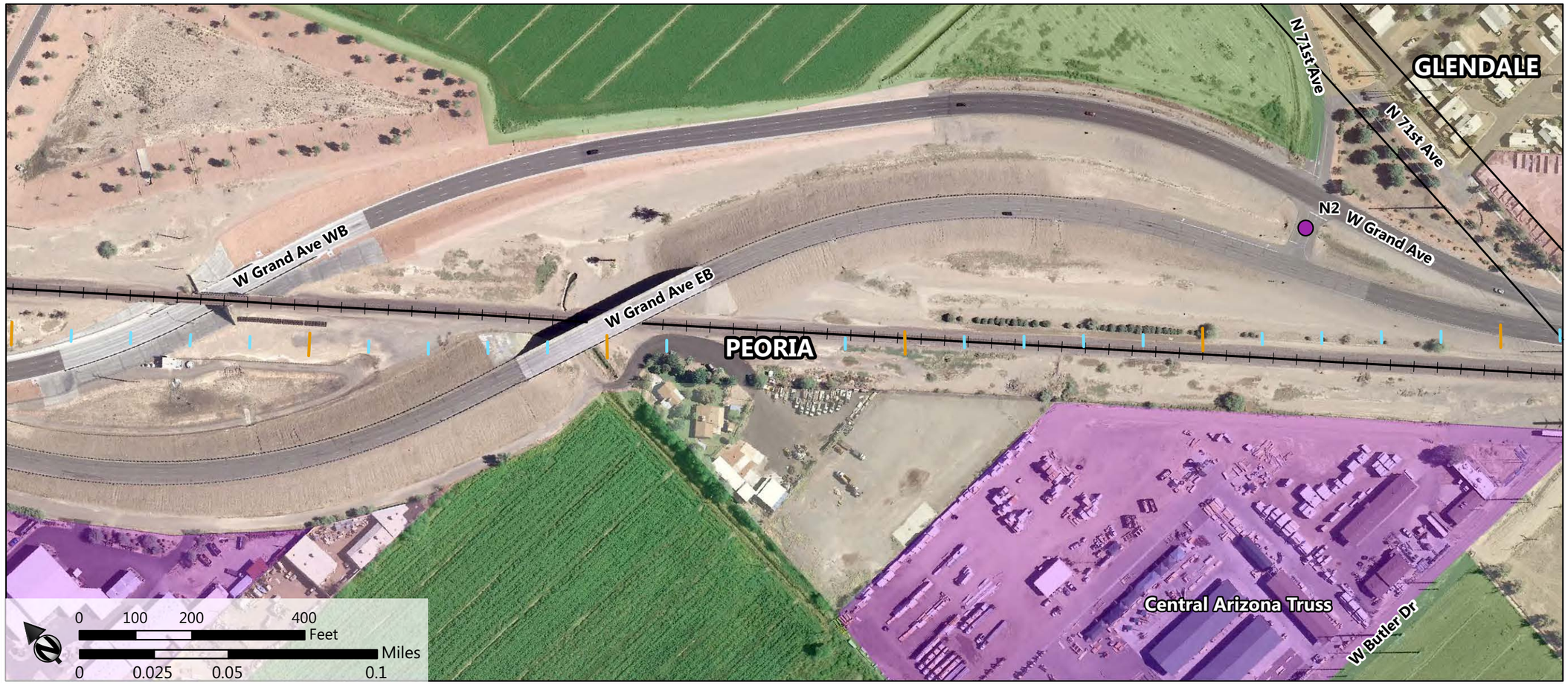

		152.1 – 152.2	152.2 – 152.3	152.3 – 152.4	152.4 – 152.5	152.5 – 152.6
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment					
	Intersection					
LEVEL OF SERVICE						
Level of Service (2008)		LOS C	LOS C	LOS C	LOS C	LOS C
ROADWAY FEATURES						
Total Approximate R/W Width		120 FT - 600 FT +/-	(VARIES)	(VARIES)	(VARIES)	120 FT - 600 FT +/-
WB	Lighting					
	Sidewalk					
	Access					STOP
	Shoulder					
	No. Roadway Lanes	3	3	3	3	3
Median	Type	SEPARATED	SEPARATED	SEPARATED	SEPARATED	SEPARATED
	Lighting					
EB	No. Roadway Lanes	3	3	3	3	3
	Shoulder					
	Access					
	Sidewalk					
	Lighting					

COMPASS
Corridor Optimization and Access Management Plan, and System Study
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US-60/Grand Avenue: Loop 303 to Interstate 10

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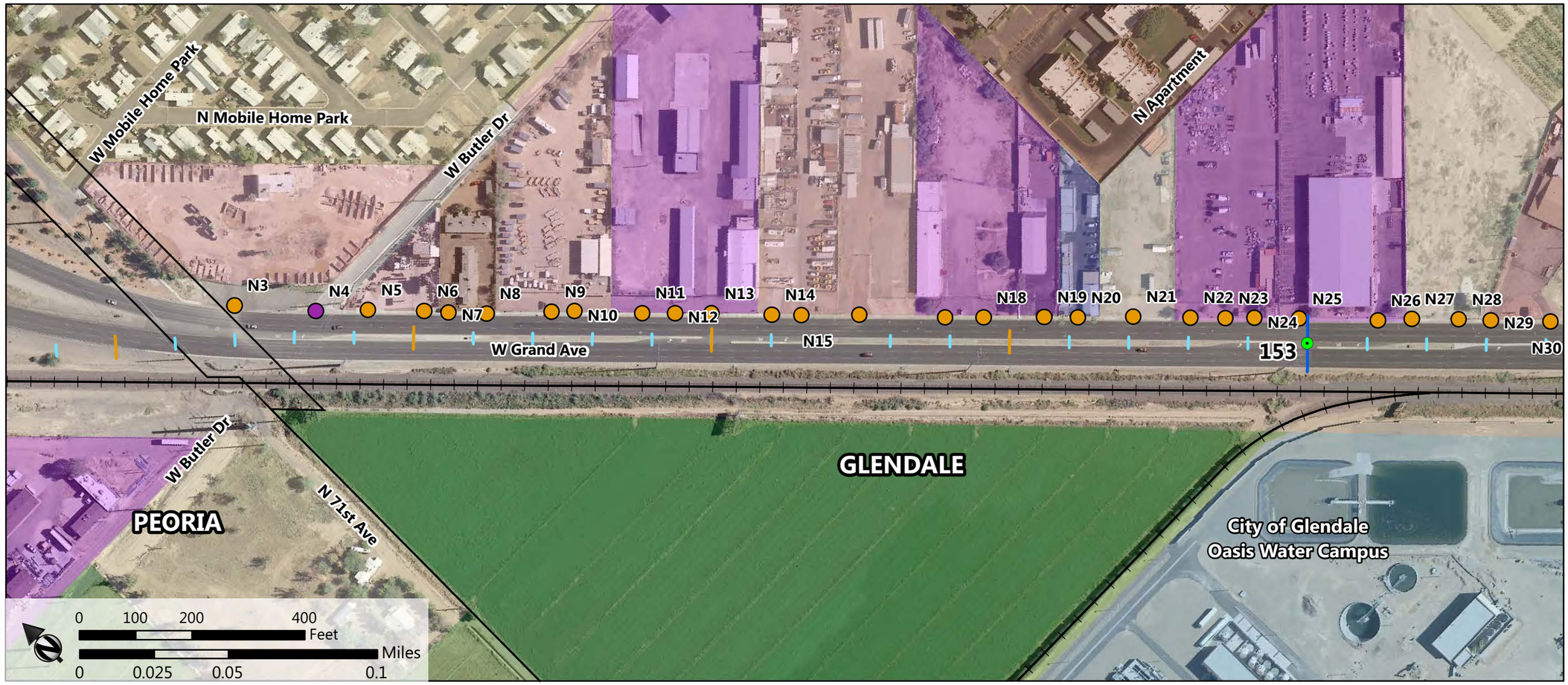
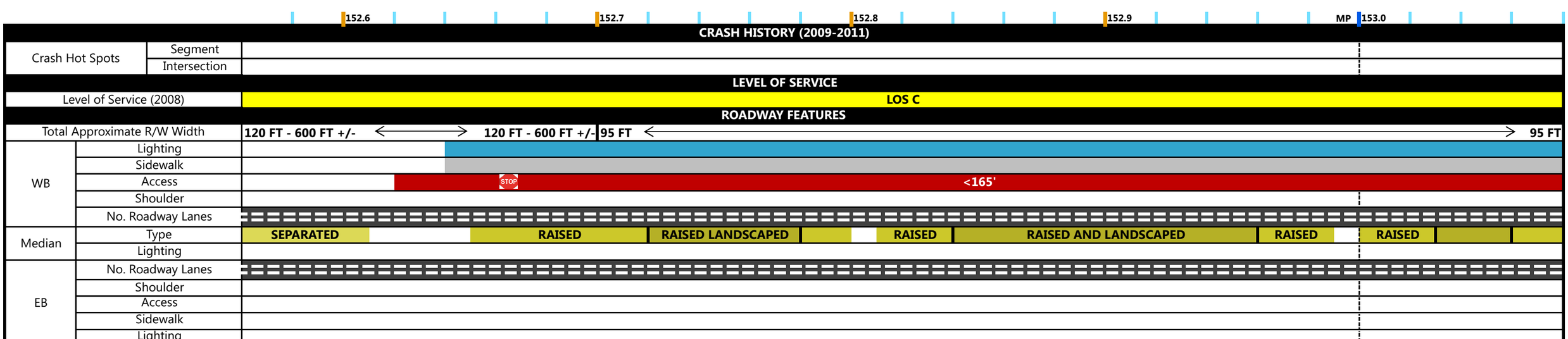
- Driveway (US-60 ID Label)
- Intersection (US-60 ID Label)
- Single Family Low Density
- Single Family Medium Density
- Single Family High Density
- Multi Family
- Developing Residential
- Retail Low
- Retail High
- Office
- Other Employment
- Developing Employment Generating
- Industrial
- Educational
- Institutional/Religious
- Medical/Nursing Home
- Cemetery
- Public/Special Event/Military
- Active Open Space
- Passive/Restricted Open Space
- Golf Course
- Agriculture
- Tourist Accomodations
- Water
- Vacant





COMPASS

Corridor Optimization and Access Management Plan, and System Study

MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

- ADOT Mile Posts
- Railway
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- Water
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153.1 153.2 153.3 153.4 153.5

CRASH HISTORY (2009-2011)

Crash Hot Spots	Segment	
	Intersection	

LEVEL OF SERVICE

Level of Service (2008)	LOS C

ROADWAY FEATURES

Total Approximate R/W Width		95 FT; 95 FT; 120 FT; 120 FT; 95 FT; 95 FT
WB	Lighting	
	Sidewalk	
	Access	<165'; 330' to 165'; 330' to 165'; <165'; 330' to 165'; <165'
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED; RAISED; RAISED; RAISED LANDSCAPED; RAISED
	Lighting	
	No. Roadway Lanes	LOOPS; LOOPS
EB	Shoulder	
	Access	
	Sidewalk	
	Lighting	

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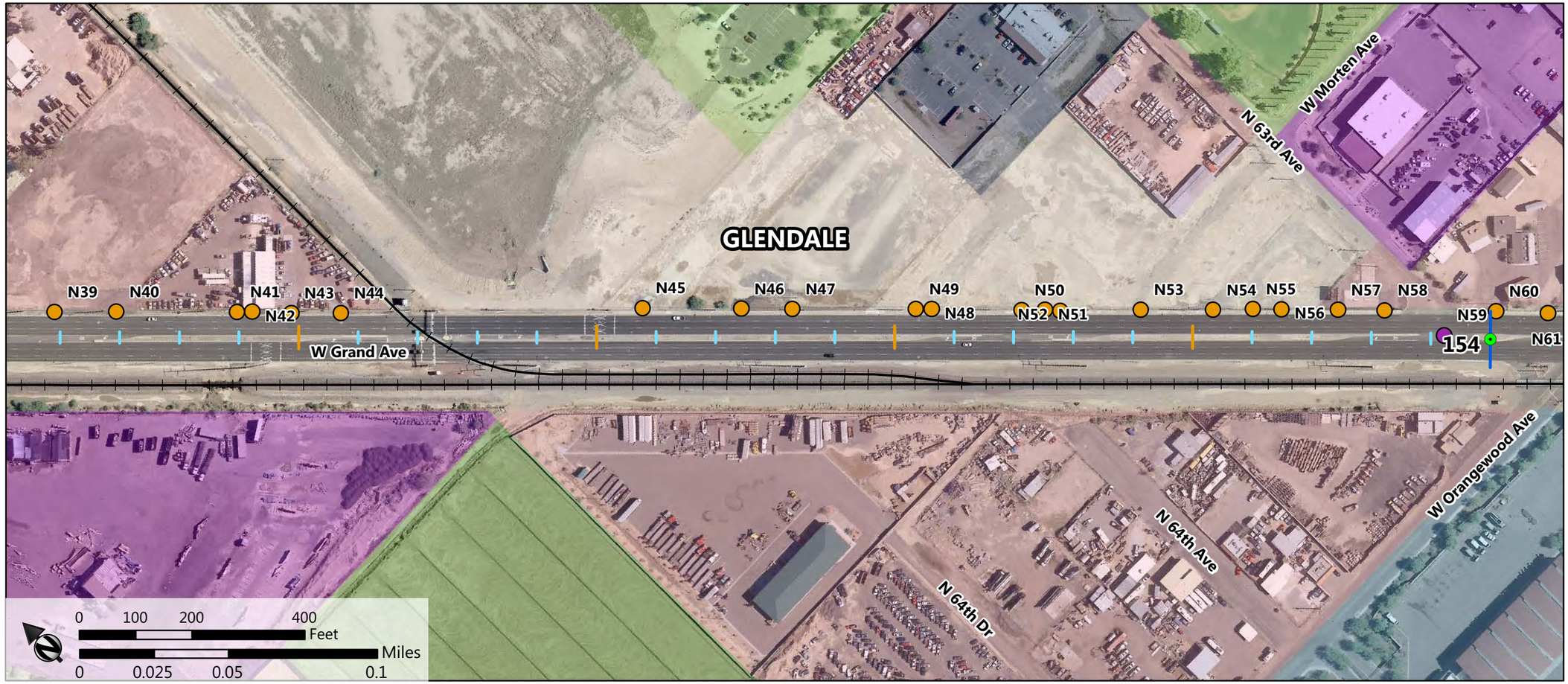

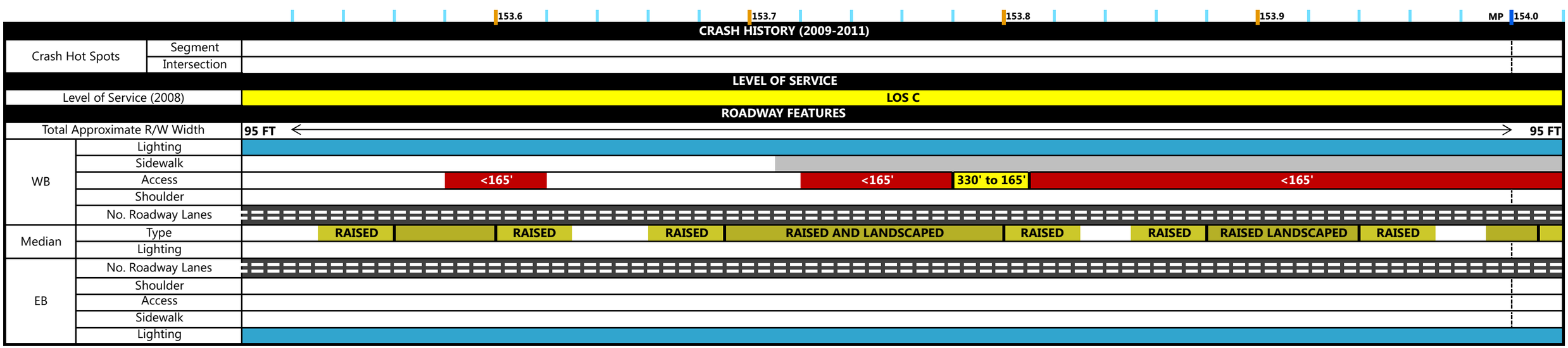

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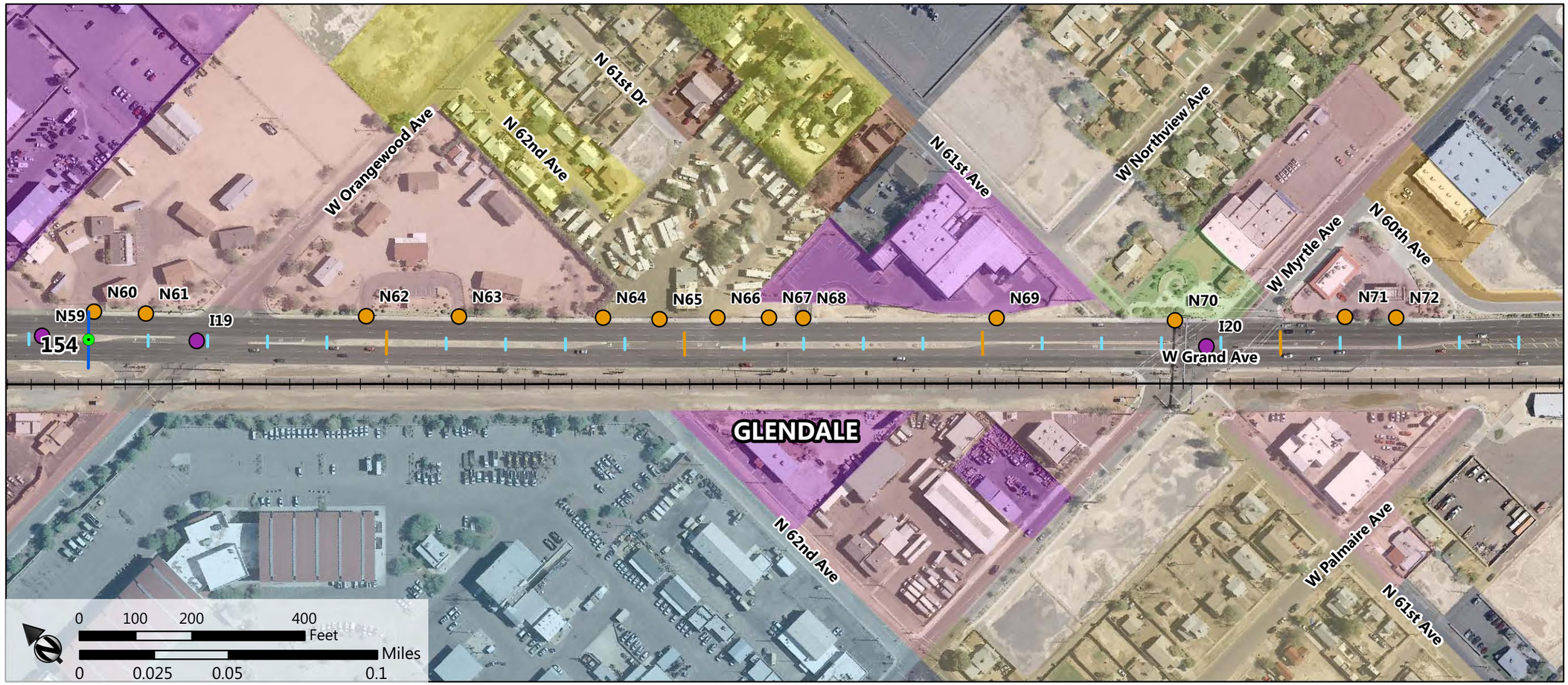

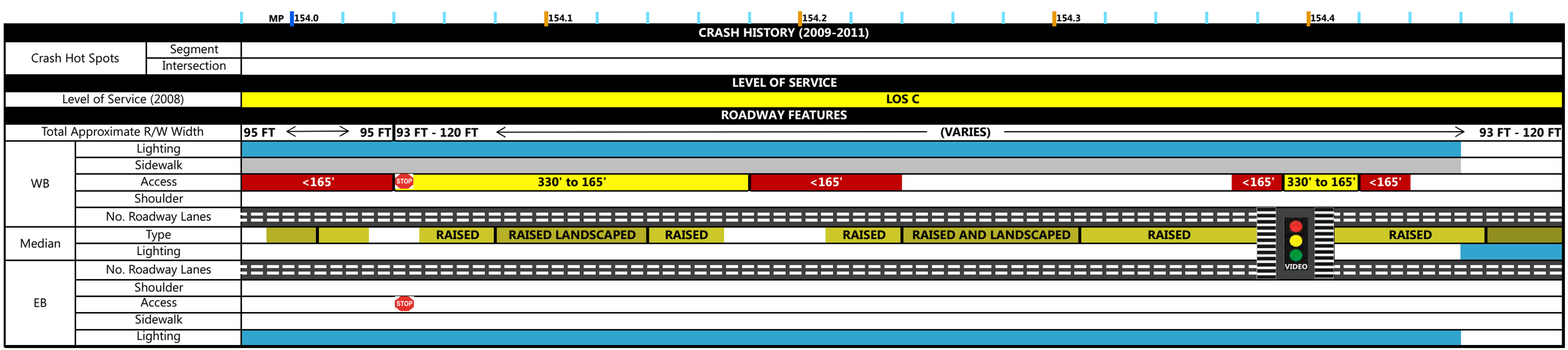

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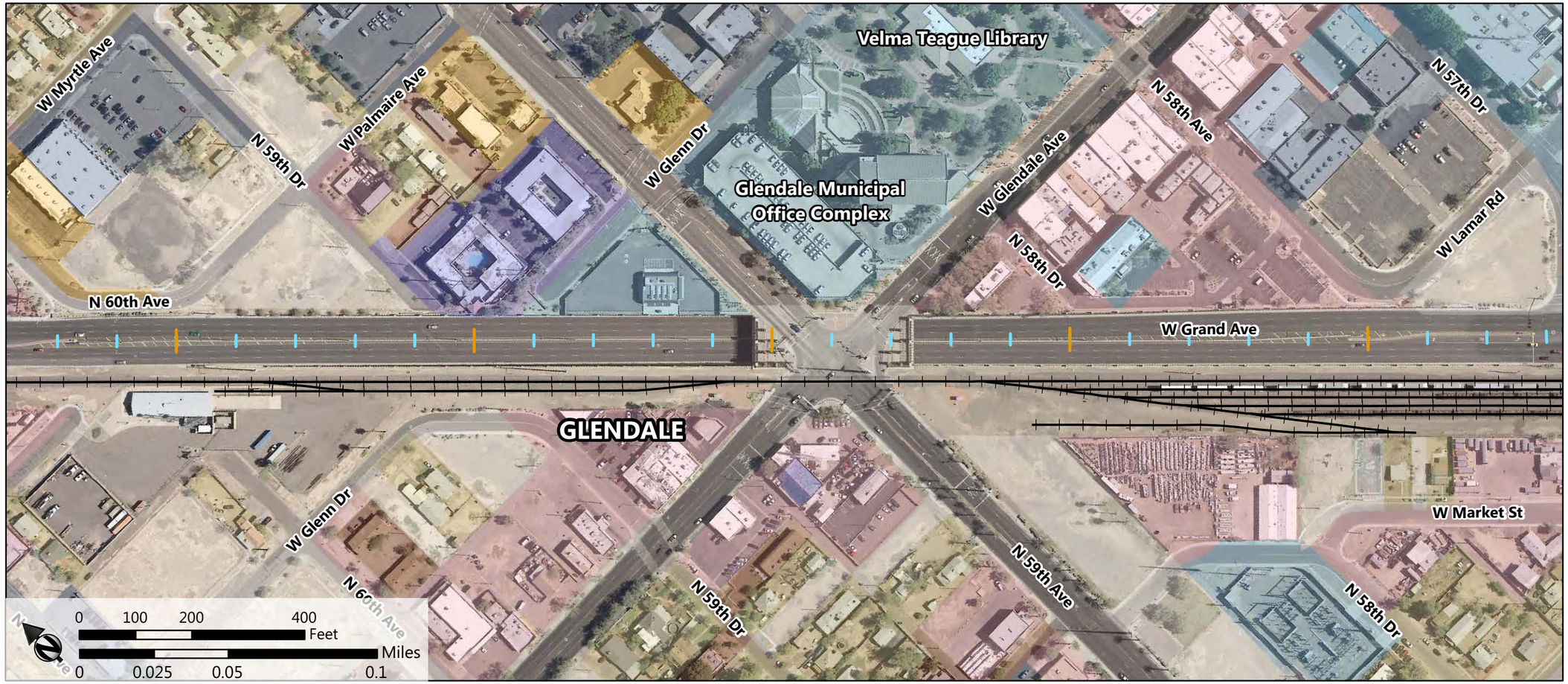

154.5 154.6 154.7 154.8 154.9

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		93 FT - 120 FT ← (VARIES) → 93 FT - 120 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED / CONCRETE BARRIER / RAISED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	
	Sidewalk	
	Lighting	

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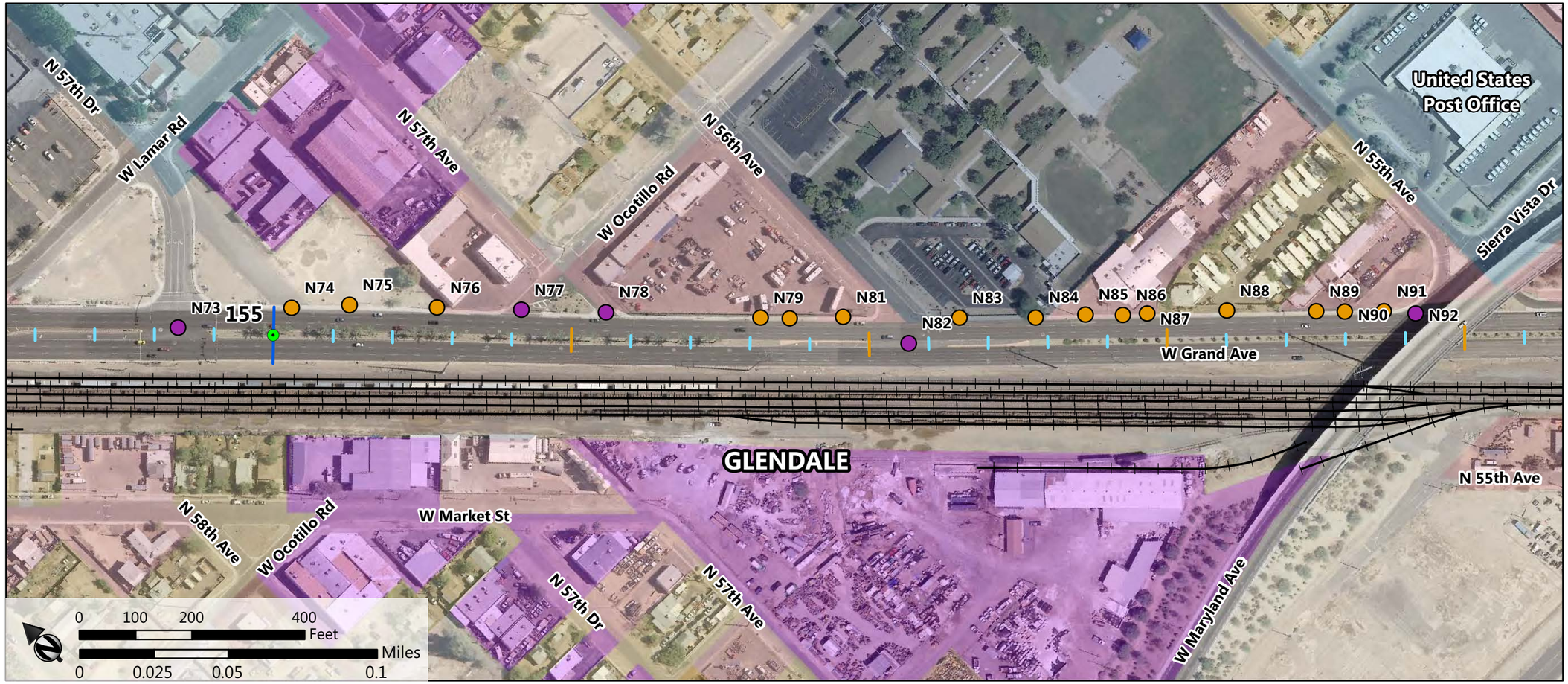

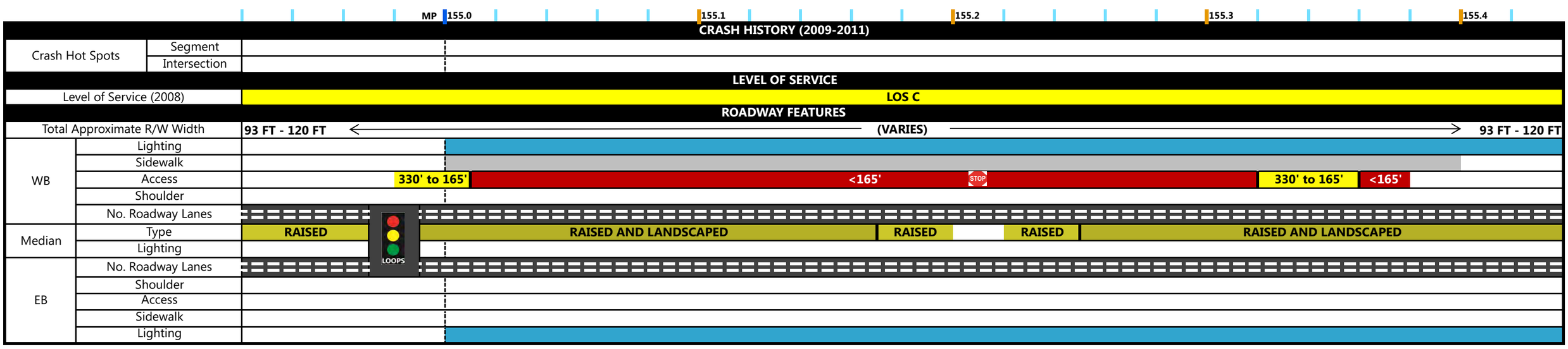

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US-60/Grand Avenue: Loop 303 to Interstate 10

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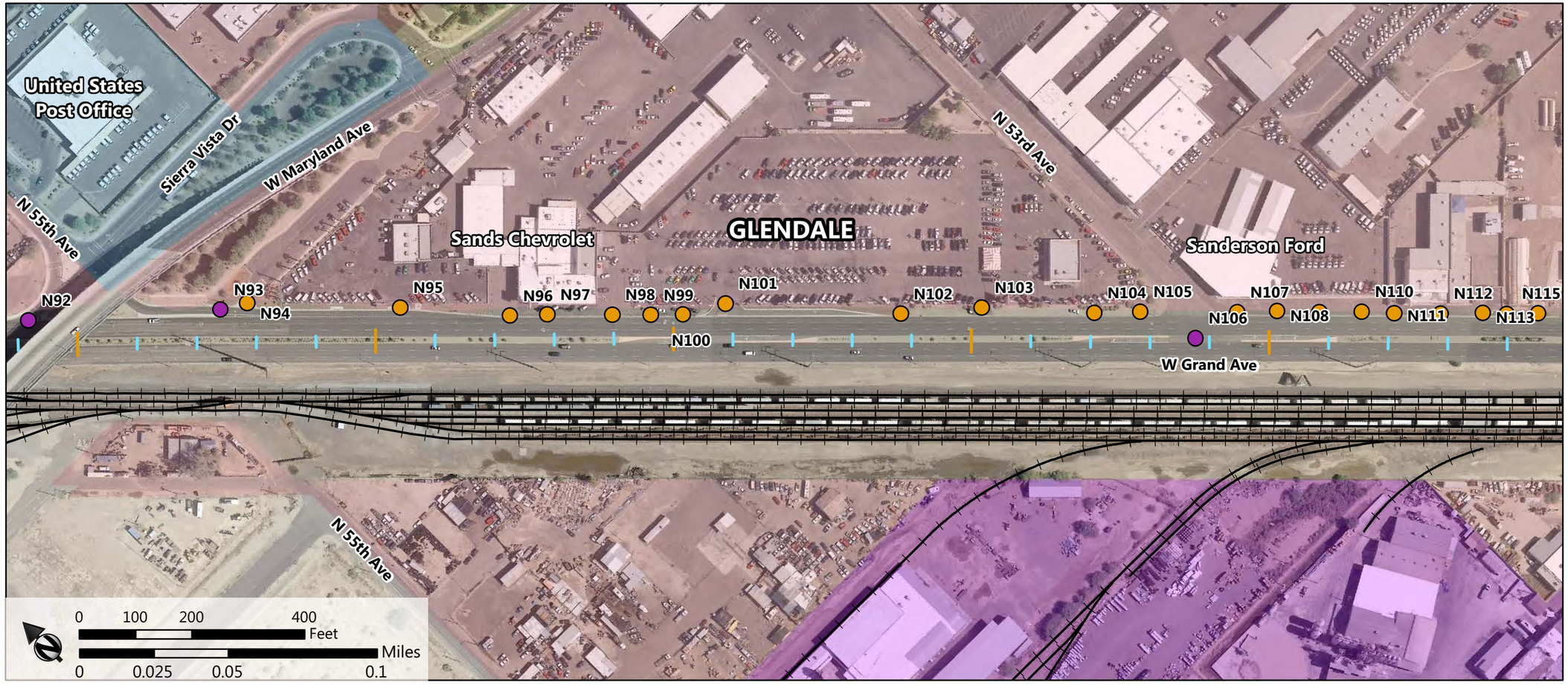

155.4 155.5 155.6 155.7 155.8

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		93 FT - 120 FT ← (VARIES) → 93 FT - 120 FT
WB	Lighting	
	Sidewalk	
	Access	330' to 165' / <165' / 330' to 165' / STOP <165'
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED / RAISED / RAISED / RAISED AND LANDSCAPED / RAISED / RAISED / RAISED AND LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	
	Sidewalk	
	Lighting	

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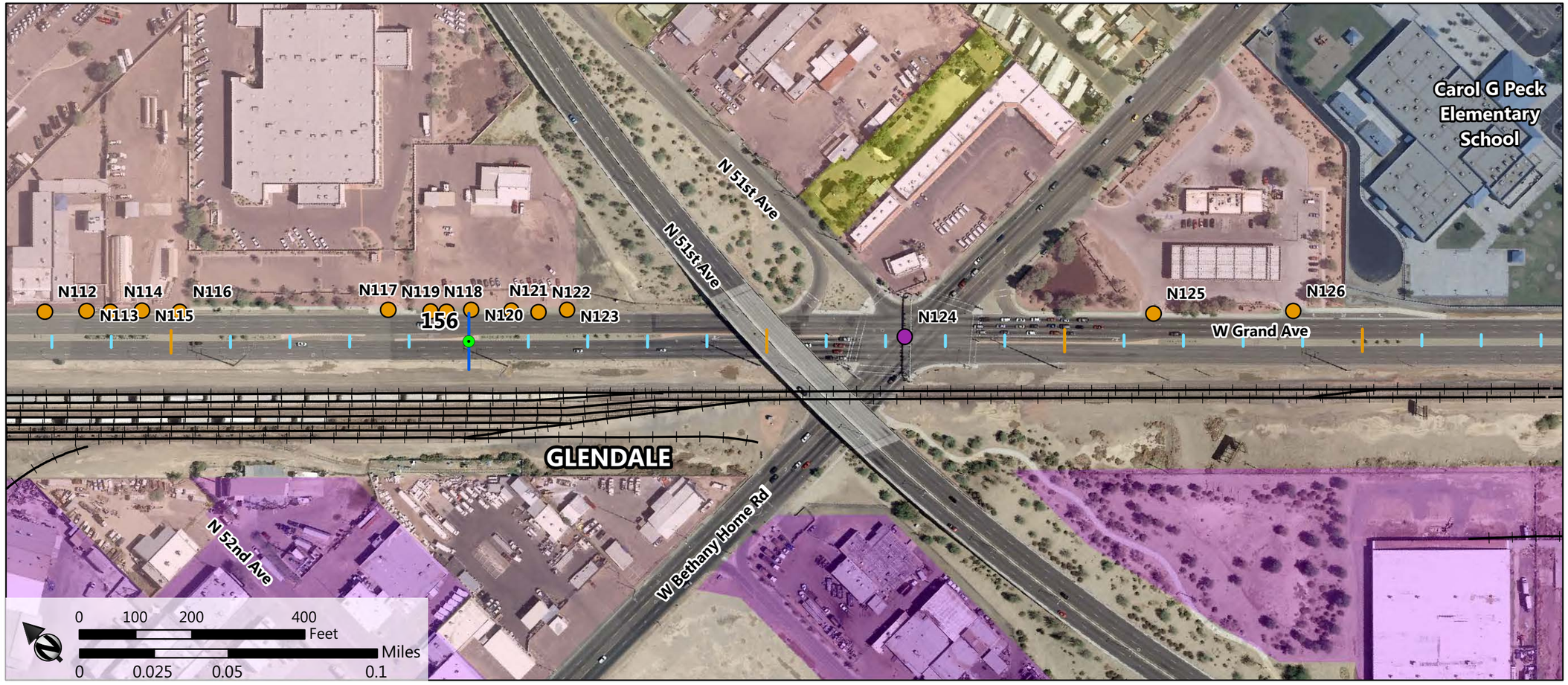

		MP 155.9 – 156.0	156.0 – 156.1	156.1 – 156.2	156.2 – 156.3
CRASH HISTORY (2009-2011)					
Crash Hot Spots	Segment				
	Intersection		TOTAL, REAR-ENDS, AND INJURIES - 5 LEGGED INTERSECTION (RANKS 1ST)		
LEVEL OF SERVICE					
Level of Service (2008)		LOS C			
ROADWAY FEATURES					
Total Approximate R/W Width		93 FT - 120 FT	(VARIES)		93 FT - 120 FT
WB	Lighting				
	Sidewalk				
	Access	<165'	<165'	330' to 165'	330' to 165'
	Shoulder				
	No. Roadway Lanes				
Median	Type	RAISED AND LANDSCAPED / RAISED	RAISED / RAISED LANDSCAPED	RAISED	RAISED / RAISED AND LANDSCAPED
	Lighting				
EB	No. Roadway Lanes				
	Shoulder				
	Access				
	Sidewalk				
	Lighting				

LOOPS

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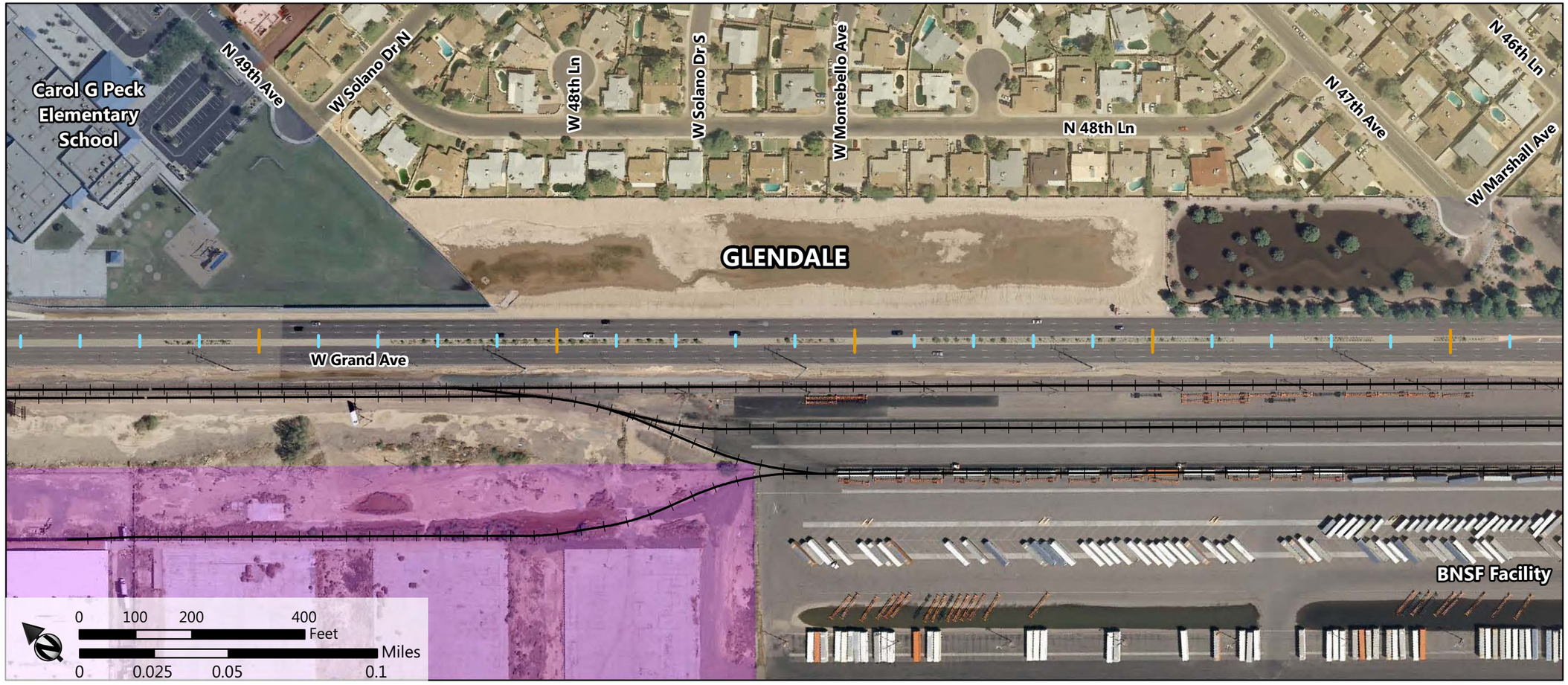

156.4 156.5 156.6 156.7 156.8

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		93 FT - 120 FT ← (VARIES) → 93 FT - 120 FT
WB	Lighting	
	Sidewalk	
	Access	
	Shoulder	
	No. Roadway Lanes	
Median	Type	RAISED AND LANDSCAPED
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	
	Sidewalk	
	Lighting	

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US-60/Grand Avenue: Loop 303 to Interstate 10

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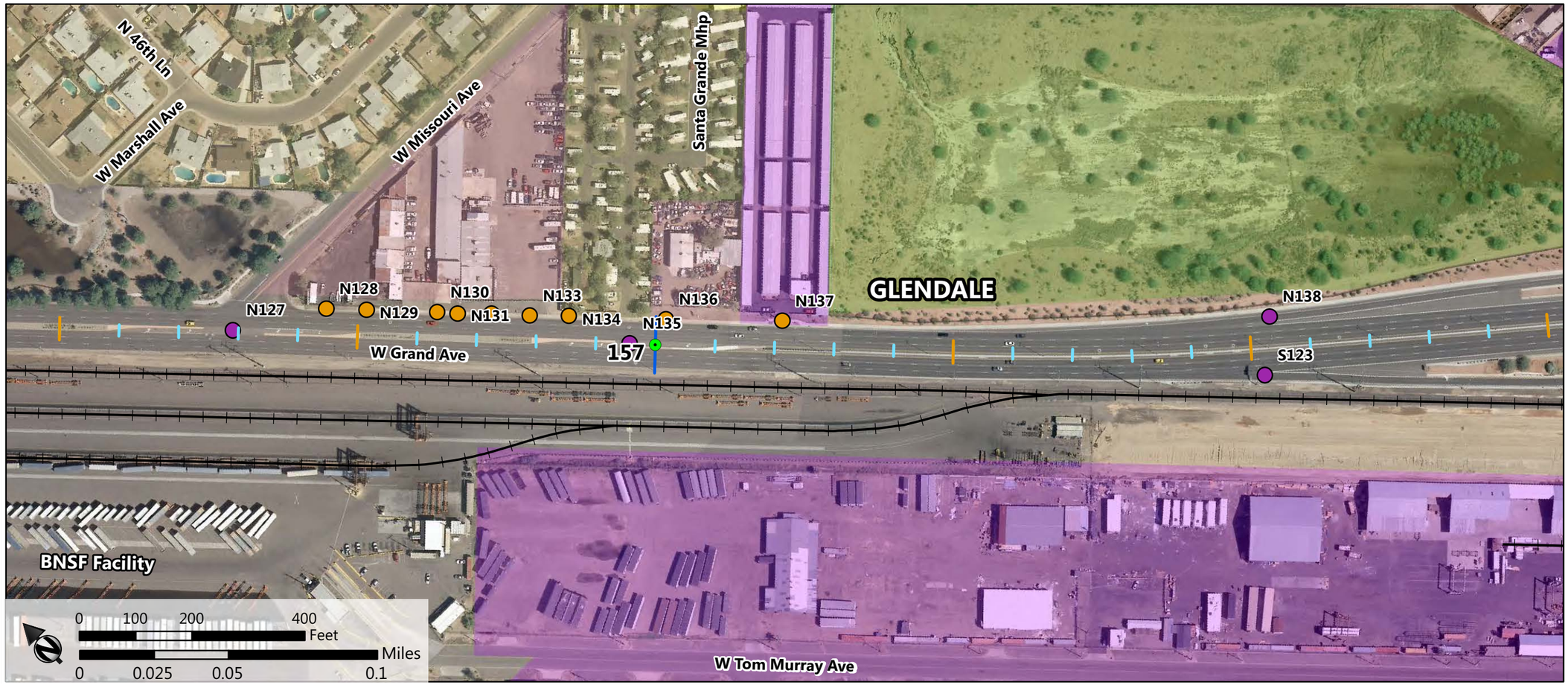

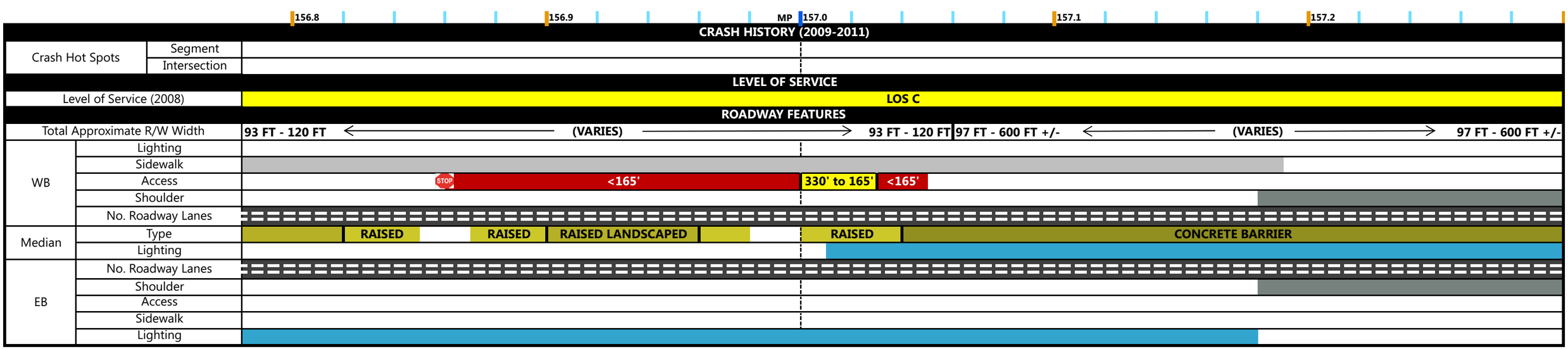

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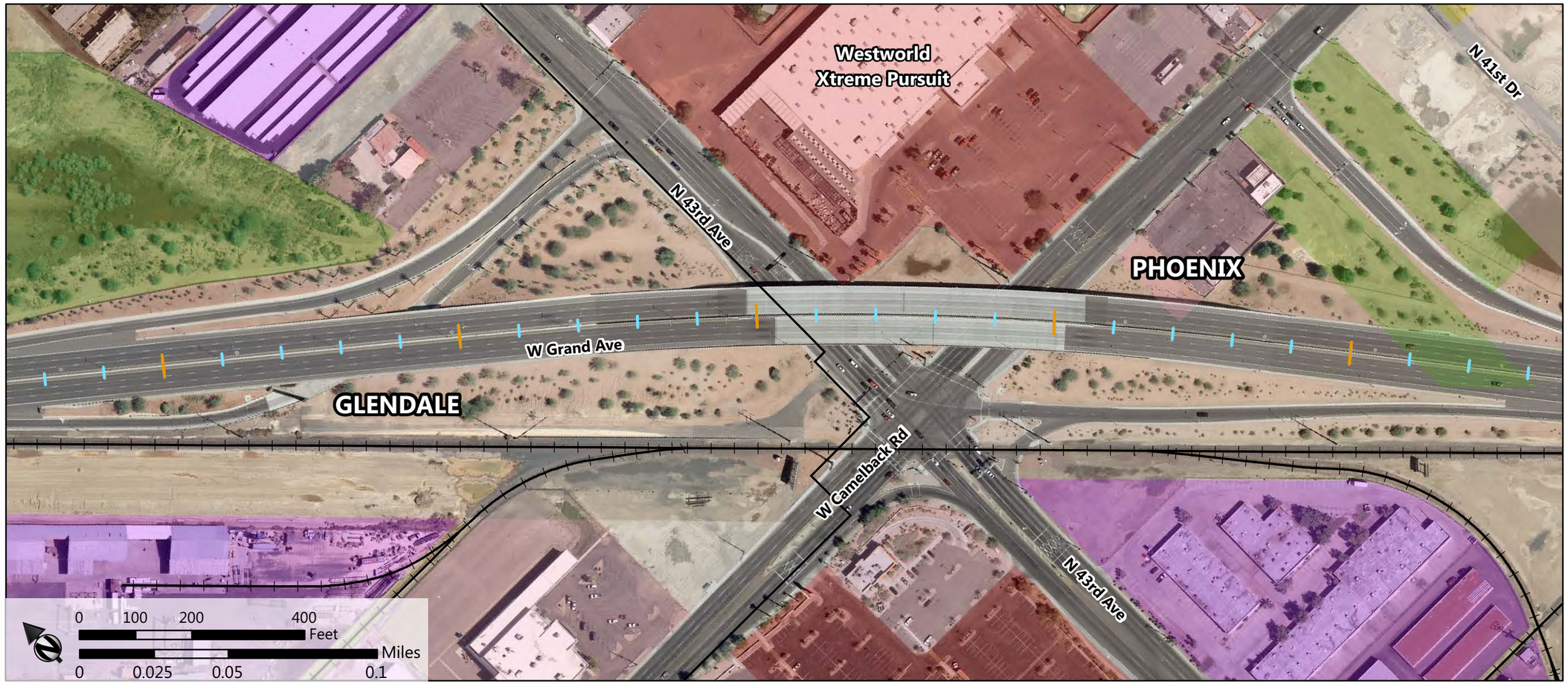

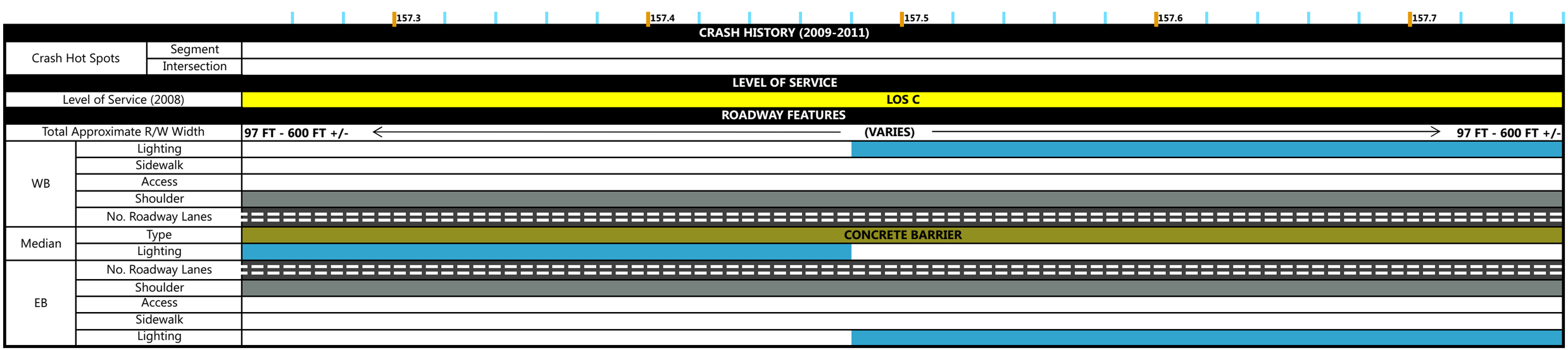

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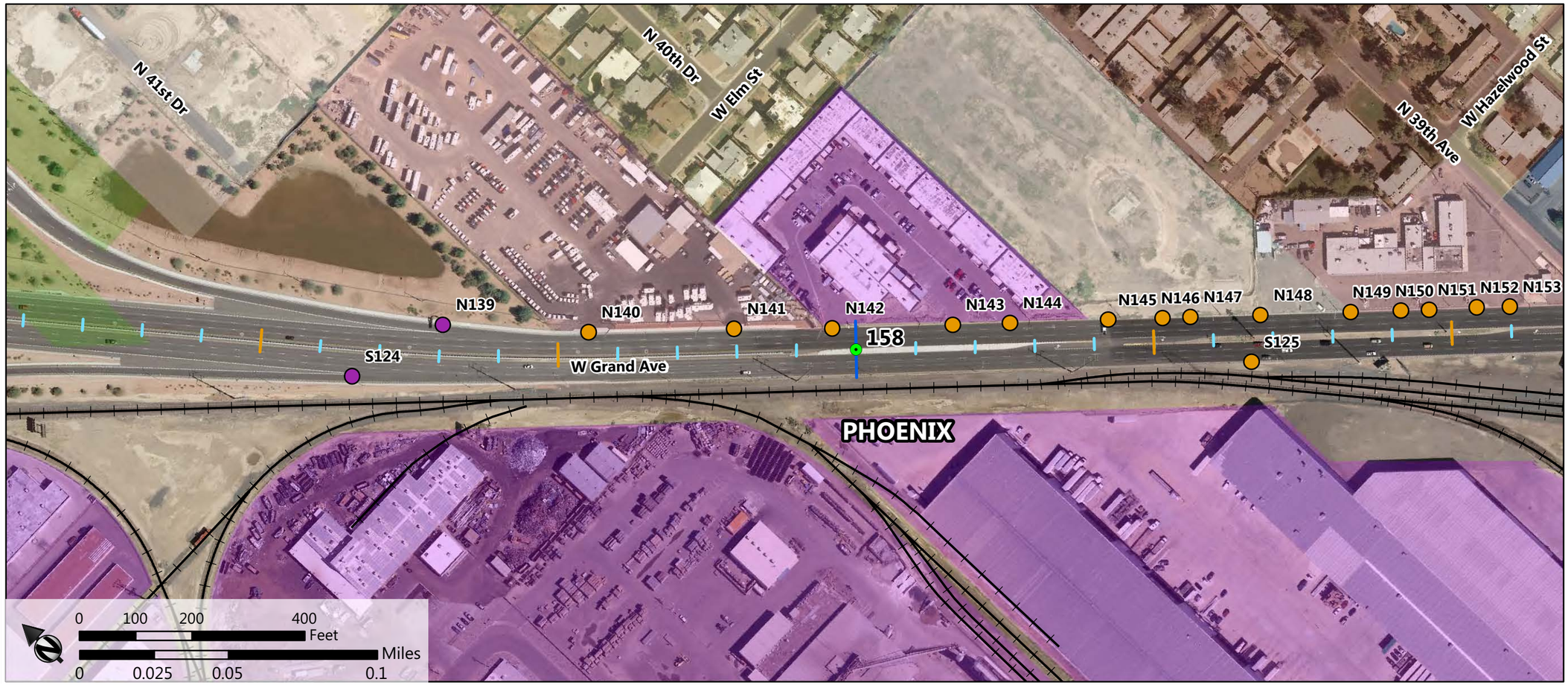

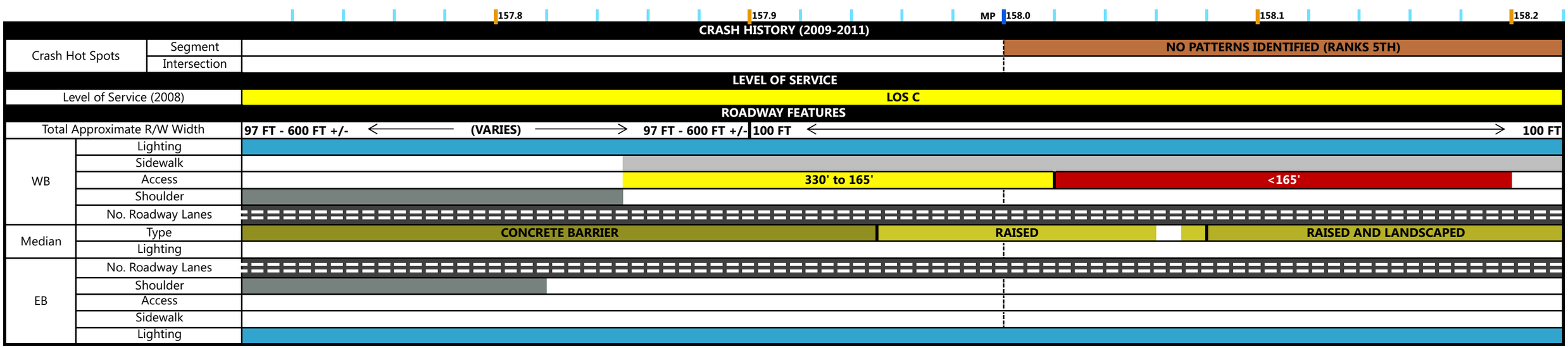

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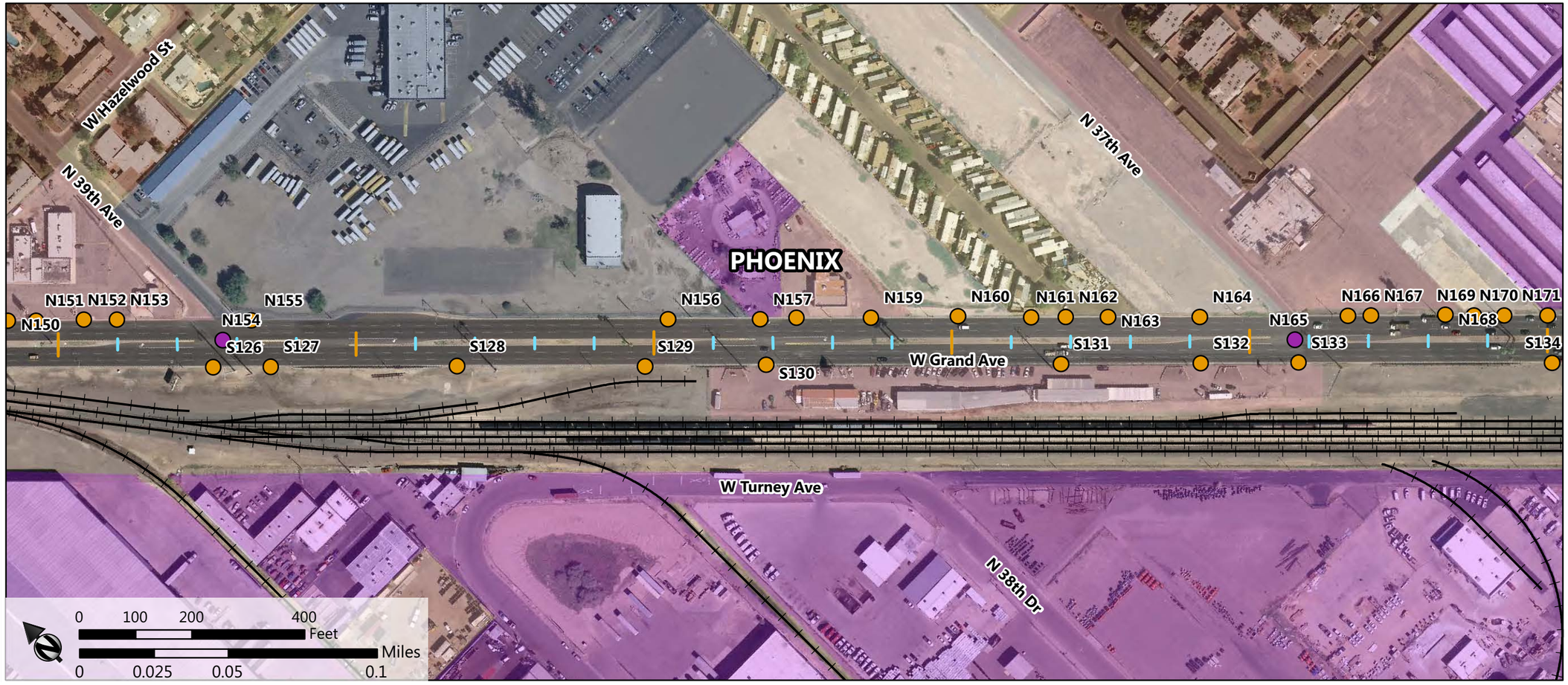

		158.2 – 158.3	158.3 – 158.4	158.4 – 158.5	158.5 – 158.6	158.6 –
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment	NO PATTERNS IDENTIFIED (RANKS 5TH)				
Crash Hot Spots	Intersection					
LEVEL OF SERVICE						
Level of Service (2008)		LOS C				
ROADWAY FEATURES						
Total Approximate R/W Width		100 FT	100 FT	97 FT - 115 FT	(VARIES)	97 FT - 115 FT
WB	Lighting					
WB	Sidewalk					
WB	Access	330' to 165'	<165'	<165'	330' to 165' / <165' / 330' to 165'	<165'
WB	Shoulder					
WB	No. Roadway Lanes					
Median	Type		RAISED AND LANDSCAPED		RAISED AND LANDSCAPED	
Median	Lighting					
EB	No. Roadway Lanes					
EB	Shoulder					
EB	Access	<165'	<165'		330' to 165' / <165'	330' to 165'
EB	Sidewalk					
EB	Lighting					

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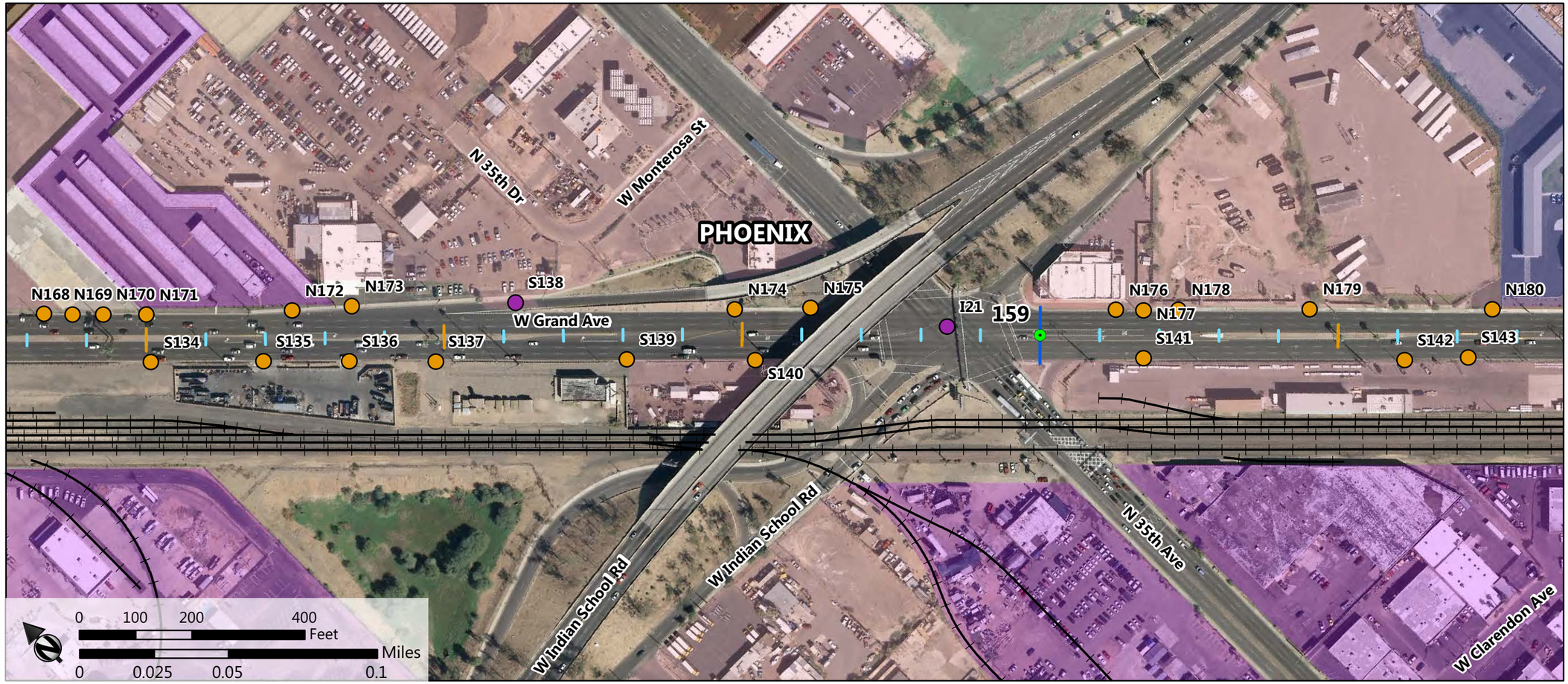

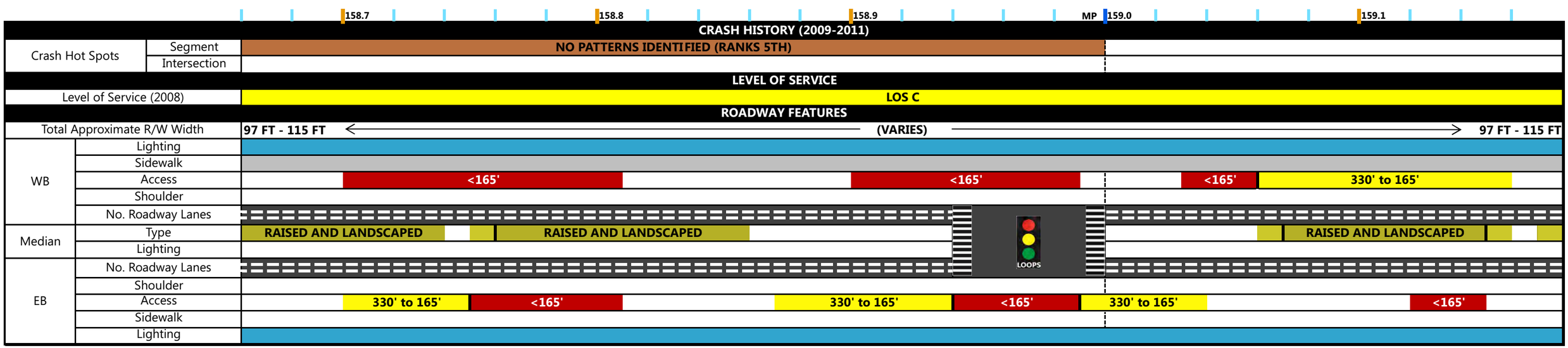

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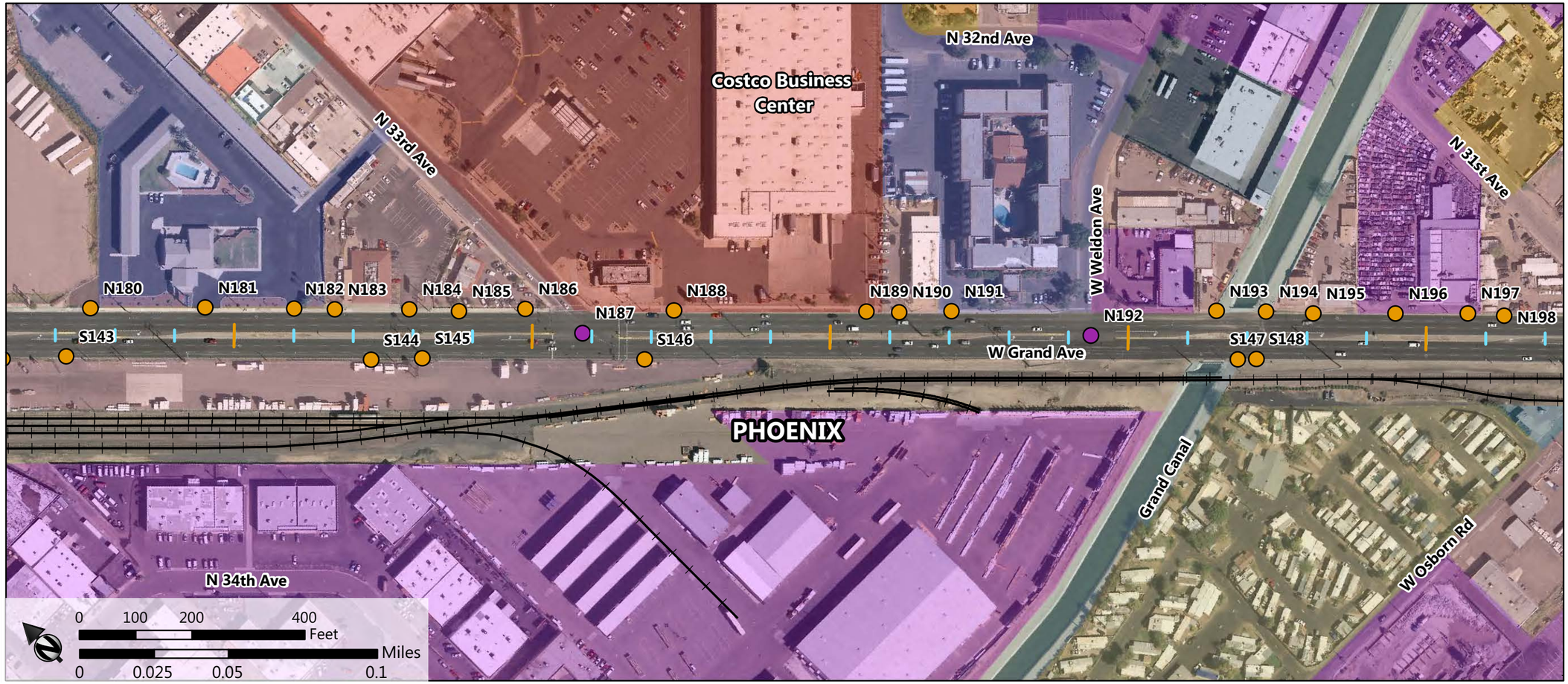

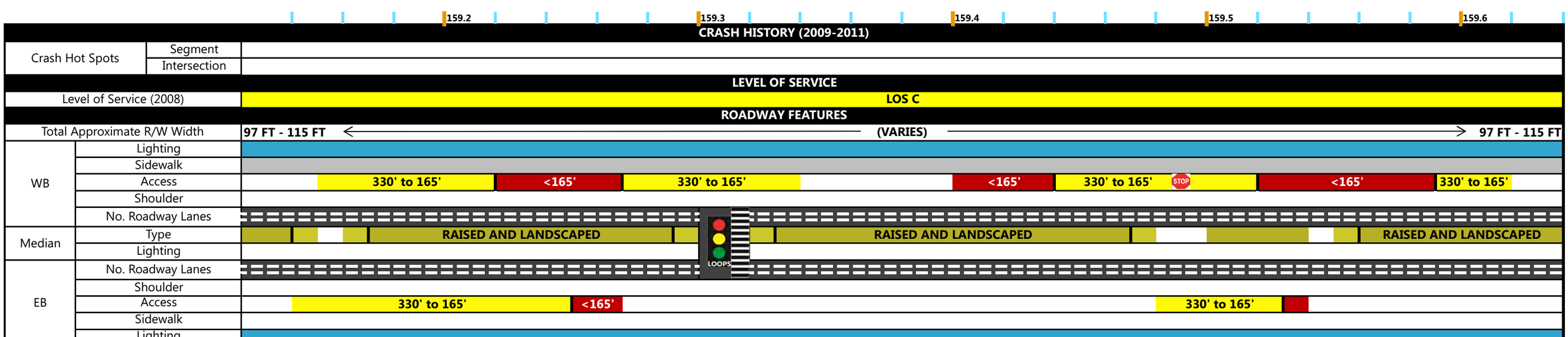

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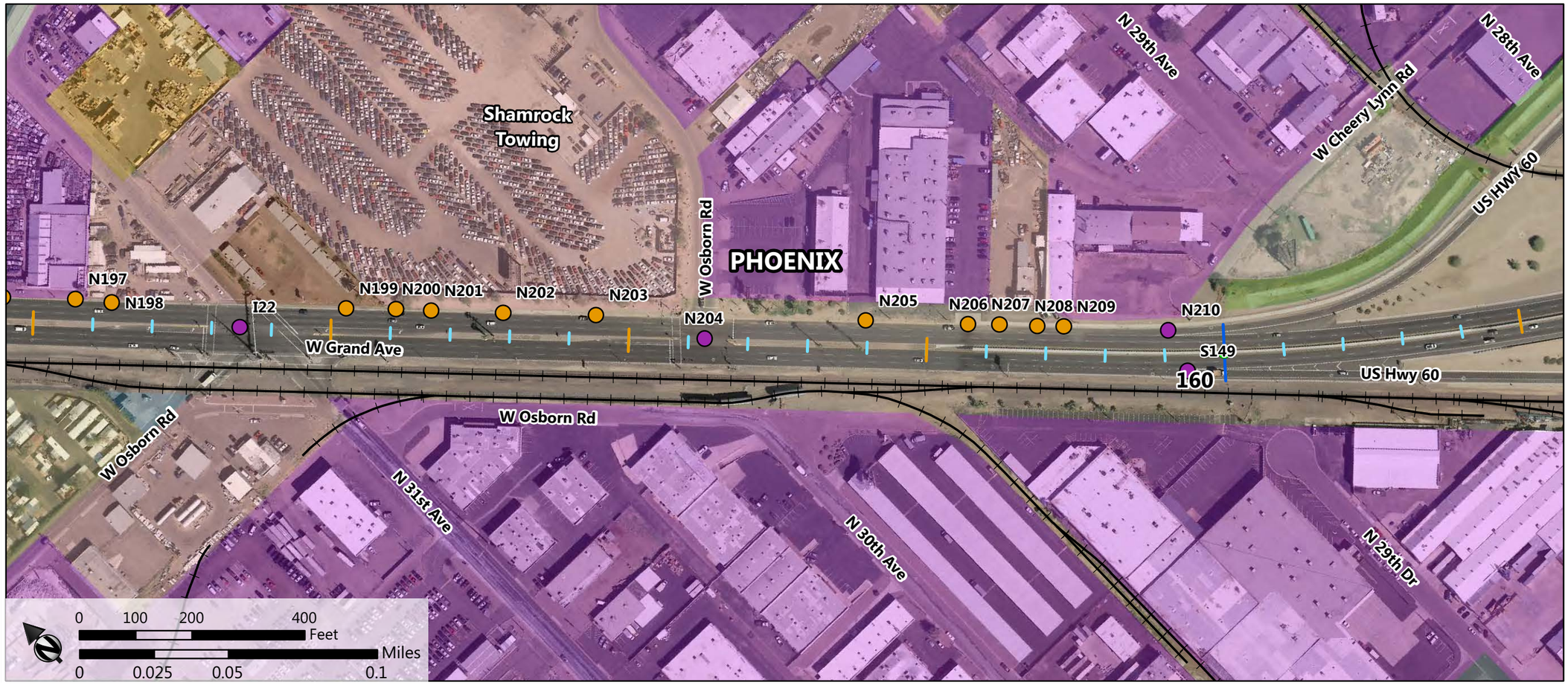
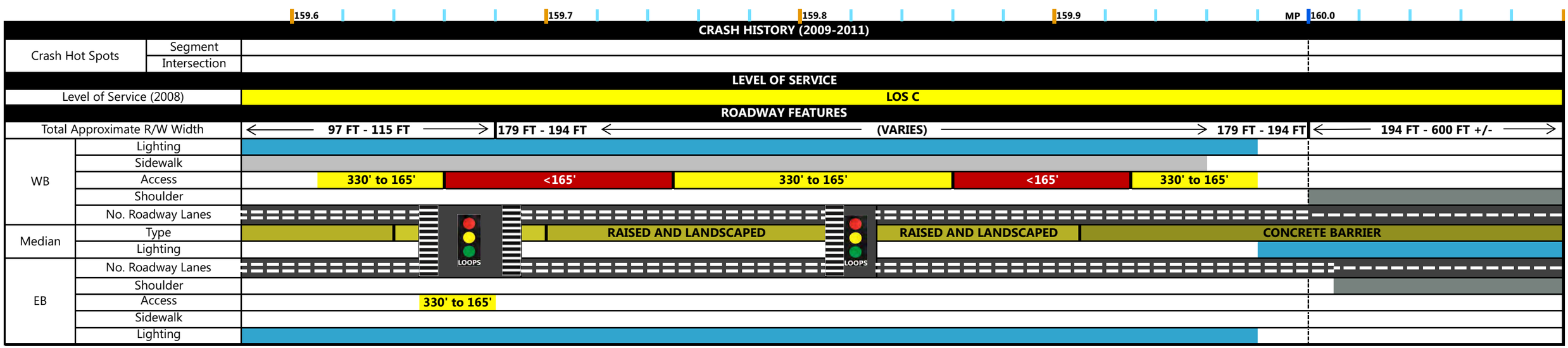
- Institutional/Religious
- Medical/Nursing Home
- Cemetery
- Public/Special Event/Military
- Active Open Space
- Passive/Restricted Open Space
- Golf Course
- Agriculture
- Tourist Accomodations
- Water
- Vacant





COMPASS

Corridor Optimization and Access Management Plan, and System Study

MARICOPA ASSOCIATION of GOVERNMENTS

8/8/2013

US-60/Grand Avenue: Loop 303 to Interstate 10

Legend

- ADOT Mile Posts
- Railway
- City Boundary
- Driveway (US-60 ID Label)
- Intersection (US-60 ID Label)
- Single Family Low Density
- Single Family Medium Density
- Single Family High Density
- Multi Family
- Developing Residential
- Retail Low
- Retail High
- Office
- Other Employment
- Developing Employment Generating
- Industrial
- Educational
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- Medical/Nursing Home
- Cemetery
- Public/Special Event/Military
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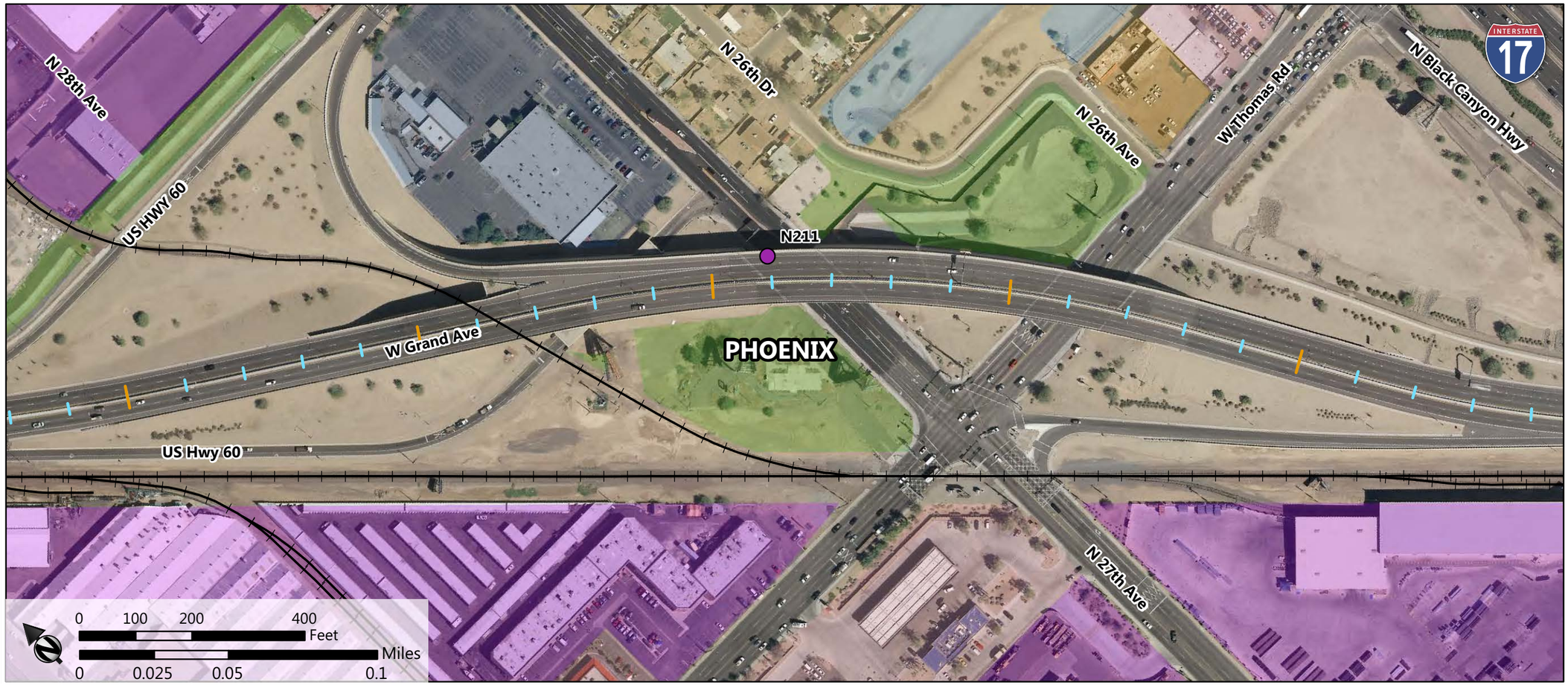

		160.1	160.2	160.3	160.4	160.5
CRASH HISTORY (2009-2011)						
Crash Hot Spots	Segment					
	Intersection					
LEVEL OF SERVICE						
Level of Service (2008)		LOS C				
ROADWAY FEATURES						
Total Approximate R/W Width		194 FT - 600 FT +/- ← (VARIES) → 194 FT - 600 FT +/-				
WB	Lighting					
	Sidewalk					
	Access					
	Shoulder					
	No. Roadway Lanes					
Median	Type	CONCRETE BARRIER				
	Lighting					
EB	No. Roadway Lanes					
	Shoulder					
	Access					
	Sidewalk					
	Lighting					

COMPASS

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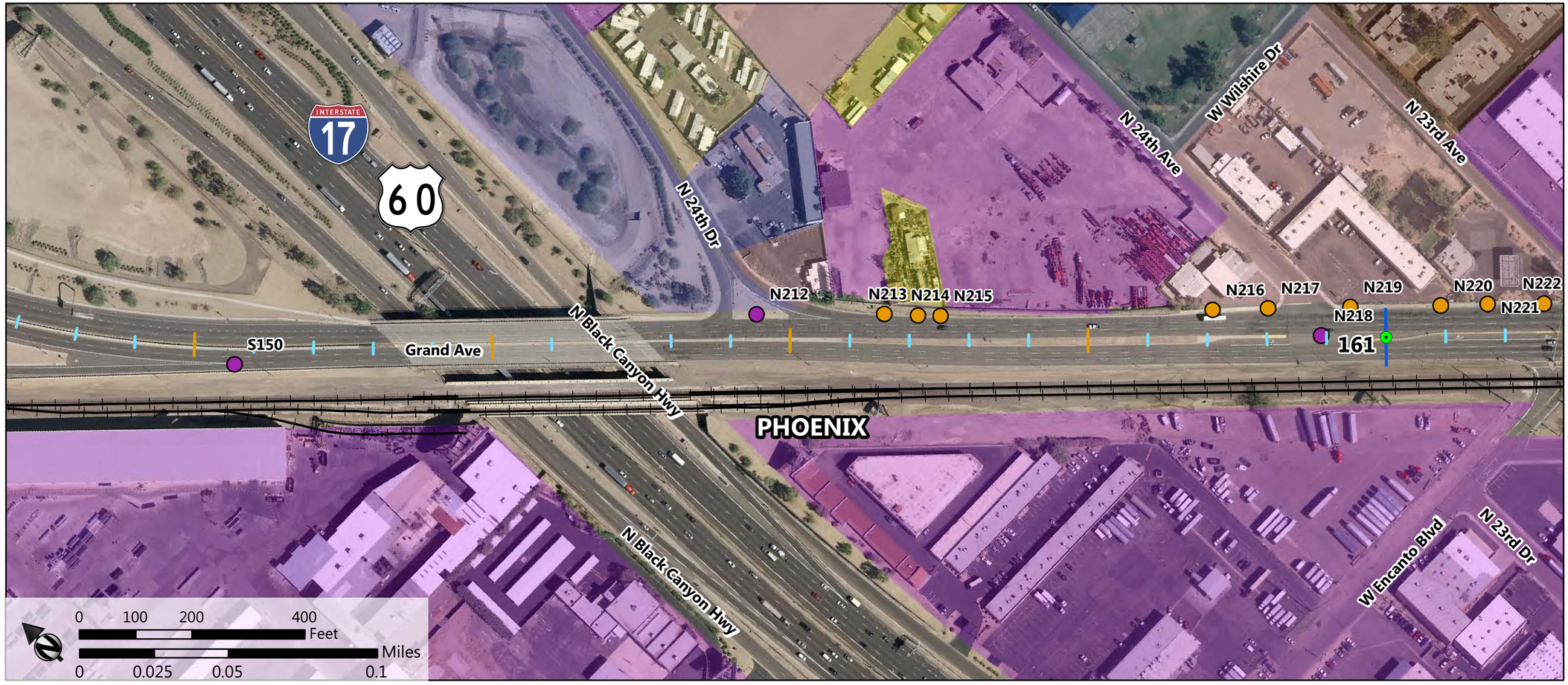

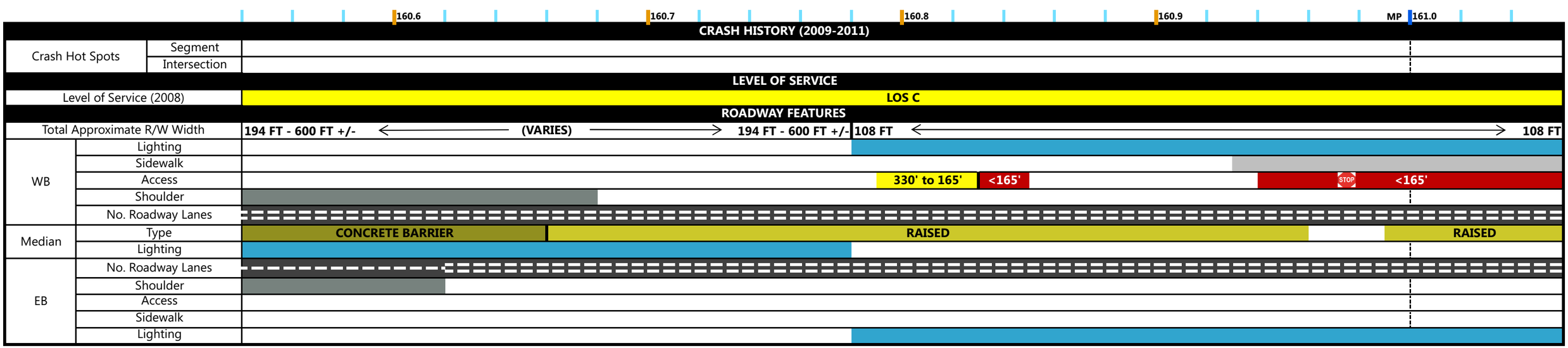

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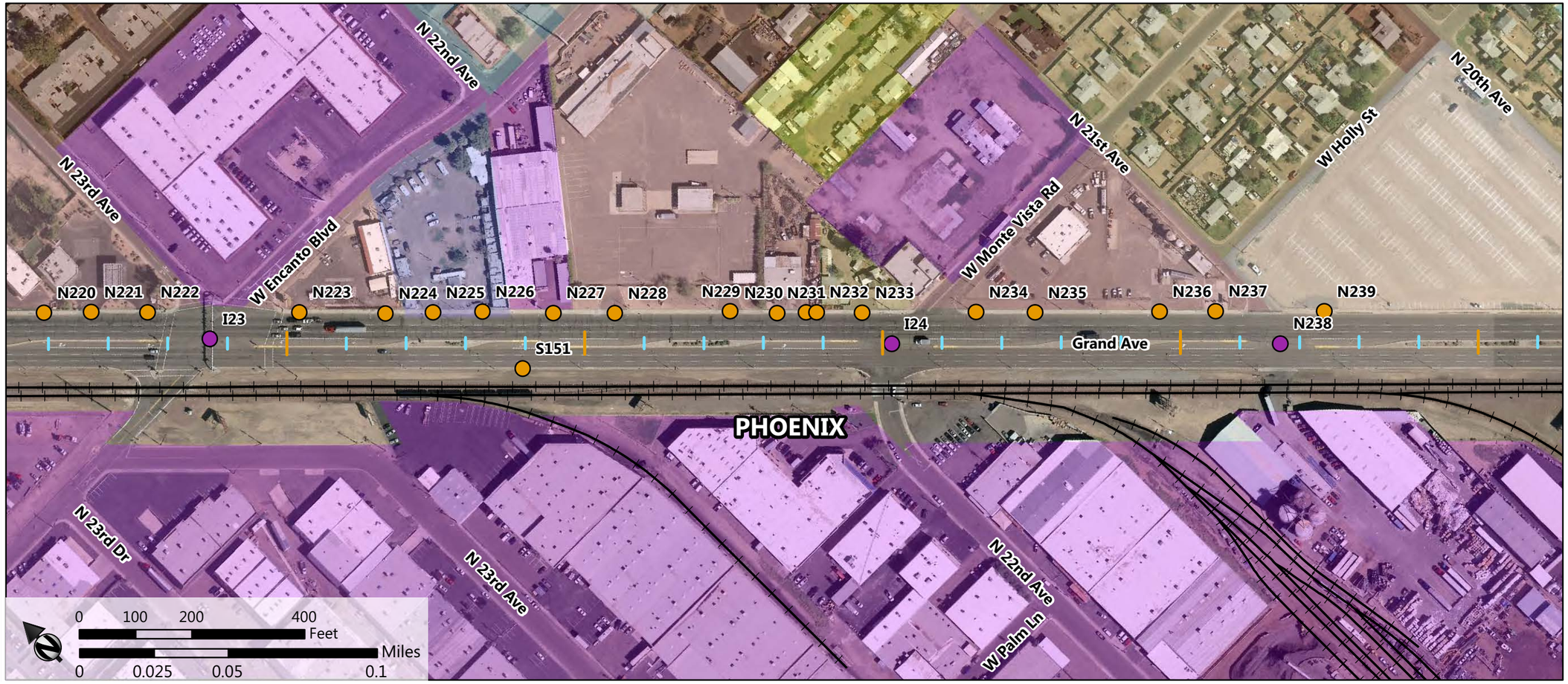

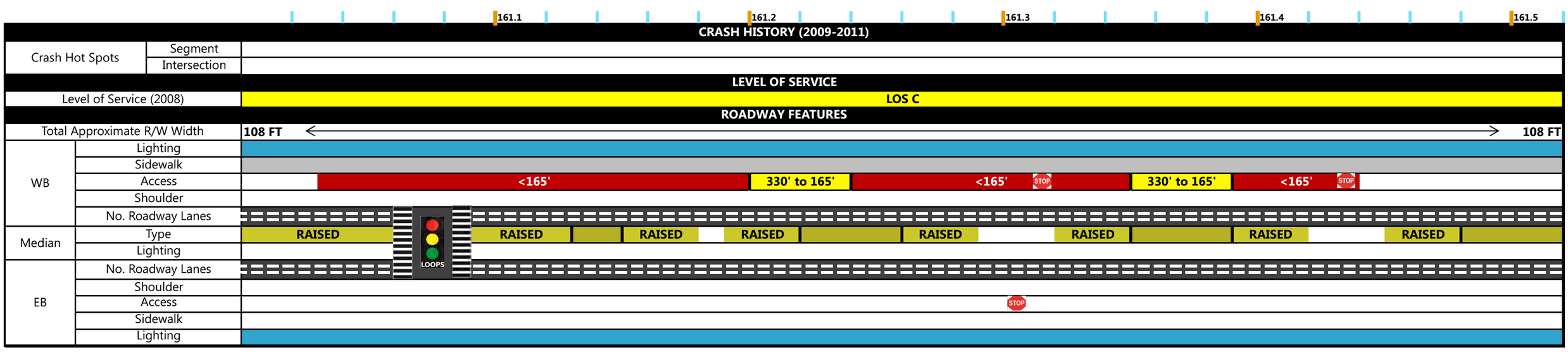

COMPASS

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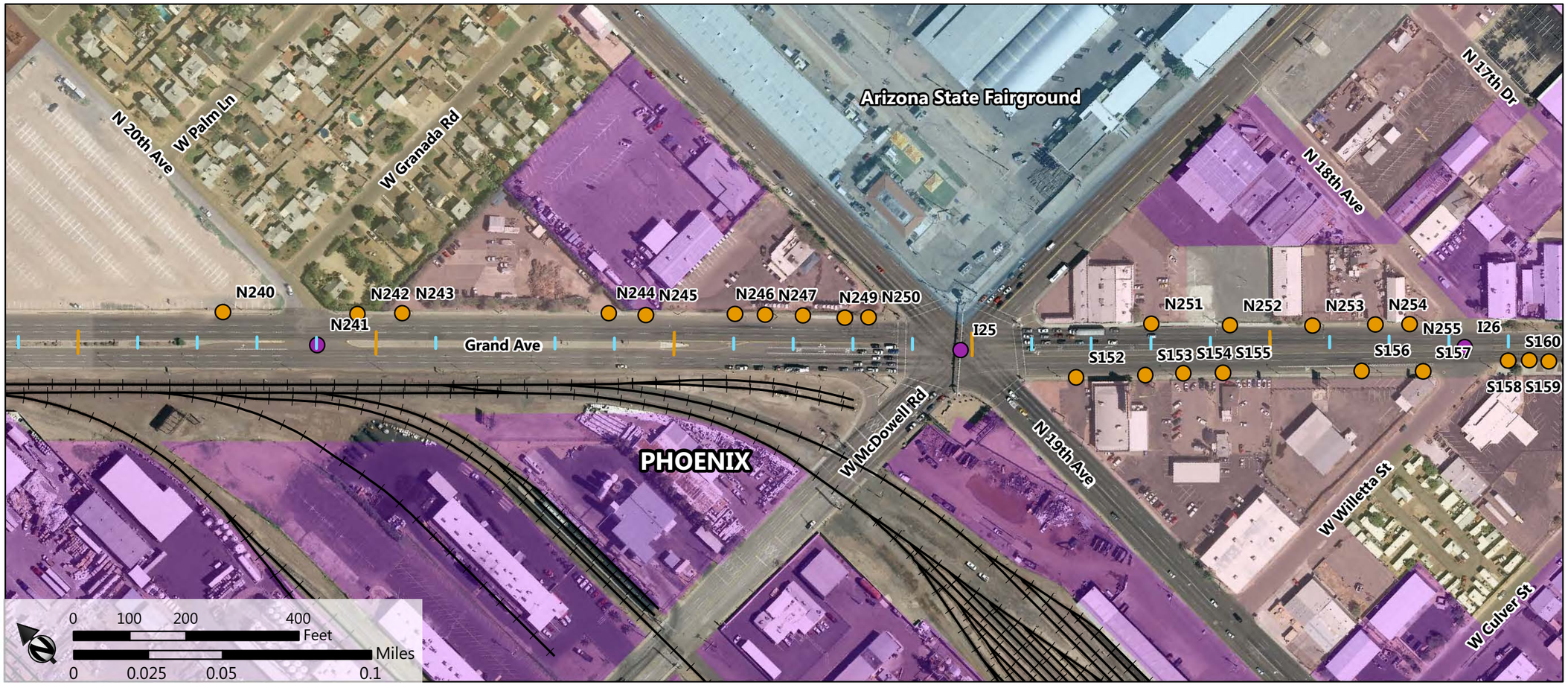

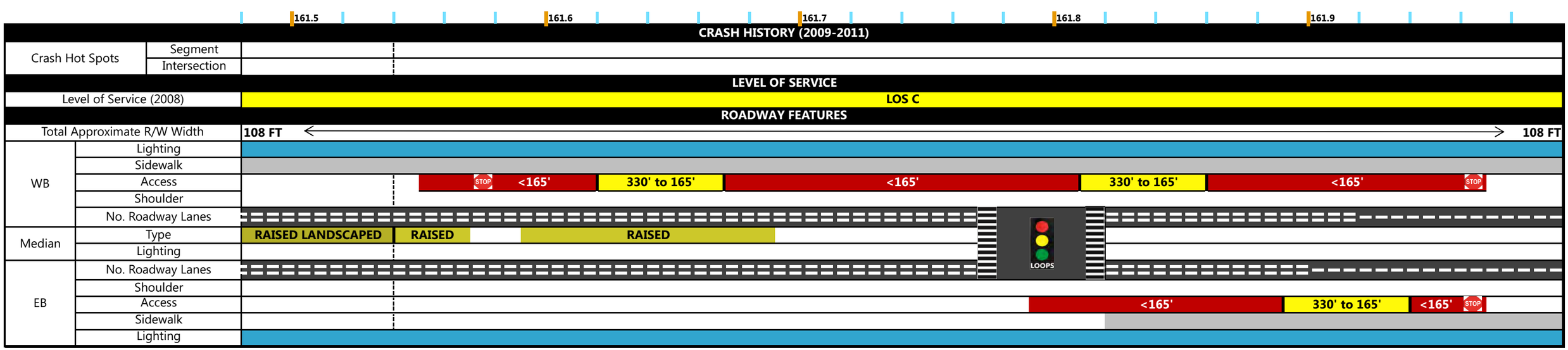

COMPASS
Corridor Optimization and Access Management Plan, and System Study
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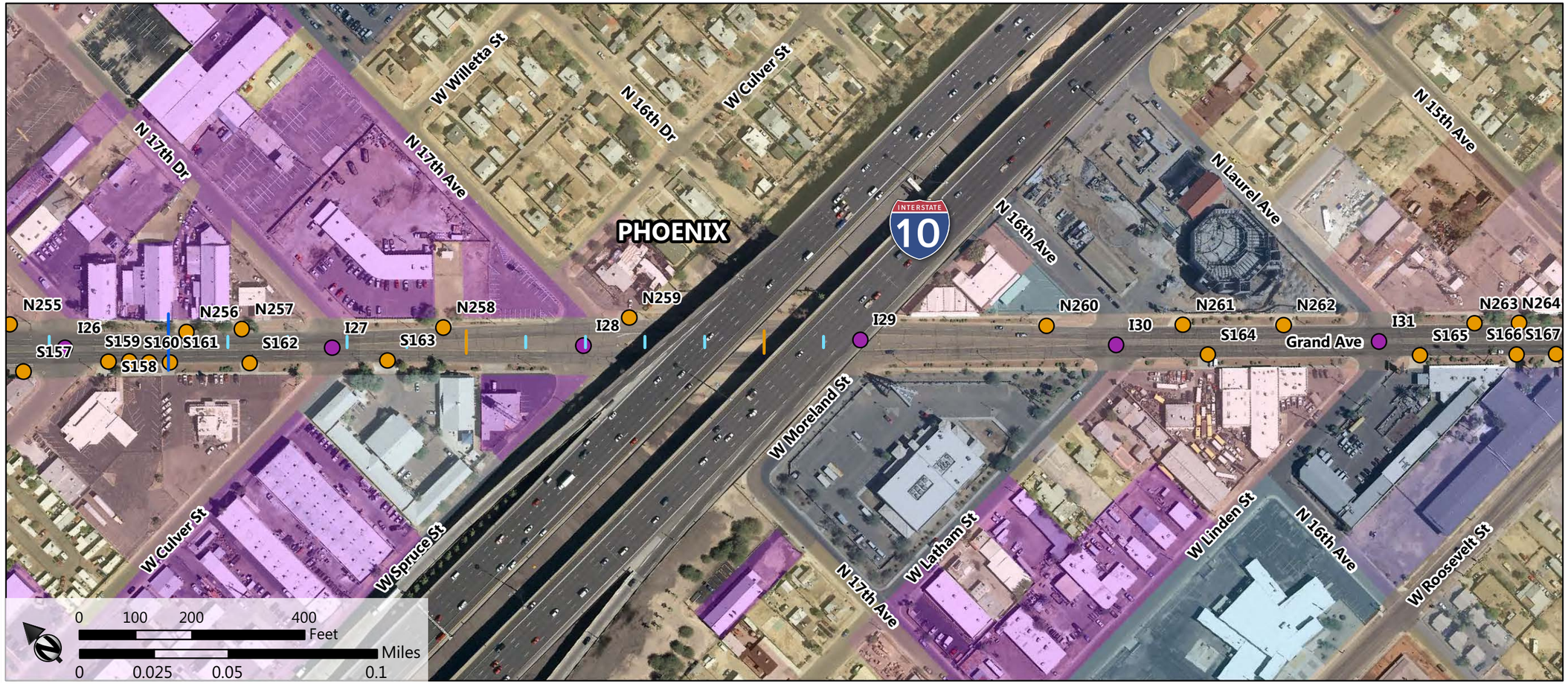

MP 162.0 162.1

CRASH HISTORY (2009-2011)		
Crash Hot Spots	Segment	
	Intersection	
LEVEL OF SERVICE		
Level of Service (2008)		LOS C
ROADWAY FEATURES		
Total Approximate R/W Width		108 FT ← → 108 FT
WB	Lighting	
	Sidewalk	
	Access	STOP 330' to 165' / <165' / STOP 330' to 165' / STOP
	Shoulder	
	No. Roadway Lanes	
Median	Type	
	Lighting	
EB	No. Roadway Lanes	
	Shoulder	
	Access	STOP <165' / STOP 330' to 165' / <165' / STOP
	Sidewalk	
	Lighting	

APPENDIX TM1-2

References

US-60/Grand Avenue COMPASS
Past Studies Summary Table

ID	Document				Source	
	Title	Description	Author	Dated	Provider	Collected By
B-002	Phoenix West High Capacity Transit Study		Valley Metro	Jul-11	B&N	JB
B-003	El Mirage Road - Northern to Bell Road	DCR, Plans, Environmental	MCDOT / Baker / Wilson / AMEC	Dec-09	B&N	JB
B-004	Grand Avenue Feasility Study - Loop 202 to Loop 101		ADOT	2008	B&N	JB
B-005	2007 MAG Regional Travel Time & Travel Speed Study		MAG / Jacobs	Apr-08	B&N	JB
B-006	2010 City of Peoria Access Management Guidelines		City of Peoria	2010	B&N	JB
B-007	MAG Access Management Primer		MAG / B&N		B&N	JB
B-008	Access Management Primer & Concepts		MAG & B&N	Nov-11	B&N	JB
B-009	2011 City of Peoria Access Management Guidelines (Also See B-006)		City of Peoria	2011	B&N	JB
B-010	2011 Sustainable Transportation and Land Use Integration Study		MAG	Jul-05	B&N	JB
B-011	Grand Avenue Commuter Rail Corridor Development Plan				B&N	
B-012	Commuter Rail		MAG		B&N	JB
B-013	Grand Avenue MIS - Phase II Final Report	02/06 Recommended Improvements		Feb-13	B&N	JB
B-015	NCHRP Synthesis 271 - Traffic Signal Operations Near Highway Rail Grade Crossings				B&N	
B-016	Grand Avenue (US 60) Traffic Signal Coordination Timing		Kimley-Horn	Mar-13	B&N	JB
B-018	35th Avenue/Indian School/Grand Avenue At-Grade Railroad Crossing Safety and Improvement Analysis		Lee Engineering	Nov-08	B&N	JB
B-019	27th Avenue/Thomas Road/Grand Avenue At-Grade Railroad Crossing Safety and Improvement Analysis		Lee Engineering	Nov-08	B&N	JB
W-001	US-60/Grand Ave Access Mgmt Plan SR-303L/Estrella Frwy to SR-74	Access Management Plan	MAG	Jan-10	Wilson	DM
W-002	Reducing Congestion in Lee County, Florida	Queue Jumpers	Reason Policy Study 374 - C. Swenson & R. Poole	Feb-09	Wilson	JT
W-003	Widening of Grand Avenue to a Continuous Six-Lane Arterial Street	Final DCR - SR 303L to 99th Ave	ADOT / DMJM Harris / AECOM	Jan-07	Wilson	JT
W-004	Grand Avenue Major Investment Study - Phase II	SR 101L to McDowell Road	MAG	Feb-06	Wilson	JT
W-005	Grand Avenue Corridor Study	Beardsley Canal to 7th Avenue/Van Buren	MAG	May-98	Wilson	JT
W-006	Grand Avenue Limited Expressway Design Concept Study for the Glendale Area		Glendale / URS	Dec-03	Wilson	JT
W-007	Grand Avenue Major investment Study (MIS) Environmental Overview		ADOT / Logan Simpson	Sep-99	Wilson	JT
W-008	The Grand Vision - Grand Avenue Image Improvement Study		Glendale / Todd & Associates	May-01	Wilson	JT
W-009	US 60, Grand Avenue - 43rd Avenue to McDowell Road	Final DCR	ADOT / DMJM Harris / AECOM	Oct-08	Wilson	JT
W-010	US 60, Grand Avenue - 71st Avenue to 43rd Avenue	Final DCR	ADOT / DMJM Harris / AECOM	Oct-08	Wilson	JT
W-011	US 60 Grand Avenue - 99th Avenue to 83rd Avenue	Final PA	ADOT / Stanley Consultants	Sep-05	Wilson	JT
W-012	US 60, Grand Avenue - SR 101L to 71st Avenue (Peoria Segment)	Utility Report Statge V (100%) Design	ADOT / Kimley-Horn	Nov-11	Wilson	JT
W-013	US 60, Grand Avenue - SR 101L to 71st Avenue	Final DCR	ADOT / DMJM Harris / AECOM	Dec-08	Wilson	JT
W-014	US 60 - Grand Avenue: SR 101L to McDowell Road	Final Drainage Report	ADOT / Kimley-Horn	Aug-11	Wilson	JT
W-015	US 60, Grand Avenue - SR 101L to McDowell Road	Utility Report State III (60%) Design	ADOT / Kimley-Horn	Sep-09	Wilson	JT
W-016	US 60, Grand Avenue - SR 303 to 99th Avenue, Segment 1	Final Drainage Report	ADOT / Dibble Engineering	Nov-08	Wilson	JT
W-017	US 60, Grand Avenue - SR 303L to SR 101L	Revised - Draft US 60 Imp. Feasibility Rpt.	ADOT / DMJM Harris / AECOM	Nov-08	Wilson	JT
W-018	NCHRP State of the Practice in Highway Access Management		Transportation Research Board	2010	Wilson	JT
W-019	ADOT Highways Program, 2013-2017	5-Yr Transportation Facilities Const. Program	ADOT	Jun-12	Wilson	LS
W-020	MAG Regional Transit Framework, Final Report and Executive Summary	Prioritzed transit needs through 2030	MAG/Valley Metro/BQAZ	Oct-09	Wilson	LS
W-021	Northern Parkway DCR, Dft Chapter 1	Design Concept Report for Northern Pkwy	Glendale/URS	Jan-08	Wilson	LS
W-022	El Mirage Road, Northern Avenue to Bell Road, Final Report	Corridor Improvement Study	MCDOT/Kirkham Michael	Feb-07	Wilson	LS
W-023	El Mirage Road Improvements, Northern Ave to Grand Ave	Project Activities Review_FY11-Fy15	MCDOT	Nov-12	Wilson	LS
W-024	El Mirage Road, Grand Avenue Linkage at Thunderbird Road	Project Listings FY 2012-2016	MCDOT	Jun-12	Wilson	LS
W-025	US 60 (Grand Avenue)	Fact Sheet, May 2010	ADOT	May-10	Wilson	LS
W-026	Comprehensive Arterial Bus Rapid Transit Planning Study, Final Report	Final Recommendations, BRT Planning	Valley Metro/RPTA & Parsons Brinckerhoff	Sep-09	Wilson	LS
W-027	Regional Paratransit Study, Final Report	Comprehensive Study of Paratransit Services	Valley Metro/RPTA & TranSystems Corp, et al	Jun-08	Wilson	LS
W-028	Short Range Transit Plan, FY 2012-2016	Identifies Transit Svc and Capital Needs for 5 Yrs	Valley Metro/RPTA	May-12	Wilson	LS
W-029	US 60 (Grand Avenue) Frontage Road	Maintenance Alert: Through May 2011	ADOT	May-11	Wilson	LS

US-60/Grand Avenue COMPASS
Past Studies Summary Table

ID	Document				Source	
	Title	Description	Author	Dated	Provider	Collected By
W-030	Grand Manor Condominiums, SE Corner of 88th Drive & Grand Avenue	Planned Area Development Approval	SKS Grand Manor, LLC, et al	Aug-09	Wilson	LS
W-031	Greeening Lower Grand Avenue, Phoenix, Arizona	Greening Amreica's Capitals	US Environmental Protection Agency	2012	Wilson	LS
W-032	Transportation Improvement Program, FY 2012-20176	5-Yrs of Capital Improvements to Cnty Rdwys	MCDOT	2012	Wilson	LS
W-033	Old Town Peoria Revitalization Plan	Revitalization Strategy for Peoria'a Old Town	City of Peoria	No Date	Wilson	LS
W-034	Park-and-Ride Reprioritization Plan, Final Report	Alignment of P&R Projects with RTP	Valley Metro/RPTA & Parsons Brinckerhoff	Apr-08	Wilson	LS
W-035	Peoria Avenue FY 2012-2021 Capital Improvement Program	83rd Avenue & BNSF Railroad Crossing Removal	City of Peoria	No Date	Wilson	LS
W-036	Peoria Avenue FY 2012-2021 Capital Improvement Program	Grand Avenue Landscaping: L101 to Peoria Av	City of Peoria	No Date	Wilson	LS
W-037	Peoria Multi-modal Transportation Plan, Final Report	Development of a Balanced Transportation Sys	City of Peoria & Nelson\Nygaard, et al	Mar-11	Wilson	LS
W-038	Old Town Specific Area Plan, 2011	Vision for Redvelopment & Revitalization	City of Peoria	2011	Wilson	LS
W-039	General Plan Circulaton Element	Discusses Alternatives to SOV travel	City of Phoenix	Aug-10	Wilson	LS
W-040	General Plan Circulaton Element Appendix	Background Information for Circulaton Element	City of Phoenix	Aug-10	Wilson	LS
W-041	US 60-Grand Avenue_SR 101L to McDowell, Glendale Segment Maps, 061108	ADOT Fact Sheet: DCR & Environmental Study	ADOT	Jun-08	Wilson	LS
W-042	US 60-Grand Avenue_SR 101L to McDowell, Glendale Segment Projects, 061108	ADOT Fact Sheet: DCR & Environmental Study	ADOT	Jun-08	Wilson	LS
W-043	US 60-Grand Avenue_SR 101L to McDowell, Peoria Segment Projects, 061108	ADOT Fact Sheet: DCR & Environmental Study	ADOT	Jun-08	Wilson	LS
W-044	US 60-Grand Avenue_SR 101L to McDowell, Peoria Segment Projects, 061108	ADOT Fact Sheet: DCR & Environmental Study	ADOT	Jun-08	Wilson	LS
W-045	US 60-Grand Avenue_SR 101L to McDowell, Phoenix Segment Projects, 061108	ADOT Fact Sheet: DCR & Environmental Study	ADOT	Jun-08	Wilson	LS
W-046	US 60-Grand Avenue_SR 101L to McDowell, Phoenix Segment Projects, 061108	ADOT Fact Sheet: DCR & Environmental Study	ADOT	Jun-08	Wilson	LS
W-047	Transportation Needs Study, Phase I and II, Drawings and Cost, Final Report	Preliminary Engineering & Costs for City TIP	City of Peoria/URS	Apr-05	Wilson	LS
W-048	US 60 Corridor Bus Service	Valley Metro System Map	Valley Metro	Jul-12	Wilson	LS
W-049	US 60-Downtown Phoenix Service Links	Valley Metro System Map	Valley Metro	Jul-12	Wilson	LS
W-050	US 60/Grand Avenue Planned Improvements	Projects: Phoenix Metro Area	ADOT Projects Web Site, Vly Fwys, US60/Grand Ave	Oct-12	Wilson	LS
W-051	Youngtown General Plan	Guidance for Future Land Use & Development	Town of Youngtown/HDR Engineering, Inc.	2003	Wilson	LS
P-001	Are We There Yet? The Role of Transp. In Driving AZ's Global Economy		Arizona Forward	Oct-12	PSA	PF
P-002	Land Use and Traffic Congestion	Final Report 618	ADOT Research Center	Mar-12	PSA	PF
P-003	High-Capacity Transit Study	Final Report	MAG/IBI Group	Jun-03	PSA	PF
P-004	El Mirage General Plan	General Plan	City of El Mirage/The Planning Center, et al	Dec-09	PSA	PF
P-005	Glendale 2025: The Next Step	General Plan	City of Glendale/Community Sciences Corporation, et al	May-02	PSA	PF
P-006	Glendale City Center Master Plan	Specific Area Plan	City of Glendale/RNL Design, et al	Jul-02	PSA	PF
P-007	The Grand Vision	Grand Ave Image Improvement Study	City of Glendale/Todd & Associates	May-01	PSA	PF
P-008	Old Town Specific Area Plan	Peoria Old Town Plan	City of Peoria	2011	PSA	PF
P-009	Peoria General Plan	General Plan	City of Peoria/BRW (2000 version)	2011	PSA	PF
P-010	Economic Development Implementation Strategy	Peoria ED plan	City of Peoria/ Garnet Consulting Services, Inc, et al	Dec-10	PSA	PF
P-011	Greening Lower Grand Avenue	Design plan	EPA/Phoenix/PLAN*et, et al	2012	PSA	PF
P-012	General Plan 2002	Phoenix General Plan	City of Phoenix	2002	PSA	PF
P-013	Surprise Center Village	Village 1 Plan	City of Surprise	Aug-10	PSA	PF
P-014	General Plan 2030: One City, Many Choices	Surprise General Plan (NOT RATIFIED)	City of Surprise	Jul-08	PSA	PF
P-015	General Plan 2020: Imagine the Possibilities	Surprise General Plan	City of Surprise	Dec-05	PSA	PF
P-016	Youngtown General Plan	General Plan	Town of Youngtown/HDR	2003	PSA	PF
P-017	Maricopa County 2020, Eye to the Future	Comprehesnive Plan	Maricopa County/BRW (1997 version)	Aug-02	PSA	PF
P-018	Surprise General Plan 2035: Foundation for the Future	General Plan	City of Surprise	Jun-13	PSA	PF
P-019	Youngtown General Plan 2025	Youngtown General Plan (update; pending ratification	Town of Youngtown/Blanton & Cooper	Jun-14	PSA	PF

APPENDIX TM1-3

Existing Access Points

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
2	North/South	I1		Three-Quarter	Yield Sign	Three-Quarter - all traffic	Raised Median		Local Road	Intersection	2343
79	North/South	I10	N 107th Ave / N Del Webb Blvd	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	52868
87	North/South	I11	N 103rd Ave	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	55481
94	North/South	I12	N 99th ave	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Raised Median		Local Road	Intersection	58302
102	North/South	I13	N 91st Ave	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	63486
126	North/South	I14	W Peoria Ave	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	69835
129	North/South	I15	N 83rd Ave	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	70413
131	North/South	I16	W Monroe St	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	72005
137	North/South	I17	N 75th Ave	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	77551
174	North/South	I18	W Northern Ave / N 67th Ave	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	84897
202	North/South	I19	N Orangewood Ave	Full	Stop Sign	Full - all traffic	Raised Median	No	Local Road	Intersection	88518
3	North/South	I2	N 163rd Ave	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	4727
212	North/South	I20	W Myrtle Ave	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	90291
336	North/South	I21	N 35th Ave	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	114393
368	North/South	I22	W Osborn Rd / N 31st Ave	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	118074
395	North/South	I23	W Encanto Blvd / N 23rd Ave	Full	Traffic Signal	Full - all traffic	Raised Median	Yes	Local Road	Intersection	125409
408	North/South	I24	N 22nd Ave / W Monte Vista	Full	Stop Sign	Full - all traffic	Raised Median	Yes	Local Road	Intersection	126612
426	North/South	I25	W Mcdowell Rd / N 19th Ave	Full	Traffic Signal	Full - all traffic	Raised Median	Yes	Local Road	Intersection	129206
438	North/South	I26	W Willetta St / N 18th Ave	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Local Road	Intersection	130096

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
446	North/South	I27	W Culver St / N 17th Dr	Full	Stop Sign	Full - all traffic	Raised Median	Yes	Local Road	Intersection	130568
449	North/South	I28	W Spruce St / N 17th Ave	Full	Stop Sign	Full - all traffic	Raised Median	Yes	Local Road	Intersection	131013
451	North/South	I29	W Moreland St	Full	Stop Sign	Full - all traffic	Raised Median	Yes	Local Road	Intersection	131503
8	North/South	I3	N Sunrise Blvd / W R H Johnson Blvd	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	13789
453	North/South	I30	W Latham St / N 16th Ave	Full	Stop Sign	Full - all traffic	Raised Median	Yes	Local Road	Intersection	131955
457	North/South	I31	W Linden St / N Laurel Ave	Full	Stop Sign	Full - all traffic	Raised Median	Yes	Local Road	Intersection	132420
24	North/South	I4	N Reems Rd / W Meeker Blvd	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	20711
47	North/South	I5	W Bell Rd	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	30401
55	North/South	I6	N Dysart Rd	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	33755
59	North/South	I7	W Greenway Rd	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	38482
63	North/South	I8	A St / N Thompson Ranch Rd	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	45450
72	North/South	I9	N 111th Ave	Full	Traffic Signal	Full - all traffic	Raised Median		Local Road	Intersection	50226
134	North	N1		Full	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	74199
140	North	N2	N 71st Ave	Full	Stop Sign	Full - all traffic	Raised Median		Local Road	Intersection	80667
141	North	N3		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	81213
142	North	N4		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Local Road	Intersection	81355
143	North	N5		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81447
144	North	N6		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81545
145	North	N7		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81588
146	North	N8		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81654
147	North	N9		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81769
148	North	N10		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81810

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
149	North	N11		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81928
150	North	N12		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	81986
151	North	N13		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	82050
152	North	N14		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	82156
153	North	N15		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	82208
154	North	N16		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	82309
155	North	N17		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	82460
156	North	N18		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	82527
157	North	N19		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	82634
158	North	N20		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	82693
159	North	N21		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	82791
160	North	N22		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	82891
161	North	N23		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	82953
162	North	N24		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	83003
163	North	N25		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	83082
164	North	N26		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	83219
165	North	N27		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	83280
166	North	N28		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	83362
167	North	N29		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	83419

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
168	North	N30		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	83523
169	North	N31		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	83614
170	North	N32	Royal Palm	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	83702
171	North	N33		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	83842
172	North	N34		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	84063
173	North	N35		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	84329
175	North	N36		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	85450
176	North	N37		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	85548
177	North	N38		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	85579
179	North	N39		Three-Quarter	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	85810
180	North	N40		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	85918
181	North	N41		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	86131
182	North	N42		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	86157
183	North	N43		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	86225
184	North	N44		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	86313
185	North	N45		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	86844
186	North	N46		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87017
187	North	N47		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87107
188	North	N49		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87324

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
189	North	N48		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87352
190	North	N50		Three-Quarter	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87510
191	North	N51		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87550
192	North	N52		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87578
193	North	N53		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87719
194	North	N54		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87847
195	North	N55		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87917
196	North	N56		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	87967
197	North	N57		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	88066
198	North	N58		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	88148
199	North	N59	N 63rd Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	88247
200	North	N60		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	88344
201	North	N61		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	88434
203	North	N62		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	88821
204	North	N63		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	88984
205	North	N64		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	89237
206	North	N65		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	89336
207	North	N66		Right-in / Right-out	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	89439
208	North	N67		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	89529

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
209	North	N68		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	89589
210	North	N69		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	89929
211	North	N70		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	90242
213	North	N71		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	90542
214	North	N72		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	90632
215	North	N73	N 57th Dr	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	93402
216	North	N74		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	93607
217	North	N75		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	93709
218	North	N76		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	93863
219	North	N77	W Ocotillo Rd	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	No	Local Road	Intersection	94011
220	North	N78		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Collector Road	Intersection	94159
221	North	N79		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	94431
222	North	N80		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	94482
223	North	N81		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	94577
224	North	N82	N 56th Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	94687
225	North	N83		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	94781
226	North	N84		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	94916
227	North	N85		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	95004
228	North	N86		Right-in / Right-out	Yield Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	95070

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
229	North	N87		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	95113
230	North	N88		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	95254
231	North	N89		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	95411
232	North	N90		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	95462
233	North	N91		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	95531
234	North	N92		On-Ramp	Stop Sign	On-Ramp	Raised Median	No	Collector Road	Intersection	95586
235	North	N93		Off-Ramp	None	Off-Ramp	Raised Median		Collector Road	Intersection	95927
236	North	N94		Right-in / Right-out	Yield Sign	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	95975
237	North	N95		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	96243
238	North	N96		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	96435
239	North	N97		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	96501
240	North	N98		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	96616
241	North	N99		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	96683
242	North	N100		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	96740
243	North	N101		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	96817
244	North	N102		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97124
245	North	N103		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97267
246	North	N104		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97465
247	North	N105		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	97546
248	North	N106	N 53rd Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	97638

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
249	North	N107		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97717
250	North	N108		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97788
251	North	N109		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97862
252	North	N110		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97937
253	North	N111		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	97993
254	North	N112		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	98076
255	North	N113		Right-in / Right-out	Yield Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	98150
256	North	N114		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	98192
257	North	N115		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	98247
258	North	N116		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	98314
259	North	N117		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	98681
260	North	N118		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	98756
261	North	N119		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	98783
262	North	N120		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	98827
263	North	N121		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	98898
264	North	N122		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	98945
265	North	N123		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	98996
266	North	N124	W Bethany Home Rd / N 51st Ave	Full	Traffic Signal	Full - all traffic	Raised Median	No	Local Road	Intersection	99586
267	North	N125		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	100028

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
268	North	N126		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	100275
269	North	N127	W Missouri Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	103320
270	North	N128		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	103488
271	North	N129		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	103559
272	North	N130		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	103684
273	North	N131		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	103719
274	North	N132		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	103779
275	North	N133		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	103846
276	North	N134		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	103915
277	North	N135		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	104018
278	North	N136		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	104086
279	North	N137		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	104291
280	North	N138		On-Ramp	Yield Sign	On-Ramp	Raised Median		Collector Road	Intersection	105153
283	North	N139		Off-Ramp	None	Off-Ramp	Raised Median	No	Collector Road	Intersection	108579
284	North	N140		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	108834
285	North	N141		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	109090
286	North	N142		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	109263
287	North	N143		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median		Driveway	Driveway	109475
288	North	N144		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median		Driveway	Driveway	109576
289	North	N145		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	109750

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
290	North	N146		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median		Driveway	Driveway	109846
291	North	N147		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	109895
292	North	N148		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	110018
294	North	N149		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	110178
295	North	N150		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	110266
296	North	N151		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	110316
297	North	N152		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	110400
298	North	N153		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	110459
300	North	N154	N 39th Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	Yes	Local Road	Intersection	110641
301	North	N155		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	110696
305	North	N156		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	111431
306	North	N157		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	111593
308	North	N158		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	111658
309	North	N159		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	111789
310	North	N160		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	111943
311	North	N161		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112072
312	North	N162		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112133
314	North	N163		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112207
315	North	N164		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112369

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
317	North	N165	N 37th Ave	Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Local Road	Intersection	112533
319	North	N166		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112631
320	North	N167		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112671
321	North	N168		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112803
322	North	N169		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112853
323	North	N170		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	112907
324	North	N171		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	112983
327	North	N172		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	113240
328	North	N173		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	113347
333	North	N174		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	114022
335	North	N175		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	114156
337	North	N176		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	114694
338	North	N177		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	114742
340	North	N178		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	114742
341	North	N179		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	115035
344	North	N180		Full	None	Full - all traffic	Raised Median	Yes	Driveway	Driveway	115358
345	North	N181		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	115560
346	North	N182		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	115717
347	North	N183		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	115788

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
349	North	N184		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	115920
351	North	N185		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	116008
352	North	N186		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	116125
353	North	N187	N 33 Ave	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	116222
355	North	N188		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	116387
356	North	N189		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	116726
357	North	N190		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	116784
358	North	N191		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	116876
359	North	N192	N Weldon Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	117118
360	North	N193		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	117343
363	North	N194		Full	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	117431
364	North	N195		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	117514
365	North	N196		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	117659
366	North	N197		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	117786
367	North	N198		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	117851
369	North	N199		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	118264
370	North	N200		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	118352
371	North	N201		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	118414
372	North	N202		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	118541

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
373	North	N203		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	118705
374	North	N204	W Osborn Rd	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Raised Median	No	Local Road	Intersection	118894
375	North	N205		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	119182
376	North	N206		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	119362
377	North	N207		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	119417
378	North	N208		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	119484
379	North	N209		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	119530
380	North	N210		On-Ramp	None	On-Ramp	Raised Median	No	Collector Road	Intersection	119715
382	North	N211	N 27th Ave	Off-Ramp	None	Off-Ramp	Raised Median	No	Collector Road	Intersection	
384	North	N212	N 24th Dr	Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Collector Road	Intersection	124085
385	North	N213		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	124139
386	North	N214		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	124198
387	North	N215		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	124238
388	North	N216		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	124719
389	North	N217		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	124816
390	North	N218	N 24th Ave.	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	Yes	Local Road	Intersection	124905
391	North	N219		Right-in / Right-out	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	124961
392	North	N220		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	125121
393	North	N221		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	125204
394	North	N222		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	125303

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
396	North	N223		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	125572
397	North	N224		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	125724
398	North	N225		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	125807
399	North	N226		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	125895
401	North	N227		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126020
402	North	N228		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126129
403	North	N229		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126332
404	North	N230		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126415
405	North	N231		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126466
406	North	N232		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126485
407	North	N233		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126565
409	North	N234		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126767
410	North	N235		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	126871
411	North	N236		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	127090
412	North	N237		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	127090
413	North	N238	N 21st Ave	Full	Stop Sign	Full - all traffic	Raised Median	Yes	Local Road	Intersection	127299
414	North	N239		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	127382
415	North	N240		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	127909
416	North	N241	N 20th Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	Raised Median	Yes	Local Road	Intersection	128071

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
417	North	N242		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	128147
418	North	N243		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	128225
419	North	N244		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	128591
420	North	N245		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	128655
421	North	N246		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	128812
422	North	N247		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	128866
423	North	N248		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	128933
424	North	N249		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	129006
425	North	N250		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	129048
428	North	N251		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	129547
432	North	N252		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	129685
433	North	N253		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	129831
435	North	N254		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	129942
436	North	N255		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	130002
443	North	N256		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	130314
444	North	N257		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	130411
448	North	N258		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	130768
450	North	N259		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	131097
452	North	N260		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	131834

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
454	North	N261		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	132075
456	North	N262		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	132253
459	North	N263		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	
460	North	N264		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	Yes	Driveway	Driveway	
1	South	S1	W Deer Valley Rd	Three-Quarter	Yield Sign	Three-Quarter - all traffic	Dedicated left-turn lane		Local Road	Intersection	0
4	South	S2		Three-Quarter	Stop Sign	Three-Quarter - all traffic	Dedicated left-turn lane		Driveway	Driveway	6359
5	South	S3		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	6967
6	South	S4	Bob Stump Memorial Pkwy / AZ-303 Loop Frontage Rd	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Dedicated left-turn lane		Local Road	Intersection	8549
7	South	S5		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)		Driveway	Driveway	9704
9	South	S6		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	15590
10	South	S7		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)		Driveway	Driveway	16109
11	South	S8		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)		Driveway	Driveway	16291
12	South	S9		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	16651
13	South	S10		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)		Driveway	Driveway	17046
14	South	S11		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)		Driveway	Driveway	17556
15	South	S12		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median		Driveway	Driveway	18120
16	South	S13		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Local Road	Intersection	18333
17	South	S14	W Yorkshire Dr	Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Local Road	Intersection	18772

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
18	South	S15		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	18986
19	South	S16		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	19146
20	South	S17		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	19567
21	South	S18	W Colannade Way	Three-Quarter	None	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	20051
22	South	S20		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	20267
23	South	S19		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	20432
25	South	S21		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	20944
26	South	S22		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	20999
27	South	S23		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	21162
28	South	S24		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	21432
29	South	S25		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	21861
30	South	S26	N Parkview Pl	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Local Road	Intersection	22149
31	South	S27		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	22425
32	South	S28		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	22803
33	South	S29	W Mountain View Blvd	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Local Road	Intersection	23263
34	South	S30	Surprise Pavillions	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Dedicated left-turn lane	No	Local Road	Intersection	23759
35	South	S31		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	24099
36	South	S32		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	24422
37	South	S33	N White Horse Trail	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)		Local Road	Intersection	24735

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
38	South	S34		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	25086
39	South	S35		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	25381
40	South	S36		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	25713
41	South	S37	Sun Village Pkwy / N Litchfield Rd	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Local Road	Intersection	27209
42	South	S38		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	27533
43	South	S39		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	27915
44	South	S40	Towne Center Dr	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	28453
45	South	S41		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	29106
46	South	S42		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	29890
48	South	S43		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	30716
49	South	S44		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	31089
50	South	S45	N Bell Grande Dr	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Local Road	Intersection	31694
51	South	S46		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	32340
52	South	S47	132nd Ave	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)		Local Road	Intersection	32841
53	South	S48		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	33060
54	South	S49		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Local Road	Intersection	33365
56	South	S50		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	34449
57	South	S51	N Sunny Ln	Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	36156
58	South	S52		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Local Road	Intersection	37340

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
60	South	S53		Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	40572
61	South	S54	N Primrose St	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	Dedicated left-turn lane	Yes	Local Road	Intersection	42551
62	South	S55	N Luna St	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Local Road	Intersection	44039
64	South	S56		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	49077
65	South	S58	N 113th Ave	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	49289
66	South	S57		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	49526
67	South	S59		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	49637
68	South	S60		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	49722
69	South	S61		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	49788
70	South	S62	N 111th Dr	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	49970
71	South	S63		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	50128
73	South	S64		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	50389
74	South	S65		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	50487
75	South	S66	N 108th Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	51785
76	South	S67		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	52352
77	South	S68		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	52510
78	South	S69		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	52787
80	South	S70		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	53226
81	South	S72		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	53434

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
82	South	S71	W Coggins Dr	Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	53789
83	South	S73	N 105th Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	54842
84	South	S74		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	55060
85	South	S75		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	55362
86	South	S76		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	55443
88	South	S77		Right-in / Right-out	None	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	55619
89	South	S78		Right-in / Right-out	None	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	55698
90	South	S79		Right-in / Right-out	None	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	55905
91	South	S80	N 102nd Dr	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	55976
92	South	S81	N 102nd Ave	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Local Road	Intersection	56320
93	South	S82	N 101st Ave	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	56677
95	South	S83		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	58524
96	South	S84		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	60870
97	South	S85		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median		Driveway	Driveway	61001
98	South	S86		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	61505
99	South	S87	AZ-101-Loop / Agua Fria Fwy	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Local Road	Intersection	61722
100	South	S88	AZ-101-Loop / Agua Fria Fwy	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Local Road	Intersection	62136
101	South	S89		Right-in / Right-out	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	63017
103	South	S90		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	63910

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
104	South	S91		Three-Quarter	None	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	64252
105	South	S92		Three-Quarter	None	Truck Only	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	64372
106	South	S93		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	64427
107	South	S94		Three-Quarter	None	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	64756
108	South	S95	N 88th Dr	Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Local Road	Intersection	66192
109	South	S96		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	66403
110	South	S97		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	66656
111	South	S98	N 87th Ave	Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Local Road	Intersection	66843
112	South	S99		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	67083
113	South	S100		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	67167
114	South	S101		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	67343
115	South	S102		Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	67597
116	South	S103		Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	Yes	Driveway	Driveway	67960
117	South	S104	N 85th Ave	Three-Quarter	Traffic Signal	Three-Quarter - all traffic	None (No break or dedicated left turn bay)		Local Road	Intersection	68443
118	South	S105		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	68574
119	South	S106		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	68662
120	South	S107		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	68697
121	South	S108		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	68770
122	South	S109		Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Driveway	Driveway	69156

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
123	South	S110	N 84th Ave	Right-in / Right-out	Stop Sign	Right-in / Right-out - all traffic	Raised Median	No	Local Road	Intersection	69459
124	South	S111		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	69669
125	South	S112		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	69739
127	South	S113		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	
128	South	S114		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	
129	South	S115	W Jefferson St	Three-Quarter	Stop Sign	Three-Quarter - all traffic	None (No break or dedicated left turn bay)	No	Local Road	Intersection	71155
132	South	S116		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	72159
133	South	S117		Full	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	74175
135	South	S118		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	74798
136	South	S119		Three-Quarter	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	75656
138	South	S120		Right-in / Right-out	Yield Sign	Right-in / Right-out - all traffic	Raised Median	No	Collector Road	Intersection	77816
139	South	S121		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	77943
178	South	S122		Right-in / Right-out	None	Unused (curb cut not used)	None (No break or dedicated left turn bay)	No	Driveway	Driveway	85676
281	South	S123		Off-Ramp	None	Off-Ramp	None (No break or dedicated left turn bay)		Collector Road	Intersection	105136
282	South	S124		On-Ramp	None	On-Ramp	Raised Median	No	Collector Road	Intersection	108408
293	South	S125		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	No	Driveway	Driveway	109992
299	South	S126		Right-in / Right-out	None	Unused (curb cut not used)	Dedicated left-turn lane	Yes	Driveway	Driveway	110620
302	South	S127		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	110722
303	South	S128		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	111050

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
304	South	S129		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	111382
307	South	S130		Three-Quarter	None	Three-Quarter - all traffic	Raised Median break with left-turn lane	Yes	Driveway	Driveway	111596
313	South	S131		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	112116
316	South	S132		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median		Driveway	Driveway	112363
318	South	S133		Three-Quarter	None	Three-Quarter - all traffic	Raised Median break with left-turn lane	No	Driveway	Driveway	112536
325	South	S134		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	112983
326	South	S135		Three-Quarter	None	Three-Quarter - all traffic	Raised Median break with left-turn lane	Yes	Driveway	Driveway	113181
329	South	S136		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	113333
330	South	S137		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	Yes	Driveway	Driveway	113485
331	South	S138		On-Ramp	Yield Sign	On-Ramp	Raised Median	No	Collector Road	Intersection	113636
332	South	S139		Three-Quarter	None	Three-Quarter - all traffic	Dedicated left-turn lane	Yes	Driveway	Driveway	113823
334	South	S140		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	114049
339	South	S141		Right-in / Right-out	None	Right-in / Right-out - all traffic	None (No break or dedicated left turn bay)	No	Driveway	Driveway	114734
342	South	S142		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	115195
343	South	S143		Three-Quarter	None	Three-Quarter - all traffic	Raised Median	No	Driveway	Driveway	115307
348	South	S144		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	115844
350	South	S145		Right-in / Right-out	None	Right-in / Right-out - all traffic	Raised Median	No	Driveway	Driveway	115934
354	South	S146		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	116327
361	South	S147		Full	None	Unused (curb cut not used)	Raised Median break with left-turn lane	No	Driveway	Driveway	117373

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
362	South	S148		Right-in / Right-out	None	Unused (curb cut not used)	Raised Median break with left-turn lane	No	Driveway	Driveway	117406
381	South	S149		Off-Ramp	None	Off-Ramp	None (No break or dedicated left turn bay)	No	Collector Road	Intersection	119744
383	South	S150		On-Ramp	None	On-Ramp	Raised Median	Yes	Collector Road	Intersection	122985
400	South	S151		Three-Quarter	None	Unused (curb cut not used)	Raised Median	Yes	Driveway	Driveway	125957
427	South	S152		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	129406
429	South	S153		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	129529
430	South	S154		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	129596
431	South	S155		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	129666
434	South	S156		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	129911
437	South	S157		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	130020
439	South	S158		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	130171
440	South	S159		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	130208
441	South	S160		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	130243
442	South	S161		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	130280
445	South	S162		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	130421
447	South	S163		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	130664
455	South	S164		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	132115
458	South	S165		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	
461	South	S166		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	

Table 2 - Access Point Table

US-60 ID *	SIDE	Access ID	Intersection Name	Current Access Type	Traffic Control Type	Allowable Traffic Movements	Median Type	Cross Access Exits	Intersection Type	Access Type	Distance
462	South	S167		Three-Quarter	None	Three-Quarter - all traffic	Two-way left-turn lane	Yes	Driveway	Driveway	132731

APPENDIX TM1-4

Existing Conditions and Findings Regarding Access Management

US-60/Grand Avenue Corridor Optimization, Access Management, and System Study (COMPASS) Loop 303 to Interstate 10

Technical Memorandum (Administrative Draft)

Existing Conditions and Finding Regarding Access Management

Part of project task A3

Prepared For: Maricopa Association of Governments

Prepared by: Philip B Demosthenes LLC

In association with: Burgess & Niple, Inc.

April 2013 (Rev. October 2013).

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INTRODUCTION TO THE Grand Avenue PROJECT

The United States Route 60 (US-60)/Grand Avenue Corridor Optimization, Access Management, and System Study (COMPASS) – Loop 303 to Interstate 10 is being conducted by the Maricopa Association of Governments (MAG) in order to identify a long-term solution for accommodating multi-modal travel demand, access to property, local and arterial streets, establish operating principles to improve the effectiveness of traffic operations, prepare an Access Management Plan, and help establish decision criteria and procedures that will help preserve the desired performance of Grand Avenue into the future.

A partnering charter was signed on February 22, 2012, by the political leadership of the communities within the US-60/Grand Avenue COMPASS corridor (Grand Avenue). The outcomes of this technical study will address the following goals that were identified in the charter:

- Cooperatively create an overall vision for the US-60/Grand Avenue Corridor that embraces the important regional function of Grand Avenue as a significant high capacity, multimodal corridor and that can recognize the unique character of different sections of the corridor and the communities it passes through.
- Cooperatively define the operational character for the US-60/Grand Avenue Corridor that will enhance economic development, maintain accessibility to adjacent land uses, improve traffic operations, and reduce highway and rail conflicts.
- Establish an access management system that provides an efficient means to accommodate intersecting roadways and access to and from adjacent properties. After the system is recommended and agreed upon, each stakeholder will incorporate the principles and recommendations into their transportation, economic development and community development.
- Develop guidelines for signage, landscaping and aesthetic treatments along the corridor recognizing the different communities along the corridor.
- Work together to provide the affected stakeholders, including daily commuters, local residents, and adjacent property owners and users with information about the project and opportunity to contribute to the study's outcome and recommendations.

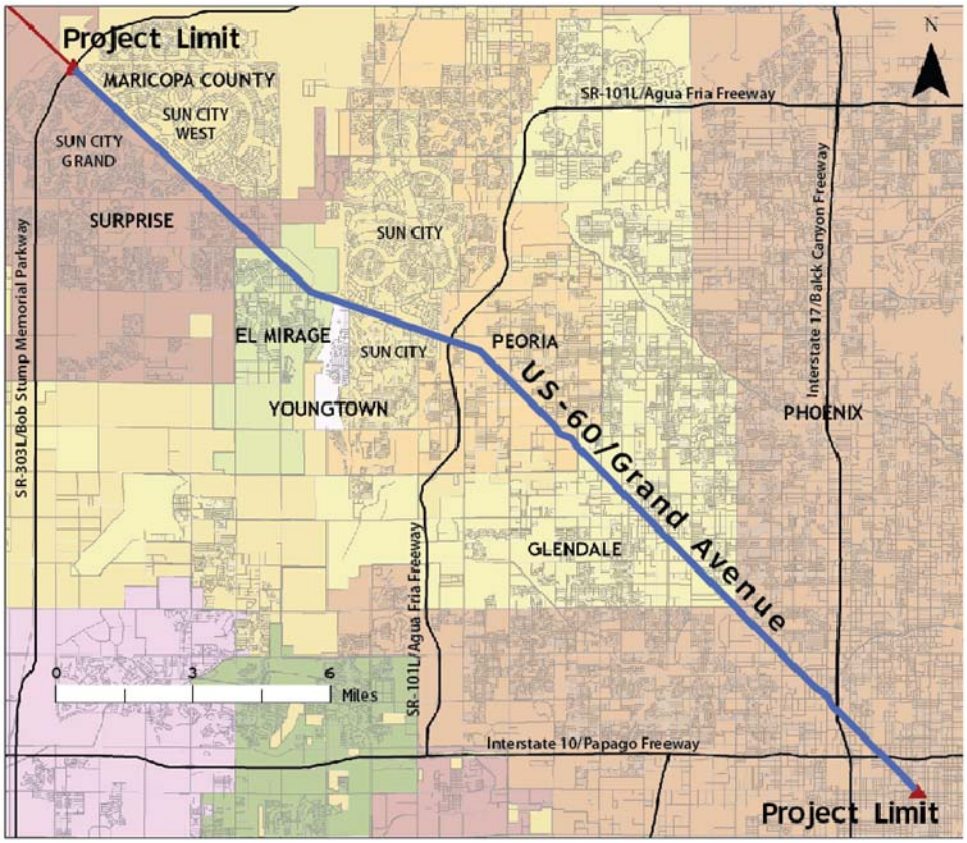
PURPOSE OF THIS MEMORANDUM

To introduce the principles, the benefits, the road design and technical concerns regarding the elements of access that exist along Grand Avenue, to report on existing access conditions and to explain how the current conditions on Grand Avenue relate to the potential strategies and techniques that might be recommended for the anticipated access management plan.

The management of access points along a corridor like Grand Avenue is the single most important roadway design element that impacts traffic safety and travel efficiency. As an illustration, three years of Grand Avenue crash records have identified that over 80 percent of all crashes are intersection related.

Study Area

The Grand Avenue study corridor begins at the traffic interchange (TI) with State Route 303 (Loop 303) in the City of Surprise and ends at the Willetta Street intersection in the City of Phoenix a distance of about 23.8 miles. The corridor is oriented northwest to southeast and passes through portions of the City of Surprise, City of El Mirage, Town of Youngtown, City of Peoria, City of Glendale, City of Phoenix, and areas of unincorporated Maricopa County such as Sun City West.



Grand Avenue is a state and regionally significant six lane arterial roadway that serves as a vital transportation corridor in the northwest quadrant of the Phoenix metropolitan area. It is designated as a part of the National Highway System which is a state requested Federal designation. US-60 extends northwest to the community of Wickenburg where it connects with and becomes US-93, which reaches Interstate 40 near Kingman in northwestern Arizona and then continues to Las Vegas, Nevada. This is the primary route connecting the large metropolitan areas of Phoenix and Las Vegas.

Photographs taken during field visits along Grand Avenue illustrating the design of Grand Avenue at various locations, truck and rail freight movement and traffic congestion.

INTRODUCTION AND CONCEPTS IN ACCESS MANAGEMENT

WHAT IS ACCESS MANAGEMENT?

Access management is the careful control of the location, spacing, design, and operation of public intersections, private driveways, medians and median openings to a roadway.

It involves roadway design applications such as median treatments, auxiliary turn lanes and the appropriate spacing of traffic signals.

The application of access control has been a useful roadway operation strategy since the latter part of the 19th century and is a key component of the Interstate Highway System. The contemporary practice of access management extends the concept of access design and location control to all roadways – not just limited access highways or freeways.

Access management is particularly important along major arterials and other principal roads those primary function is the safe and efficient movement of traffic. As the roadways step down in functional importance towards truly a local street, more access can be allowed. But even on local streets such as minor collectors or residential streets it is still necessary to address basic access related engineering and safety considerations such as design, sight distance, safety and location.

Both research and experience have shown that careful considerations of location and design of access have significant benefits to public safety, community and economic vitality, and results in smoother traffic flow, better travel times and a less stressful drive.

Managing access involves finding a balance between the dual roles that highways serve: The safe and efficient movement of people and goods by road-based transport (car, truck, bus, motorcycle, bicycle and foot); and providing for vehicular access to abutting land - either directly or indirectly via intersecting local roads and private circulation such as parking lots.

In general, these two roles can be in conflict. Access related turning movements by motorists at intersections and driveways interfere with the free flow of traffic resulting in the less efficient and less safe movement of traffic. The degree to which this interference is problematic depends on the purpose and assigned function of the road.

As shown by the figure below, it is generally recognized that as the function of the road grows in importance from local to arterial, access must be reduced in favor of increasing movement until the highest form of arterial is reached, the freeway.

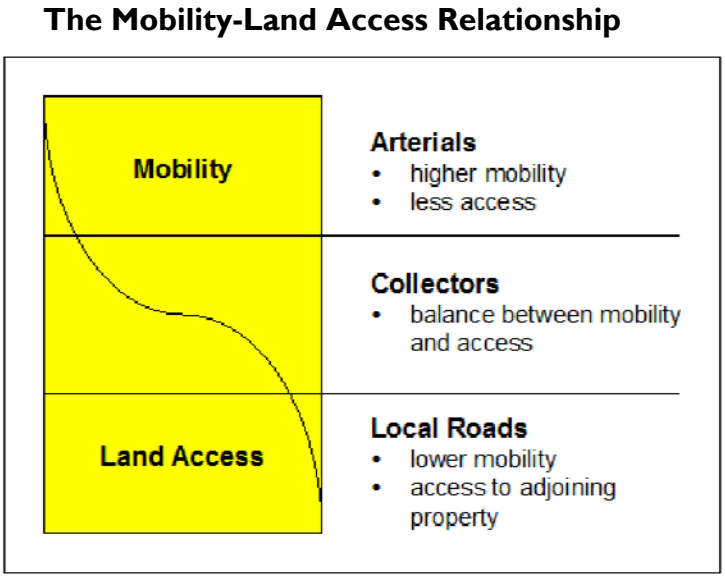


Figure 1. Concept of roadway functional hierarchy, from "Safety Effectiveness of Highway Design Features" FHWA RD-91-044 (Adopted from System Considerations for Urban Arterial Street, ITE, 1969).

WHY MANAGE ACCESS?

Roads play a vital role in economic development and it is important that each road performs correctly, efficiently and achieves its assigned purpose. Efficient mobility and a well-operating roadway network are considered to be key preconditions for local, regional and national economic growth. We invest in transportation systems at great cost so that they can be efficient and the cost of transport and communication can be reduced, thereby facilitating trade and creating wealth. Productive roads are generally seen as an engine of growth and a guarantor of mobility, both internally to the region and externally to the global economy.

Traveling is so common in our daily lives we usually take it for granted. What we notice most about traveling is the quality of our travels: How long will it take to get there? How safe will travel be? How many red lights will we encounter? Will we be delayed by stop-and-go congestion? Will there be someone slowing or stopped in the middle of the road waiting to make a left turn? Will there be a long traffic queue where we want to turn left? When we travel, the majority of delay and congestion is related to access points – mostly intersections.

For over 100 years, research has clearly shown that managing access location and design on arterials is the most important road design element determining road efficiently and public safety. Because of the role access management plays in maintaining efficiency, it must be addressed in corridor studies such as this to assure that roads can indeed play a productive role in the regional economy.

Travel efficiency is a key economic aspect for every sector of business including natural resources, manufacturing, distribution and retail. Retail business, including unique regional events and tourism activity, depend on market area,

which is generally defined by travel time. As drivers we make decisions based both on interest and the anticipated quality of transportation usually measured in terms of travel time and travel safety.

Tourism is not only dependent on attractors, like the quality of an area or town for visiting, goods and services, recreation, or special events; it is also affected by the qualities of the travel necessary to get to a destination. As the regional highways that bring visitors and commerce to an area become more difficult and less safe to navigate and as travel time is lengthened, fewer people will visit. The supply side of businesses like the delivery of goods to shops and restaurants also becomes more costly as travel time increases.

Transportation inefficiency increases the cost of doing business. Movement of freight such as goods and natural resources is a business cost that includes fuel, labor and equipment. In a 2005 study of shipping costs, the Federal Highway Administration developed a conservative value of $26.70 per hour of traffic delay.

Improving transportation safety reduces worker risks and product loss during travel. Transportation reliability means transportation costs are more predictable over time and there is less risk of significant increases in transportation related costs and problems.

Poor transportation facilities and difficult travel conditions can also affect other aspects of the local economy. For instance, as commuting for residents becomes more difficult and unpleasant, residential real estate markets can be adversely affected as people find it necessary to live closer to their jobs or near routes with less congestion. The same is true for commercial businesses. When travel to businesses becomes more difficult, the market for those businesses shrinks as customers become less willing to endure the increasing inconvenience of travel.

Roads are also an important public investment. They are costly to build and are costly to improve or replace. With revenue-constrained agency budgets, effective management of the transportation system is not an option – it is essential. It is simply not practical or economically responsible to allow regional arterial roadways to deteriorate with the assumption that they will be replaced or reconstructed in the future.

By managing roadway access, government agencies extend or improve the life of roads and highways by preserving capacity and public safety. Not only does access management preserve the transportation functions of roadways, it also helps preserve long-term property values and the economic viability of abutting development by helping ensure long-term reliability in road performance.

From an environmental perspective, improved traffic flow translates into greater fuel efficiency, reduced vehicular emissions and lowers the need for wider or new roads. These are both economic and environmental benefits.

The overall benefits of access management include the following:

- Supports sustainability – preserves the function of the road
- Cost effective – low cost improvements have significant results
- Preserves the function of roadways reducing improvement needs
- Reduces accidents, lowering costs to motorists
- Improves capacity, reducing reconstruction needs
- Reduces travel time and delay
- Smoothes traffic flow
- Preserves market area for businesses
- Improves customer safety and convenience
- Maintains more efficient freight movement

SAFETY

Since the latter part of the 19th century there has been recognition among practitioners who specialize in roadway efficiency and safely that there is a direct correlation between increasing levels of roadway access and increasing levels of congestion, reduced traffic speeds and a significant increase in traffic crashes even when horses, carriages and bicycles dominated urban roads. The first access controlled route was established in New Jersey in 1902.

Without exception, studies through history show that the number of accidents increases as the density of arterial access connections increases. Individual studies show that accident rates vary depending on several variables, including roadway width, presence of a median, roadway speeds, and overall traffic and intersection volumes. A 2005 study of the safety effects of access by Dr. J. L. Gattis (University of Arkansas) referenced 11 other studies between the 1940's and 2005 where the crash rate consistently increased as the number of median openings or the number of access points increased.

In Arizona and nationally, over 50 percent of all crashes continue to be related to access movements. As mentioned earlier, on Grand Avenue, over 80% of all crashes have occurred at intersections. National studies indicate that human error is the cause of over 90 percent of all crashes. Any road design or safety strategy that can reduce the probability of driver error, reduce the frequency of conflict experienced while driving will decrease access related crashes and have a significant effect on total crash history in the community.

Crash data indicates that on average, the addition of the each access point on an arterial increases the crash rate by four percent. National Cooperative Highway Research Project Report 420, Impacts of Access Management Techniques (1999), reviewed completed safety studies and also conducted field studies. That report also concluded that increasing the access frequency would increase the crash rate.[1]

[1] Impacts of Access Management Techniques, NCHRP, Transportation Research Board, Washington, DC, 1999, and the Access Management Manual, TRB, National Research Council, Washington, DC, 2003.

As an example, in the figure below, increasing the access rate from 10 to 20 per mile on an arterial resulted in an average 30 percent increase in the crash rate. Neither the Gattis study nor NCHRP 420 found any studies to the contrary. NCHRP 420 has been the most complete report to date on the impacts of access management techniques.

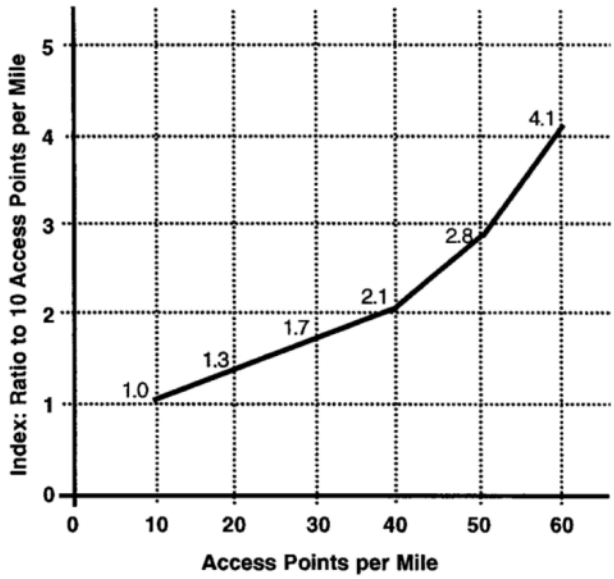


Figure 2. From TRB NCHRP Report 420, figure 15. The figure is a composite from various research studies comparing the number of access points per mile to the number of crashes per mile.

From the research it is easy to draw the conclusion that there is no safe access. Each access allowed will contribute to the crash frequency and rate to some degree. Other studies show that by managing the frequency and severity of access related conflicts along a corridor, crash reductions of 20 to 60 percent have been achieved depending on the source of access related crashes in the before condition and the access related roadway improvements selected.

In addition, crashes most often require a government response to assist including services of police, fire and other first responders which result in costs to the community and some risk to the responders. Crashes are also incidents that often reduce or block the flow of traffic and sometimes lead to secondary accidents.

SIGHT DISTANCE

The ability of the driver to see potential conflicts is sight distance – the line of sight between the driver and the conflict whether it is another vehicle or an unexpected object on the road such as an animal or rocks.

Stopping sight distance is the distance from the approaching driver to the conflict such as being able to see a stopped vehicle in the road as you come around a curve or over a hill. It includes the distance traveled while perceiving a

conflict, the reaction time (taking action), and the braking distance to slow or stop the vehicle.

Intersection sight distance is for the entering driver to be able to see left and right while waiting at an intersection for a gap in traffic. Intersection sight distance is longer than stopping sight distance. On higher speed and wide roads like Grand Avenue, judging approaching speeds and gaps in traffic is more difficult and certainly a higher risk for error.

Maintaining what is called the intersection sight triangle is often an ongoing task. Figure 3 illustrates the sight triangle concept.

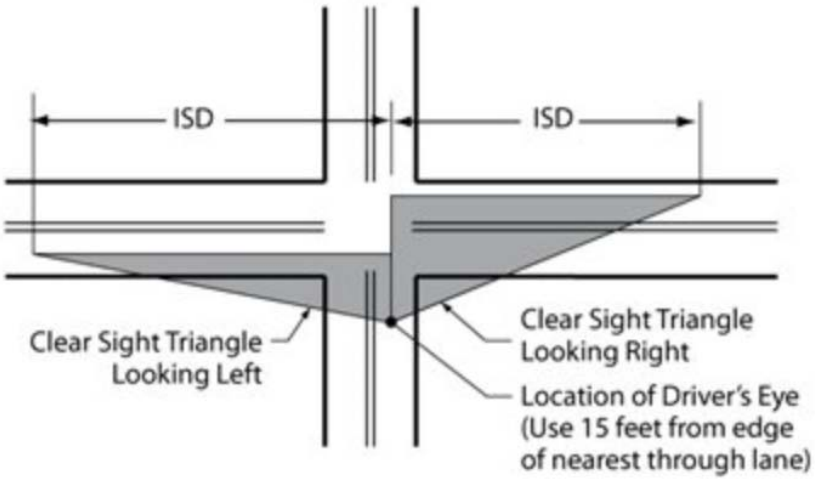


Figure 3: Sight Distance Triangle Concept, from FHWA Office of Safety

The sight triangle is usually applied to non-signalized intersections such as a minor street or driveway. Roadway design calls for the entering driver's eye to be about 15 feet from the edge of the nearest through lane. Assuming the driver wants to make a left turn on a six lane highway (Grand Avenue), the sight distance should be about 630 feet for an entering passenger car and 815 feet for a single unit truck.

The very width of Grand Avenue increases the risk of a crash for left turns and crossing vehicles. To make a left turn onto Grand Avenue the entering driver must find a gap in about 5 lanes of traffic width. A driver crossing the entire width must be able to determine a gap in three lanes of traffic approaching from the left at relatively high speed while also judging a gap in traffic approaching from the right three lanes on the far side of the median.

Decision sight distance is the distance a driver needs in order to make a considered decision such as changing lanes or other avoidance behavior not just simply putting on the brakes. Decision sight distance provides both the driver on the highway and the driver at the intersection greater sight distance and therefore more time to make a good decision.

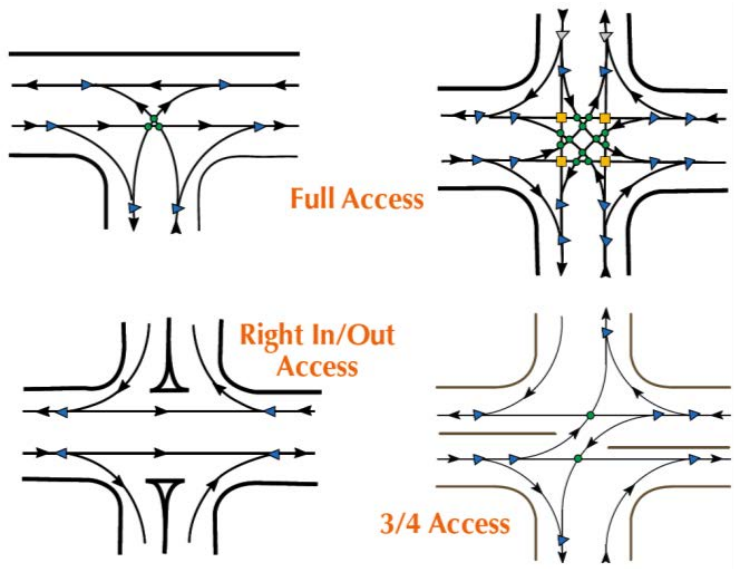
CONFLICT MANAGEMENT

The locations where the paths of vehicles will cross, merge or diverge are called conflict points. Conflicts are created along highways wherever driveways, intersections and other access points are introduced. These conflicts involve traffic traveling on the highway, crossing traffic, and traffic turning into or out of an intersecting roadway.

The number of conflict points that occur at an access location varies significantly depending on the type of access. Full movement access points have the highest number and a simple right-in-right-out access point has the least.

The number and type of conflicts at a multi-leg, multi-lane intersection such as Grand Avenue at North 35th Avenue vary depending on signal phasing and permissive movements. The purpose of the traffic signal is to manage the conflicts and allow turns in heavy traffic. However, a number of conflicts remain with each phase and drivers make errors at signals. It is rare that a traffic signal actually reduces crashes and severe crash types remain. Turning errors, red-light running and rear-end crashes make up the majority of signalized intersection crashes.

The following simple diagrams illustrate conflict points and provide a count of conflict types for four intersection configurations on a two lane road. Grand Avenue has three through lanes in each direction so the conflict numbers at a non-signalized access would be higher unless some movements were restricted with median control.



	Crossing	Turning	Merge/Diverge	Total
Full Access +	4	12	16	32
Full Access **T**	0	3	6	9
¾ Access	0	2	8	10
Right In/Out Access	0	0	4	4

Figure 4. Adopted from Minnesota DOT Traffic Safety Fundamentals Handbook, 2008. Comparing conflict types and numbers by intersection type.

Roadway conflicts can be measured in number per mile as well as number per intersection and their expected severity as shown above. At access locations, crossing or approach turn conflicts are considered the most likely to cause severe injuries. When the speed of vehicles or the frequency of access along an arterial highway increases, the rate of conflict and the average frequency of crashes increases.

Besides the conflicts due to crossing paths within the intersection, traffic signals introduce additional conflicts usually seen as rear-end crashes beyond the actual intersection. When a traffic signal goes to red, everyone must stop or a rear-end crash, or worse, red-light running occurs. Aggressive driving and inattentive driving (i.e. texting) is increasing the likelihood of failure to stop.

In its simplest form, access management is in effect conflict management. When a motorist takes a trip, the fewer conflicts that occur during the driving experience from origin to destination, the less the delay caused by conflicts, including red lights, and the lower the probability of a traffic crash.

Studies also show that a greater percentage of crashes occur involving left turns. A left turn out takes more time than a right turn and exposes the motorist to more potential conflicts than a right turn. Left turns are a bit more dangerous in that the crash type, usually a broadside, can have more severe injuries and an

out-bound left turn onto the highway is more difficult, the motorist needing to judge gaps in traffic from two directions.

Due to the number of severe conflict types and research showing the frequency of crashes at intersections, managing the location and frequency of full movement intersections is one of the most important elements of access management. Intersections typically have higher crash rates compared to mid-block segments. Intersections with traffic signals almost always have higher crash rates than before signals were installed. Traffic signals usually reduce the rate of severe injury crashes but most always increase the rate of minor, damage only crashes such as rear-end types.

For intersection control, only a modern roundabout reduces conflict points and eliminates severe conflict types. Roundabouts are a much safer form of intersection control compared to traffic signals. Roundabouts only allow right turns. As a result when crashes do occur they are normally sideswipe or rear-ends crashes at low speed and less severe.

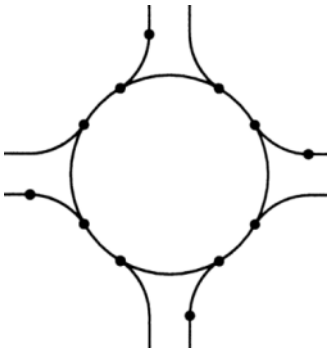


Figure 5: Conflict points at a roundabout intersection

INTERSECTIONS AND TRAFFIC SIGNALS

National crash data shows that the majority of traffic crashes occur at intersections. Below is a figure by the Federal Highway Administration comparing the percentage of crashes occurring at intersections compared to non-intersections.

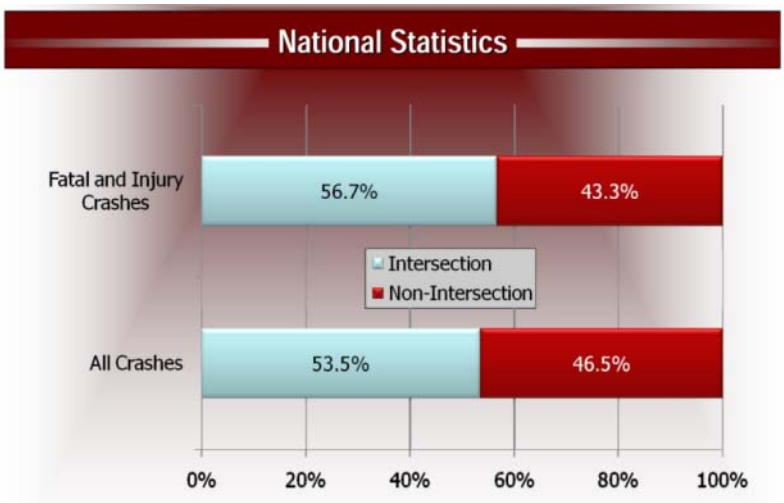


Figure 6. FHWA "Safety at Unsignalized Intersections" presentation based on national crash data, 2002 to 2006.

When full movement intersections become signalized there is a measurable reduction in intersection capacity. With the traffic signal, one or more signal

phases are devoted to the side street and turning movements and not the main arterial. Traffic on the main arterial must stop and wait. While strategies such as signal progression timing, and side street detector loops and computerized systems improve or optimize traffic signals, a capacity reduction remains and traffic on the arterial experiences additional delay with each additional traffic signal.

On two-way highways like Grand Avenue, two-way traffic progression is much more difficult when traffic signals have irregular spacing and when they are spaced close together. Computerized traffic signal systems cannot overcome problems caused by the physical location of traffic signals when trying to maintain good traffic progression in both directions.

FRONTAGE ROADS

For many decades frontage roads have been used to keep private driveways from connecting to the main lanes of major arterials such as Grand Avenue. They were seen as a reasonable accommodation to mitigate the impacts of controlled access highways. They exist in part because highway agencies have not had the authority to plan or create local street systems to improve local circulation and secondary access. By acquiring a wider right-of-way, state agencies were able to build a secondary road immediately parallel to a main highway. Decades ago when traffic volumes on frontage roads were low and the area was low density almost rural in nature the problems created by side-by-side roads were not seen as significant.

With modern traffic volumes created by urbanization and commercial growth parallel frontage roads began to have operational and safety problems. The frontage road and main intersections are close together making it difficult for large vehicles and large volumes of traffic as well as complicating traffic signal timing and adding delay to the main road traffic due to design complexities. Frontage roads become part of the local network and are rarely closed but sometimes their connections to the main highway are restricted or closed due to necessity as operational and safety problems become acute as traffic volumes continue to grow. Another alternative is to make the frontage-roads one-way on each side. This improves traffic operations but they do not function very well as local secondary streets and other circulation improvements are necessary to improve local connectivity and circulation.

The contemporary strategy is for the highway agency and the local governments to work cooperatively in transportation planning of streets, roads and developments with internal circulation to achieve an effective network, a hierarchy, of roads and reduce the need for frontage roads. Rather than frontage roads, access solutions are provided by internal circulation, backage roads and non-fronting service roads. The result is better circulation, better spaced intersections, safer and more effective local circulation and more effective use of land. Access management plans are one method to achieve a cooperative transportation and access location plan.

SPEED DIFFERENTIAL

Speed differential created by access activities is often a source of access related congestion, delay and crashes. An example of speed differential is when a driver slows to about 10 mph on Grand Avenue to make a right or left turn and the prevailing speed on Grand Avenue is 45 mph. This represents a speed differential of 35 mph.

For the less observant and less careful driver, unanticipated speed differential in a through lane can result in a crash.

Entering onto Grand Avenue also creates speed differential. When traffic enters onto the highway, drivers on Grand Avenue may need to slow down which reduces the smooth flow of traffic, increases travel time and can cause congestion if traffic volumes are high and the cause of the speed differential is frequent or long lasting.

The figure below is an illustration of how the likelihood of a crash increases exponentially as speed differential between a slowing vehicle and a following vehicle increases.

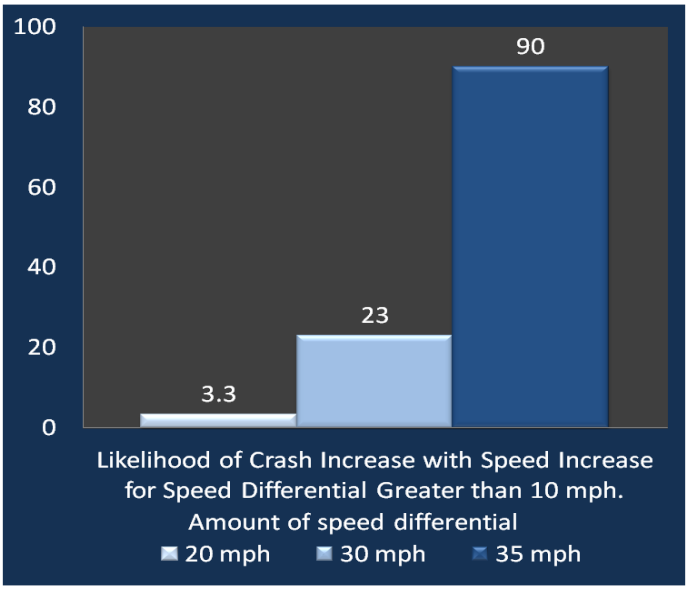


Figure 7. Relative Crash Involvement Rate Ratios [adopted from Stover and Koepke, 1987 Transportation and Land Development, Institute of Transportation Engineers]

Speed is a factor for both vehicle crashes and vehicle to pedestrian crashes. As vehicle speed increases above 20 mph, the likelihood of injuries increases rapidly. This is because kinetic energy (the energy of a car in motion), increases with the square of the speed. For example, a car traveling at 40 mph has four times the energy but only twice the speed as the same car traveling at only 20 mph.

The figure below shows how rapidly the potential for serious injury or death increases as the speed of the vehicle increases in a vehicle/pedestrian crash. A pedestrian hit by a vehicle is 9 times more likely to be killed at 30 mph than a vehicle at 20 mph. This is one of the reasons pedestrian and school zones are posted at 20 to 25 mph and why crossing Grand Avenue must be done carefully. In the three year crash study period for Grand Avenue there were 8 pedestrian crashes including two fatalities.

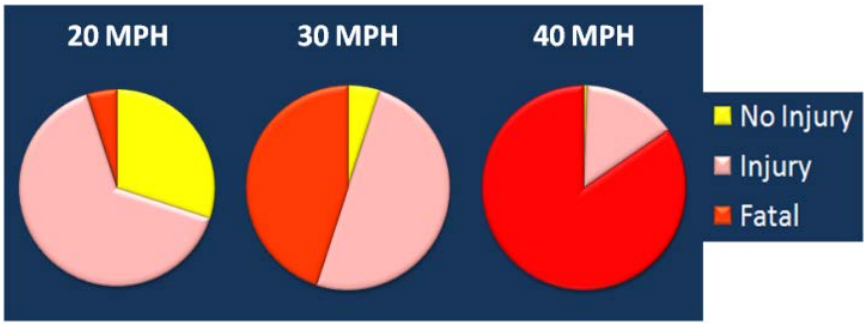


Figure 8. How the probability of a pedestrian fatality rapidly increases as vehicle speed increases. Adopted from "Literature Review on Vehicle Travel Speeds and Pedestrian Injuries". U. S. DOT, National Highway Traffic Safety Administration, DOT HS 809 021 October 1999. (Graphic produced by P. Demosthenes)

GOALS OF ACCESS MANAGEMENT

The known effect of access activity on roadways leads to the following goals and objectives of an access management on Grand Avenue.

- Reduce the total number of conflict points on the road
- Reduce the type of conflict points that can result in severe crashes
- Greater separation between access points
- When access is allowed, mitigate its impact by improved access design
- Maximize the available intersection sight distance
- When access is allowed, do not allow left turns unless necessary
- Using frontage and backage roads and local streets, reduce the need for new direct access to Grand Avenue
- Reduce the occurrences of speed differential caused by motorists slowing and turning or stopped in traffic caused by access movements
- Reduce occurrences of stopping due to traffic signals
- Increase the smooth flow of traffic by improving signal spacing
- Switch to roundabout intersection control
- Set a range of access standards for location, design and type commensurate with the functional importance and speed of Grand Avenue.
- Incorporate access management location and design principles and criteria into land-use and site development requirements.

These items will accomplish a reduction of roadway conflict points and where conflict will occur; create a roadway design that minimizes the severity of the conflicts.

EXISTING CONDITIONS

The project team collected traffic data, maps, plans, publications, crash data, photographs and video and conducted a thorough reconnaissance of the corridor to determine access related issues.

US-60/GRAND AVENUE CORRIDOR

This 24 mile corridor is a major six-lane urban arterial with a normal speed limit of 45 mph. While it is consistently a six-lane highway, the design of the six lanes varies over its length. The oldest roadway design is found at the southeast end in Phoenix and Glendale and then the road becomes progressively more modern proceeding to the northwest with the sections in Surprise approaching Loop 303 being the most modern and improved.

The entire length has a center median lane that varies in its design and width. At the most southeasterly end there is about 1,500 feet of painted median beginning north of McDowell and extending south past the I-10 structure. The remaining 23 miles has a raised median with openings at all signalized and some non-signalized intersections and private entrances. Where the median is open left-turn lanes are provided but the left turn lane design varies. Left turn lanes vary in length and width. They tend to be very short and narrow in the older sections and somewhat longer in the newer sections.

Right turn-lanes are rare in the 10 miles between Interstate 10 and North 71st Avenue. With over 310 access points, about 277 being driveways, there are only six right turn lanes. At Cotton Crossing and north-westerly to Dysart there are only nine right turn lanes in eight miles, three private and six at public intersections. North of Dysart right turns are more frequent for both public and private access points.

Over the length of the project there is a mix of non-signalized and signalized full movement intersections. There are three-leg, four-leg, five-leg and six-leg intersections. Some major junctions have been improved to include grade separations to separate high traffic volume cross arterials.

In some sections private driveways are frequent, may be very close together and sometimes have median openings opposite allowing left turns. Most driveways use a curb-cut design with a very small actual radius. Driveways into larger newer centers at the northwest end are usually built with curb-returns similar to a local street intersection.

The Burlington Northern Santa Fe railroad corridor is on the easterly side from Loop 303 to about West Olive Avenue, the north end of Glendale, where it switches to the west side and continues to the railroad yards along North 19th Avenue. Because of the railroad right of way abutting Grand Avenue there are no abutting businesses along the railroad property northwest of West Olive and only a few abutting railroad related business activities south of West Camelback Road. The presence of the railroad on one side or another greatly reduces the

potential for private driveways and is one of the reasons Grand Avenue operates as well as it does. But trains do impact the performance of Grand Avenue several times a day by cutting off side streets temporarily during train crossings.

ALLOWING ACCESS TO A MAJOR ARTERIAL

Every access point on a major arterial with higher speeds creates a number of problems for the arterial. National crash research studies consistently indicate that each additional access location increases the potential for crashes. An access point results in vehicles slowing and turning from the through travel lanes. An access point is where vehicles enter the through lanes. Maneuvering in travel lanes both prior and downstream from each access point adds turbulence to the main through lanes.

To some extent access is certainly a necessity. The purpose of access management is to manage the location and design of each access opportunity to decrease its impact on the efficiency of Grand Avenue and to minimize the safety impacts. The foremost strategy of access management is to reduce the frequency and to increase the spacing between access points.

TRAFFIC SIGNALS

In the 13.5 miles between Loop 303 current on-ramp and W Olive/ N 75th, there are a total of 39 full movement* intersections. Twenty-six have signals and 13 do not. All but one of the non-signalized intersections is a “T” intersection because there is no fourth leg across the railroad tracks. Of the 26 signals, 16 have four legs with one approach across the railroad tracks and 10 are three-leg “T” intersections that do not have a fourth leg across the tracks. [*full movement means left turns to and from Grand Avenue]

Between North 71st Ave (south end of railroad overpass) and West Willetta Street near Interstate 10 there are 42 full movement intersections in about 9.5 miles. There are eleven traffic signal public intersections and 31 non-signalized full movement intersections. Of these there are thirteen non-signalized public intersections and eighteen private full movement intersections.

Full Movement Intersections	Signalized	Non-signalized
Loop 303 to W Olive/N 75th 13.5 mi	26	13
N 71st Ave to W Willetta St, 9.5 mi	11	31

Traffic signal spacing is a very important factor in achieving progressed traffic flow for both directions of traffic at 45 mph. Even spacing at about one-half mile intervals works best to achieve two direction traffic flow on a major arterial. However, the signal spacing on Grand Avenue is irregular with many short spacing’s. In the ten mile section from Reems/Meeker to Cotton Crossing there are 23 signals. Eleven of the spacing segments are less than 2,000 feet. Eight spacing segments are less than 1,400 feet. This makes two-way signal

progression impossible over the length of the project and difficult even for one-mile sections.

While system level computerized controls and traffic detection systems will help improve traffic, it is difficult to overcome the physical locations of the signals. Computer controlled systems can also assist by using hourly adjustments to handle variations in morning, midday and afternoon traffic directional flows and optimize the operation of each traffic signal.

When signals are too close together the queue from one can backup and impact the operation of the other as shown below. This more likely occurs during peak hours when all phases of the signal cycle are operating over capacity. Closely spaced traffic signals reduce the capacity of the highway at the intersection when it needs it the most. In the image below, while the close signals are green, the signals in the distance are still red and the queue from the far intersection backs up through the closer intersection.

More complicated roadway design makes intersections more difficult. At the intersection below (Grand at SR 101 overpass), the road is curving to the right into the intersection and then immediately curves to the left in the intersection. A driver must be maneuvering the vehicle through the reverse curve while in the intersection taking care to stay within the lane while also being observant of two sets of traffic signals and turning vehicles. These roadway design complications add to driver work load and increases the potential for crashes.

Sometimes the queue from one major signal backs up to block a minor intersection. While drivers will often attempt make a left through a gap in the queue – this is not a very a safe maneuver.

LEFT TURNS

Providing some opportunities to make a left turn from Grand Avenue is a given necessity. The purpose of access management is to manage the location and design of each left turn opportunity to decrease its impact on the efficiency of Grand Avenue and to minimize the safety risks of left turns for both the person making the turn and the traffic on Grand Avenue.

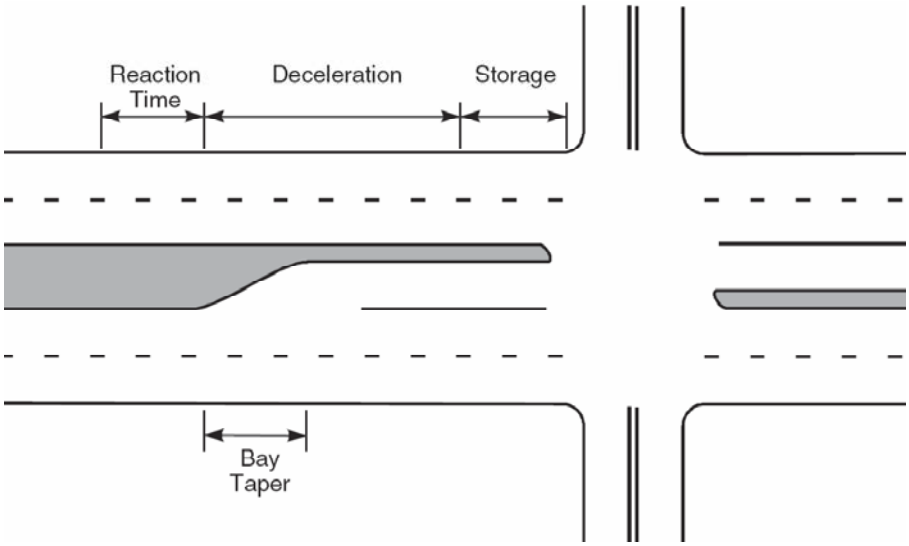
There are six major elements to consider in the location and design of left turns from the highway to access points.

- Every additional left turn location increases crossing conflicts with through traffic and will increase the crash rate to some degree. Every effort should be made to minimize the frequency of left turn locations.
- Each left turn location necessitates a turn lane.

- The left turn lane must be long enough to store turning vehicles without spilling back with waiting vehicles blocking the through traffic lanes. Storage calculation must include trucks if present.
- In addition to storage, there needs to be additional length to allow motorists to shift from the through lanes into the left turn lane and decelerate with a minimum of slowing occurring in the through lane.
- When the left turning volume is sufficiently large, there will not be enough gaps in oncoming traffic to allow enough turns and a traffic signal will be needed to stop oncoming traffic to allow the left turns. Stopping through traffic to allow the left turns has the greatest impact on the capacity of through traffic.
- The median area at the turn lane including the lane width, the gutters and the width of the raised portion must be wide enough to safety store waiting vehicles, provide for drainage, and enough raised width to hold signs including the width of the sign itself with clearance between the sign and any vehicle, a minimum of about 17 feet. If in a pedestrian area the median must comply with ADA median refuge dimensions.

While frequent left turn opportunities do provide a more convenient and direct trip to a destination, the accumulative impact on roadway operations and safety of many convenient left turn locations is not acceptable for a major arterial. The performance of the arterial will suffer each time an additional left turn is added. So each left turn location should be a necessity with a thorough consideration of alternative routes that might eliminate the need for the left turn.

Many of the left turn lanes on Grand Avenue are under designed by current standards. Many of the turn lanes are too short and do not provide sufficient distance for the deceleration or storage of turning vehicles. This means there is more than 10 mph speed differential in the through lanes. The standard factors to determine left turn lane length consist of a bay taper, deceleration length based on 45 mph and a queue length based on a calculation that looks at turning traffic volumes.



The distances for the design elements noted in the figure above at 45 mph calls for about 96 to 180 feet of taper, a deceleration length between 230 and 340 feet and sufficient storage length for the queue of waiting vehicles. The minimum storage length is 50 feet. If the turn lane design is based on a higher design speed, using 50 mph, the deceleration length should be between 290 to 410 feet and the taper closer to 180 feet. This means, as a very rough calculation, every left turn lane should be no less than about 375 feet. A length of 500 feet plus additional storage queue length would be better.

Northwest of SR 101 most all the turn lanes are longer with total lengths ranging from 300 to 500 feet. Southeast of SR 101 many of the left turns are short, some with total distance less than 90 feet when the minimum should be about 280 feet for a very low volume left turn.

Along several sections of Grand Avenue the median area is narrow yet left turn lanes are installed. The narrowness makes the lane more difficult to use and decreases the mitigation of impacts a proper width median can provide.

In the photo below the raised median is very narrow. Each sign is very close to the travel lane and close to the tuning lane. There is a strong risk that the sign will be hit by turning vehicles. In addition, the turn lanes are very short.

The left turn lane below is very short and narrow in the older section of Grand Avenue. However, the top of the raised median is sufficient for signs and offers more protection for the occasional pedestrian than a narrower raised median.

The segment of Grand Avenue shown below (SB at 85th) has raised medians that are too narrow for the signs, narrow turn lanes and short turn lanes with inadequate deceleration and storage lengths. This also shows a series of left turns that are too closely spaced. In the photo there are three left turns in ¼ mile. In this area there are seven left turns southbound in ¾ mile. This creates a high frequency of left turn maneuvers in a short distance and increases the turbulence in the main stream of traffic both upstream and downstream as drivers maneuver to make a left or adjust their position after the changes in traffic conditions.

When left turn lanes are required to be longer using distances of 375 to 500 feet, a series of closely spaced left turn lanes cannot occur.

These two U-turn lanes only provide about 100 feet for deceleration and storage creating a significant speed differential for any vehicle following.

When left turn lanes are too short they overflow, backing into the inside travel lane creating higher speed conflicts and temporarily blocking one lane of the three through lanes.

The photo below shows a left turn lane about 430 feet long. The proper length can be determined by a traffic analysis. Sometimes the original constructed length works in the near term but fails as traffic increases due to growth, a change in traffic circulation or a change in a local development that generates a much higher traffic activity.

Another consideration for left turn lane length is providing extra storage for the additional delay when a train temporarily blocks the cross street and more vehicles wait until the train clears the intersection.

Along the corridor there are also left turns out of certain properties where there is an opening in the median. The motorist in the silver pickup is making a left turn from a driveway across three lanes of 45 mph traffic and must enter a gap on the other side of the median. The narrow median does not allow the truck to wait in the center. A left turn out at an un-controlled access point is one of the least safe access maneuvers.

RIGHT TURNS

There are many locations where right turns to and from Grand Avenue occur. The purpose of access management is to manage the location and design of each right turn opportunity to decrease its impact on the efficiency of Grand Avenue and to minimize the safety impacts of for both the person making the turn and the through traffic on Grand Avenue.

There are five major elements to consider in the location and design of right turn access points.

- Every additional right turn location increases slowing and delay of through traffic to some degree and can increase the crash rate. Every effort should be made to minimize the frequency of right turn locations.
- Each right turn location should have a right turn lane, full shoulder or taper to minimize the slowing and rear end crash possibility in the through traffic lane.
- The right turn lane must be long enough to store turning vehicles without spilling back with waiting vehicles blocking the through traffic lanes. Delay in turning right is caused by backage from a parking lot, pedestrians on the crosswalk, and other turning traffic.
- If the access approach crossing the railroad then the right turn lane storage must be long enough to hold the queue that forms while a train is present.
- When making a right turn onto Grand Avenue, the motorist must look the left for a gap in traffic. Care should be taken to ensure that the sight triangle at each access point is maintained.

While frequent right turn opportunities can provide a more convenient and direct trip to a destination, the accumulative impact on roadway operations and safety of many convenient right turn locations is not acceptable for a major arterial. The performance of the arterial will suffer to some degree each time an additional right turn is needed. Each right turn location should be a necessity with a thorough consideration of alternative routes that might eliminate the need for the right turn.

Every right turn location on a major arterial should have at least a minimum right turn lane unless the right turn volume is very low. Right turn lanes usually do not require much storage length as compared to left turns as right turns usually have fewer conflicts to cause delays. A railroad track would be an exception. Right turns on red are permitted in Arizona which also helps to empty the right turn lane. However, this is not always true. Some intersections are sufficiently busy that right turns are delayed due to cross traffic and left turn arrows and the capacity of right turns is diminished.

Every right turn adds to the width of the highway. This makes the walk for a pedestrian longer at traffic signals and requires more right of way width. While this may be a reason not to install right turn lanes, the lack of a right turn lane can create more significant problems. The solution is to limit access points to

the minimum necessary to proved access service and to improve access service from secondary roads and internal site circulation.

The image below shows how right turns cause braking in the outside travel lane.

The right turn lane shown below is only 75 feet long and immediately follows a traffic signal. While the turn lane does mitigate some of the impacts caused by a driveway very close to an intersection, a greater distance would be an improvement.

At an access close to a signal, the intersection queue backs up and blocks the motorist at the access from making a right turn. This location, opposite the left turn lane, also allows drivers at the driveway to cross over three lanes to enter the intersection left turn lane. If the access point is too close the movement to the left turn lane can leave the vehicle at an angle and block a through lane. If the access point is further back, upstream from the signal queue and the left turn lane, this problem is avoided.

DRIVEWAY LOCATION

Driveways are basically unsignalized minor intersections. Unlike public intersections, they can have low traffic volume which does allow more flexibility in location and design. But busier driveways can have the same operational and safety issues that any public intersection might have.

Beginning back in the mid 1950's, AASHTO has recommended that private driveways not be connected to arterial highways. In part this follows the principles of design transition as well as the desire to minimize the effects of driveways on arterial operation and safety. The principle of design transition recommends that driveway traffic should transition to a local street, from the local street to the collector street and the collector street to the arterial. Each of these connections should be built at a higher level of design to better provide the transition from lower speeds to higher speeds. Driveway curb cuts do not provide the design quality for the traffic speeds and volume of an arterial.

The preferred solution when improving arterial operation and safety is to reduce the number of driveways on by closing and removing driveway connections when the property served has a safer and reasonable alternative route to access a lower functional public street. If a driveway cannot be removed the design of the driveway should be improved to lessen the impacts on the arterial.

All driveway locations should be well spaced which helps spread out the access related maneuvers and conflict points. This reduces the conflict rate for all motorists and allows driving decisions to avoid conflicts to be more sequential rather than overlapping.

An example of poor spacing (aka corner clearance) is when a driveway is immediately downstream from an intersection. Drivers turning left from the cross street into the intersection may decide to make an immediate turn into the driveway. Drivers turning right into the intersection from the cross street might decide to turn immediately into the driveway. Drivers in the outside (right) through lane, after accelerating into the intersection when the signal

turns green, might then decide to immediately slow and turn right into the close driveway.

While the maneuvers may not be difficult the maneuver does impact drivers following that must, perhaps unexpectedly, slow or stop to allow the maneuver into the driveway. Turn signals are at best confusing if even possible. When the driveway is further down the road, perhaps 300 feet or so, the intersection turning movements are completed and driveway turning movements usually do not interfere with intersection operation. Braking and turn signals for the driveway make more sense to the vehicle following.

When driveways are well spaced, the driver or the drivers following need only deal with one access activity at a time. On arterials, the use of stopping sight distance as driveway spacing criteria has been a practice nationally. At 45 mph design speed, stopping sight distance is about 360 feet.

There are several sections along Grand Avenue where driveways are very frequent and closely spaced. Most of these sections are southeast from North 71st Avenue to Interstate 10. In the photo below, near West Butler Drive, the spacing between driveways varies from 10 to 100 feet.

In the northwest portion of Grand Avenue, the raised median is more continuous and all minor driveways are restricted to right turns due to the raised median. Limiting driveways to right turns only and restricting left turns greatly reduces the impacts of driveway activity.

The one-way sign and arrow sign in the photo below can be very helpful in preventing left turns the wrong way on Grand Avenue. Due to the roadway width and at night new or forgetful drivers may not realize they need to make a right turn. These one-way signs are not at all similar situations.

DRIVEWAY DESIGN

The traditional private driveway design on Grand Avenue is a curb-cut as shown below. These types of driveways require very low speeds to use and have very small radii and usually narrow widths. Private driveway design can be improved to reduce impacts on the arterial.

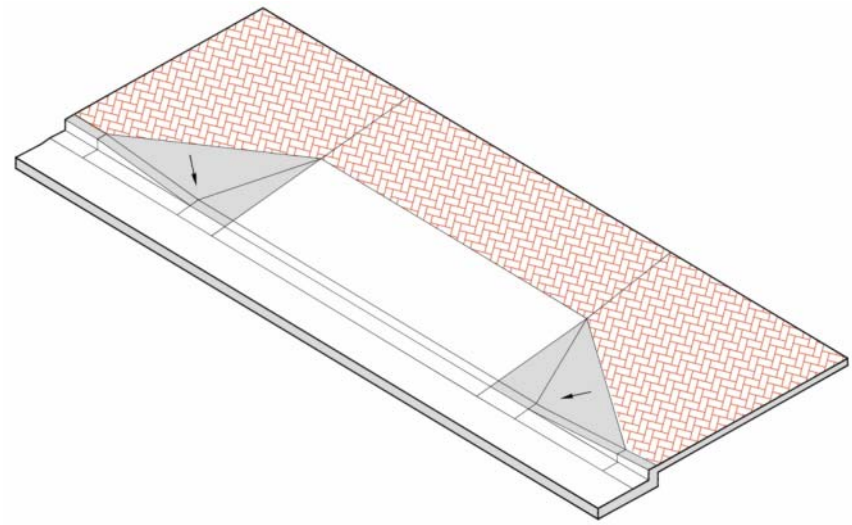
The minimum turning radius of a passenger car is about 15 feet. The curb cut design on Grand Avenue has only about one-foot of radius. The actual available radii at each location will depend on how far away from the curb the travel lane is and how much the inbound vehicle encroaches on the outbound side of the driveway.

Turning in and out of these driveways often impacts more than one highway lane as well as the entire width of the driveway. This impacts the safety and operation of Grand Avenue. When this type of driveway design is used when the travel lane is immediately adjacent to the curb and gutter, the negative impacts are even greater. For the majority of Grand Avenue the through travel lanes are immediately adjacent to the curb and gutter.

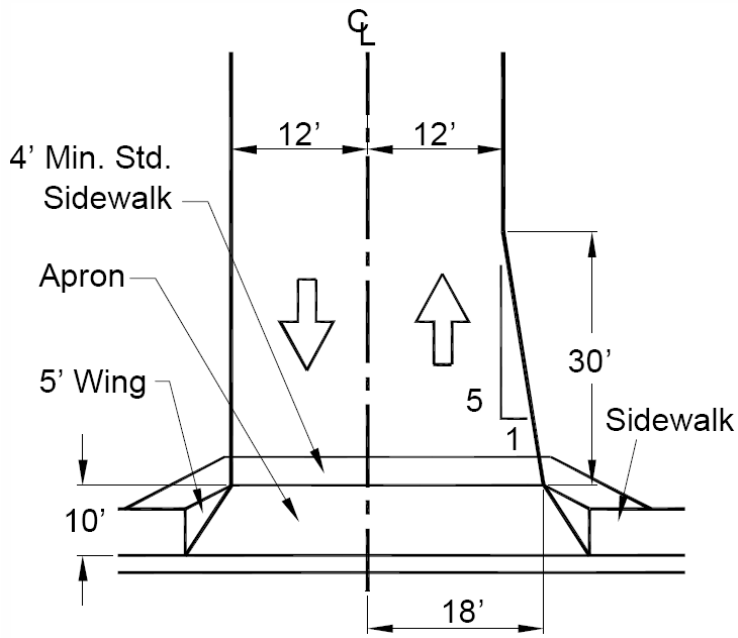
The photos below show how little effective turning radius exists at a curb cut and by the blackened curb how often the right wheels hit the curb causing curb damage and tracking over the dirt. A more substantial flair would improve the situation by increasing the effective radius.

If the driveway is low volume and a curb-cut design is necessary, the effective radius of the curb-cut can be increased by using a flared design and by making the six-inch curb transition longer. In the Figure below the combination of curb transition and flare is about 11 feet. This makes it easier to use the driveway without hitting the vertical curb and allows for a smoother transition between the roadway and the driveway especially when the roadway lanes are close to the face of curb.

Driveway width should be based on the swept path of the design vehicle. With the travel lane of Grand Avenue adjacent to the gutter, the driveway width should be wider.



An alternative design from the City of Scottsdale shows how to flair the driveway width. In this illustration the inbound side is flared an additional five feet which helps with turning radius and reduces encroachment on the outbound lane.



These access design improvements will help reduce the impacts of private driveways on Grand Avenue safety and operations.

If the driveway is busy the curb-cut design can be converted into a minor street intersection design with curb radius returns to accommodate the selected design. This increases the radius of the turn and the speed of the exit to about 10-15 mph. In the photo below the access has curb returns and a right turn lane.

In the photo below, the driveway grade results in dirt and rocks to runoff onto the main lanes of Grand Avenue and the driveway is in poor repair. The stop sign requires an immediate stop before crossing the rail road tracks. There is barely enough room to fit a vehicle – which also means each access maneuver needs to be very slow.

Due to the lack of a raised median on Grand Avenue, these two driveways have full movement access immediately adjacent to the intersection.

This commercial property has more driveways than necessary to serve the property and the driveway area is not paved creating entry and exit difficulties and adding dirt and gravel to the main lanes.

SIGHT DISTANCE

Sight distance is a very critical design element effecting safety as discussed in the earlier section. Only a few sight distance concerns were observed on Grand Avenue.

With Grand Avenue being very wide and the outside lane usually close to the curb and gutter, it is important to control the sight triangle and often the sight triangle will be across private property.

With the posted speed at 45 mph and the actual speeds often in the range of 46 to 55 mph, maintaining good sight distance based on a design speed of 55 mph is very helpful to all motorists. This means sight distance over 700 feet in both directions is necessary just for a passenger car or light truck. Heavier vehicles require more sight distance.

There are several common obstacles that occur in sight triangles and most common is overgrown landscaping. Other obstacles can be on-premise property signs, temporary parking, and fences.

In the image below landscaping on private property is limiting both stopping and intersection sight distance within the sight distance triangle at a public intersection. It is recommended that the required sight distance be available at about 15 feet back from the edge of the nearest travel lane. Most drivers, faced with the situation in the picture, nose out to within a few feet of the travel lane in order to see to the right.

This is a full movement public street connection. (N 20th and Grand). While minimums might be met, the entering motorist must be quick to make a right turn once a gap in approaching traffic is seen. Making a left turn requiring the driver to look for gaps to the right and quickly to the left, will be difficult and the chance for error higher.

In the photo below, the driveway has a minimum of sight distance to the right within the sight triangle due to the concrete barrier and posts in combination with the vertical curve of the road. While the driver's solution is to nose out towards traffic until the driver can see a greater distance, this is not desirable and should be avoided when possible.

FRONTAGE ROADS

For decades frontage roads have been used nationally to provide local access and to keep driveways off the main highway. Along Grand Avenue there are parallel frontage road segments between Dysart and West Thompson Ranch Road and a few other short segments like the one between N 91 and N 92 Avenues.

Where the frontage road and Grand Avenue are connected the intersections are very closely spaced. In the photo below there is only 50 feet between the two roadways. The corners have only about 25 feet of radius. Intersections should be separated by a minimum of about 300 feet under low volume conditions.

The close spacing creates several constraints. All the connections between the frontage road and Grand Avenue have limited capacity and operating difficulties. There is insufficient turning radius for larger trucks resulting in opposing lane encroachments. The intersection sight distance for the stop location in the picture below requires the driver to look back over their left shoulder to judge vehicles that might quickly turn from Grand Avenue onto the frontage road.

As growth continues to occur, both residential and commercial, some of the frontage road intersections are becoming more congested reducing both capacity and safety.

When a traffic signal is added, there is better traffic control but using the intersection is still difficult and capacity is limited by the spacing of the two intersections, the lack of storage and the short radii. In the photo below (Primrose) the motorist is faced with what is basically a six-leg intersection. As traffic volumes on Primrose grow this intersection will operate more poorly and safety will suffer.

The City of El Mirage is currently studying a combination of improvements along this frontage road including making parts of it one-way and adding a new traffic signal to Grand Avenue at Acoma Drive. There is also a proposal to reconfigure the West Thunderbird Road and West Thompson Ranch Road intersection area which would improve capacity, ease congestion and improve safety on the local streets.

At the frontage road intersection below a back to back queue has formed due to an offset local street (Acoma) that temporarily locks up the short block and interferes with traffic to and from Grand Avenue and the frontage road intersection. The reason for this problem is short spacing, about 120 feet, and increasing traffic volume.

MISCELLANEOUS OBSERVATIONS

Trash pick-up should not occur from the through traffic lanes of Grand Avenue, yet it occurs in certain sections on a regular basis. The solution is to be sure a trash truck can enter the property as any freight delivery vehicle would and not service the property from the public right of way.

Certain accesses on Grand Avenue have unique traffic activity. Here is the early morning platoon of UPS trucks leaving their distribution center.

Advanced street signing helps drivers anticipate their access point and reduce the potential of last moment maneuvers to be in the correct lane.

Sometimes the queue from one intersection backs up to block a minor intersection. While drivers will often make a left through a gap in the queue it is not always a safe maneuver.

Trains are frequent along Grand Avenue and complicate the operation of each four-leg intersection.

At this time there is only one intersection, Primrose, equipped with red-light running cameras.

Conclusions from Observations

The goals of the multi-city partnership and the Maricopa Association of Governments would be well served by improving the access conditions along Grand Avenue. Many access related improvements can be made and still maintain the unique character of different sections of the corridor and the communities Grand Avenue passes through.

Absent access improvements and a plan to keep new access demands from further diminishing the transportation capacity of Grand Avenue, the goals of enhancing economic development, improving traffic operations and reducing transportation conflicts will not be met.

As the most significant regional at-grade highway in the northwest metropolitan area, Grand Avenue has significant economic opportunities. But if the Avenue becomes more congested, slower and less desirable to use for travel the economic opportunities, especially those requiring regional transportation efficiency, will be less attractive. Traffic delay, slow speeds and safety issues will increase the travel costs to businesses and discourage customers.

There are certainly competing interests in the corridor that have differing opinions as to the best method to manage access. The proven method to find a cooperative set of solutions is to establish an access management plan, a future vision, for the location and design of access along Grand Avenue. The emphasis on access management exists because it is the most critical element in determining the capacity, travel time and crash rates for the Grand Avenue corridor. After an access management plan is agreed upon, each agency stakeholder should incorporate the principles and recommendations into their transportation, economic and community development plans and standards.

The next tasks of the project will analyze alternatives and develop corridor optimization recommendations. In cooperation with the Project Planning Partners, an access management plan will be drafted. This plan will include a description of the disposition of every access point in the corridor and will include a detailed matrix summarizing the current and future status of each access point.

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APPENDIX TM1-5

Existing Left Turn Storage Length Inventory

EXISTING LEFT TURN STORAGE LENGTHS						
LOCATION			LENGTH (FT)			
MP	Direction	Access Street	Taper	No. of Lanes	Storage per Lane	Total Storage
138.6	Out	303 Ramp Access	150	2	400	800
139.6	In	Sunrise Blvd	160	2	350	700
139.6	Out	Sunrise Blvd	160	2	512	1024
140.55	Out	Yorkshire Dr	160	1	280	280
140.8	Out	Colonnade Way	100	1	105	105
140.9	In	Reems Rd	125	2	305	610
141.9	Out	Reems Rd	140	2	500	1000
141.3	Out	Parkview Pl	160	1	530	530
141.5	Out	Goodwill Comm. Plaza	120	1	250	250
141.7	In	Mountain View Blvd	100	1	316	316
141.7	Out	Mountain View Blvd	140	2	380	760
142.12	Out	Sun Village Pkwy	150	1	300	300
142.4	Out	Towne Center Dr	130	2	320	640
142.72	In	Bell Rd	80	2	680	1360
142.72	Out	Bell Rd	150	2	680	1360
143	In	Bell Grande Dr	80	1	200	200
143.21	Out	Vacant	70	1	175	175
143.21	In	Vacant	120	1	205	205
143.4	In	Dysart Rd	110	2	390	780
143.4	Out	Dysart Rd	120	2	325	650
143.8	Out	Sunny Ln	70	1	270	270
144.28	In	Greenway Rd	140	1	320	320
144.28	Out	Greenway Rd	140	2	480	960
144.7	Out	Acoma Dr	70	1	300	300
145.06	Out	Primrose St	70	1	320	320
145.6	In	Thompson Ranch Rd	120	1	340	340
145.6	Out	Thompson Ranch Rd	110	2	500	1000
146.38	In	113th Ave	70	1	310	310
146.58	In	111th Ave	70	1	410	410
146.58	Out	111th Ave	70	1	405	405
146.89	Out	108th Ave	76	1	300	300
147.12	In	107th Ave	80	1	310	310
147.12	Out	107th Ave	86	1	304	304
147.29	In	Coggins Dr	86	1	300	300
147.5	Out	105th Ave	86	1	114	114
147.64	In	103rd Ave	74	1	412	412
147.64	Out	103rd Ave	80	1	405	405
147.88	Out	101st Ave	88	1	260	260
148.2	In	99th Ave	80	1	420	420
148.2	Out	99th Ave	86	1	400	400

EXISTING LEFT TURN STORAGE LENGTHS						
LOCATION			LENGTH (FT)			
148.59	In	Midblock U-Turn	72	1	100	100
148.59	Out	Midblock U-Turn	82	1	100	100
148.96	Out	L101	110	1	174	174
149.24	In	91st Ave	110	2	395	790
149.24	Out	91st Ave	80	1	150	150
149.4	Out	D/W	0	1	304	304
149.5	Out	D/W	85	1	100	100
149.9	In	87th Ave - U-Turn	70	1	110	110
149.9	Out	87th Ave	80	1	110	110
150.11	In	U-Turn	80	1	100	100
150.11	Out	D/W	70	1	100	100
150.2	In	85th Ave - U-Turn	70	1	100	100
150.2	Out	85th Ave	70	1	100	100
150.34	In	U-Turn	70	1	100	100
150.34	Out	D/W	90	1	104	104
150.4	In	Peoria Ave	60	1	304	304
150.4	Out	Peoria Ave	80	1	164	164
150.6	In	83rd Ave	70	1	180	180
150.6	Out	83rd Ave	70	1	115	115
150.72	In	Jefferson St - U-Turn	70	1	130	130
150.72	Out	Jefferson St	125	1	125	125
150.88	In	Cotton Crossing	120	2	390	780
150.88	Out	Cotton Crossing	120	2	460	920
151.3	In	D/W	70	1	110	110
151.3	Out	D/W	70	1	226	226
151.6	Out	D/W	70	1	115	115
151.94	In	Olive Ave	70	1	320	320
151.94	Out	Olive Ave	60	1	270	270
152.62	Out	U-Turn	70	1	110	110
152.8	In	D/W	30	1	90	90
152.8	Out	U-Turn	60	1	120	120
153	In	D/W	50	1	90	90
153	Out	U-Turn	55	1	90	90
153.12	In	Royal Palm	55	1	250	250
153.34	In	Northern/67th Ave	70	1	250	250
153.64	In	Spur - U-Turn	50	1	100	100
153.66	Out	Spur - U-Turn	60	1	90	90
153.98	In	63rd Ave	70	1	96	96
154.04	In	Orangewood Ave	70	1	80	80
154.04	Out	Orangewood Ave	60	1	80	80
154.19	In	D/W	85	1	72	72
154.19	Out	U-Turn	85	1	95	95

EXISTING LEFT TURN STORAGE LENGTHS						
LOCATION			LENGTH (FT)			
154.38	In	Myrtle Ave	80	1	290	290
154.38	Out	Myrtle Ave	90	1	250	250
154.97	In	57th Drive	90	1	180	180
155.22	In	56th Ave	90	1	110	110
155.22	Out	U-Turn	70	1	90	90
155.61	In	D/W	90	1	82	82
155.61	Out	U-Turn	90	1	86	86
155.78	In	53rd Ave	90	1	102	102
155.78	Out	U-Turn	90	1	102	102
155.97	In	D/W	90	1	80	80
155.97	Out	U-Turn	90	1	80	80
156.15	In	Bethany Home Rd	80	1	270	270
156.15	Out	Bethany Home Rd	80	1	250	250
156.86	In	Missouri Ave	70	1	180	180
158.25	In	39th Ave	80	1	100	100
158.44	In	D/W	85	1	80	80
158.44	Out	D/W	85	1	85	85
158.62	In	37th Ave	80	1	100	100
158.62	Out	D/W	90	1	80	80
158.75	In	D/W	80	1	80	80
158.75	Out	D/W	80	1	90	90
158.87	In	U-Turn	86	1	100	100
158.87	Out	D/W	95	1	50	50
158.97	In	35th Ave/Indian School Rd	100	2	260	520
158.97	Out	35th Ave/Indian School Rd	120	2	240	480
159.15	In	D/W	86	1	80	80
159.15	Out	D/W	80	1	80	80
159.32	In	33rd Ave	90	1	90	90
159.32	Out	U-Turn	70	1	80	80
159.49	In	Weldon Ave	80	1	100	100
159.49	Out	U-Turn	80	1	85	85
159.55	Out	U-Turn/Canal	75	1	90	90
159.67	In	31st Ave/Osborn Rd	90	1	100	100
159.67	Out	31st Ave/Osborn Rd	90	1	190	190
159.83	In	Osborn Rd/30th Ave	80	1	82	82
160.98	In	24th Ave	60	1	100	100
160.98	Out	U-Turn	80	1	70	70
160.07	In	Encanto Blvd	80	1	200	200
160.07	Out	Encanto Blvd	80	1	170	170
160.19	In	D/W	50	1	86	86
160.19	Out	D/W	96	1	108	108
161.3	In	Monte Vista Rd	70	1	150	150

EXISTING LEFT TURN STORAGE LENGTHS						
LOCATION			LENGTH (FT)			
161.3	Out	22nd Ave	90	1	150	150
161.43	In	21st Ave	80	1	145	145
161.43	Out	D/W	80	1	90	90
161.58	In	20th Ave	80	1	100	100
161.8	In	McDowell Rd/19th Ave	80	2	240	480
161.8	Out	McDowell Rd/19th Ave	80	2	270	540

APPENDIX TM1-6

Drainage Overview

US-60/Grand Avenue

Corridor Optimization, Access Management, and System Study (COMPASS)

Loop 303 to Interstate 10

Drainage Overview

Prepared for:

MARICOPA ASSOCIATION of GOVERNMENTS

Prepared by:
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In association with:
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March 2013

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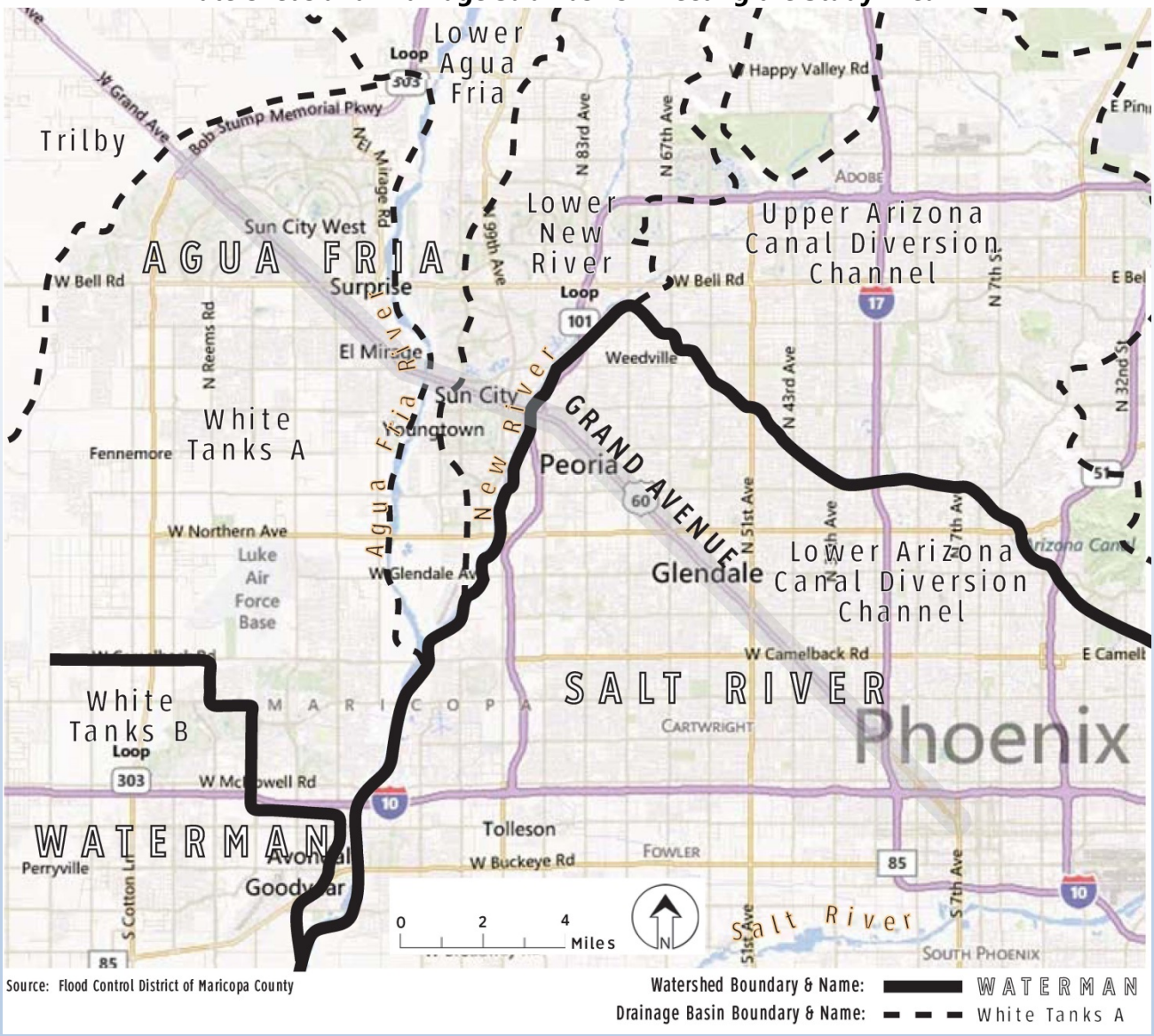
1.0 Study Area Drainage Patterns

The study area is located within two regional watersheds that generally drain from the northeast to the southwest: Agua Fria River-Middle Gila River and Salt River. ***Figure 1*** shows the boundaries of these two watersheds and drainage sub-basins recognized by the Flood Control District of Maricopa County (FCDMC). The northern portion of the Study Area (north of SR-101/Agua Fria Freeway) is affected by drainage associated with three sub-basins: White Tanks A, Lower Agua Fria, and Lower New River. The southern portion of the Study Area is located within and affected by drainage in the Lower Arizona Canal Diversion Channel Sub-Basin.

Figure 1
Watersheds and Drainage Sub-Basins Affecting the Study Area



2.0 Design Criteria

US-60/Grand Avenue is a part of the National Highway System (NHS) and is maintained by the Arizona Department of Transportation (ADOT). It is anticipated that ADOT also will serve as the primary public agency leading any future construction actions relating to this roadway. As such, ADOT design criteria are recommended for use in all future projects within the study area, supplemented by criteria from the FCDMC, where appropriate or necessary. Design manuals that will apply to future design and construction projects include:

- Arizona Department of Transportation –
  - Roadway Design Guidelines, Chapter 600
  - Highway Drainage Design Manual, Hydrology
  - Highway Drainage Design Manual, Hydraulics;
- Flood Control District of Maricopa County –
  - Drainage Design Manual for Maricopa County, Volume I – Hydrology (Flood Discharges)
  - Drainage Design Manual for Maricopa County, Volume II – Hydraulics (Storm Drainage Facilities)
  - Drainage Design Manual for Maricopa County, Volume II – Erosion Control (Stormwater Compliance during Construction Activity).

2.1. Off-Site Drainage Considerations

2.1.1. Hydrology

US-60/Grand Avenue is considered a Drainage Class 1 highway for ADOT drainage design elements. Therefore, the following design frequencies will be used per the *Roadway Design Guidelines*:

- Cross drainage new construction 50-year;
- Cross drainage reconstruction 50-year; and
- Cross drainage structure affected by major project 50-year.

According to the *Roadway Design Guidelines*, the flood frequency curve for a given facility should use existing hydrologic studies whenever possible. All major wash and river crossings in the study area have been studied by the FCDMC as a part its role in flood hazard identification, prevention, regulation, and remediation. Completed studies and projects that influence drainage in the study area include:

- Arizona Canal Diversion Channel Area Drainage Master Study (ADMS);
- Arizona Canal Diversion Channel;
- Arizona Canal Diversion Channel Improvements;
- Glendale/Peoria Area Drainage Master Plan (ADMP);
- Loop 303 Corridor/White Tanks ADMP Update;
- Maryvale ADMS;
- Metro Phoenix ADMP;
- Middle New River Water Course Master Plan;

- New River Channelization;
- New River Dam;
- North Peoria ADMP; and
- Sun City and Sun City West Drains.

In addition, the FCDMC has one active project underway focusing on channelization alternatives for the Agua Fria River (Agua Fria Watercourse Master Plan - WCMP) that includes the reach crossing US-60/Grand Avenue.

Where available, flowrates reported in the ADMS and ADMP documents should be used. For drainage crossings that do not have flowrates reported, or where the flood frequency curve is incomplete, methods recommended in the Highway Drainage Design Manual, Hydrology should be used. According to this manual, the Rational Method should be used for drainage areas of 160 acres or less, and HEC-1 modeling should be used for watersheds larger than 160 acres.

ADOT designates all routes on the State Highway System as one of four classes relative to operational importance. An operational storm frequency has been established for each class, identifying an acceptable level of risk of the highway having reduced capacity or damage during a storm. US-60/Grand Avenue is designated as ADOT Operational Drainage Class 3. According to the ADOT Roadway Design Guidelines (Table 603.2B), cross drainage design for this highway corridor must meet the minimum defined for the 25-year storm event. Pavement drainage design must meet local spread criteria for the 10-year storm.

2.1.2. Bridges and Culverts

Bridges and culverts should be designed according to the requirements in the *Highway Drainage Design Manual, Hydraulics*.

2.2. On-Site Drainage Considerations

2.2.1. Hydrology

According to the *Roadway Design Guidelines*, peak flows for on-site drainage facilities should be calculated using the Rational Method based on methods recommended in the *Highway Drainage Design Manual, Hydrology*. The following design frequencies should be applied for on-site drainage features per the *Roadway Design Guidelines:*

- Pavement drainage 10-year;
- Storm drain systems 10-year;
- Cut and median ditches 50-year; and
- Detention basins 10-year.

2.2.2. Pavement Drainage

Pavement should drain into roadside drainage ditches parallel to the roadway until it is diverted into natural channels.

2.2.3. Roadside Drainage Ditches

Drainage ditches paralleling US-60/Grand Avenue are designed for a 50-year storm frequency. These ditches intercept cross-flows, redirecting them to discharge points. Ditches are required to maintain one-foot of

freeboard, if there is the possibility the ditch could overflow and result in flooding outside the ADOT right-of-way.

2.2.4. Storm Drains

A system of catch basins and connector pipes is required to drain the highway median, where appropriate. Catch basins are designed according to criteria in the *Highway Drainage Design Manual, Hydraulics*. Connector pipes are designed according to the criteria in Section 607 of the *Roadway Design Guidelines*.

2.2.5. Detention Basins

Detention basins are provided wherever outlets of roadside ditches to natural washes cause a higher flow than under existing conditions. Detention basins are designed according to Section 609 in the *Roadway Design Guidelines*.

3.0 Existing Hydrologic Conditions

Offsite drainage within the Study Area generally flows from the northeast to southwest. The topography is relatively flat, with an average slope of 0.13%. The BNSF Railway acts a berm, ponding the flow upstream of US-60/Grand Avenue at multiple locations, particularly between SR-101L and 83rd Avenue. Drainage conditions in the study area have been studied and documented by the FCDMC. ***Figure 2, Figure 3,*** and ***Figure 4*** show the major drainage locations and highlight potential flooding concerns. The following subsections provided information relating to specific drainage conditions and facilities.

3.1. Major Rivers, Channels, Floodways, and Floodplains

There are three major drainage or water conveyances in the Study Area: Agua Fria River, New River, and the Grand Canal.

3.1.1. Agua Fria River

The Agua Fria River, located approximately 4/10ths of a mile west of Main Street in El Mirage and a similar distance east of 111th Avenue in Youngtown, is the major natural watercourse that must be accommodated by US-60/Grand Avenue in the study area. The existing 530-foot, six-lane bridge at 114th Avenue facilitates flow of the river across the roadway ROW (refer to ***Figure 2***). Nevertheless, there is an area northeast of the bridge that is susceptible to flooding.

3.1.2. New River

The New River, a tributary to the Agua Fria River, is approximately 14,000 (2.65 miles) to the east. US-60/Grand Avenue crosses the New River directly west of SR-101L (approximately 600 feet) on a 375-foot bridge (refer to ***Figure 2***).

3.1.3. Grand Canal

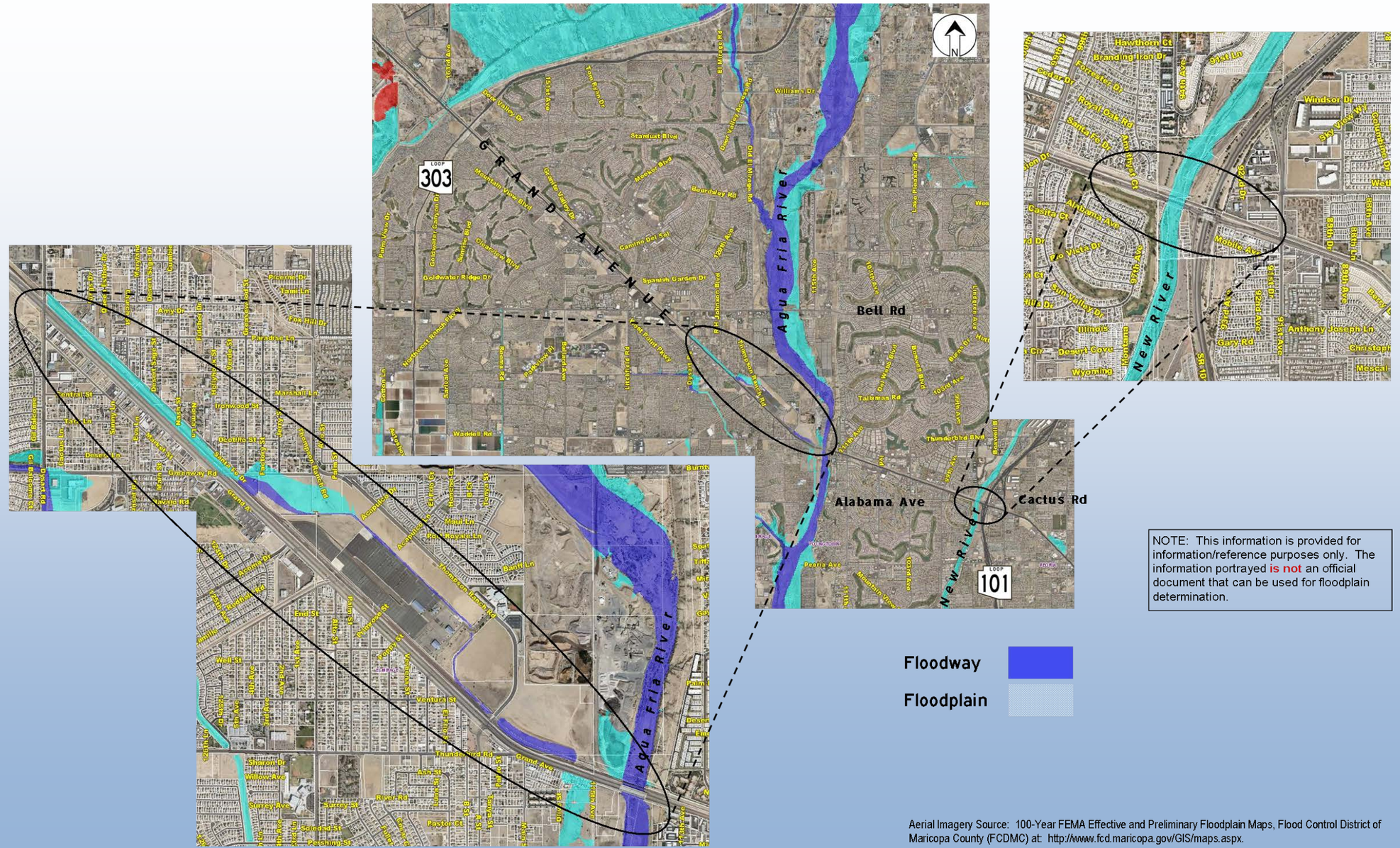
The Grand Canal crosses US-60/Grand Avenue between Thomas and Indian School Roads (refer to ***Figure 4***). The Grand Canal was constructed in 1878, making it a significant historic feature in the study area. It was not designed to convey stormwater, but irrigation water transported as part of the Salt River Project that manages several lakes east of the Phoenix metropolitan area. Nevertheless, the canal does convey storm flows and is considered to be a jurisdictional Waters of the United States (WOUS) under Section 404 of the Clean Water Act.

3.2. Storm Drainage Channels

There are four major drainage channels in the study area that convey stormwater across US-60/Grand Avenue. Brief descriptions of these important regional drainage facilities are provided in this section.

Agua Fria East Channel: A 28-foot wide concrete-lined channel passes under US-60/Grand Avenue in immediately east of the SR-101L culvert. An inlet atop the culvert drains the area between the roadway and the BNSF Railway tracks.

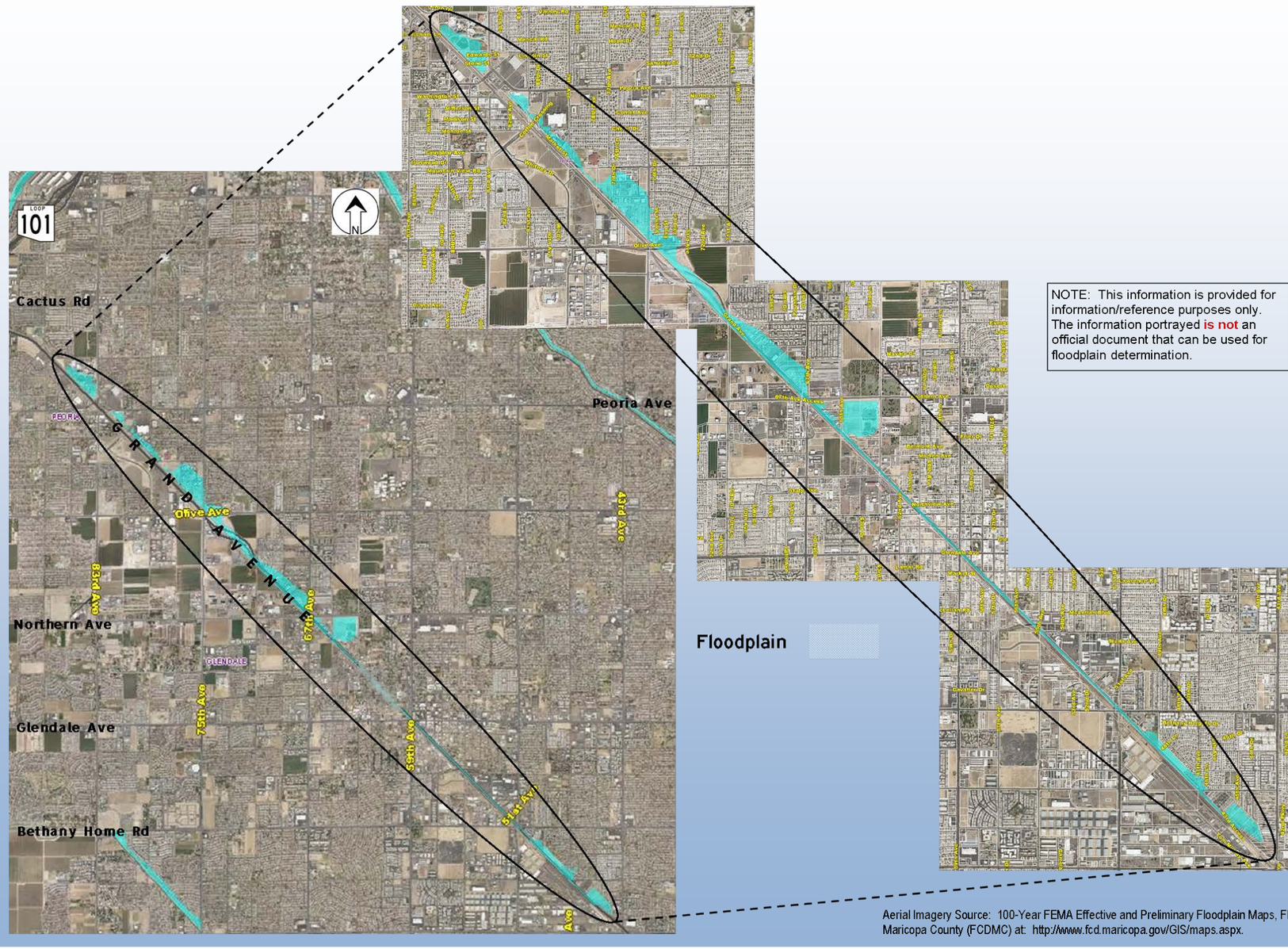
Figure 2
Major Drainage and Flood Prone Locations in the Study Area: SR-303L to SR-101L



NOTE: This information is provided for information/reference purposes only. The information portrayed is not an official document that can be used for floodplain determination.

Aerial Imagery Source: 100-Year FEMA Effective and Preliminary Floodplain Maps, Flood Control District of Maricopa County (FCDMC) at: http://www.fcd.maricopa.gov/GIS/maps.aspx.

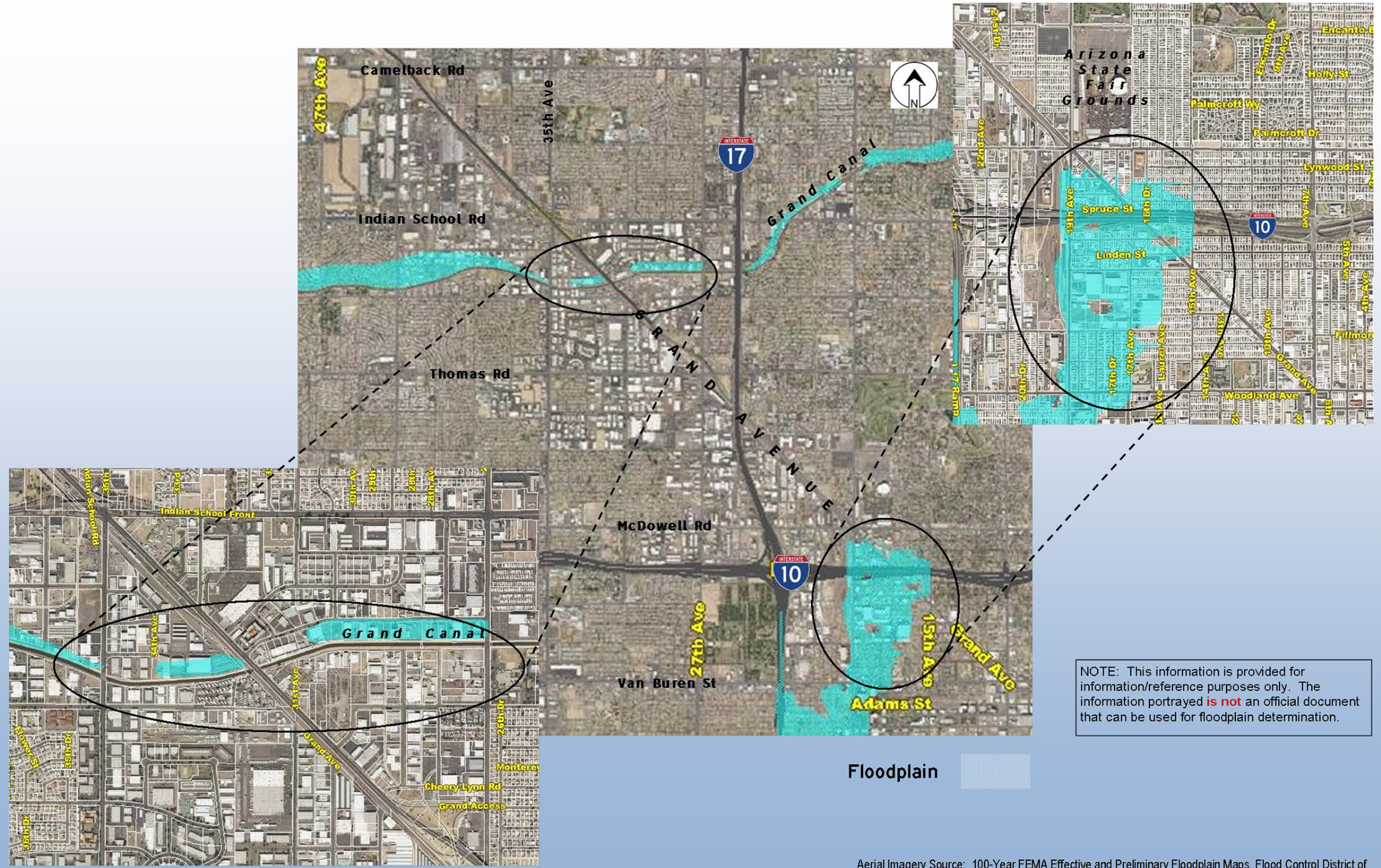
Figure 3
Major Drainage and Flood Prone Locations: SR-101L to Camelback Road



NOTE: This information is provided for information/reference purposes only. The information portrayed is not an official document that can be used for floodplain determination.

Aerial Imagery Source: 100-Year FEMA Effective and Preliminary Floodplain Maps, Flood Control District of Maricopa County (FCDMC) at: http://www.fcd.maricopa.gov/GIS/maps.aspx.

Figure 4
Major Drainage and Flood Prone Locations: Camelback Road to Phoenix Downtown



NOTE: This information is provided for information/reference purposes only. The information portrayed is not an official document that can be used for floodplain determination.

Aerial Imagery Source: 100-Year FEMA Effective and Preliminary Floodplain Maps, Flood Control District of Maricopa County (FCDMC) at: http://www.fcd.maricopa.gov/GIS/maps.aspx.

Olive Avenue Storm Drain (91st Ave. to 51st Ave.): This facility was constructed to improve drainage conveyance in the Peoria and Glendale. Installation of the storm drain coincided with reconstruction of Olive Avenue and its grade separation from US-60/Grand Avenue. The drain passes under US-60/Grand Avenue at the roadways intersection with 75th Avenue.

Northern Avenue Storm Drain: This project resulted in construction of a storm drain to convey drainage along Northern Avenue to 64th Avenue. The 64th Avenue drain conveys drainage south from Northern Avenue, passing under US-60/Grand Avenue to a basin at 63rd Avenue and Orangewood. The Northern and Orangewood Storm Drain and Basin Project carries stormwater to an outfall at the New River. Under an Intergovernmental Agreement (IGA 98017), the FCDMC has given ADOT authorization to use the basin at 63rd Avenue as an outfall for US-60/Grand Avenue drainage.

26th Avenue/Verde Lane Basin: This important facility is located between 27th Avenue and I-17 on the north side of Thomas Road. US-60/Grand Avenue forms the boundary at the southwest corner of this basin, having been grade separated from the former US-60/Grand Avenue/27th Avenue/Thomas six-legged intersection. The drainage improvement project created a basin providing adequate retention volume for the 100-year, 24-hour storm and associated storm drains along 25th and 26th drives. The new basin drains into the existing 27th Avenue storm drain system after peak flows have passed.

3.3. Detention/Retention Basins

There are three major on-site detention/retention basin complexes in the Study Area that have been constructed as part of recent intersection Improvements along US-60/Grand Avenue (***Figure 5***). According to the as-built plans, the majority of these basins use drywells to drain the basins. The basins are present at the three locations cited below:

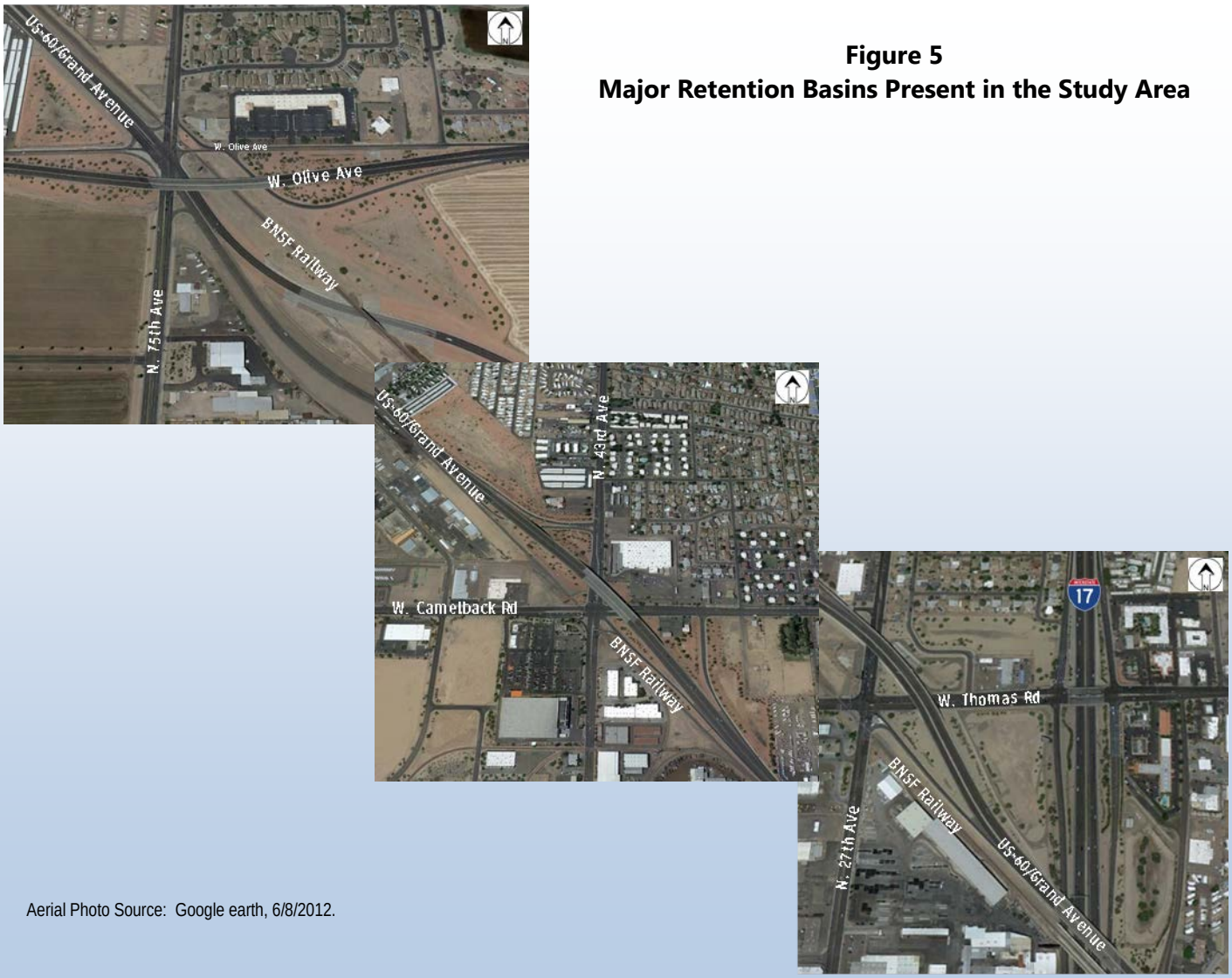
- 75th Avenue and Olive Avenue at US-60/Grand Avenue (2 basins);
- 43rd Avenue and Camelback Road at US-60/Grand Avenue (2 basins); and
- 27th Avenue and Thomas Road Intersection at US-60/Grand Avenue (northeast and Southeast quadrants) (3 basins).

In addition to these three major drainage features, there are multiple private retention basins present along US-60/Grand Avenue adjacent to the roadway that serve abutting commercial parcels.

3.4. BNSF Railway

The BNSF Railway primarily operates one track through the study area, but there are several locations with multiple tracks and other railway-related (e.g., transload and multi-modal) facilities within the project limits. The track runs parallel to US-60/Grand Avenue over its entire length. The rail corridor is located on the west side from the 19th Avenue/McDowell Road intersection the Alice Avenue alignment, one-half the distance between Butler Drive and Olive Avenue. At this point, US-60/Grand Avenue crosses over the rail corridor, and the track(s) is located on the east side of the highway through the remainder of the study area.

Figure 5
Major Retention Basins Present in the Study Area



Aerial Photo Source: Google earth, 6/8/2012.

The presence of the BNSF Railway track(s) results in numerous at-grade crossings affecting the north-south and east-west mile roads. Only Olive Avenue, 67th Avenue, Maryland Avenue (half-mile road), 51st Avenue, and Indian School Road have been grade separated at the BNSF Railway corridor. There is the potential for Bell Road to be grade separated from the railroad operations in the future, depending on the final design adopted for grade separation of this major regional arterial from US-60/Grand Avenue, which is being planned.

Because the BNSF Railway corridor lies upstream of US-60/Grand Avenue north of the Alice Avenue alignment, the track embankment serves as a barrier in some locations that intercepts sheet flow and concentrated off-site flows approaching the roadway. There are cross drainage structures at various points that convey flows under the railroad embankment into an existing ditch located north of and parallel to US-60/Grand Avenue. The inlet atop the Agua Fria East Channel (noted earlier) is an example of a treatment to convey the flow in the ditch into the regional drainage system.

3.5. Other Drainage Features

3.5.1. Cut Ditches and Area Inlets

Cut ditches, area inlets, and drainage culverts area are provided throughout the length of the US-60/Grand Avenue corridor to convey stormwater away from the roadway.

3.5.2. Pavement Drainage

The existing on-site drainage system is a combination of roadway catch basins, curb and gutters, storm drain pipes, and drainage ditches that collect and convey flows to detention/retention basins and drainage channels previously described.

3.5.3. Pump Stations

There is one pump station located at the intersection of 75th Avenue and Olive Avenue adjacent to the US-60/Grand Avenue overpass. This pump station discharges into the 6.5-acre retention basin in the southeast quadrant of the intersection.

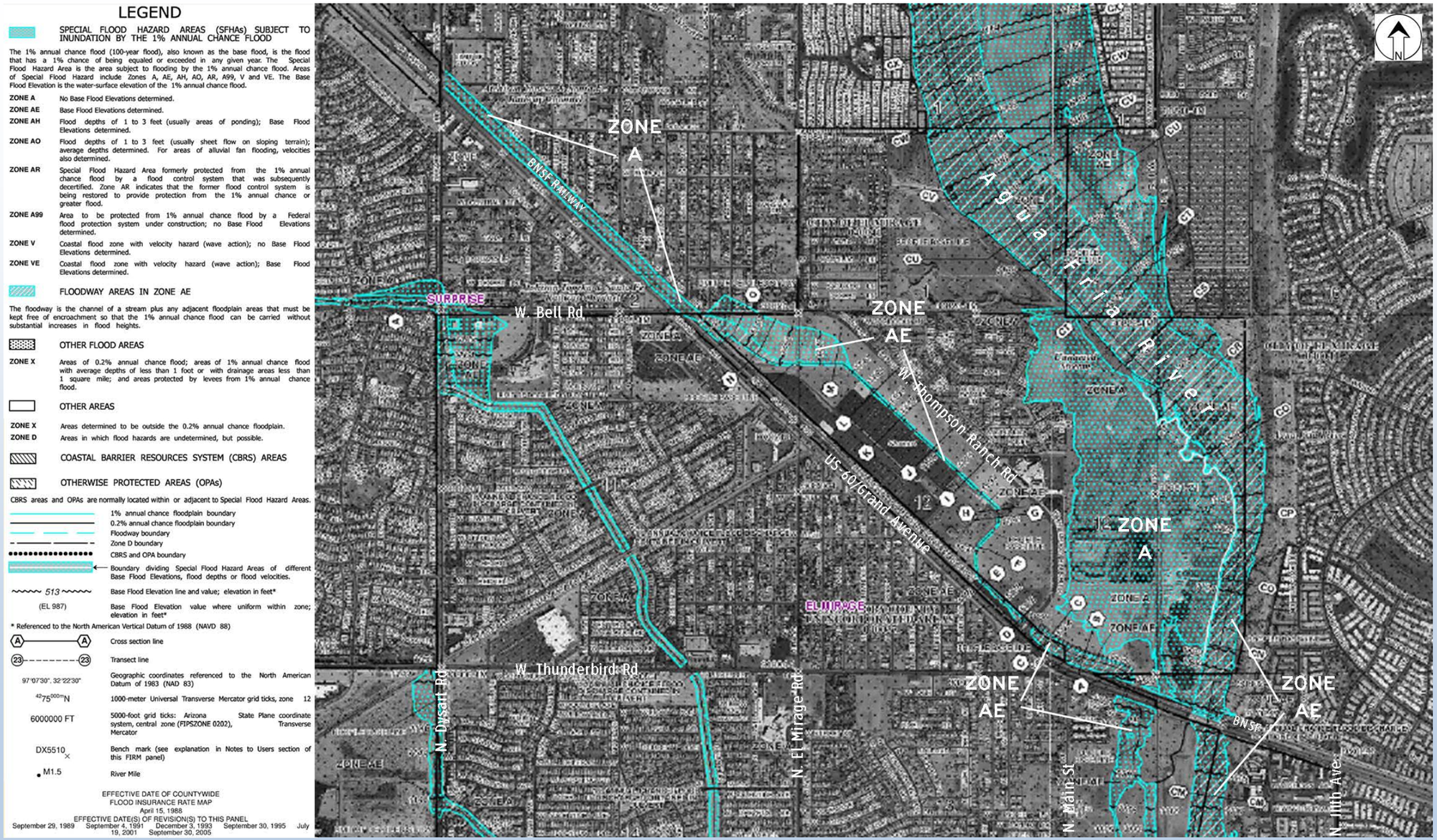
3.6. Drainage Conditions

The Federal Emergency Management Agency (FEMA) publishes Flood Insurance Rate Maps (FIRM) applicable to communities through the United States. A Draft of the Digital FIRM for 2012 is available on the FCDMC Web site for the Study Area. Special flood hazard areas (SFHAs) have been delineated on the Digital FIRM to identify areas subject to flooding by the 1% annual chance flood. The 1% annual chance flood (also defined as a 100-year flood), referred to as the "base flood," is the flood that has a 1% chance of being equaled or exceeded in any given year.

Information extracted from the Web site is presented in ***Figure 6, Figure 7,*** and ***Figure 8***. This information is similar to that shown in ***Figure 2, Figure 3,*** and ***Figure 4***, but provide greater detail regarding the extent and depth of potential flooding events. The majority of the Study Area is unaffected by flooding. There are four zones identified in the Study Area:

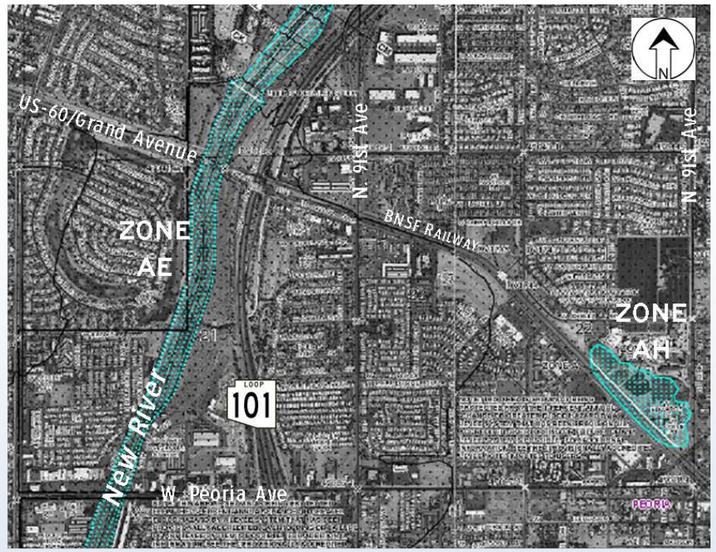
- Zone A – This is an area in which the approximate limits of potential flooding, i.e., the floodplain, have been determined, but the base flood elevations have not been established;
- Zone AE – The approximate limits of the floodplain of this zone have been delineated and base flood elevations have been determined;
- Zone AH – In this zone, the approximate limits of the flooding and base flood elevations have been determined and identified as flood depths of one to three feet and usually associated with areas of ponding; and
- Zone AO – This zone is similar to Zone AH with average flood depths being determined and usually associated with sheet flow on sloping terrain.

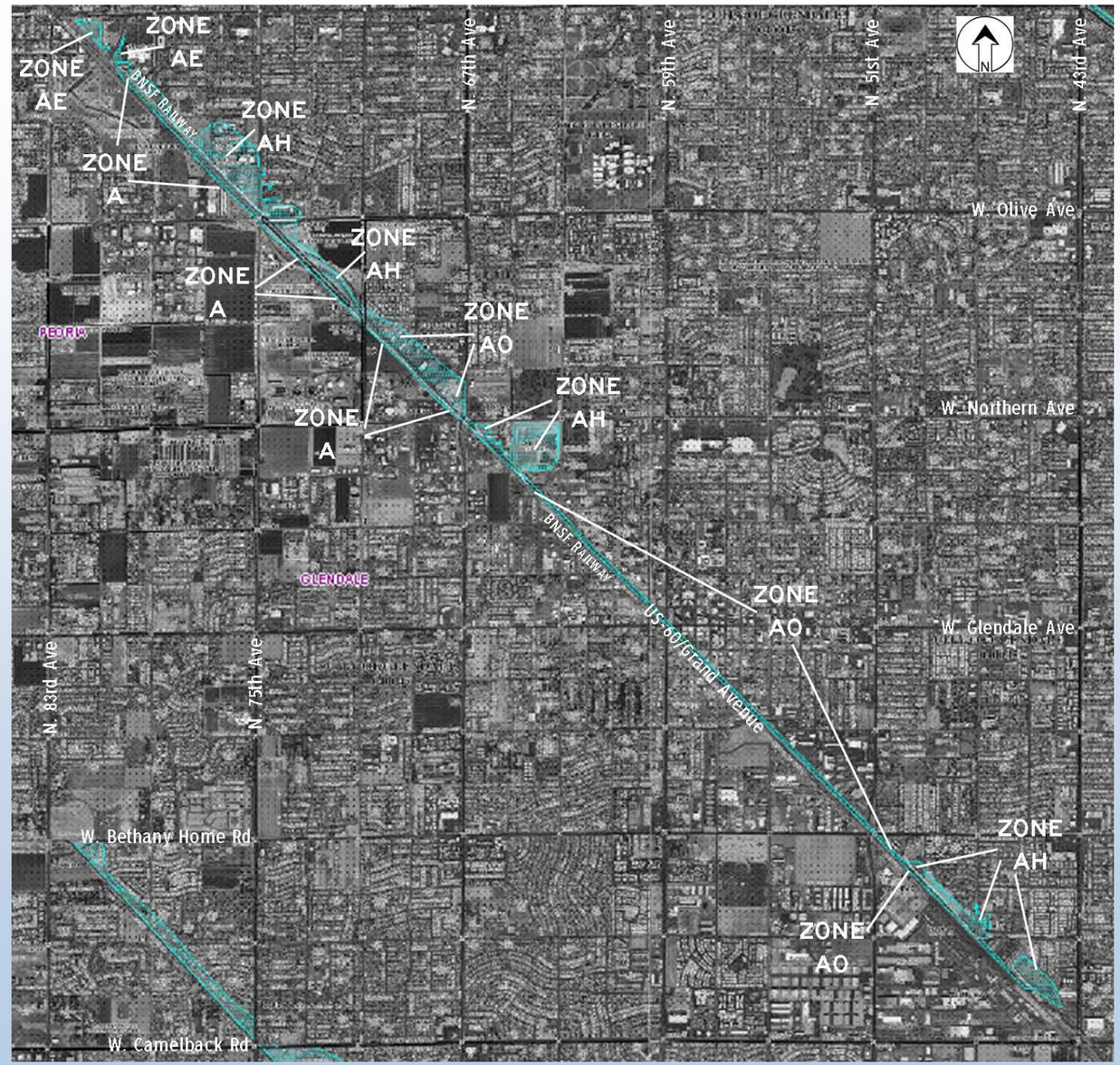
Figure 6
Special Flood Hazard Areas in the Study Area: Surprise and El Mirage



Preliminary 2012 Countywide Digital Flood Insurance Rate (DFIRM) map panels with the 2005 DFIRM panels, Flood Control District of Maricopa County.

Figure 7
Special Flood Hazard Areas in the Study Area: Peoria and Glendale



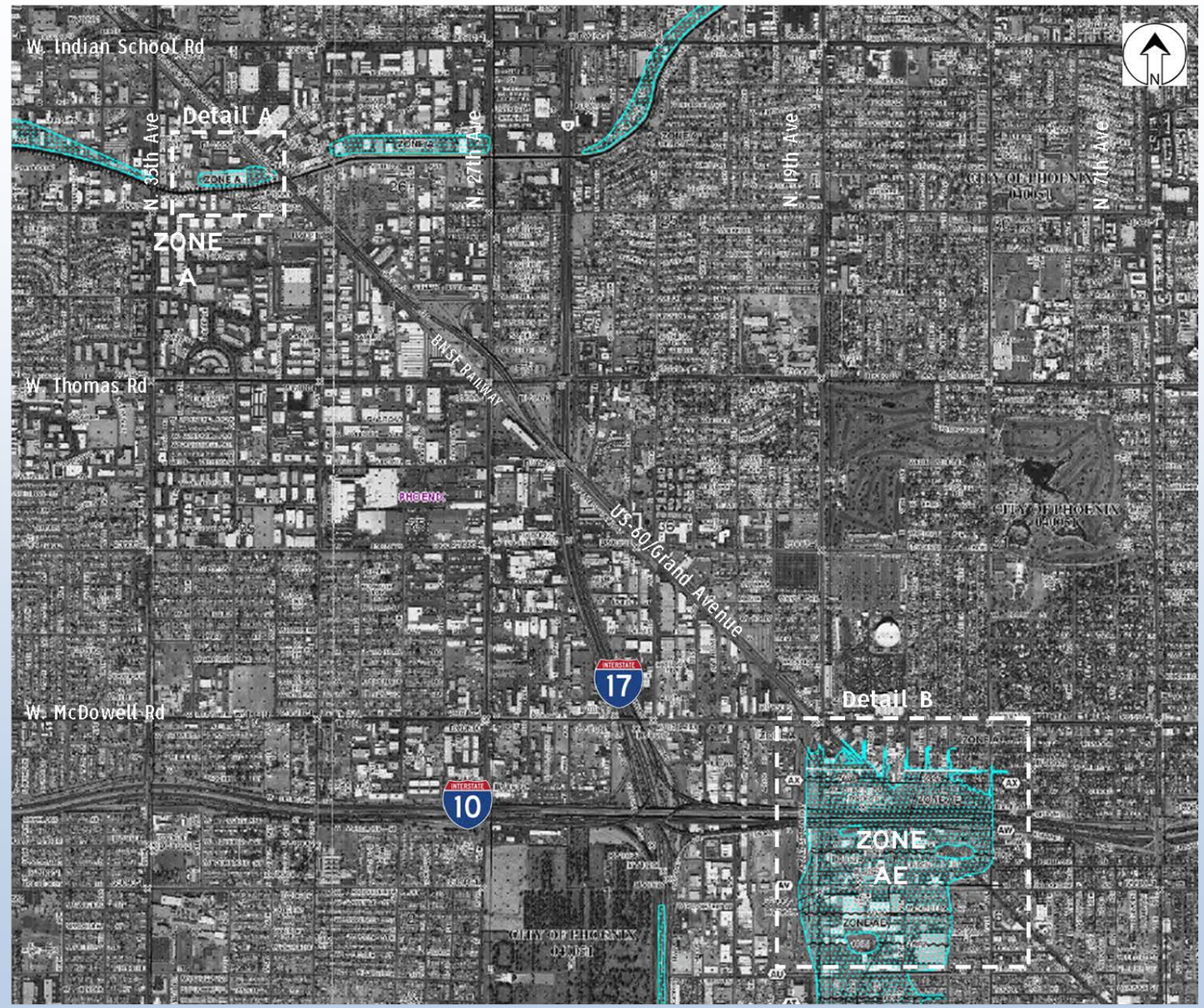


Preliminary 2012 Countywide Digital Flood Insurance Rate (DFIRM) map panels with the 2005 DFIRM panels, Flood Control District of Maricopa County.

Figure 8
Special Flood Hazard Areas in the Study Area: Phoenix

Detail A

Detail B



Preliminary 2012 Countywide Digital Flood Insurance Rate (DFIRM) map panels with the 2005 DFIRM panels, Flood Control District of Maricopa County.

Stream flow (e.g., Agua Fria and New rivers) is associated with Zone AE and, therefore, may have an associated floodway. The floodway is the channel of the stream plus adjacent floodplain area that must remain free of encroachment to maintain and ensure the 1% annual chance flood capacity of the drainage feature and preclude substantial increase in the base flood elevations.

3.6.1. Zone A Delineations

In the Study Area, there are two Zone A delineations north of SR-101L (refer to ***Figure 6)***. A linear drainage condition exists adjacent to the north side of US-60/Grand Avenue from Dysart Road to Bell Road. A large area, approximately 230 acres in size, is present directly west of the Agua Fria River floodway to Thompson Ranch Road between US-60/Grande Avenue and Caribbean Lane. South of SR-101L, there are two Zone A delineations (refer to ***Figure 7***). The northernmost area is a narrow strip present along the west side of US-60/Grand Avenue between the Cotton Crossing in Peoria and Northern Avenue in Glendale. The southern Zone A area is present directly west of the highway and north of the Grand Canal levee (refer to ***Figure 8***).

3.6.2. Zone AE Delineations

There are three Zone AE delineations north of SR-101L (refer to ***Figure 6 and Figure 7***). One is associated with drainage control associated with the BNSF Railway El Mirage Vehicle Facility located with within an industrial area defined by Greenway Road, Thompson Ranch Road, and the BNSF Railway track(s). A drainage ditch along the north, east, and south sides of the BNSF Railway facility conveys stormwater south along the east side of the BNSF Railway track(s) to an outfall that passes under US-60/Grand Avenue at Olive Street in El Mirage, eventually draining into the Agua Fria River. The second of the two AE zones consists of the floodway of the Agua Fria River, directly east of the BNSF Railway facility drainage ditch outfall. The third Zone AE delineation is the New River, which flows along the west side of SR-202L in Peoria.

There are three Zone AE delineations south of the SR-101L. Two small Zone AE delineations are present south of Peoria Town Center. One is located on the east side of a small BNSF Railway yard north of Cotton Crossing. Another is located along the south side of Cotton Crossing at the north end of the linear Zone A at Cotton Crossing, noted above. The third Zone AE delineation is located at the southern end of the Study Area south and southeast of the McDowell Road/19th Avenue intersection (refer to ***Figure 8***).

3.6.3. Zone AH and Zone AO Delineations

All Zone AH and Zone AO areas are located between SR-101L and Camelback Road (refer to ***Figure 7***). As noted earlier, drainage through the Study Area is northeast to southwest. Therefore, these flood hazard delineations are present on the east side of the BNSF Railway track(s), north of the US-60/Grand Avenue crossover south of Olive Avenue (at the Alice Avenue alignment), and on the east side of US-60/Grand Avenue south of the crossover.

3.7. Inventory of Drainage Facilities

3.7.1. SR-303L to 99th Avenue

Portions of the following information have been excerpted from the Final Drainage Report prepared for ADOT on the US-60/Grand Avenue segment from SR-303L to 99th Avenue:

Curb and gutter along the outer edge of the roadway exists continuously along the eastbound lanes between SR-303L and Dysart Road, and intermittently between Thompson Ranch Road and 103rd Avenue. For the westbound lanes, outside curb and gutter only exists for the segment between Thompson Ranch Road and the Agua Fria River Bridge. Catch basins constructed within the curb-and-gutter sections of the roadway collect pavement runoff and discharge it into roadside ditches and channels that ultimately drain to the Agua Fria River. Pavement runoff for all other sections without curb and gutter is allowed to sheet flow to the same roadside ditches, channels, or the median. The existing recessed median northwest of the Agua Fria River Bridge is drained by median inlets with outfalls to the outside ditches and channels. Median inlets were not provided for the existing raised medians in the remainder of the project.

3.7.2. SR-101L to McDowell Road

Portions of the following information have been excerpted from the Final Drainage Report prepared for ADOT on the US-60/Grand Avenue segment from SR-101L/Agua Fria Freeway to McDowell Road:

Pavement drainage of westbound US-60/Grand Avenue located within the cities of Phoenix and Glendale is collected in catch basins and conveyed into a storm drain trunk line. Existing drainage inlets are composed of single-curb-opening catch basins, single-grate catch basins, and a combination of these two types of catch basins. The storm drain trunk lines within Glendale run along the eastbound side of the road. The storm drain trunk line within the City of Phoenix runs along both the westbound and eastbound sides of the roadway at different intervals, depending on drainage requirements.

US-60/Grand Avenue mostly has been constructed through the study area as a six-lane highway with a median and standard curb and gutter cross-section. Exceptions to this design treatment occur at the following locations:

- SR-303L to Yorkshire Drive – This recently completed section of US-60/Grand Avenue does not have curb and gutter on the westbound lanes. Curb and gutter has been installed along the eastbound outside lane, except for the first 1,100 feet from SR-303L, which presumably will be completed when the SR-303L/US/60/Grand Avenue traffic interchange is constructed.
- Yorkshire Drive to east of Bell Road – The eastbound outside lane has been constructed without curb and gutter. A very small section of the curb and gutter and sidewalk treatment of the eastbound lanes directly east of Yorkshire Drive has not been completed.
- West of Dysart Road (Surprise) – US-60/Grand Avenue westbound lanes lack of an outside curb and gutter for a distance of approximately 1,800 feet west of Dysart Road. An open ditch parallels the eastbound lanes for this same section, and the outside eastbound lane has been finished with curb and gutter. Also, three access points have been installed to accommodate future development.
- Dysart Road (Surprise) to Thompson Ranch Road (El Mirage) – There is concrete drain on the west side of the roadway's eastbound lanes, which is protected with a guard rail. The drain extends from Dysart Road to approximately 600 feet east of Thompson Ranch Road (the covered drain extends to an outfall at the Agua Fria River). In this stretch of the roadway, the westbound lanes have been constructed without curb and gutter; some sections are planted with low shrubs.

- Westbound lanes of US-60/Grand Avenue from 111th Avenue to directly west of the New River Bridge within Sun City (Maricopa County) – The roadway has been constructed without a standard curb and gutter on the outside (east) lane;
- US-60/Grand Avenue/BNSF Railway alignment transition – The transition of US-60/Grand Avenue from the east side of the BNSF Railway track(s) to the west side between Olive Avenue and Butler Drive resulted in approximately 1,050 feet of the eastbound at-grade/transition lanes constructed without curb and gutter, as well as 800 feet of the westbound at-grade/transition lanes.

APPENDIX TM1-7

Socioeconomic Data

		Elderly Population		Female Head of Houshold		Low-Income Population				Minorities: Race & Ethnic Origin													
Geographic Unit	Total Population	60+ Population	% of Geographic Unit	Female Head of Household (With and Without Children)	% of Geographic Unit	Median Household Income	% of County	Population per Occupied Dwelling Unit	Poverty Guideline	Black/ African American	% of Geographic Unit	American Indian & Alaska Native	% of Geographic Unit	Asian	% of Geographic Unit	Native Hawaiian & Other Pacific Islander	% of Geographic Unit	Some Other Race	% of Geographic Unit	Two or More Races	% of Geographic Unit	Hispanic or Latino	% of Geographic Unit
Maricopa County	3,817,117	652,489	17.1%	175,551	4.6%	$55,099	100.0%	2.7	$18,324	190,519	5.0%	78,329	2.1%	132,225	3.5%	7,790	0.2%	489,705	12.8%	131,768	3.5%	1,128,741	29.6%
Affected Tracts	259,719	75,930	29.2%	12,698	4.9%					12,641	4.9%	4,092	1.6%	5,633	2.2%	417	0.2%	49,008	18.9%	9,022	3.5%	103,434	39.8%
Average (Mean)	4,189	1,225		205		$42,789	77.7%	2.6	$12,294	204		66		91		7		790		146		1,668	
Census Tract 405.06	5,209	4,731	90.8%	98	1.9%	$39,048	70.9%	1.6	$13,920	40	0.8%	12	0.2%	14	0.3%	3	0.1%	12	0.2%	32	0.6%	75	1.4%
Census Tract 405.07	6,097	5,722	93.8%	90	1.5%	$43,045	78.1%	1.6	$13,920	48	0.8%	5	0.1%	35	0.6%	4	0.1%	7	0.1%	31	0.5%	71	1.2%
Census Tract 405.12	1,690	1,595	94.4%	14	0.8%	$57,804	104.9%	1.7	$14,304	15	0.9%	3	0.2%	12	0.7%	1	0.1%	1	0.1%	2	0.1%	16	0.9%
Census Tract 405.13	3,031	2,872	94.8%	42	1.4%	$54,167	98.3%	1.7	$14,304	24	0.8%	2	0.1%	15	0.5%	0	0.0%	4	0.1%	9	0.3%	17	0.6%
Census Tract 405.20	4,142	257	6.2%	99	2.4%	$104,170	189.1%	3.3	$20,736	129	3.1%	9	0.2%	159	3.8%	18	0.4%	122	2.9%	141	3.4%	434	10.5%
Census Tract 405.22	4,181	3,940	94.2%	28	0.7%	$50,804	92.2%	1.7	$14,304	40	1.0%	6	0.1%	39	0.9%	4	0.1%	6	0.1%	22	0.5%	50	1.2%
Census Tract 405.24	1,474	1,206	81.8%	11	0.7%	$68,611	124.5%	1.8	$14,706	37	2.5%	4	0.3%	22	1.5%	0	0.0%	4	0.3%	13	0.9%	39	2.6%
Census Tract 405.25	3,046	2,641	86.7%	17	0.6%	$58,447	106.1%	1.8	$14,706	50	1.6%	3	0.1%	36	1.2%	2	0.1%	4	0.1%	7	0.2%	57	1.9%
Census Tract 405.28	6,212	5,698	91.7%	41	0.7%	$55,974	101.6%	1.8	$14,706	59	0.9%	16	0.3%	48	0.8%	2	0.0%	8	0.1%	13	0.2%	87	1.4%
Census Tract 405.29	3,222	2,948	91.5%	23	0.7%	$44,811	81.3%	1.8	$14,706	34	1.1%	7	0.2%	38	1.2%	0	0.0%	0	0.0%	10	0.3%	29	0.9%
Census Tract 405.30	3,559	545		149	4.2%	$51,890	94.2%	2.7	$18,324	180	5.1%	20	0.6%	63	1.8%	11	0.3%	142	4.0%	152	4.3%	586	16.5%
Census Tract 405.31	3,395	1,979	58.3%	122	3.6%	$42,122	76.4%	1.9	$15,108	136	4.0%	16	0.5%	37	1.1%	1	0.0%	91	2.7%	71	2.1%	362	10.7%
Census Tract 608.01	5,832	1,372	23.5%	333	5.7%	$32,991	59.9%	3.1	$19,932	264	4.5%	83	1.4%	31	0.5%	15	0.3%	1,982	34.0%	257	4.4%	3,892	66.7%
Census Tract 608.02	1,975	271	13.7%	104	5.3%	$59,926	108.8%	3.0	$19,530	131	6.6%	27	1.4%	53	2.7%	2	0.1%	298	15.1%	71	3.6%	710	35.9%
Census Tract 609.01	4,640	314	6.8%	231	5.0%	$57,411	104.2%	3.4	$21,138	375	8.1%	52	1.1%	83	1.8%	14	0.3%	797	17.2%	269	5.8%	1,715	37.0%
Census Tract 609.02	3,842	476	12.4%	228	5.9%	$34,468	62.6%	3.9	$23,148	168	4.4%	45	1.2%	22	0.6%	4	0.1%	1,847	48.1%	152	4.0%	2,995	78.0%
Census Tract 609.03	4,983	269	5.4%	268	5.4%	$38,654	70.2%	3.7	$22,344	325	6.5%	66	1.3%	54	1.1%	14	0.3%	1,409	28.3%	235	4.7%	2,849	57.2%
Census Tract 609.04	3,527	234	6.6%	214	6.1%	$34,643	62.9%	3.6	$22,050	243	6.9%	72	2.0%	35	1.0%	5	0.1%	1,025	29.1%	225	6.4%	2,058	58.3%
Census Tract 610.28	2,417	179	7.4%	153	6.3%	$55,667	101.0%	2.9	$19,128	194	8.0%	14	0.6%	75	3.1%	8	0.3%	187	7.7%	145	6.0%	567	23.5%
Census Tract 610.29	4,905	921	18.8%	227	4.6%	$62,658	113.7%	2.5	$17,520	252	5.1%	24	0.5%	120	2.4%	9	0.2%	369	7.5%	225	4.6%	939	19.1%
Census Tract 610.35	6,699	720	10.7%	295	4.4%	$74,194	134.7%	3.2	$20,334	433	6.5%	42	0.6%	236	3.5%	25	0.4%	521	7.8%	341	5.1%	1,443	21.5%
Census Tract 610.40	3,929	319	8.1%	203	5.2%	$47,365	86.0%	3.1	$19,932	315	8.0%	54	1.4%	115	2.9%	5	0.1%	573	14.6%	207	5.3%	1,256	32.0%
Census Tract 610.41	4,319	216	5.0%	238	5.5%	$37,386	67.9%	3.4	$21,138	279	6.5%	91	2.1%	96	2.2%	35	0.8%	968	22.4%	197	4.6%	1,915	44.3%
Census Tract 715.03	4,708	4,289	91.1%	113	2.4%	$35,778	64.9%	1.5	$13,500	68	1.4%	7	0.1%	20	0.4%	1	0.0%	6	0.1%	19	0.4%	73	1.6%
Census Tract 715.05	5,964	4,514	75.7%	244	4.1%	$36,382	66.0%	1.7	$14,304	126	2.1%	18	0.3%	56	0.9%	0	0.0%	84	1.4%	57	1.0%	302	5.1%
Census Tract 715.06	4,260	3,638	85.4%	110	2.6%	$41,289	74.9%	1.7	$14,304	39	0.9%	13	0.3%	21	0.5%	0	0.0%	20	0.5%	30	0.7%	98	2.3%
Census Tract 715.17	3,740	425	11.4%	211	5.6%	$75,625	137.3%	2.8	$18,726	110	2.9%	16	0.4%	133	3.6%	17	0.5%	184	4.9%	143	3.8%	635	17.0%
Census Tract 716	3,668	1,181	32.2%	206	5.6%	$32,516	59.0%	2.2	$16,314	114	3.1%	57	1.6%	32	0.9%	4	0.1%	628	17.1%	117	3.2%	1,343	36.6%
Census Tract 717.02	3,219	2,715	84.3%	131	4.1%	$31,747	57.6%	1.6	$13,920	65	2.0%	8	0.2%	18	0.6%	1	0.0%	35	1.1%	23	0.7%	143	4.4%
Census Tract 718.01	5,148	4,024	78.2%	162	3.1%	$28,663	52.0%	1.7	$18,324	106	2.1%	19	0.4%	31	0.6%	2	0.0%	72	1.4%	36	0.7%	229	4.4%
Census Tract 719.03	6,306	1,157	18.3%	341	5.4%	$59,723	108.4%	2.7	$18,324	183	2.9%	69	1.1%	63	1.0%	6	0.1%	681	10.8%	204	3.2%	1,678	26.6%
Census Tract 719.06	5,816	707	12.2%	356	6.1%	$52,131	94.6%	3.0	$19,530	283	4.9%	80	1.4%	296	5.1%	12	0.2%	981	16.9%	217	3.7%	2,303	39.6%
Census Tract 719.10	6,218	912	14.7%	346	5.6%	$51,948	94.3%	2.9	$19,128	265	4.3%	106	1.7%	102	1.6%	1	0.0%	978	15.7%	208	3.3%	2,387	38.4%
Census Tract 719.11	3,081	275	8.9%	145	4.7%	$60,000	108.9%	3.1	$19,932	249	8.1%	89	2.9%	160	5.2%	3	0.1%	337	10.9%	171	5.6%	896	29.1%
Census Tract 719.12	2,817	420	14.9%	204	7.2%	$31,309	56.8%	2.7	$18,324	108	3.8%	84	3.0%	25	0.9%	0	0.0%	507	18.0%	100	3.5%	1,021	36.2%
Census Tract 719.14	3,125	316	10.1%	188	6.0%	$48,750	88.5%	3.5	$21,540	109	3.5%	47	1.5%	30	1.0%	5	0.2%	804	25.7%	167	5.3%	1,571	50.3%
Census Tract 719.15	3,439	500	14.5%	229	6.7%	$36,830	66.8%	2.6	$17,922	157	4.6%	63	1.8%	45	1.3%	13	0.4%	499	14.5%	148	4.3%	1,160	33.7%
Census Tract 923.12	5,001	1,136	22.7%	278	5.6%	$29,142	52.9%	2.2	$16,314	500	10.0%	133	2.7%	262	5.2%	8	0.2%	580	11.6%	198	4.0%	1,272	25.4%
Census Tract 925	4,935	1,025	20.8%	285	5.8%	$36,422	66.1%	2.7	$18,324	247	5.0%	82	1.7%	241	4.9%	27	0.5%	1,235	25.0%	153	3.1%	2,492	50.5%
Census Tract 926	3,177	334	10.5%	226	7.1%	$29,428	53.4%	3.2	$20,334	175	5.5%	69	2.2%	90	2.8%	3	0.1%	724	22.8%	143	4.5%	1,918	60.4%
Census Tract 927.05	3,702	199	5.4%	216	5.8%	$51,361	93.2%	3.3	$20,736	393	10.6%	111	3.0%	271	7.3%	4	0.1%	1,014	27.4%	147	4.0%	1,821	49.2%
Census Tract 928.01	4,756	357	7.5%	295	6.2%	$29,028	52.7%	3.6	$22,050	287	6.0%	114	2.4%	37	0.8%	9	0.2%	1,916	40.3%	205	4.3%	3,661	77.0%
Census Tract 928.02	5,217	441	8.5%	292	5.6%	$26,810	48.7%	3.8	$22,746	238	4.6%	72	1.4%	67	1.3%	0	0.0%	2,155	41.3%	240	4.6%	3,982	76.3%
Census Tract 929	2,866	335	11.7%	221	7.7%	$25,561	46.4%	3.2	$20,334	138	4.8%	42	1.5%	9	0.3%	0	0.0%	1,218	42.5%	148	5.2%	2,359	82.3%
Census Tract 930.01	4,841	563	11.6%	433	8.9%	$36,940	67.0%	2.9	$19,128	549	11.3%	177	3.7%	49	1.0%	13	0.3%	1,125	23.2%	265	5.5%	2,517	52.0%
Census Tract 930.02	4,082	458	11.2%	284	7.0%	$29,363	53.3%	3.4	$21,138	437	10.7%	118	2.9%	101	2.5%	5	0.1%	1,169	28.6%	223	5.5%	2,294	56.2%
Census Tract 931.01	4,547	656	14.4%	330	7.3%	$30,096	54.6%	2.9	$19,128	436	9.6%	154	3.4%	66	1.5%	8	0.2%	1,270	27.9%	191	4.2%	2,683	59.0%
Census Tract 931.04	4,385	468	10.7%	403	9.2%	$21,388	38.8%	2.9	$19,128	456	10.4%	125	2.9%	41	0.9%	5	0.1%	1,331	30.4%	228	5.2%	2,732	62.3%
Census Tract 932	3,355	252	7.5%	280	8.3%	$30,206	54.8%	2.7	$18,324	359	10.7%	112	3.3%	145	4.3%	5	0.1%	769	22.9%	153	4.6%	1,413	42.1%
Census Tract 1071.01	4,262	523	12.3%	227	5.3%	$34,913	63.4%	3.8	$22,746	249	5.8%	86	2.0%	175	4.1%	5	0.1%	1,010	23.7%	225	5.3%	2,669	62.6%
Census Tract 1071.02	5,197	409	7.9%	364	7.0%	$34,714	63.0%	3.6	$22,050	409	7.9%	178	3.4%	283	5.4%	16	0.3%	1,438	27.7%	235	4.5%	3,373	64.9%
Census Tract 1091.01	3,283	292	8.9%	162	4.9%	$33,974	61.7%	3.9	$23,148	68	2.1%	85	2.6%	139	4.2%	1	0.0%	1,235	37.6%	120	3.7%	2,521	76.8%
Census Tract 1091.02	5,299	415	7.8%	235	4.4%	$36,108	65.5%	3.8	$22,746	225	4.2%	83	1.6%	124	2.3%	10	0.2%	2,137	40.3%	192	3.6%	4,146	78.2%
Census Tract 1092	4,096	258	6.3%	237	5.8%	$27,692	50.3%	3.2	$20,334	242	5.9%	112	2.7%	73	1.8%	6	0.1%	1,704	41.6%	140	3.4%	3,112	76.0%
Census Tract 1093	4,670	388	8.3%	207	4.4%	$29,972	54.4%	4.5	$25,560	239	5.1%	100	2.1%	54	1.2%	2	0.0%	1,937	41.5%	162	3.5%	3,714	79.5%
Census Tract 1101	6,612	509	7.7%	368	5.6%	$33,631	61.0%	4.0	$23,550	178	2.7%	123	1.9%	115	1.7%	6	0.1%	2,949	44.6%	248	3.8%	5,743	86.9%
Census Tract 1119	2,238	497	22.2%	82	3.7%	$69,773	126.6%	2.1	$15,912	74	3.3%	39	1.7%	50	2.2%	2	0.1%	132	5.9%	66	2.9%	396	17.7%
Census Tract 1121	3,838	290	7.6%	201	5.2%	$26,905	48.8%	4.3	$24,756	82	2.1%	125	3.3%	7	0.2%	3	0.1%	1,609	41.9%	168	4.4%	3,418	89.1%
Census Tract 1129	4,805	544	11.3%	288	6.0%	$29,457	53.5%	2.6	$17,922	316	6.6%	171	3.6%	69	1.4%	4	0.1%	1,199	25.0%	175	3.6%	2,797	58.2%
Census Tract 1168	2,655	364	13.7%	135	5.1%	$27,300	49.5%	2.7	$18,324	100	3.8%	67	2.5%	17	0.6%	1	0.0%	795	29.9%	103	3.9%	1,573	59.2%
Census Tract 1169	2,387	146	6.1%	110	4.6%	$28,913	52.5%	4.2	$24,354	56	2.3%	33	1.4%	18	0.8%	0	0.0%	1,081	45.3%	111	4.7%	2,031	85.1%
Census Tract 1170	5,678	573	10.1%	325	5.7%	$34,873	63.3%	2.9	$19,128	435	7.7%	232	4.1%	660	11.6%	27	0.5%	1,083	19.1%	316	5.6%	2,796	49.2%

Civilian Noninstitutionalized Population 5+ Yrs of Age (2000 Census)			Limited English Proficiency							Civilian Labor Force				
			English Only Spoken			Language Other Than English Spoken								
Total	With Disability	% of Geographic Unit	Population 5+ Years of Age	All Persons 5+ Yrs of Age	% of Geographic Unit Population 5+ Years of Age	All Persons 5+ Yrs of Age	% of Geographic Unit Population 5+ Years of Age	English Spoken Less Than "Very Well"	% of Geographic Unit Population 5+ Years of Age	Population 16+ Years of Age	Employed	Unemployed	% Unemployment: Population 16+ Yrs of Age	% Unemployment: Civilian Work Force
3,027,366	509,992	16.8%	3,544,453	2,626,587	74.1%	917,866	25.9%	359,478	10.1%	2,898,581	1,736,116	157,166	5.4%	8.3%
107,782	26,944		239,254	156,977	65.6%	82,277	34.4%	41,098	17.2%	201,445	91,606	12,135		
4,311	1,078	25.0%	3,859	2,532		1,327		663		3,249	1,478	196	6.0%	11.7%
5,773	1,509	26.1%	5,647	5,396	95.6%	251	4.4%	60	1.1%	5,357	851	177	3.3%	17.2%
6,292	1,853	29.5%	6,599	6,342	96.1%	257	3.9%	18	0.3%	6,564	603	50	0.8%	7.7%
--	--	--	1,946	1,841	94.6%	105	5.4%	16	0.8%	1,734	46	0	0.0%	0.0%
--	--	--	2,885	2,701	93.6%	184	6.4%	86	3.0%	2,969	222	0	0.0%	0.0%
--	--	--	3,076	2,884	93.8%	192	6.2%	47	1.5%	2,491	1,941	151	6.1%	7.2%
--	--	--	4,258	4,135	97.1%	123	2.9%	40	0.9%	4,420	264	0	0.0%	0.0%
--	--	--	1,159	1,110	95.8%	49	4.2%	11	0.9%	1,206	269	16	1.3%	5.6%
--	--	--	3,162	3,048	96.4%	114	3.6%	70	2.2%	2,864	575	36	1.3%	5.9%
--	--	--	5,990	5,644	94.2%	346	5.8%	24	0.4%	5,990	710	112	1.9%	13.6%
--	--	--	3,079	2,894	94.0%	185	6.0%	24	0.8%	3,022	379	27	0.9%	6.7%
--	--	--	3,239	3,051	94.2%	188	5.8%	75	2.3%	2,557	1,580	168	6.6%	9.6%
--	--	--	2,684	2,212	82.4%	472	17.6%	272	10.1%	2,552	738	104	4.1%	12.4%
--	--	--	4,564	2,603	57.0%	1,961	43.0%	1,162	25.5%	3,754	1,359	160	4.3%	10.5%
--	--	--	1,076	764	71.0%	312	29.0%	189	17.6%	1,221	753	55	4.5%	6.8%
--	--	--	3,783	2,922	77.2%	861	22.8%	354	9.4%	2,782	1,936	73	2.6%	3.6%
--	--	--	2,453	1,010	41.2%	1,443	58.8%	922	37.6%	2,157	1,350	64	3.0%	4.5%
--	--	--	3,988	2,597	65.1%	1,391	34.9%	714	17.9%	2,907	1,801	352	12.1%	16.3%
--	--	--	2,952	1,921	65.1%	1,031	34.9%	446	15.1%	2,141	1,293	138	6.4%	9.6%
--	--	--	1,888	1,270	67.3%	618	32.7%	169	9.0%	1,508	961	38	2.5%	3.8%
--	--	--	5,053	4,269	84.5%	784	15.5%	239	4.7%	3,759	2,427	138	3.7%	5.4%
--	--	--	5,446	4,623	84.9%	823	15.1%	364	6.7%	4,370	2,801	261	6.0%	8.5%
--	--	--	2,924	2,401	82.1%	523	17.9%	213	7.3%	2,603	1,711	116	4.5%	6.3%
--	--	--	3,265	2,051	62.8%	1,214	37.2%	581	17.8%	2,725	1,699	129	4.7%	7.1%
4,675	1,698	36.3%	4,969	4,790	96.4%	179	3.6%	59	1.2%	4,797	714	110	2.3%	13.3%
5,076	1,612	31.8%	5,931	5,453	91.9%	478	8.1%	218	3.7%	5,563	1,524	58	1.0%	3.7%
4,245	1,318	31.0%	4,252	3,996	94.0%	256	6.0%	96	2.3%	4,159	697	162	3.9%	18.9%
--	--	--	3,366	3,076	91.4%	290	8.6%	109	3.2%	2,810	2,080	106	3.8%	4.8%
2,683	1,033	38.5%	3,004	2,132	71.0%	872	29.0%	535	17.8%	2,635	1,325	183	6.9%	12.1%
--	--	--	3,426	3,286	95.9%	140	4.1%	65	1.9%	3,411	619	171	5.0%	21.6%
4,845	1,774	36.6%	5,068	4,811	94.9%	257	5.1%	94	1.9%	5,322	1,243	186	3.5%	13.0%
6,035	796	13.2%	6,045	4,548	75.2%	1,497	24.8%	728	12.0%	5,196	3,280	350	6.7%	9.6%
4,738	1,192	25.2%	5,000	3,501	70.0%	1,499	30.0%	818	16.4%	3,891	2,425	181	4.7%	6.9%
6,281	1,119	17.8%	5,706	4,284	75.1%	1,422	24.9%	804	14.1%	5,379	3,616	266	4.9%	6.9%
2,257	394	17.5%	3,110	2,404	77.3%	706	22.7%	179	5.8%	2,472	1,643	223	9.0%	12.0%
--	--	--	2,061	1,548	75.1%	513	24.9%	287	13.9%	1,795	828	231	12.9%	21.8%
--	--	--	3,338	2,466	73.9%	872	26.1%	276	8.3%	2,416	1,466	216	8.9%	12.8%
--	--	--	3,700	2,618	70.8%	1,082	29.2%	244	6.6%	2,642	1,654	131	5.0%	7.3%
--	--	--	4,495	3,499	77.8%	996	22.2%	322	7.2%	3,680	2,128	248	6.7%	10.4%
3,918	836	21.3%	4,619	2,326	50.4%	2,293	49.6%	873	18.9%	3,807	2,148	327	8.6%	13.2%
3,187	671	21.1%	2,755	1,326	48.1%	1,429	51.9%	967	35.1%	2,272	1,042	416	18.3%	28.5%
2,128	746	35.1%	3,611	1,609	44.6%	2,002	55.4%	1,123	31.1%	2,739	1,834	109	4.0%	5.6%
--	--	--	4,181	1,445	34.6%	2,736	65.4%	1,588	38.0%	2,901	1,381	286	9.9%	17.2%
--	--	--	4,329	1,713	39.6%	2,616	60.4%	1,572	36.3%	3,609	1,703	540	15.0%	24.1%
3,113	773	24.8%	3,170	988	31.2%	2,182	68.8%	1,037	32.7%	2,295	1,225	299	13.0%	19.6%
--	--	--	5,194	2,234	43.0%	2,960	57.0%	1,142	22.0%	3,962	2,285	392	9.9%	14.6%
--	--	--	3,579	1,391	38.9%	2,188	61.1%	1,020	28.5%	2,686	1,496	228	8.5%	13.2%
4,033	724	18.0%	3,772	1,866	49.5%	1,906	50.5%	1,067	28.3%	2,962	1,409	384	13.0%	21.4%
3,132	712	22.7%	3,918	1,682	42.9%	2,236	57.1%	1,000	25.5%	2,785	1,352	315	11.3%	18.9%
--	--	--	3,427	1,872	54.6%	1,555	45.4%	691	20.2%	2,470	1,527	301	12.2%	16.5%
3,894	660	16.9%	3,531	1,579	44.7%	1,952	55.3%	698	19.8%	2,719	1,457	318	11.7%	17.9%
4,648	1,031	22.2%	5,009	1,376	27.5%	3,633	72.5%	1,797	35.9%	4,329	2,379	589	13.6%	19.8%
--	--	--	3,212	1,096	34.1%	2,116	65.9%	1,031	32.1%	2,415	1,259	338	14.0%	21.2%
--	--	--	5,819	914	15.7%	4,905	84.3%	2,658	45.7%	3,840	1,935	333	8.7%	14.7%
4,188	937	22.4%	3,459	967	28.0%	2,492	72.0%	1,661	48.0%	3,035	1,672	285	9.4%	14.6%
4,256	950	22.3%	3,363	1,165	34.6%	2,198	65.4%	945	28.1%	2,372	1,373	275	11.6%	16.7%
6,657	1,896	28.5%	6,707	1,408	21.0%	5,299	79.0%	2,803	41.8%	5,307	2,938	351	6.6%	10.7%
2,421	478	19.7%	2,051	1,856	90.5%	195	9.5%	37	1.8%	2,019	1,398	47	2.3%	3.3%
3,737	979	26.2%	3,331	716	21.5%	2,615	78.5%	1,463	43.9%	2,536	1,294	54	2.1%	4.0%
5,570	1,253	22.5%	4,311	2,594	60.2%	1,717	39.8%	1,173	27.2%	3,914	2,070	152	3.9%	6.8%
--	--	--	2,643	1,282	48.5%	1,361	51.5%	762	28.8%	2,178	1,184	56	2.6%	4.5%
--	--	--	2,211	554	25.1%	1,657	74.9%	893	40.4%	1,478	864	30	2.0%	3.4%
--	--	--	6,465	2,917	45.1%	3,548	54.9%	2,167	33.5%	4,994	2,870	523	10.5%	15.4%

Commute to Work													Housing and Occupied Housing						
Total Workers 16+ Yrs	Car, Truck, Van - Drove Alone	% of Geographic Unit	Car, Truck, Van - Carpooled	% of Geographic Unit	Public Transportation (excluding Taxicab)	% of Geographic Unit	Walked	% of Geographic Unit	Other Means	% of Geographic Unit	Work at Home	% of Geographic Unit	Total Dwelling Units (DUs)	Occupied DUs	% of Geographic Unit	Owner-Occupied DUs	% of Geographic Unit	Vacant DUs	% of Geographic Unit
1,702,892	1,291,456	75.8%	209,024	12.3%	40,361	2.4%	28,246	1.7%	40,236	2.4%	93,569	5.5%	1,639,279	1,411,583	86.1%	910,320	55.5%	227,696	13.9%
90,049	64,623		14,492		3,242		1,782		2,698		3,212		121,245	100,223		68,629		21,034	
1,452	1,042	71.8%	234	16.1%	52	3.6%	29	2.0%	44	3.0%	52	3.6%	1,956	1,617	82.7%	1,107	56.6%	339	17.3%
796	609	76.5%	30	3.8%	0	0.0%	43	5.4%	69	8.7%	45	5.7%	4,236	3,271	77.2%	2,991	70.6%	965	22.8%
547	387	70.7%	13	2.4%	0	0.0%	0	0.0%	44	8.0%	103	18.8%	4,689	3,837	81.8%	3,135	66.9%	852	18.2%
36	14	38.9%	0	0.0%	0	0.0%	0	0.0%	13	36.1%	9	25.0%	1,162	981	84.4%	943	81.2%	181	15.6%
222	160	72.1%	13	5.9%	0	0.0%	0	0.0%	36	16.2%	13	5.9%	2,172	1,796	82.7%	1,741	80.2%	376	17.3%
1,907	1,415	74.2%	140	7.3%	11	0.6%	0	0.0%	178	9.3%	163	8.5%	1,483	1,253	84.5%	1,010	68.1%	230	15.5%
264	216	81.8%	31	11.7%	0	0.0%	0	0.0%	0	0.0%	17	6.4%	2,935	2,481	84.5%	2,207	75.2%	454	15.5%
269	189	70.3%	13	4.8%	0	0.0%	0	0.0%	9	3.3%	58	21.6%	1,015	812	80.0%	752	74.1%	215	21.2%
563	357	63.4%	77	13.7%	0	0.0%	0	0.0%	28	5.0%	101	17.9%	2,116	1,686	79.7%	1,633	77.2%	430	20.3%
710	454	63.9%	0	0.0%	0	0.0%	0	0.0%	40	5.6%	216	30.4%	4,437	3,481	78.5%	3,349	75.5%	956	21.5%
379	319	84.2%	0	0.0%	0	0.0%	0	0.0%	29	7.7%	31	8.2%	2,345	1,820	77.6%	1,723	73.5%	525	22.4%
1,621	1,386	85.5%	88	5.4%	7	0.4%	56	3.5%	28	1.7%	56	3.5%	1,518	1,310	86.3%	998	65.7%	208	13.7%
704	611	86.8%	27	3.8%	0	0.0%	39	5.5%	12	1.7%	15	2.1%	2,737	1,810	66.1%	1,379	50.4%	927	33.9%
1,344	1,064	79.2%	91	6.8%	16	1.2%	53	3.9%	36	2.7%	84	6.3%	2,833	1,898	67.0%	1,083	38.2%	935	33.0%
715	566	79.2%	91	12.7%	0	0.0%	0	0.0%	11	1.5%	47	6.6%	737	661	89.7%	565	76.7%	76	10.3%
1,894	1,385	73.1%	331	17.5%	26	1.4%	0	0.0%	0	0.0%	152	8.0%	1,543	1,351	87.6%	941	61.0%	192	12.4%
1,350	1,029	76.2%	143	10.6%	0	0.0%	43	3.2%	109	8.1%	26	1.9%	1,112	989	88.9%	553	49.7%	123	11.1%
1,761	1,417	80.5%	227	12.9%	80	4.5%	13	0.7%	24	1.4%	0	0.0%	1,546	1,346	87.1%	894	57.8%	200	12.9%
1,290	1,129	87.5%	123	9.5%	0	0.0%	0	0.0%	11	0.9%	27	2.1%	1,145	975	85.2%	596	52.1%	170	14.8%
932	666	71.5%	178	19.1%	0	0.0%	24	2.6%	0	0.0%	64	6.9%	1,101	825	74.9%	410	37.2%	276	25.1%
2,532	2,020	79.8%	321	12.7%	13	0.5%	0	0.0%	67	2.6%	111	4.4%	2,148	1,931	89.9%	1,134	52.8%	217	10.1%
2,829	2,446	86.5%	250	8.8%	16	0.6%	0	0.0%	13	0.5%	104	3.7%	2,366	2,115	89.4%	1,600	67.6%	251	10.6%
1,754	1,301	74.2%	331	18.9%	8	0.5%	0	0.0%	42	2.4%	72	4.1%	1,461	1,284	87.9%	978	66.9%	177	12.1%
1,648	1,125	68.3%	347	21.1%	125	7.6%	43	2.6%	0	0.0%	8	0.5%	1,420	1,270	89.4%	932	65.6%	150	10.6%
657	564	85.8%	0	0.0%	15	2.3%	18	2.7%	30	4.6%	30	4.6%	3,746	3,042	81.2%	2,410	64.3%	704	18.8%
1,511	1,274	84.3%	27	1.8%	0	0.0%	14	0.9%	99	6.6%	97	6.4%	4,207	3,528	83.9%	2,937	69.8%	679	16.1%
669	584	87.3%	22	3.3%	0	0.0%	0	0.0%	0	0.0%	63	9.4%	2,876	2,498	86.9%	2,282	79.3%	378	13.1%
2,048	1,714	83.7%	244	11.9%	23	1.1%	3	0.1%	0	0.0%	64	3.1%	1,428	1,348	94.4%	1,136	79.6%	80	5.6%
1,323	1,073	81.1%	182	13.8%	14	1.1%	10	0.8%	17	1.3%	27	2.0%	1,959	1,699	86.7%	845	43.1%	260	13.3%
553	472	85.4%	36	6.5%	0	0.0%	0	0.0%	37	6.7%	8	1.4%	2,662	2,072	77.8%	1,782	66.9%	590	22.2%
1,193	920	77.1%	124	10.4%	11	0.9%	58	4.9%	0	0.0%	80	6.7%	3,907	3,058	78.3%	2,169	55.5%	849	21.7%
3,116	2,411	77.4%	528	16.9%	34	1.1%	0	0.0%	81	2.6%	62	2.0%	2,609	2,363	90.6%	1,848	70.8%	246	9.4%
2,425	1,924	79.3%	301	12.4%	48	2.0%	38	1.6%	86	3.5%	28	1.2%	2,186	1,955	89.4%	1,299	59.4%	231	10.6%
3,616	2,993	82.8%	451	12.5%	39	1.1%	0	0.0%	62	1.7%	71	2.0%	2,346	2,128	90.7%	1,631	69.5%	218	9.3%
1,603	1,395	87.0%	138	8.6%	14	0.9%	19	1.2%	22	1.4%	15	0.9%	1,199	1,009	84.2%	769	64.1%	190	15.8%
779	564	72.4%	62	8.0%	17	2.2%	57	7.3%	10	1.3%	69	8.9%	1,213	1,053	86.8%	729	60.1%	160	13.2%
1,466	902	61.5%	409	27.9%	0	0.0%	0	0.0%	29	2.0%	126	8.6%	989	905	91.5%	669	67.6%	84	8.5%
1,641	1,289	78.5%	213	13.0%	51	3.1%	23	1.4%	15	0.9%	50	3.0%	1,438	1,303	90.6%	893	62.1%	135	9.4%
2,086	1,420	68.1%	292	14.0%	211	10.1%	105	5.0%	48	2.3%	10	0.5%	2,772	2,305	83.2%	764	27.6%	467	16.8%
2,103	1,240	59.0%	517	24.6%	17	0.8%	119	5.7%	152	7.2%	58	2.8%	2,054	1,820	88.6%	956	46.5%	234	11.4%
1,041	786	75.5%	117	11.2%	62	6.0%	24	2.3%	52	5.0%	0	0.0%	1,246	1,008	80.9%	465	37.3%	238	19.1%
1,806	1,166	64.6%	524	29.0%	28	1.6%	18	1.0%	24	1.3%	46	2.5%	1,435	1,132	78.9%	614	42.8%	303	21.1%
1,362	891	65.4%	325	23.9%	23	1.7%	44	3.2%	70	5.1%	9	0.7%	1,718	1,323	77.0%	409	23.8%	395	23.0%
1,674	1,009	60.3%	484	28.9%	0	0.0%	126	7.5%	55	3.3%	0	0.0%	1,739	1,372	78.9%	573	32.9%	367	21.1%
1,196	661	55.3%	269	22.5%	56	4.7%	76	6.4%	68	5.7%	66	5.5%	1,145	899	78.5%	350	30.6%	246	21.5%
2,250	1,427	63.4%	594	26.4%	110	4.9%	17	0.8%	52	2.3%	50	2.2%	2,144	1,680	78.4%	832	38.8%	464	21.6%
1,449	1,104	76.2%	152	10.5%	130	9.0%	16	1.1%	19	1.3%	28	1.9%	1,397	1,214	86.9%	702	50.3%	183	13.1%
1,396	883	63.3%	336	24.1%	89	6.4%	5	0.4%	61	4.4%	22	1.6%	1,780	1,551	87.1%	829	46.6%	229	12.9%
1,335	1,012	75.8%	165	12.4%	70	5.2%	38	2.8%	37	2.8%	13	1.0%	1,830	1,534	83.8%	363	19.8%	296	16.2%
1,467	1,095	74.6%	77	5.2%	13	0.9%	108	7.4%	77	5.2%	97	6.6%	1,534	1,221	79.6%	408	26.6%	313	20.4%
1,414	1,129	79.8%	188	13.3%	2	0.1%	0	0.0%	0	0.0%	95	6.7%	1,241	1,117	90.0%	809	65.2%	124	10.0%
2,258	1,488	65.9%	519	23.0%	153	6.8%	18	0.8%	66	2.9%	14	0.6%	1,830	1,431	78.2%	627	34.3%	399	21.8%
1,221	740	60.6%	245	20.1%	98	8.0%	18	1.5%	118	9.7%	2	0.2%	913	832	91.1%	609	66.7%	81	8.9%
1,880	1,184	63.0%	587	31.2%	59	3.1%	0	0.0%	50	2.7%	0	0.0%	1,724	1,379	80.0%	710	41.2%	345	20.0%
1,635	750	45.9%	486	29.7%	258	15.8%	50	3.1%	25	1.5%	66	4.0%	1,703	1,277	75.0%	399	23.4%	426	25.0%
1,343	933	69.5%	253	18.8%	84	6.3%	10	0.7%	0	0.0%	63	4.7%	1,153	1,040	90.2%	713	61.8%	113	9.8%
2,899	1,501	51.8%	795	27.4%	267	9.2%	159	5.5%	136	4.7%	41	1.4%	1,988	1,647	82.8%	798	40.1%	341	17.2%
1,379	1,026	74.4%	118	8.6%	68	4.9%	19	1.4%	60	4.4%	88	6.4%	1,199	1,064	88.7%	788	65.7%	135	11.3%
1,294	818	63.2%	224	17.3%	168	13.0%	16	1.2%	51	3.9%	17	1.3%	1,035	885	85.5%	521	50.3%	150	14.5%
1,996	1,332	66.7%	328	16.4%	201	10.1%	46	2.3%	36	1.8%	53	2.7%	2,349	1,853	78.9%	630	26.8%	496	21.1%
1,164	620	53.3%	324	27.8%	127	10.9%	46	4.0%	28	2.4%	19	1.6%	1,169	974	83.3%	581	49.7%	195	16.7%
864	690	79.9%	91	10.5%	12	1.4%	23	2.7%	40	4.6%	8	0.9%	655	571	87.2%	380	58.0%	84	12.8%
2,870	1,374	47.9%	880	30.7%	368	12.8%	127	4.4%	86	3.0%	35	1.2%	2,470	1,950	78.9%	853	34.5%	520	21.1%

Employment by Industry

Civilian Employed Population 16+ Years of Age	Agriculture, Forestry, Fishing, Hunting, & Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation, Warehousing, & Utilities	Information	Finance, Insurance, & Real Estate (FIRE)	Professional, Scientific, Mgmt, Administration, & Waste Mgmt Svcs	Educational Svcs, Health Care, & Social Assistance	Arts, Entertainment, Recreation, Accommodations, and Food Svcs	Other Svcs, except Public Administration	Public Administration
1,736,116	10,556	141,348	142,087	50,506	210,153	88,980	34,272	169,080	215,272	344,370	169,807	82,384	77,301
91,624	500	10,474	6,197	2,326	11,460	4,374	1,640	7,139	11,474	17,278	8,712	5,817	4,227
1,478	8	169	100	38	185	71	26	115	185	279	141	94	68
851	0	58	30	34	117	0	0	44	60	304	126	78	0
603	0	25	24	0	187	16	0	99	42	125	59	13	13
46	0	0	0	0	0	13	0	10	9	14	0	0	0
222	0	0	14	0	70	0	0	39	12	63	24	0	0
1,941	0	124	61	0	200	32	76	323	248	613	136	86	42
264	0	0	26	18	32	0	0	52	17	14	56	49	0
269	0	38	8	8	40	8	13	44	9	49	18	34	0
575	0	8	20	56	63	0	0	58	29	119	115	96	11
710	0	0	64	0	54	13	50	114	186	124	62	26	17
379	0	30	58	0	87	15	0	54	0	74	29	32	0
1,580	0	239	81	68	205	18	22	49	68	388	215	87	140
738	0	0	91	0	85	71	80	24	59	172	11	39	106
1,359	15	180	57	0	161	128	0	76	184	322	88	148	0
753	0	20	19	9	127	46	82	50	134	156	38	56	16
1,936	0	239	122	8	344	103	16	200	95	458	149	61	141
1,350	0	149	39	29	99	151	23	51	259	294	146	41	69
1,801	0	199	150	7	204	87	34	106	214	443	248	44	65
1,293	18	130	13	8	224	38	0	78	81	259	167	142	135
961	0	46	33	0	84	103	61	56	159	270	45	39	65
2,427	30	62	74	10	242	48	90	266	269	561	286	194	295
2,801	11	146	101	6	508	157	31	264	338	672	263	67	237
1,711	0	95	139	65	246	44	28	414	154	309	129	53	35
1,699	0	175	150	76	146	95	0	239	305	209	101	121	82
714	0	29	0	13	66	35	16	10	107	269	45	93	31
1,542	0	113	58	14	316	81	19	176	205	211	153	120	76
697	0	55	53	22	141	34	0	27	110	199	14	22	20
2,080	0	136	139	41	189	113	50	167	309	479	202	82	173
1,325	29	142	49	6	205	66	0	22	180	361	137	61	67
619	16	13	15	0	131	12	0	27	50	271	41	14	29
1,243	0	83	103	36	158	140	0	102	65	363	97	36	60
3,280	0	272	167	125	536	126	14	272	417	693	232	162	264
2,425	6	161	162	67	149	156	110	256	157	559	276	111	255
3,616	5	391	298	58	645	145	10	215	352	777	358	272	90
1,643	0	24	84	132	348	127	11	179	87	285	147	123	96
828	0	28	30	56	91	49	0	95	120	258	76	25	0
1,466	0	156	97	54	242	132	14	217	119	167	77	175	16
1,654	0	92	142	58	213	35	76	50	230	363	106	260	29
2,128	7	109	117	37	206	262	73	227	345	452	138	94	61
2,148	0	157	206	111	271	108	50	155	433	269	173	130	85
1,042	0	172	104	12	124	80	8	88	69	179	104	47	55
1,834	65	189	163	61	315	84	10	100	178	270	125	156	118
1,381	36	329	58	34	118	52	22	134	149	189	189	41	30
1,703	0	242	98	60	311	64	13	120	279	238	146	99	33
1,225	10	253	138	24	71	34	15	45	98	310	85	63	79
2,285	0	214	163	0	213	121	15	335	310	261	388	176	89
1,496	16	218	95	49	286	95	72	81	164	110	87	158	65
1,409	8	235	39	145	219	54	48	74	290	140	96	48	13
1,352	0	195	94	43	172	64	30	156	208	138	157	89	6
1,527	110	76	121	54	126	135	18	103	165	367	143	77	32
1,457	0	255	127	55	86	57	15	93	131	283	96	144	115
2,379	0	418	289	53	168	103	36	109	299	363	370	91	80
1,259	0	273	135	47	137	67	0	39	133	171	114	87	56
1,935	0	674	99	111	163	107	0	0	124	221	282	125	29
1,672	0	411	187	20	137	25	114	16	317	123	262	36	24
1,373	0	164	206	81	238	76	0	12	151	259	32	100	54
2,938	19	507	356	61	300	150	38	42	653	199	282	273	58
1,398	15	20	61	46	67	30	71	139	247	297	237	16	152
1,294	18	335	132	39	77	0	0	2	112	194	174	180	31
2,070	0	224	225	11	268	34	41	107	256	369	197	147	191
1,184	35	227	44	18	95	74	7	52	263	165	35	165	4
864	0	290	40	21	53	21	0	72	237	30	49	50	1
2,870	31	629	129	49	284	40	18	313	424	414	279	163	91

APPENDIX TM1-8

FDOT 2013 Quality Level of Service Handbook Table 1

TABLE 1

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	16,800	17,700	**
4	Divided	*	37,900	39,800	**
6	Divided	*	58,400	59,900	**
8	Divided	*	78,800	80,100	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
2	Undivided	*	7,300	14,800	15,600
4	Divided	*	14,500	32,400	33,800
6	Divided	*	23,300	50,000	50,900
8	Divided	*	32,000	67,300	68,100

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	2,900	7,600	19,700
50-84%	2,100	6,700	19,700	>19,700
85-100%	9,300	19,700	>19,700	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	2,800	9,500
50-84%	*	1,600	8,700	15,800
85-100%	3,800	10,700	17,400	>19,700

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Core Urbanized

Lanes	B	C	D	E
4	47,400	64,000	77,900	84,600
6	69,900	95,200	116,600	130,600
8	92,500	126,400	154,300	176,600
10	115,100	159,700	194,500	222,700
12	162,400	216,700	256,600	268,900

Urbanized

Lanes	B	C	D	E
4	45,800	61,500	74,400	79,900
6	68,100	93,000	111,800	123,300
8	91,500	123,500	148,700	166,800
10	114,800	156,000	187,100	210,300

Freeway Adjustments

Auxiliary Lanes Present in Both Directions	Ramp Metering
+ 20,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	8,600	17,000	24,200	33,300
4	Divided	36,700	51,800	65,600	72,600
6	Divided	55,000	77,700	98,300	108,800

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1]Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 1
(continued)

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**

12/18/12

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities				Interrupted Flow Facilities					
					State Arterials				Class I	
	Freeways	Core Freeways	Highways		Class I		Class II		Bicycle	Pedestrian
ROADWAY CHARACTERISTICS										
Area type (u,lu)	lu	lu	u	u	u	u	u	u	u	u
Number of through lanes (both dir.)	4-10	4-12	2	4-6	2	4-8	2	4-8	4	4
Posted speed (mph)	70	65	50	50	45	50	30	30	45	45
Free flow speed (mph)	75	70	55	55	50	55	35	35	50	50
Auxiliary Lanes (n,y)	n	n								
Median (n, nr, r)			n	r	n	r	n	r	r	r
Terrain (l,r)	l	l	l	l	l	l	l	l	l	l
% no passing zone			80							
Exclusive left turn lane impact (n, y)			[n]	y	y	y	y	y	y	y
Exclusive right turn lanes (n, y)					n	n	n	n	n	n
Facility length (mi)	4	4	5	5	2	2	1.9	1.8	2	2
Number of basic segments	4	4								
TRAFFIC CHARACTERISTICS										
Planning analysis hour factor (K)	0.090	0.085	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Directional distribution factor (D)	0.547	0.547	0.550	0.550	0.550	0.560	0.565	0.560	0.565	0.565
Peak hour factor (PHF)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base saturation flow rate (pcphpl)			1,700	2,100	1,950	1,950	1,950	1,950	1,950	1,950
Heavy vehicle percent	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	2.5	2.0
Local adjustment factor	0.91	0.91	0.97	0.98						
% left turns					12	12	12	12	12	12
% right turns					12	12	12	12	12	12
CONTROL CHARACTERISTICS										
Number of signals					4	4	10	10	4	6
Arrival type (1-6)					3	3	4	4	4	4
Signal type (a, c, p)					c	c	c	c	c	c
Cycle length (C)					120	150	120	120	120	120
Effective green ratio (g/C)					0.44	0.45	0.44	0.44	0.44	0.44
MULTIMODAL CHARACTERISTICS										
Paved shoulder/bicycle lane (n, y)									n, 50%, y	n
Outside lane width (n, t, w)									t	t
Pavement condition (d, t, u)									t	
On-street parking (n, y)										
Sidewalk (n, y)										n, 50%, y
Sidewalk/roadway separation(a, t, w)										t
Sidewalk protective barrier (n, y)										n

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highways		Arterials		Bicycle	Ped	Bus
	Density	Two-Lane %ffs	Multilane Density	Class I ats	Class II ats	Score	Score	Buses/hr.
B	≤ 17	> 83.3	≤ 17	> 31 mph	> 22 mph	≤ 2.75	≤ 2.75	≤ 6
C	≤ 24	> 75.0	≤ 24	> 23 mph	> 17 mph	≤ 3.50	≤ 3.50	≤ 4
D	≤ 31	> 66.7	≤ 31	> 18 mph	> 13 mph	≤ 4.25	≤ 4.25	< 3
E	≤ 39	> 58.3	≤ 35	> 15 mph	> 10 mph	≤ 5.00	≤ 5.00	< 2

% ffs = Percent free flow speed ats = Average travel speed

APPENDIX TM1-9

Select Link Analysis

N
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Select Link Q1
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Miles
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195th Ave
Deer Valley Rd
Beardsley Rd
Union Hills Dr
Rose Garden Ln
Yorkshire Dr
Mayo Blvd
92nd St
Golden Eagle Blvd
Raintree Dr
Bell Rd
Shea Blvd
Via Linda Dr
Doubletree Ranch Rd
Indian Bend Rd
Palisades Blvd
Fountain Hills Blvd
Saguaro Blvd
Beeline Hwy
Greenway Rd
Thunderbird Rd
Cave Creek Rd
Peoria Ave
Dunlap Ave
Olive Ave
Northern Ave
Glendale Ave
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Colter St
Highland Ave
Lincoln Dr
Chaparral
Thomas Rd
Oak St
McDowell Rd
Osborn Rd
Campbell Ave
Encanto Blvd
Wigwam Blvd
Indian School Rd
Virginia Ave
I-10 Frontage Road
Test Dr
Van Buren St
Roosevelt St
Jefferson St
Washington St
Grant St
Air Ln
Sky Harbor Blvd
Rio Salado Pkwy
Apache Blvd
McKellips Rd
Brown Rd
University Dr
Yuma Rd
Buckeye Rd
Lower Buckeye Rd
Broadway Rd
Southern Ave
Indian Springs Rd
MC Hwy 85 Main St
Beloat Rd
Elliot Rd
Dobbins Rd
Central Ave
Baseline Rd
Guadalupe Rd
Warner Rd
Ray Rd
Chandler Blvd
Pecos Rd
Queen Creek Rd
Sun Valley Pky
Happy Trails Rd
Sunrise Blvd
Reems Rd
Grand Ave
Stardust Blvd
Waddell Rd
Cactus Rd
Cotton Ln
Sarval Ave
Litchfield Rd
Mountain View Rd
Royal Palm
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Claremont St
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Jackrabbit Trl
Perryville Rd
Dysart Rd
Avondale Blvd
Bullard Ave
Airport Rd
Estrella Pky
Rainbow Valley Rd
Tuthill Rd
Beltline Rd
Desert Foothills Pkwy
Mountain Pky
Loop 101
Loop 202
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Higley Rd
Greenfield Rd
Gilbert Rd
Lindsay Rd
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Alma School Rd
Extension Rd
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Kyrene Rd
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Priest Dr
Hardy Dr
Terrace Rd
Mill Ave
Miller Rd
Granite Reef Rd
Tatum Blvd
Invergordon Rd
Mockingbird Ln
Goldwater Blvd
Scottsdale Rd
Hayden Rd
Pima Rd
Loop 303
Loop 202
Loop 101
Loop 60
Loop 10
SR 51
SR 153
SR 143
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Ellis Rd
Price Rd
Pecos Rd
Alma School Rd
Alvarado Way

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Yorkshire Dr
Pinnacle Peak Rd
Mayo Blvd
92nd St
Golden Eagle Blvd
Greenway Rd
Thunderbird Rd
Raintree Dr
Bell Rd
Palisades Blvd
Waddell Rd
Cactus Rd
Peoria Ave
Shea Blvd
Via Linda Dr
Olive Ave
Dunlap Ave
Northern Ave
Doubletree Ranch Rd
Glendale Ave
Indian Bend Rd
Maryland Ave
Lincoln Dr
Bethany Home Rd
Missouri Ave
Camelback Rd
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Highland Ave
Chaparral
Beeline Hwy
Wigwam Blvd
Indian School Rd
Osborn Rd
Virginia Ave
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Oak St
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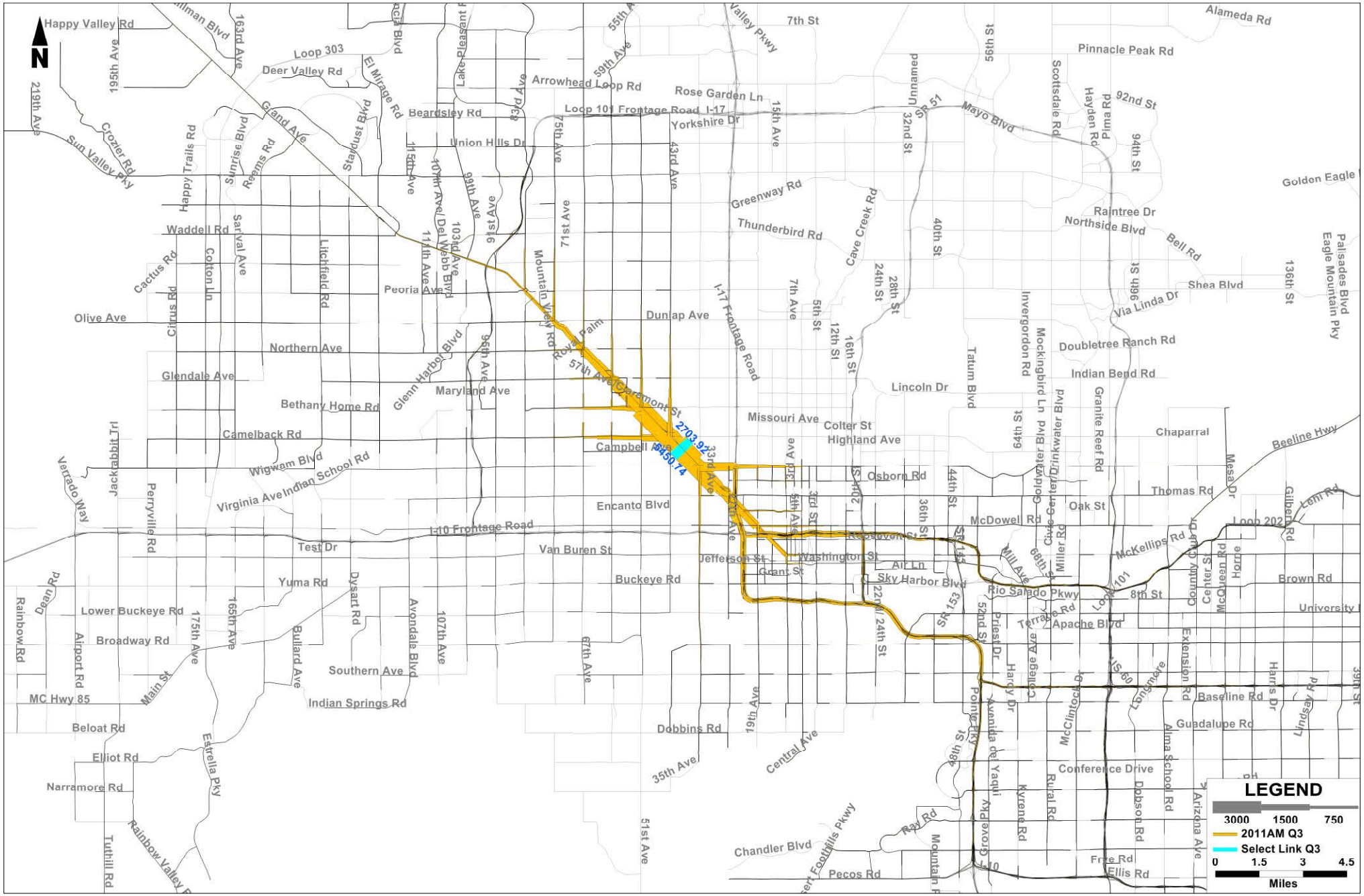
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Invergordon Rd
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Miller Rd
Scottsdale Rd
Hayden Rd
Pima Rd
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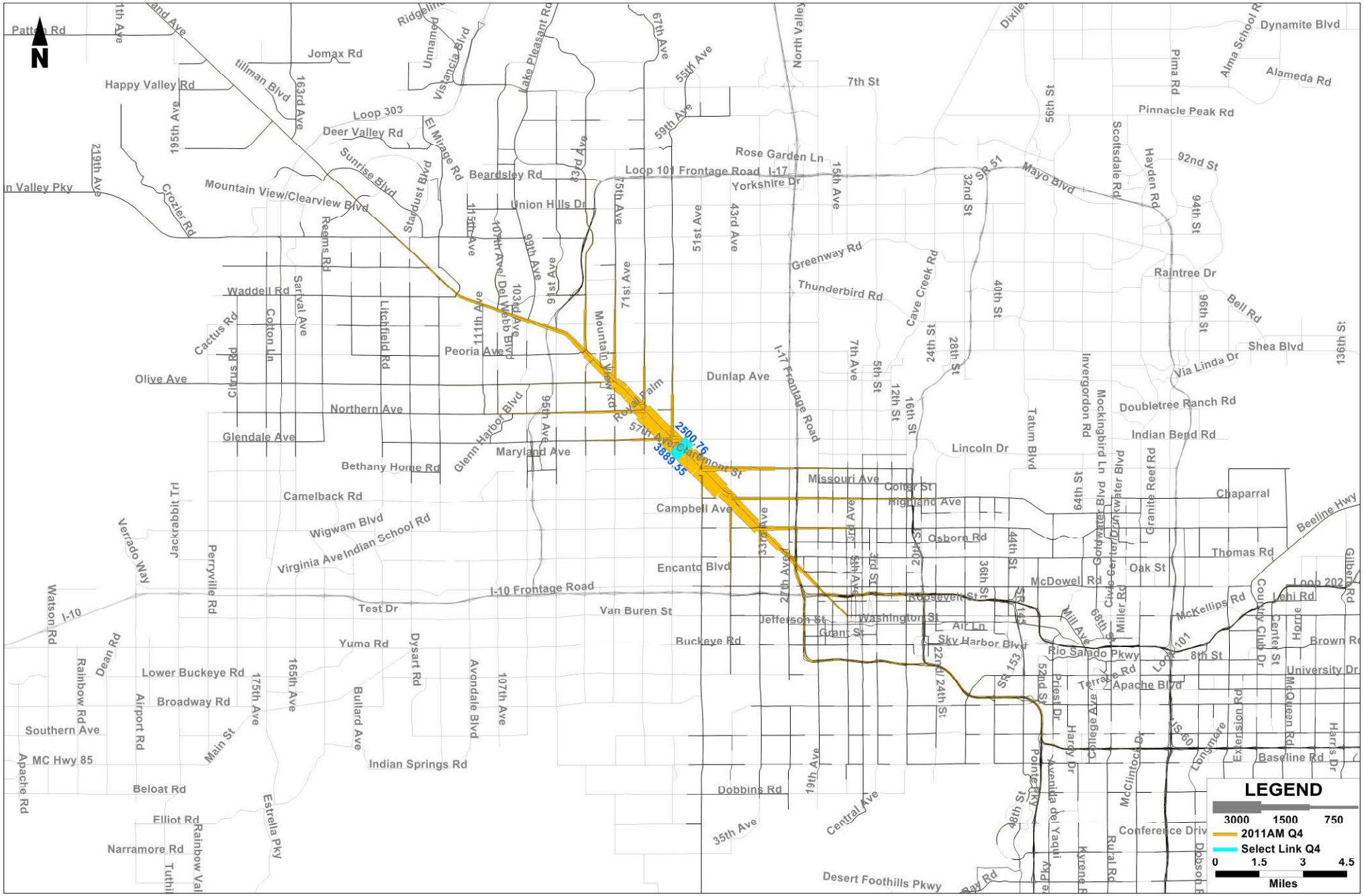
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Sunrise Blvd
Stardust Blvd
El Mirage Rd
Vistancia Blvd
Lake Pleasant Rd
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Cave Creek Rd
Gotowater Blvd
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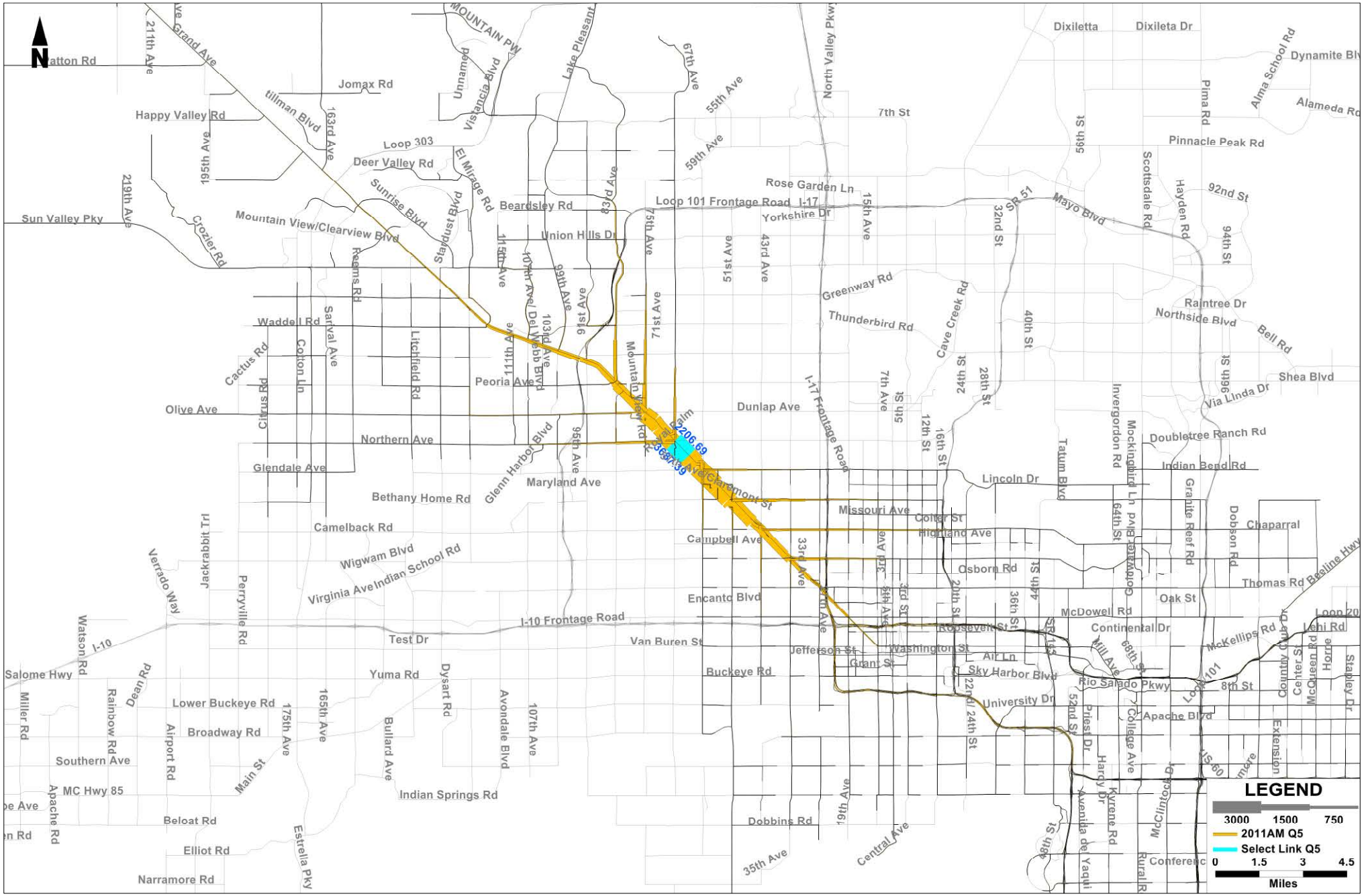
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59th Ave
Sun Valley Pky
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Stardust Blvd
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43rd Ave
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Thunderbird Rd
Cave Creek Rd
40th St
Raintree Dr
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Sarival Ave
Cotton Ln
Litchfield Rd
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Jefferson St
Washington St
Grant St
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McKellips Rd
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Buckeye Rd
Rio Salado Pkwy
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8th St
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Harry Dr
Kyrene Rd
College Ave
McClintock Dr
Avenida del Yaqui
Rural Rd
Conference
Extension
Center St
McQueen Rd
County Club Dr
Horne
LEGEND
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Select Link Q5
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Miles

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Pima Rd
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Westland Rd
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Invergordon Rd
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Union Hills Dr
Deer Valley Rd
Happy Valley Rd
Jomax Rd
Patton Rd
Sun Valley Pky
Mountain View/Clearview Blvd
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Olive Ave
Northern Ave
Glendale Ave
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Indian School Rd
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Maryland Ave
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Del Webb Blvd
Vistancia Blvd
Lake Pleasant Rd
Unnamed
LONE MOUNTAIN PW
Tillman Blvd
Sunrise Blvd
Stardust Blvd
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Cactus Rd
Citrus Rd
Sarival Ave
Litchfield Rd
Reems Rd
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I-10
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Test Dr
Yuma Rd
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Rainbow Rd
Tuthill Rd
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Rooks Rd
Baseline Rd
Apache Rd
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Bullard Ave
Dysart Rd
Avondale Blvd
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203rd Ave
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75th Ave
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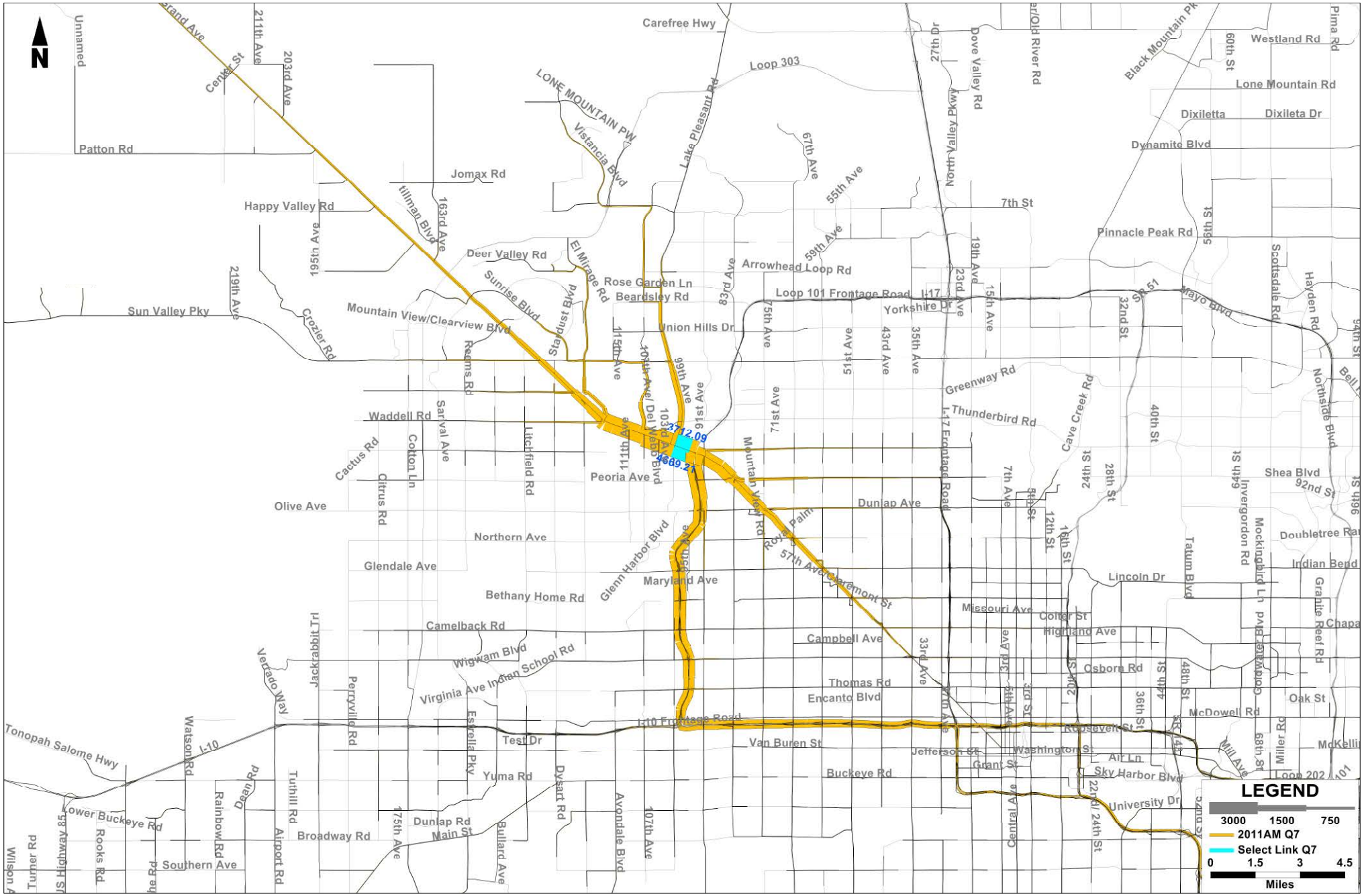
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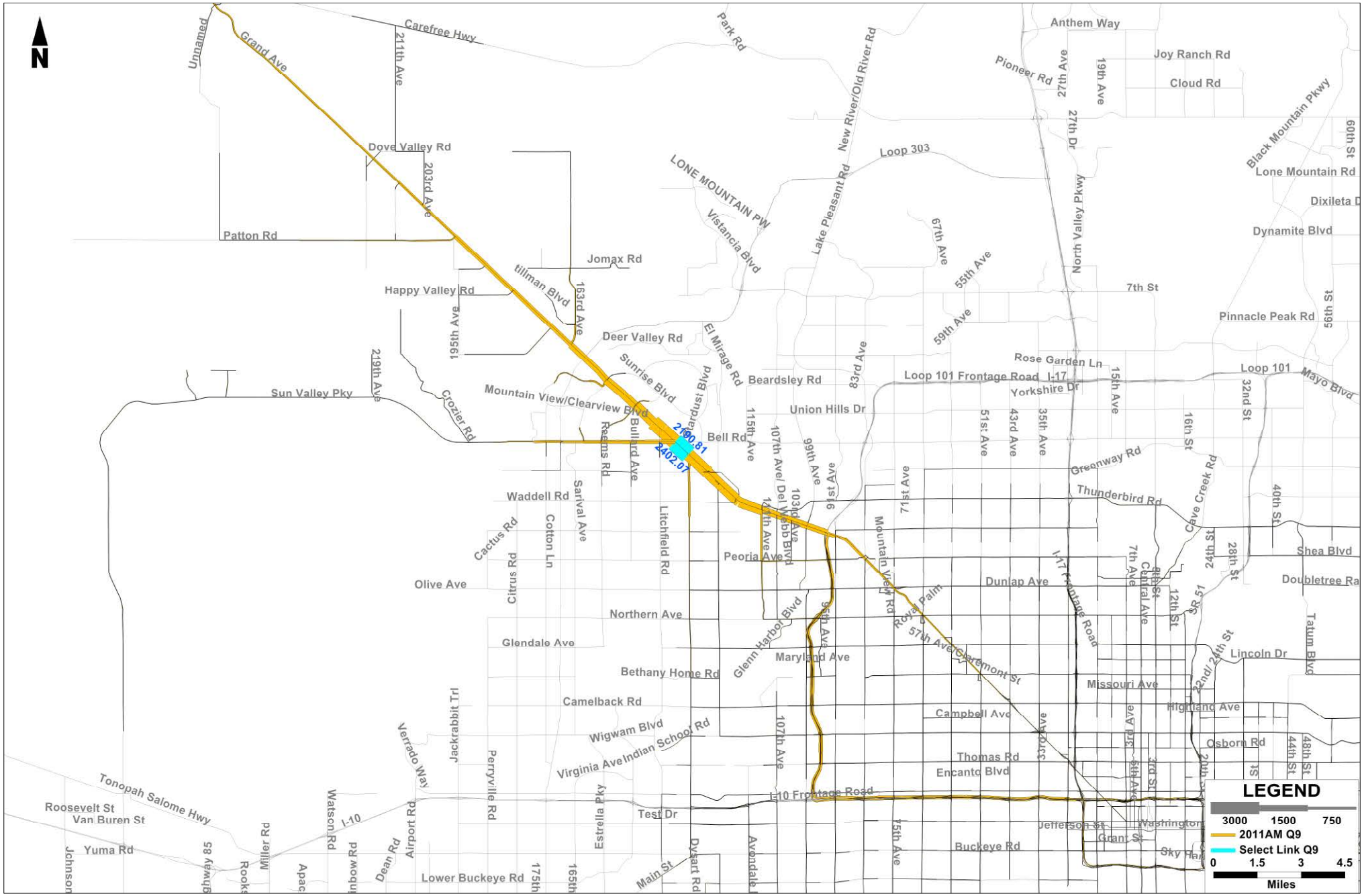
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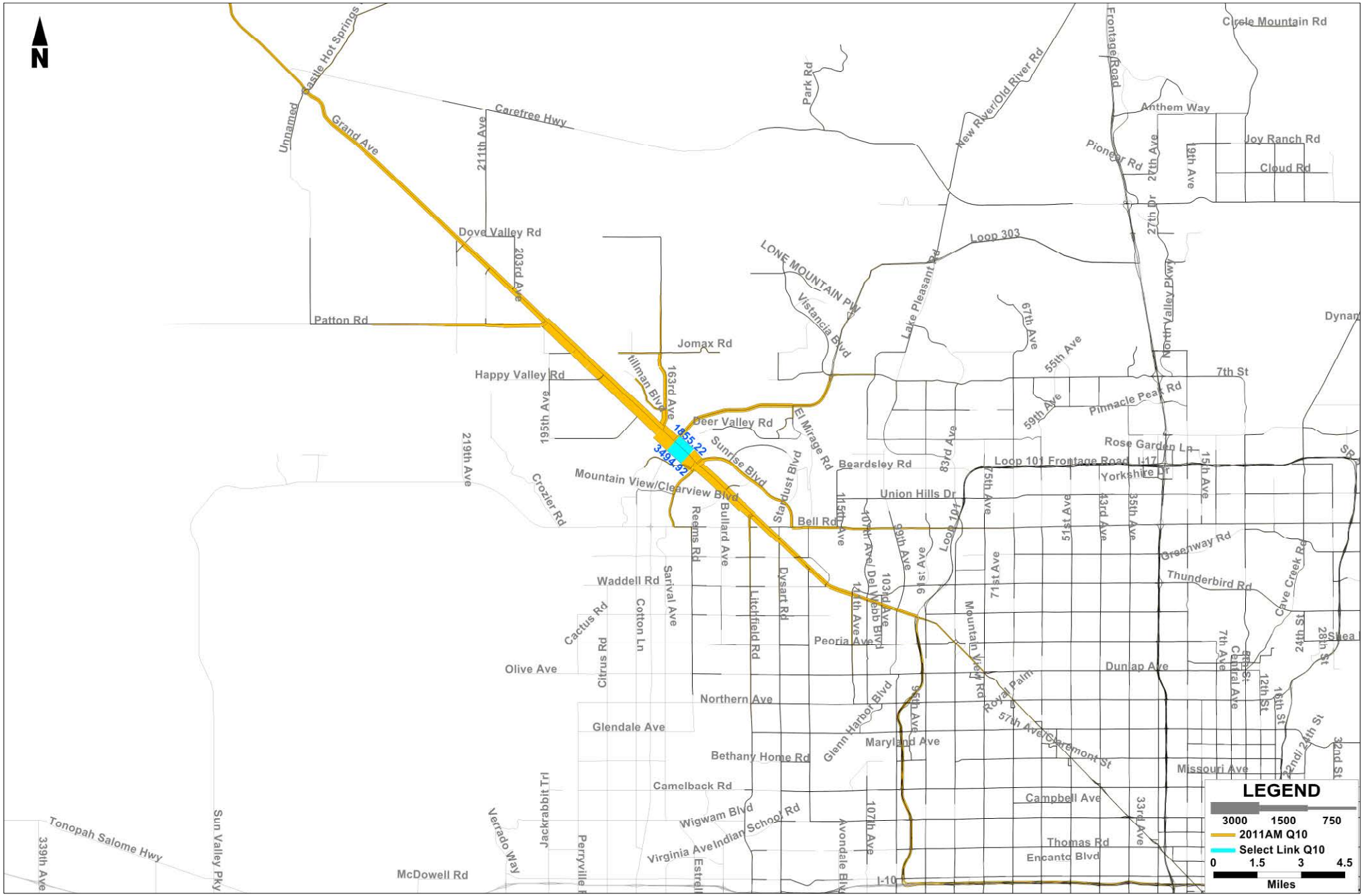
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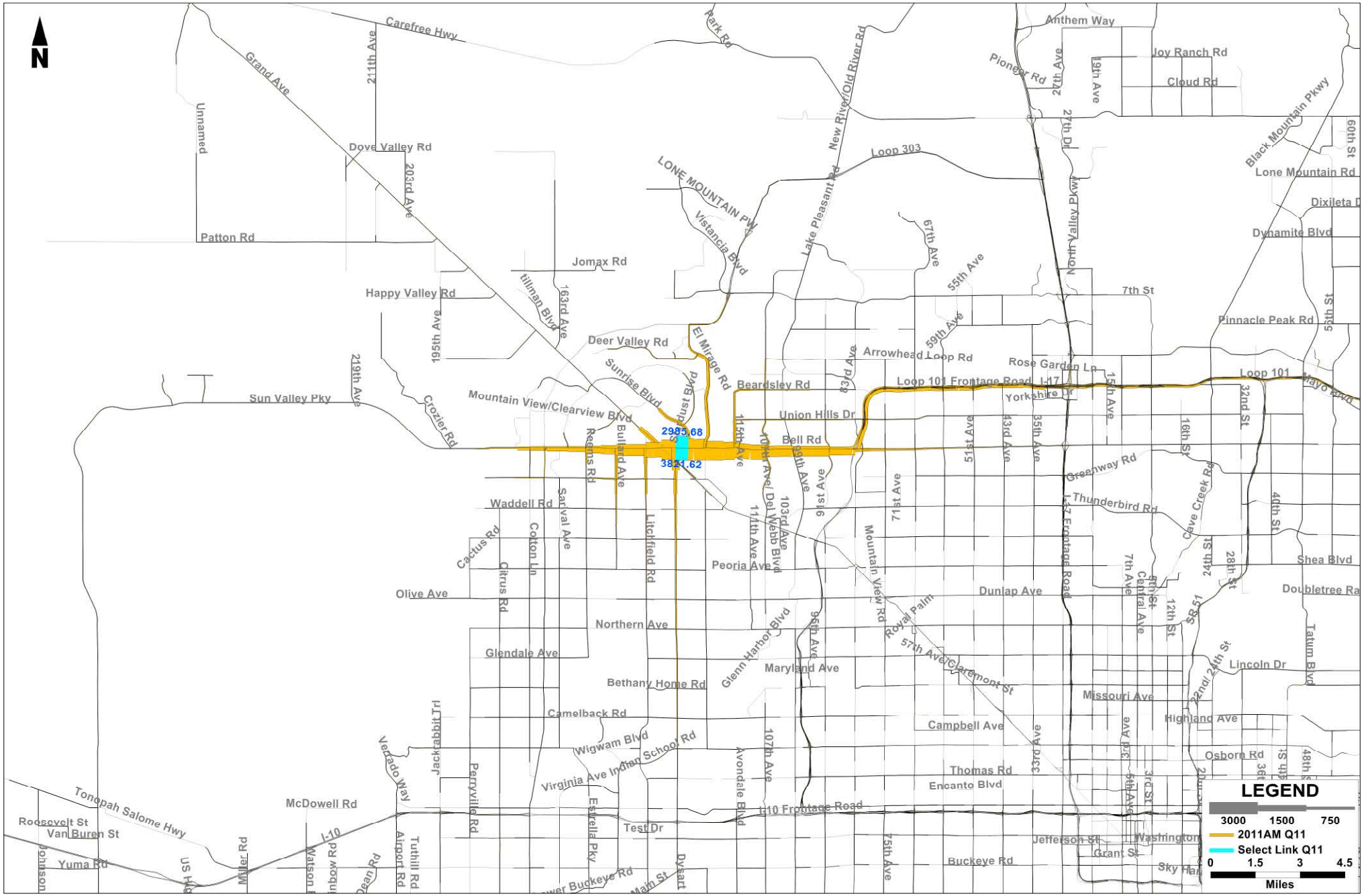
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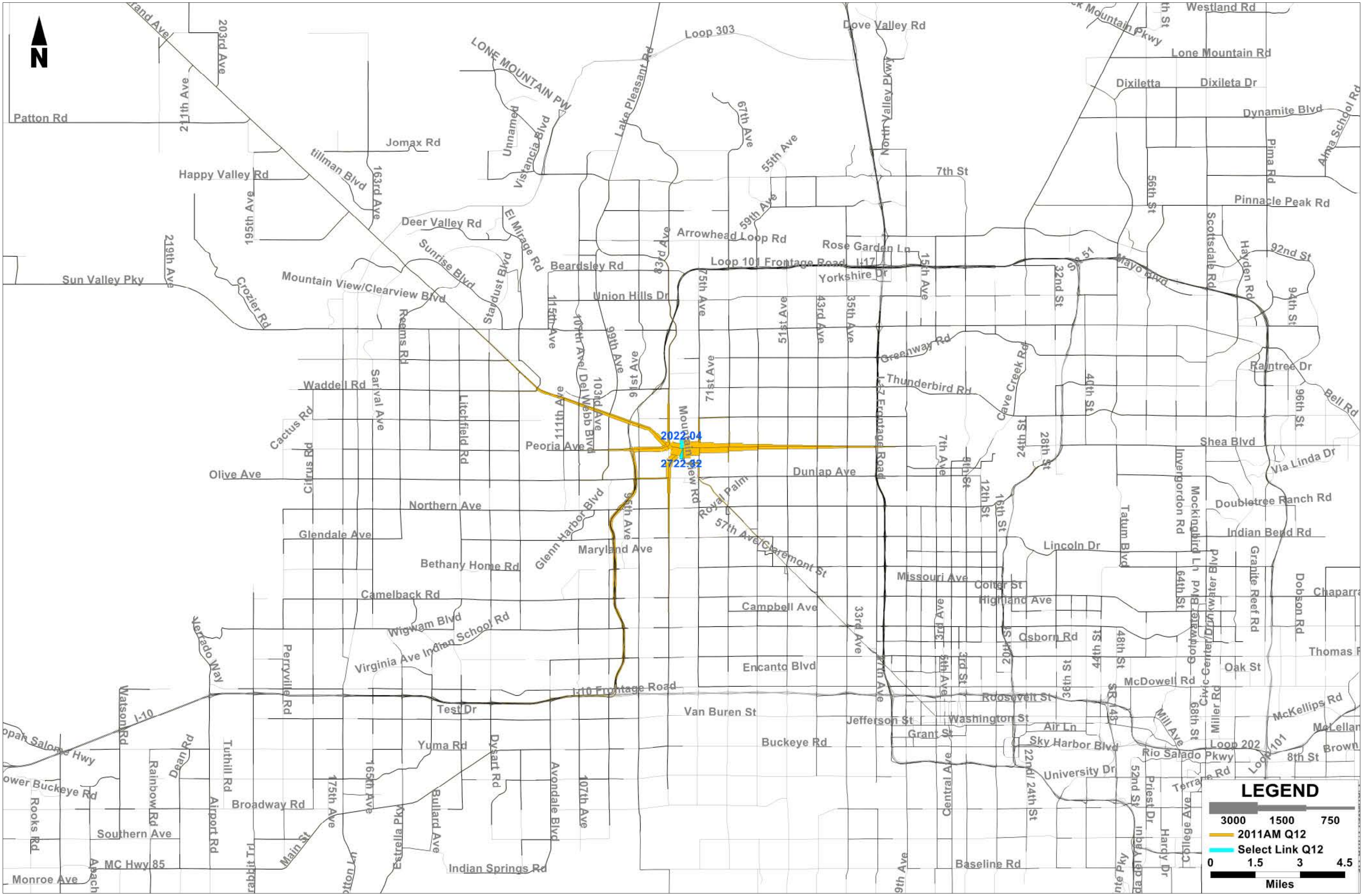
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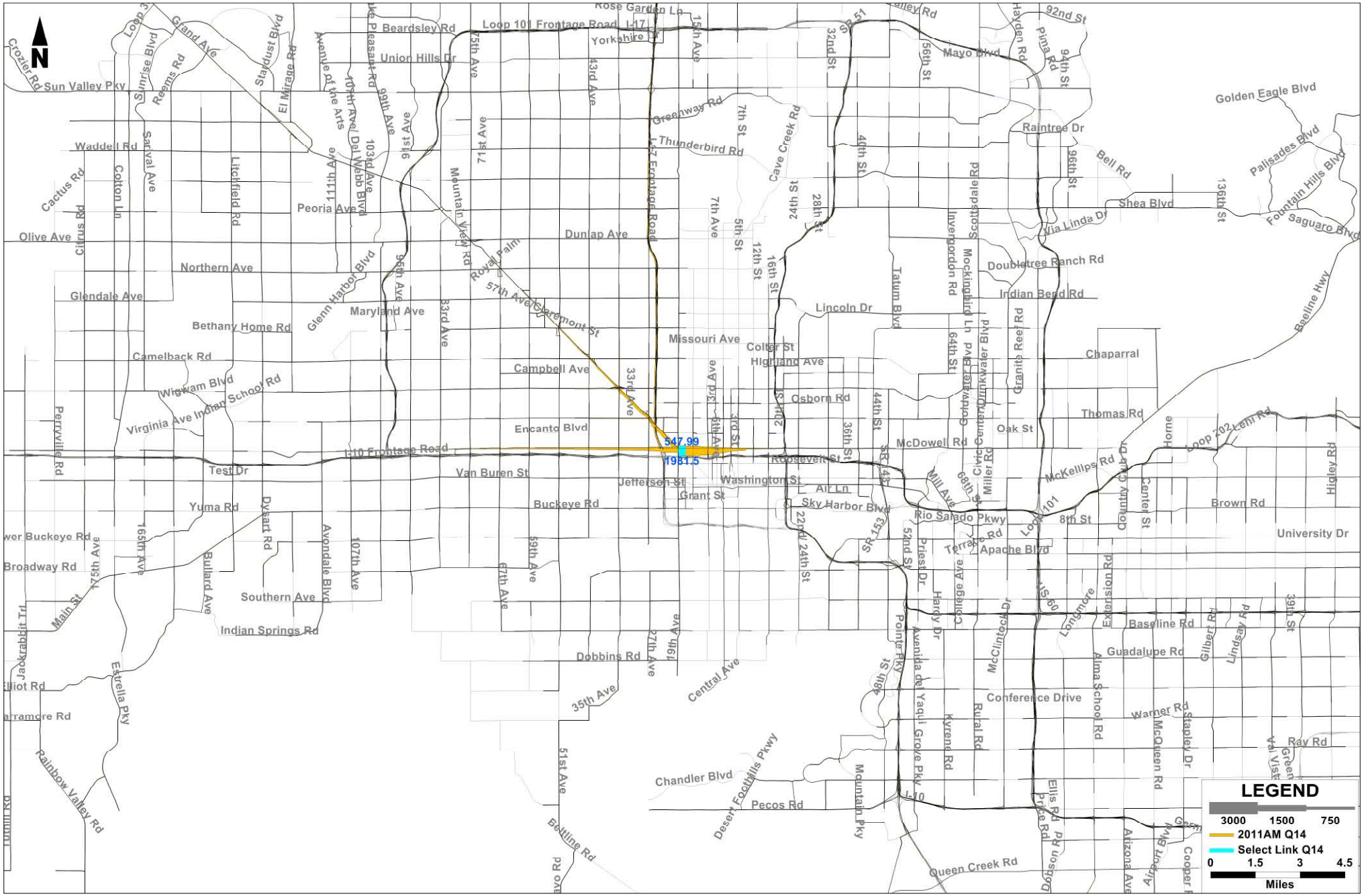
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Reems Rd
Litchfield Rd
Colton Ln
Sarival Ave
Glenn Harbor Blvd
Avondale Blvd
Dysart Rd
Bullard Ave
Perryville Rd
Main St
Estrella Pky
Rainbow Valley Rd
Beltline Rd
Desert Foothills Pkwy
Mountain Pky
Loop 101 Frontage Road
Ellis Rd
Price Rd
Loop 101
I-17
I-17 Frontage Road
Royal Palm
57th Ave/Claremont St
Cave Creek Rd
Tatum Blvd
Invergordon Rd
Mockingbird Ln
Goldwater Blvd
Civic Center/Drinkwater Blvd
Granite Reef Rd
Miller Rd
Mill Ave
Terrace Rd
College Ave
Hardy Dr
Priest Dr
Avenida del Yaqui
Grove Pky
Kyrene Rd
Rural Rd
McClintock Dr
Longmore
Alma School Rd
Extension Rd
Country Club Dr
Center St
McQueen Rd
Mesa Dr
Horne
Gilbert Rd
Lindsay Rd
Staple
Hayden Rd
Pima Rd
Tatum Blvd
Unnamed
Tsdale Rd
SR 51
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I-60
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Grand Ave
Loop 30
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Beardsley Rd
Union Hills Dr
Yorkshire Dr
Greenway Rd
Thunderbird Rd
Peoria Ave
Mountain View Rd
Olive Ave
Dunlap Ave
Northern Ave
Glendale Ave
Bethany Home Rd
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Virginia Ave
Indian School Rd
Maryland Ave
Missouri Ave
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Highland Ave
Lincoln Dr
Chaparral
Thomas Rd
Oak St
McDowell Rd
Osborn Rd
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Grant St
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Rio Salado Pkwy
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Lehi Rd
Brown Rd
University
Buckeye Rd
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Yuma Rd
Southern Ave
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Broadway Rd
Dobbins Rd
Central Ave
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Deer Valley Rd
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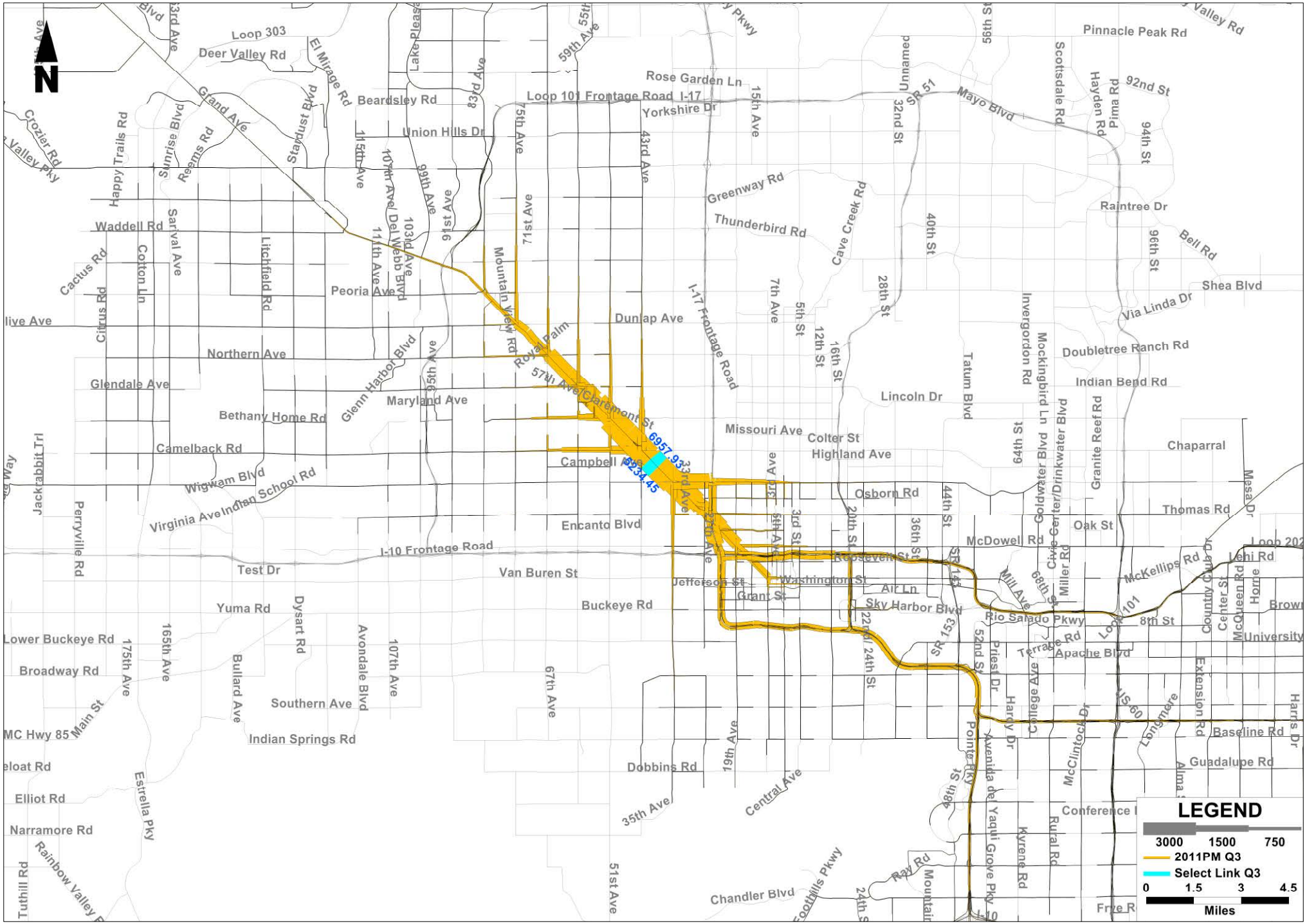
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Washington St
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Grant St
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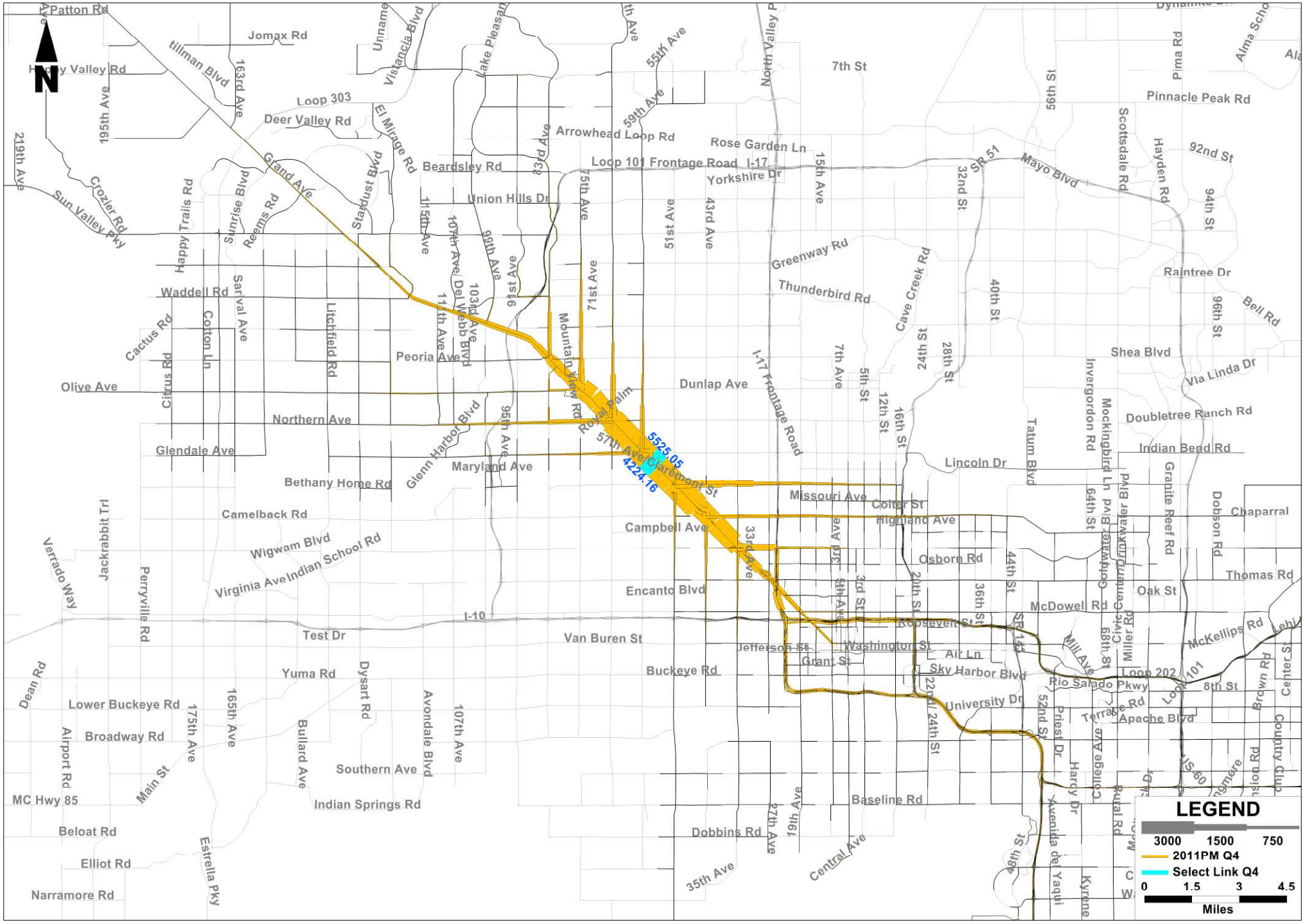
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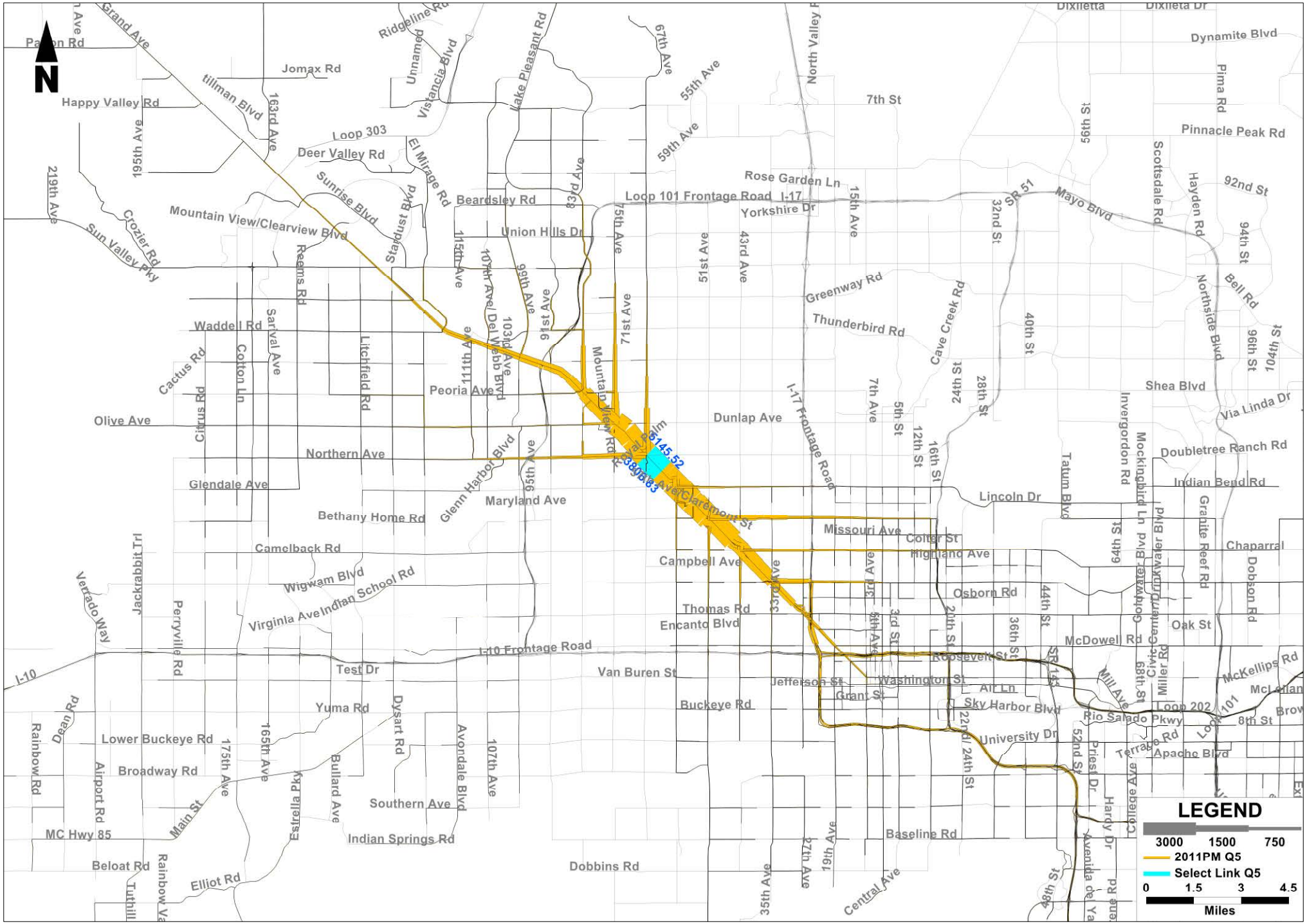
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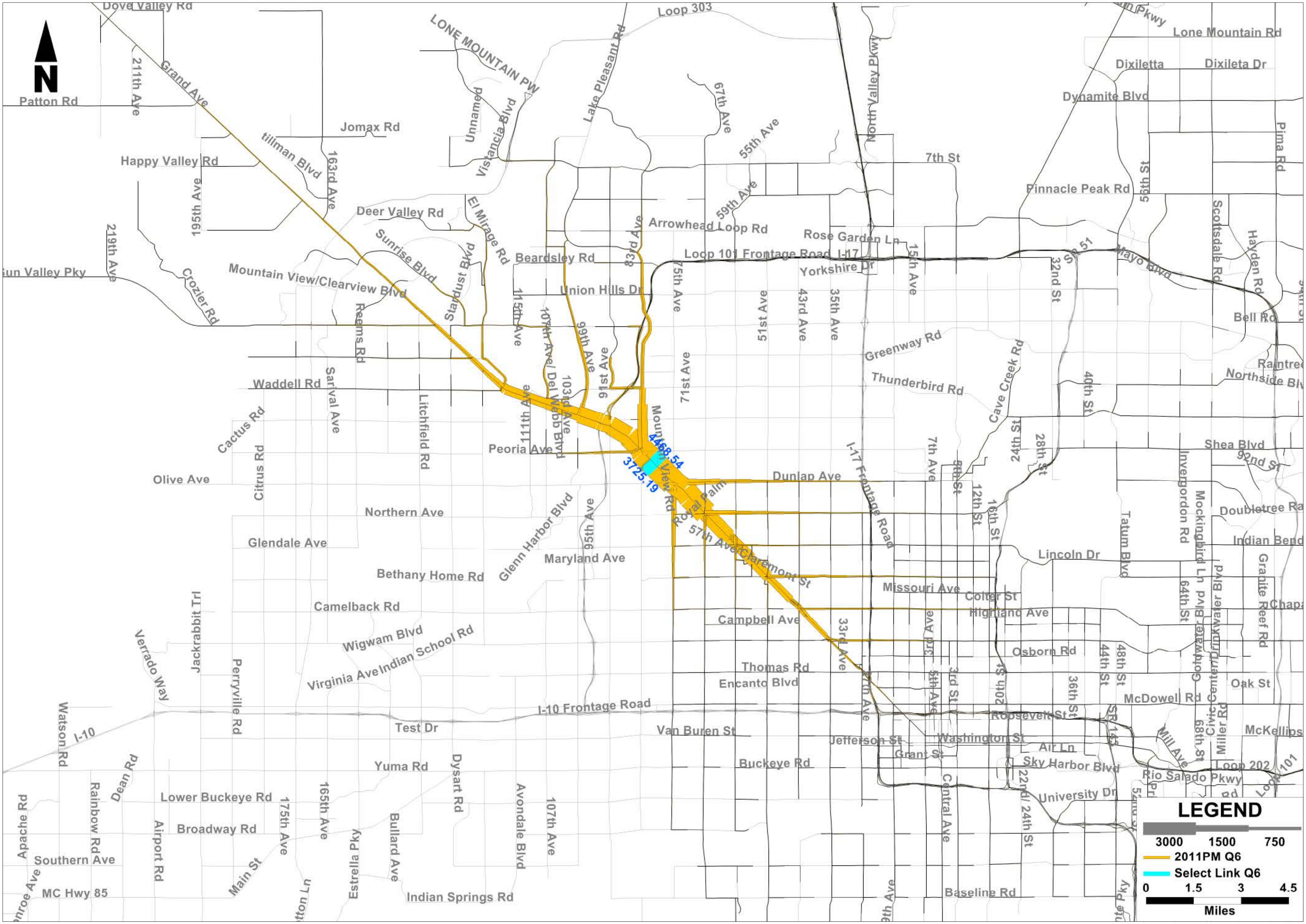
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219th Ave
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Scottsdale Rd
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Sun Valley Pkwy
Crozier Rd
Mountain View/Clearview Blvd
Stardust Blvd
Union Hills Dr
75th Ave
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43rd Ave
35th Ave
Reems Rd
115th Ave
107th Ave/ Del Webb Blvd
99th Ave
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Greenway Rd
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Maryland Ave
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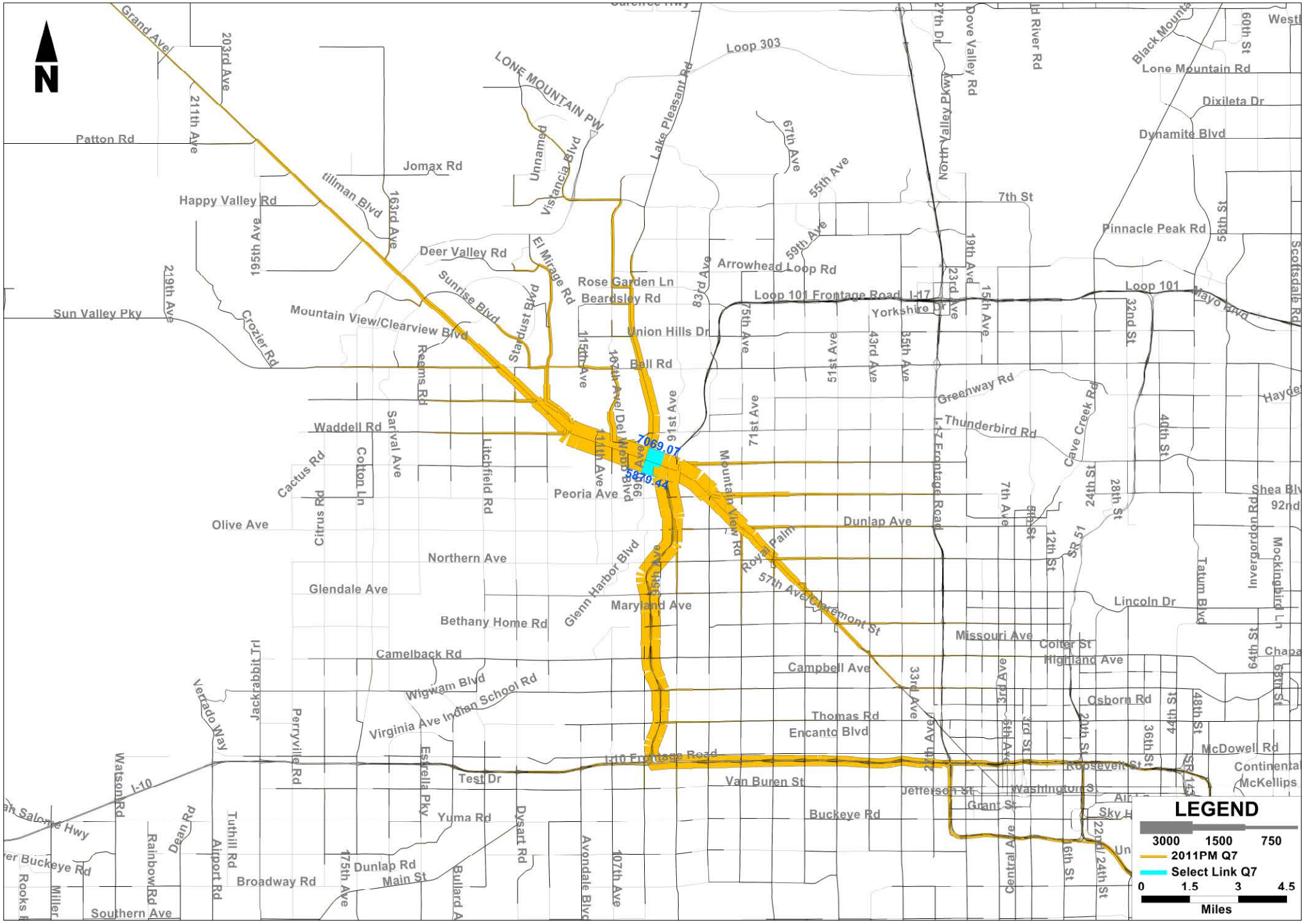
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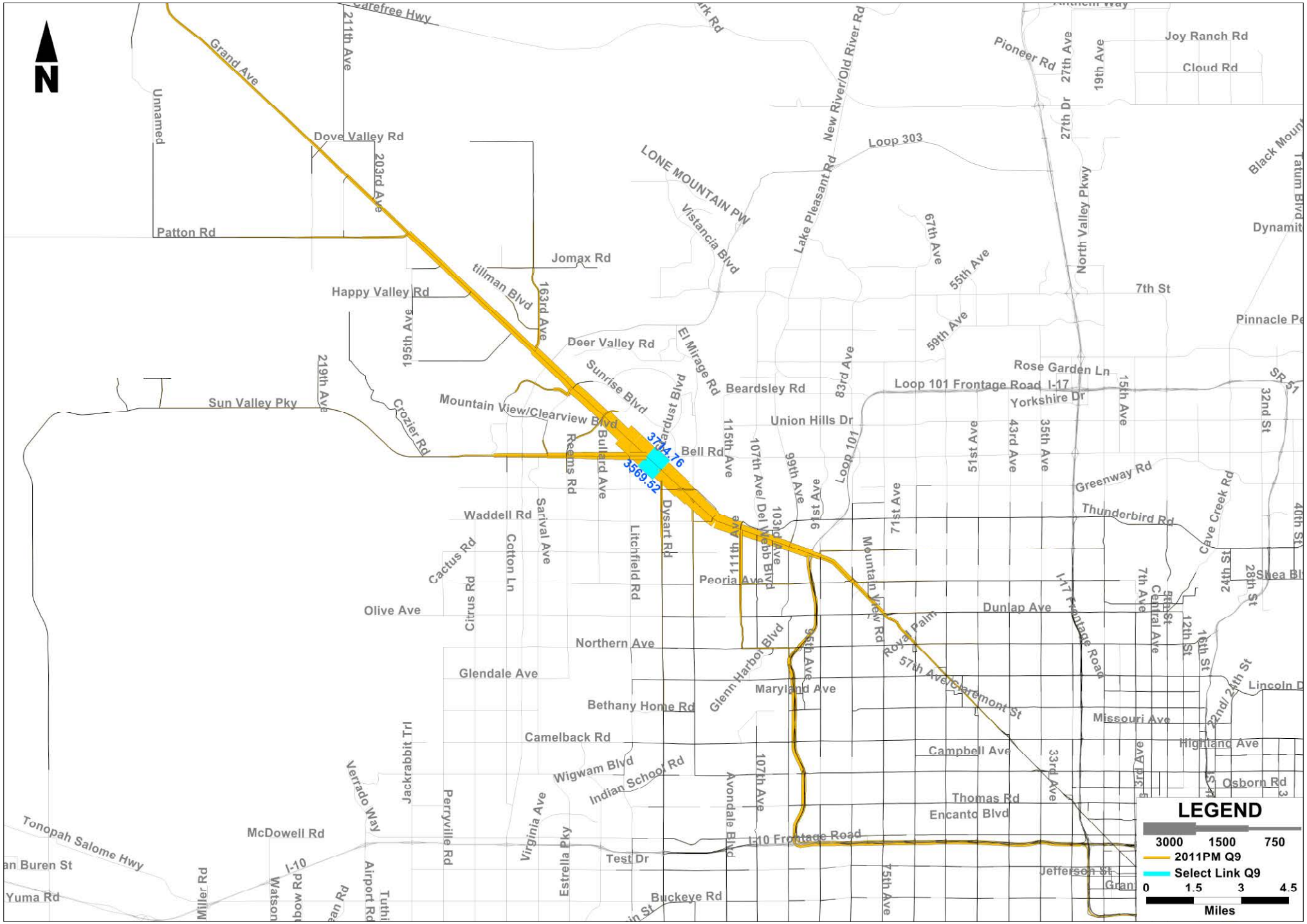
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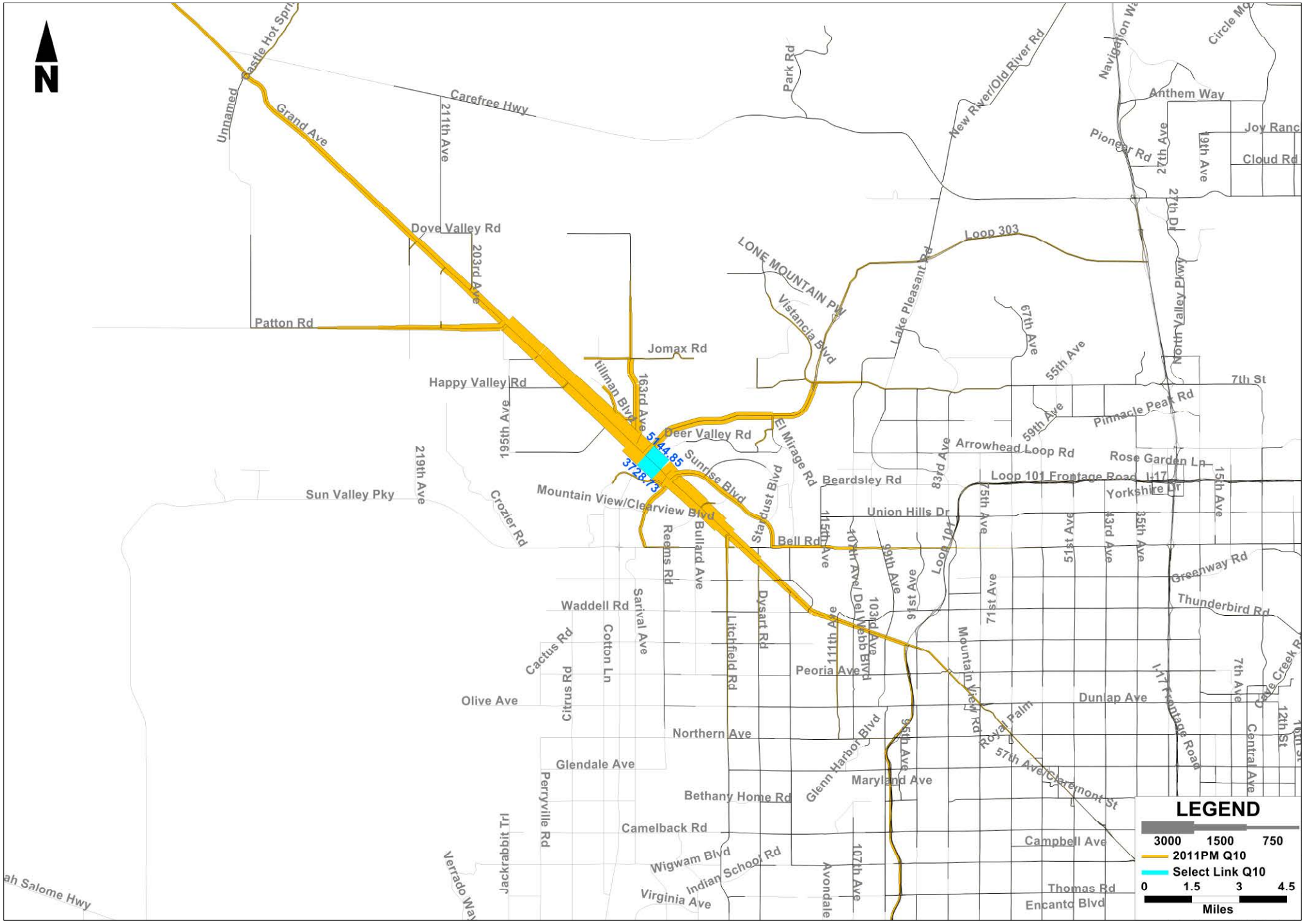
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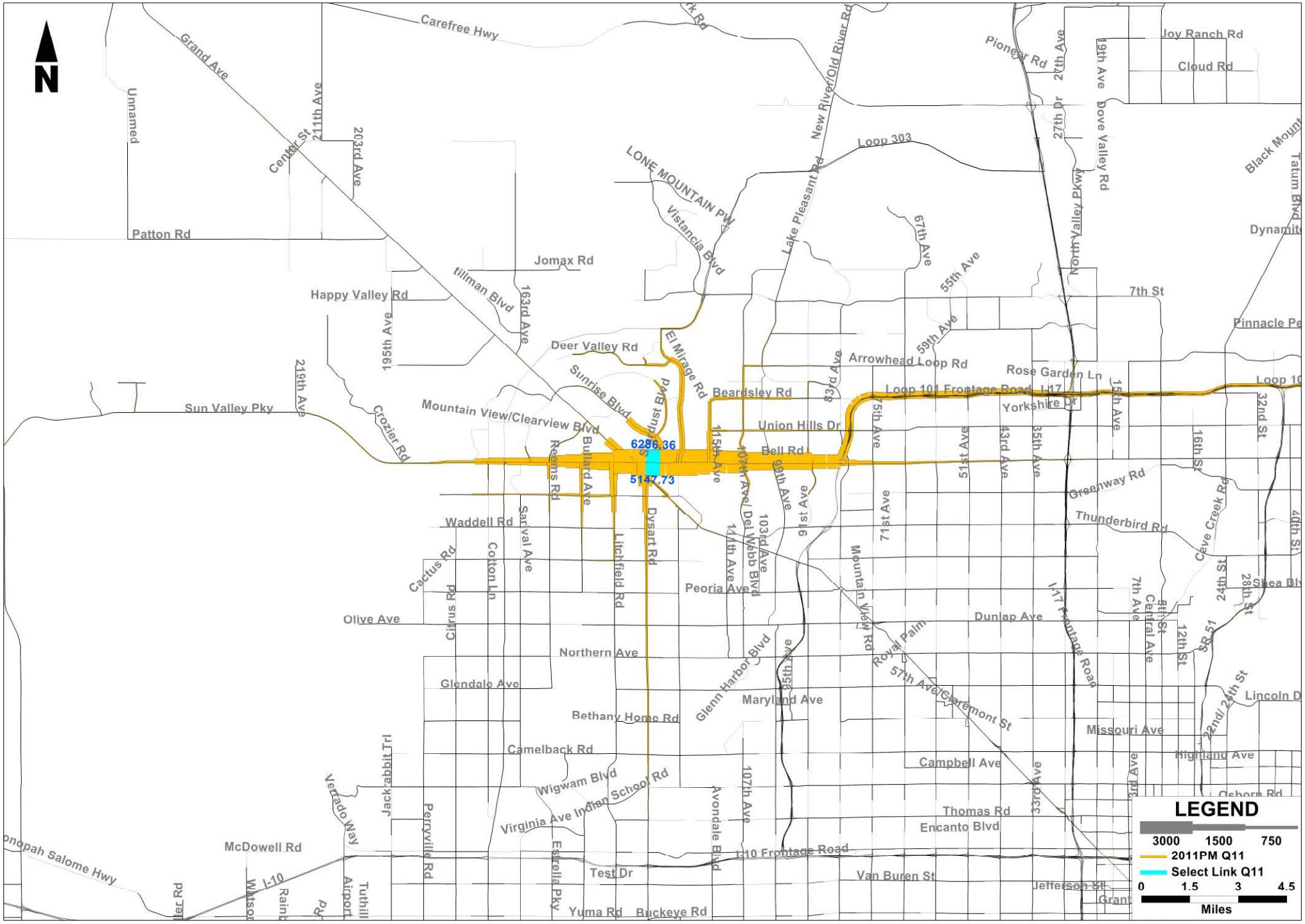
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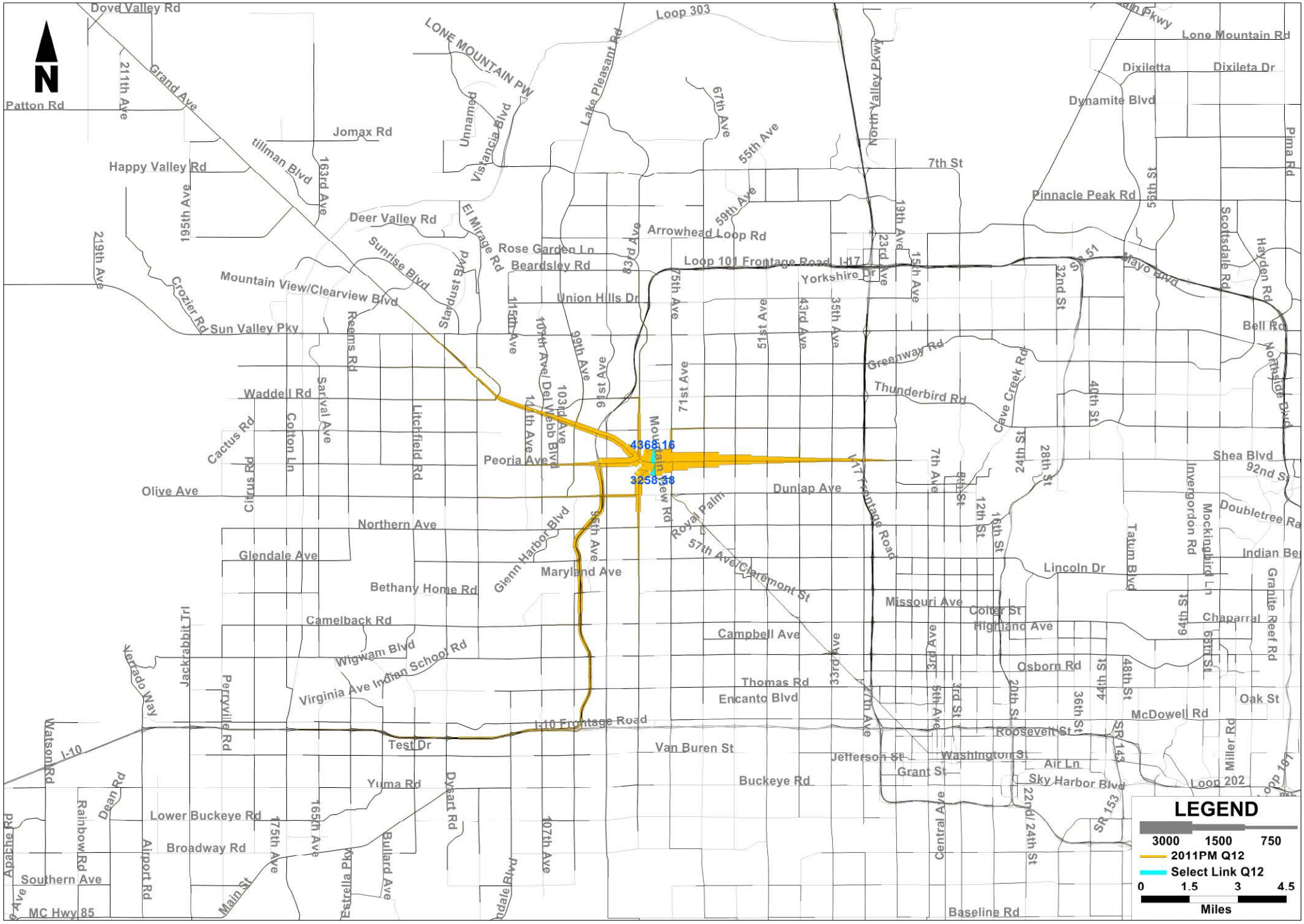
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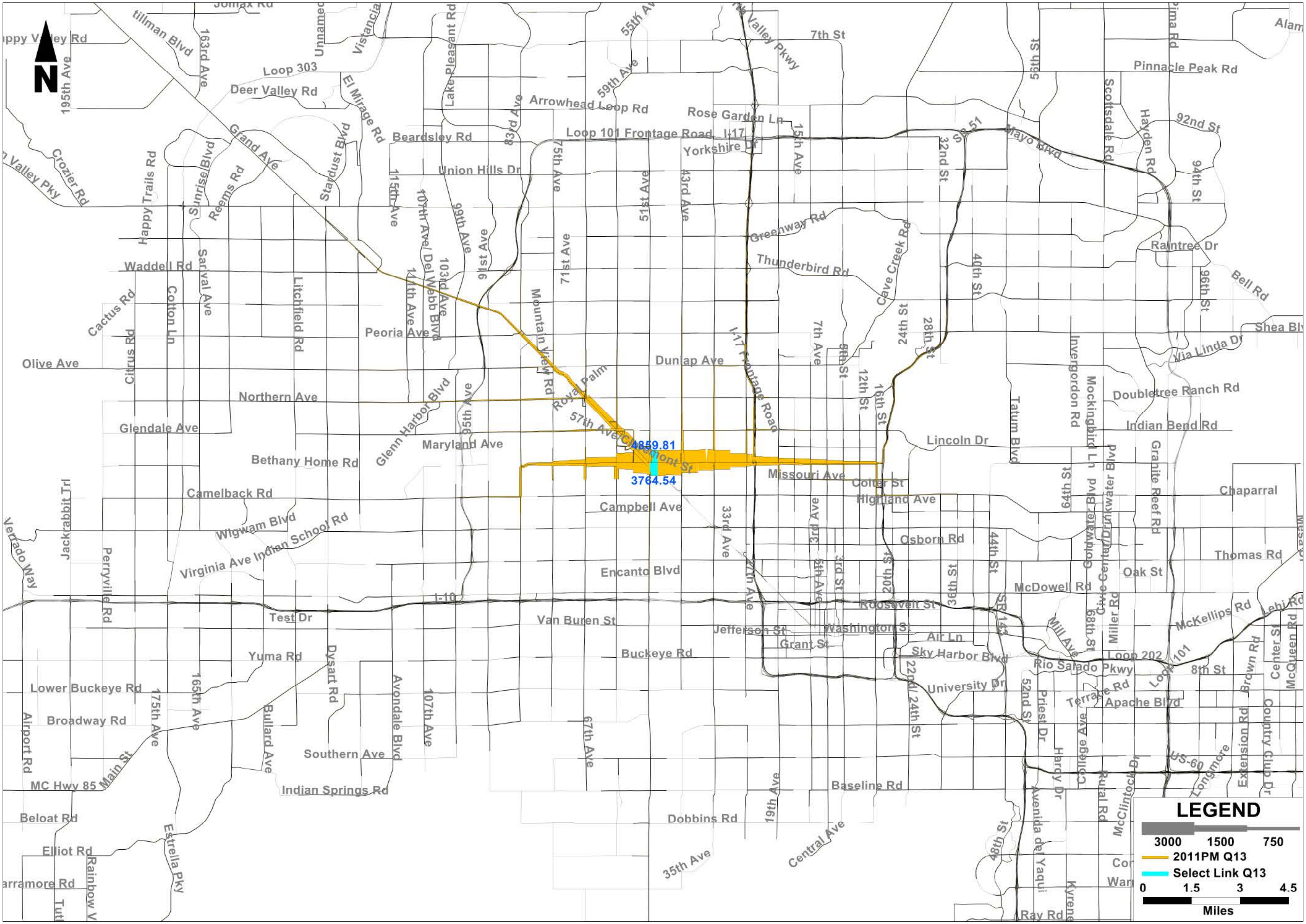
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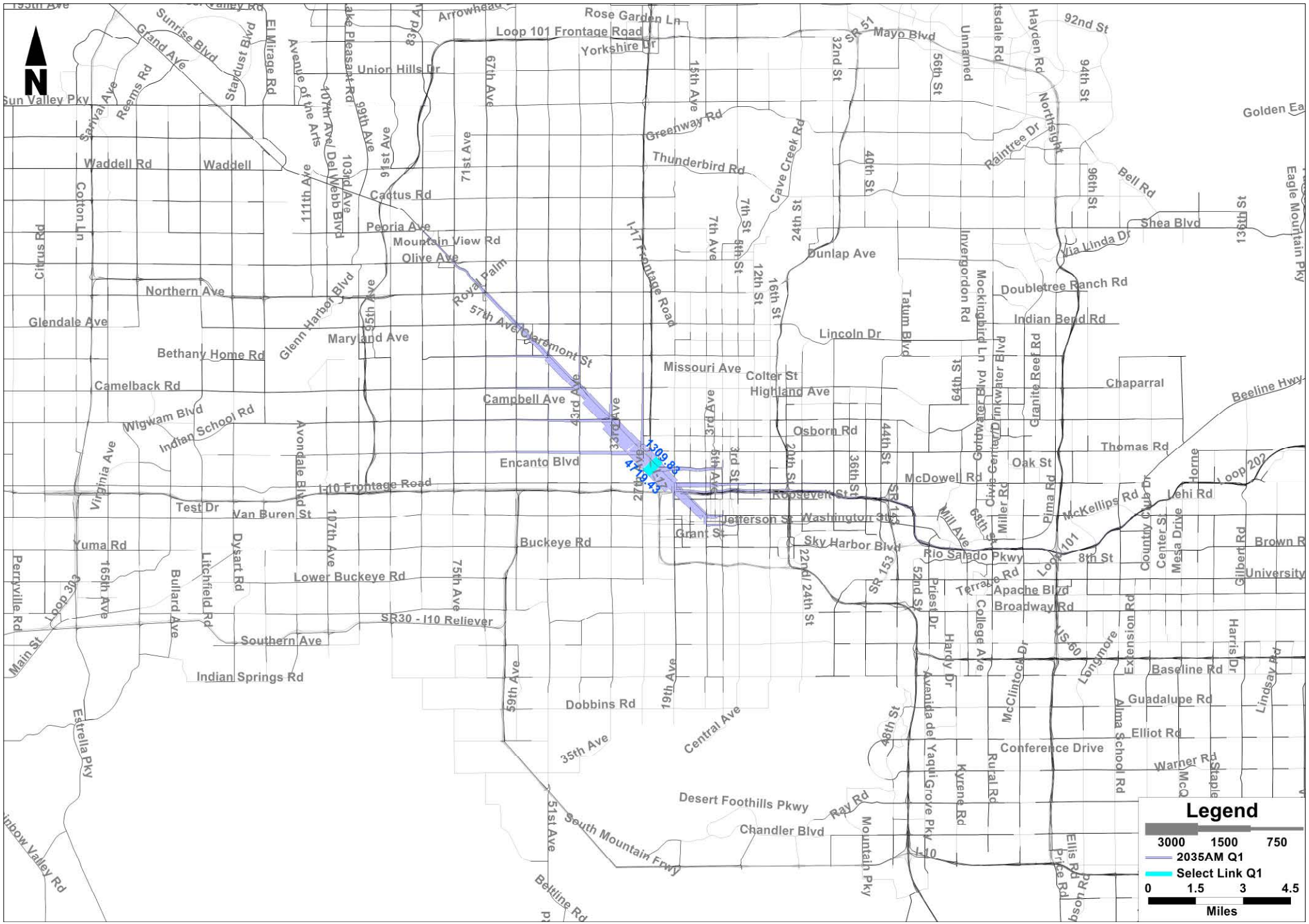
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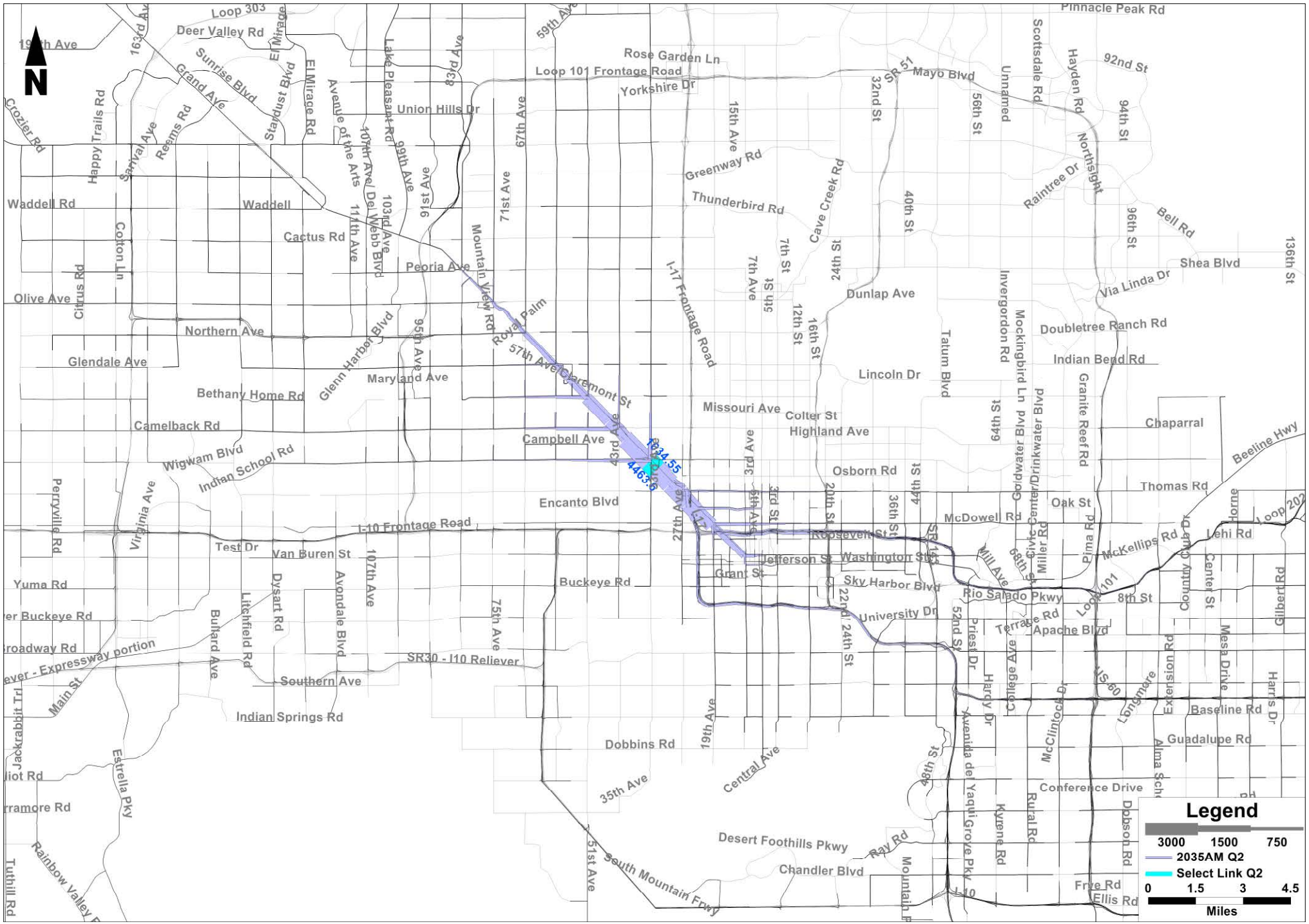
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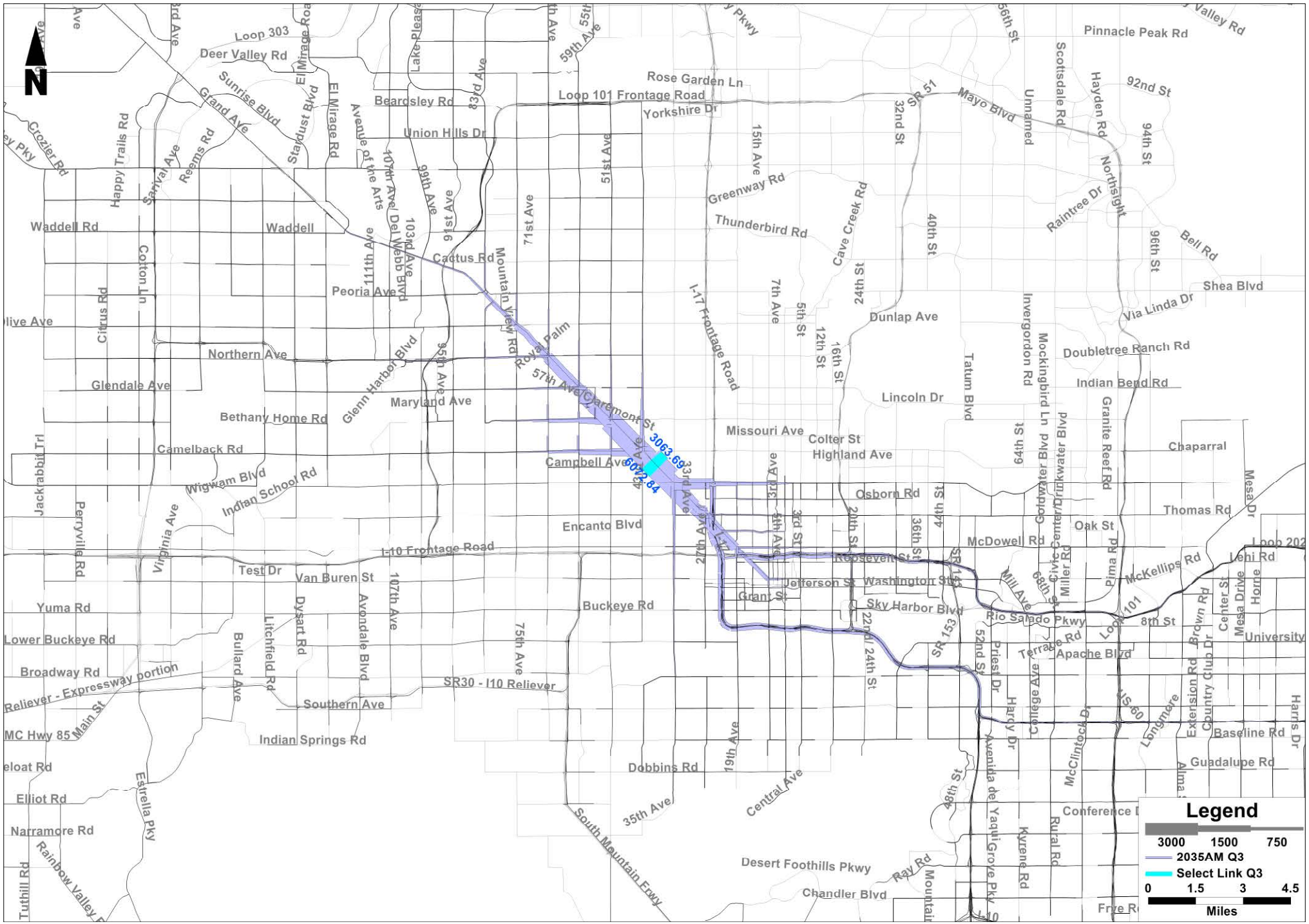
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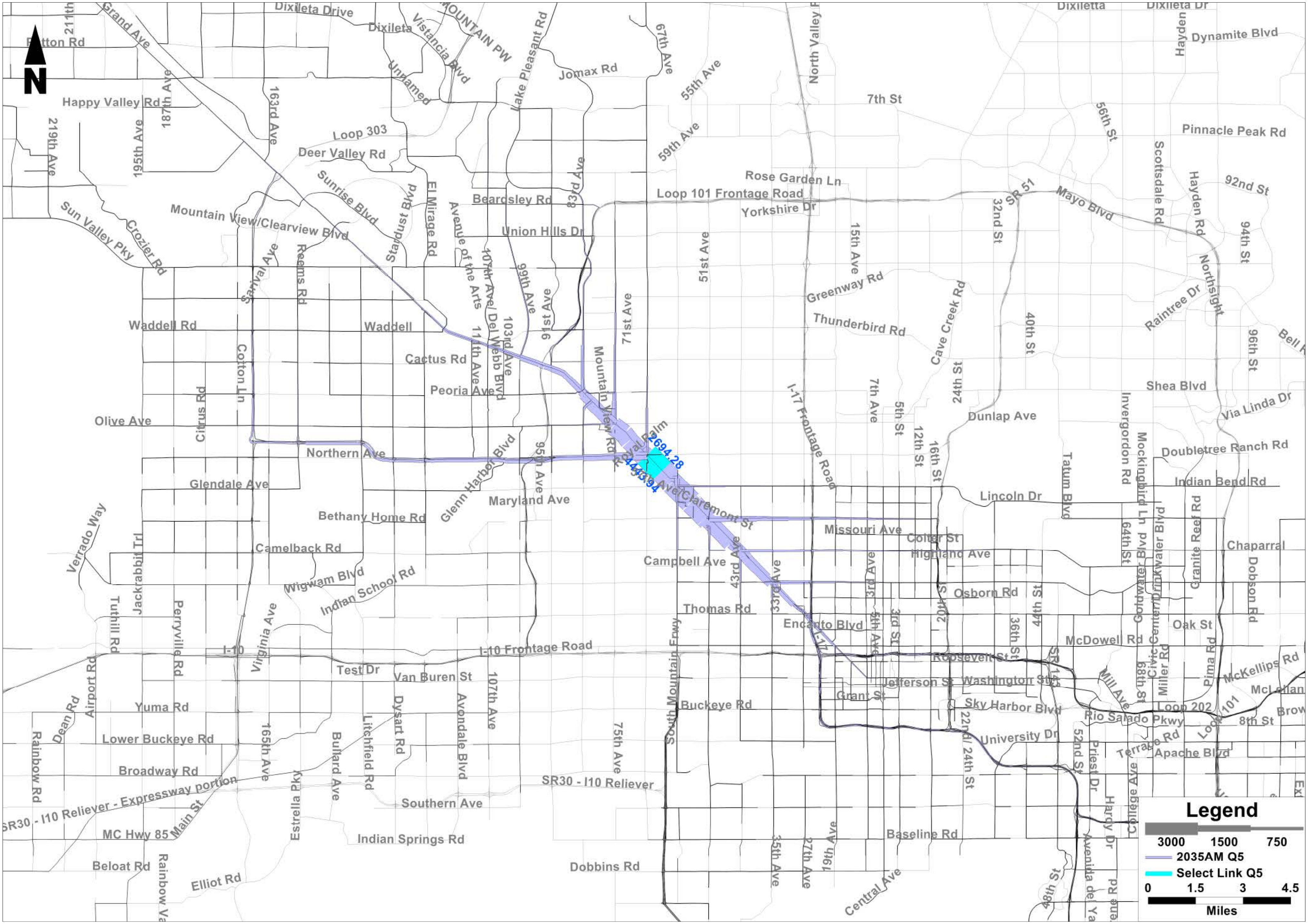
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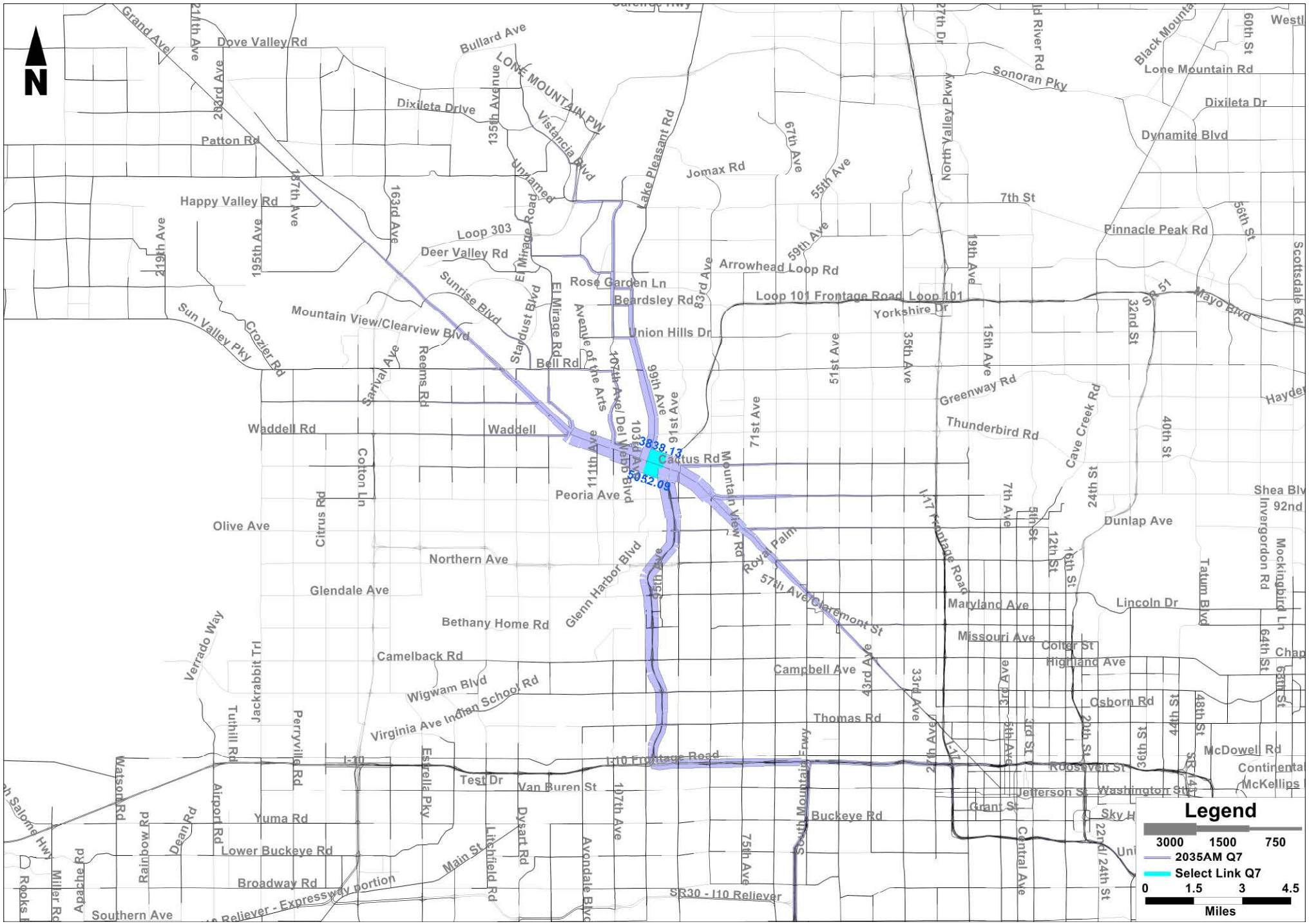
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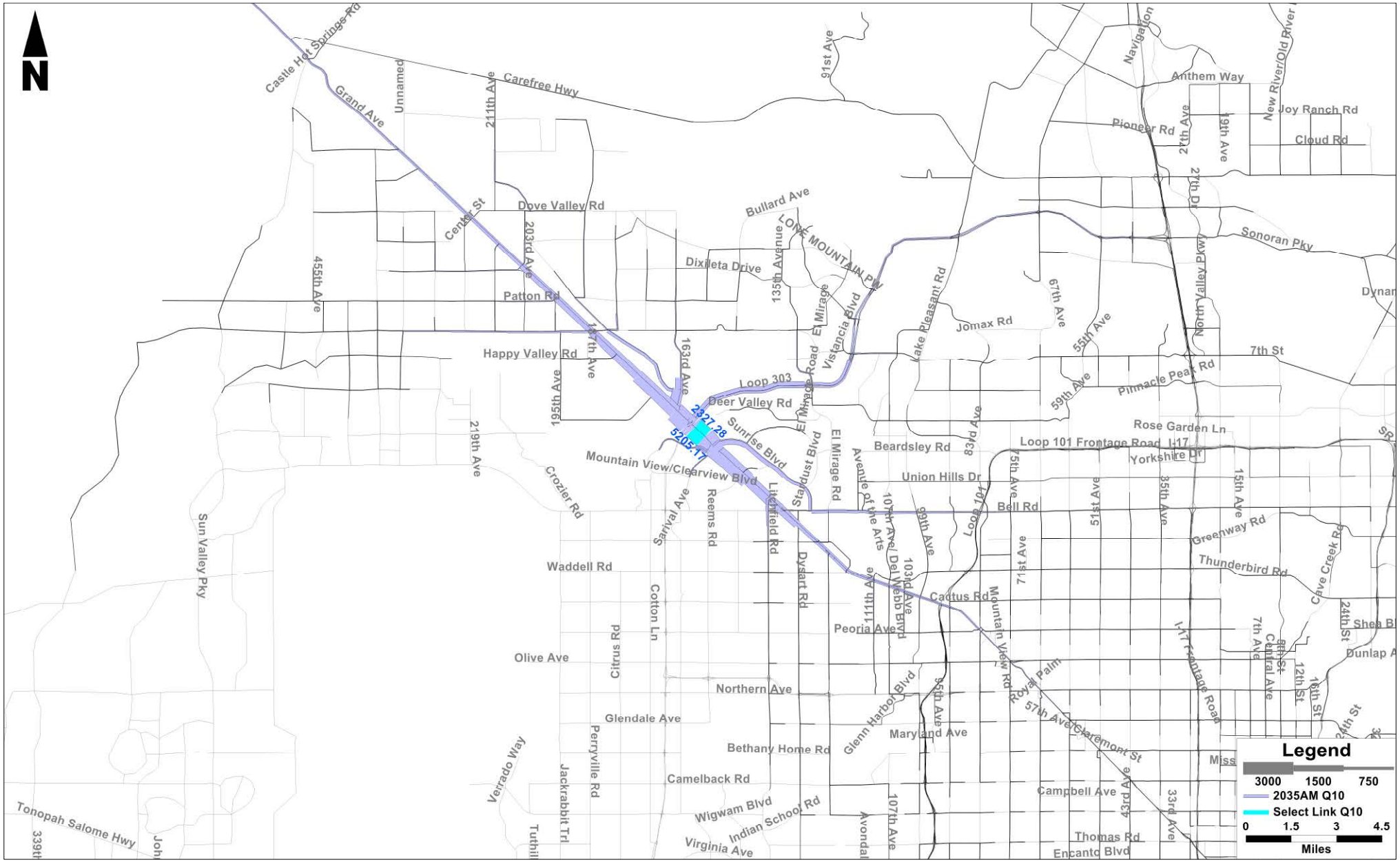
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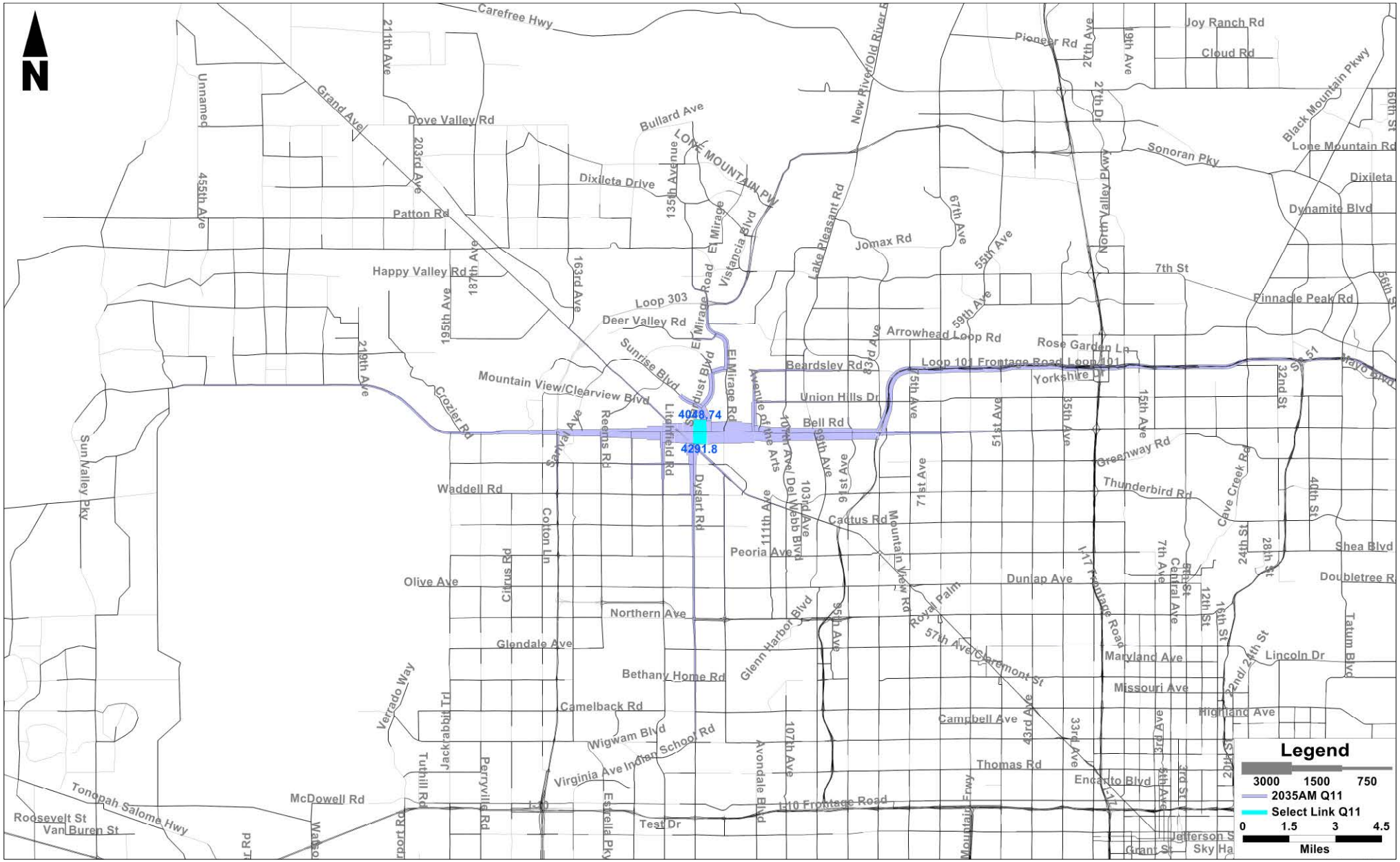
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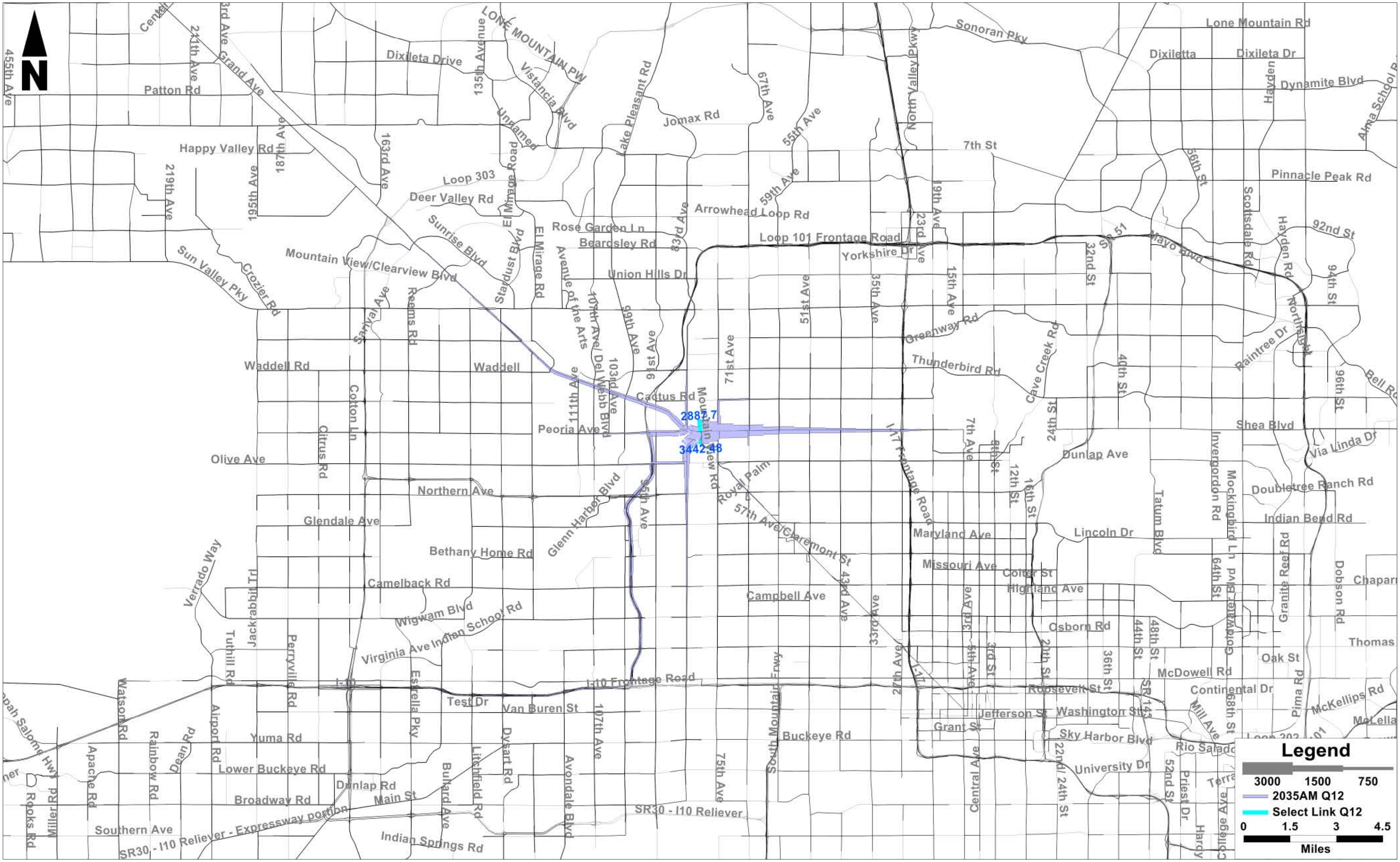
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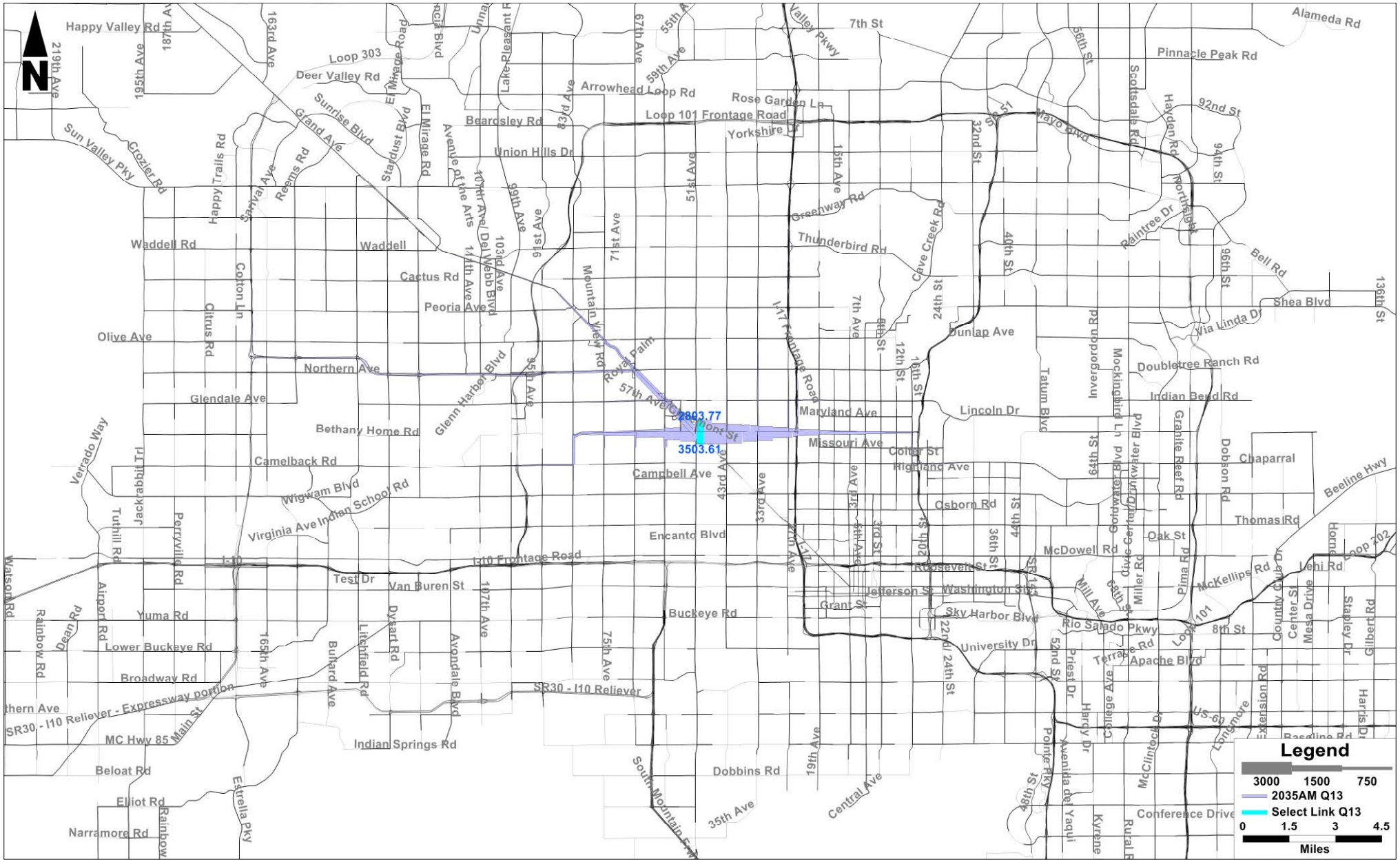
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MC Hwy 85
Main St
Indian Springs Rd
Beloat Rd
Elliot Rd
Narramore Rd
Dobbins Rd
South Mountain Fwy
Central Ave
35th Ave
19th Ave
75th Ave
107th Ave
165th Ave
163rd Ave
195th Ave
187th Ave
219th Ave
Avondale Blvd
Litchfield Rd
Dysart Rd
Bullard Ave
Estrella Pky
Citrus Rd
Colton Ln
Santa Fe Ave
Glenn Harbor Blvd
Royal Palm
Mountain View Rd
Del Webb Blvd
Avenue of the Arts
Lake Pleasant Rd
Unnamed
Valley Pkwy
I-17 Frontage Road
Cave Creek Rd
24th St
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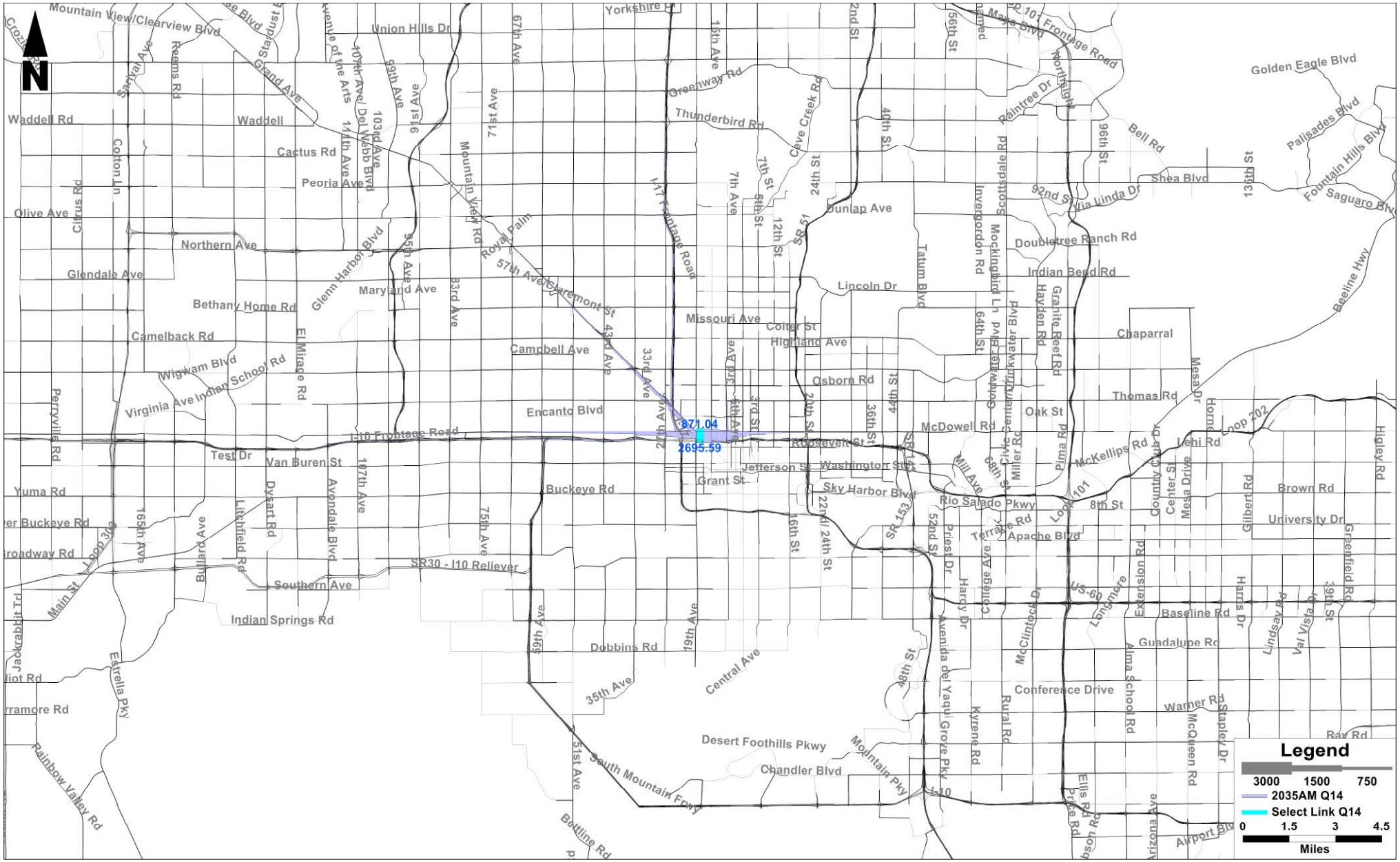
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Yorkshire Dr
Golden Eagle Blvd
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Waddell
Cactus Rd
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Olive Ave
Northern Ave
Glendale Ave
Bethany Home Rd
Camelback Rd
Wigwam Blvd
Indian School Rd
Virginia Ave
Maryland Ave
Missouri Ave
Colter St
Highland Ave
Campbell Ave
Osborn Rd
Encanto Blvd
Thunderbird Rd
Greenway Rd
Dunlap Ave
Lincoln Dr
Doubletree Ranch Rd
Indian Bend Rd
Shea Blvd
Bell Rd
Palisades Blvd
Fountain Hills Blvd
Saguaro Blvd
Beeline Hwy
Chaparral
Thomas Rd
Oak St
McDowell Rd
McKellips Rd
Lehi Rd
Brown Rd
University Dr
Baseline Rd
Guadalupe Rd
Warner Rd
Ray Rd
Conference Drive
Test Dr
Van Buren St
Yuma Rd
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Broadway Rd
Southern Ave
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Dobbins Rd
Roosevelt St
Jefferson St
Washington St
Grant St
Sky Harbor Blvd
Rio Salado Pkwy
Apache Blvd
Terrace Rd
Mill Ave
Priest Dr
Hardy Dr
Kyrene Rd
Rural Rd
McClintock Dr
Longmore
Extension Rd
Alma School Rd
McQueen Rd
Stapley Dr
Harris Dr
Gilbert Rd
Greenfield Rd
Val Vista Dr
Lindsay Rd
Ellis Rd
Price Rd
Airport Blvd
Arizona Ave
Desert Foothills Pkwy
Chandler Blvd
South Mountain Fwy
Mountain Pkwy
Central Ave
Estrella Pkwy
Rainbow Valley Rd
Bethline Rd
Elliot Rd
Warmer Rd
Main St
Loop 202
Loop 101
Loop 303
I-10 Frontage Road
SR30 - I10 Reliever
I-17 Frontage Road
Royal Palm
57th Ave
Claremont St
Cave Creek Rd
Scottsdale Rd
Tatum Blvd
Invergordon Rd
Mockingbird Ln
Hayden Rd
Granite Reef Rd
Pima Rd
Miller Rd
Mesa Dr
Horne
Higley Rd
Perryville Rd
Litchfield Rd
Dysart Rd
Avondale Blvd
Bullard Ave
Citrus Rd
Cotton Ln
Reems Rd
Sarival Ave
Grand Ave
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El Mirage Rd
Mountain View Rd
Jackrabbit Trl
Yuma Rd
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Central Ave
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Sunrise Blvd
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Reems Rd
Santa Fe Ave
El Mirage Rd
Avenue of the Arts
Lake Pleasant Rd
Arrowhead
Rose Garden Ln
Loop 101 Frontage Road
Yorkshire Dr
Union Hills Dr
Mayo Blvd
SR 51
Hayden Rd
92nd St
94th St
Golden Ea
Waddell Rd
Waddell
Cotton Ln
Citrus Rd
Cactus Rd
Peoria Ave
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Olive Ave
Northern Ave
Glendale Ave
Glenn Harbor Blvd
Maryland Ave
Bethany Home Rd
Camelback Rd
Wigwam Blvd
Indian School Rd
Virginia Ave
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Test Dr
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Beltline Rd
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Greenway Rd
Thunderbird Rd
Cave Creek Rd
Dunlap Ave
Lincoln Dr
Missouri Ave
Colter St
Highland Ave
Osborn Rd
Encanto Blvd
Roosevelt St
Jefferson St
Washington St
Grant St
Sky Harbor Blvd
Rio Salado Pkwy
McDowell Rd
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Thomas Rd
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Beeline Hwy
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Lehi Rd
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Yorkshire Dr
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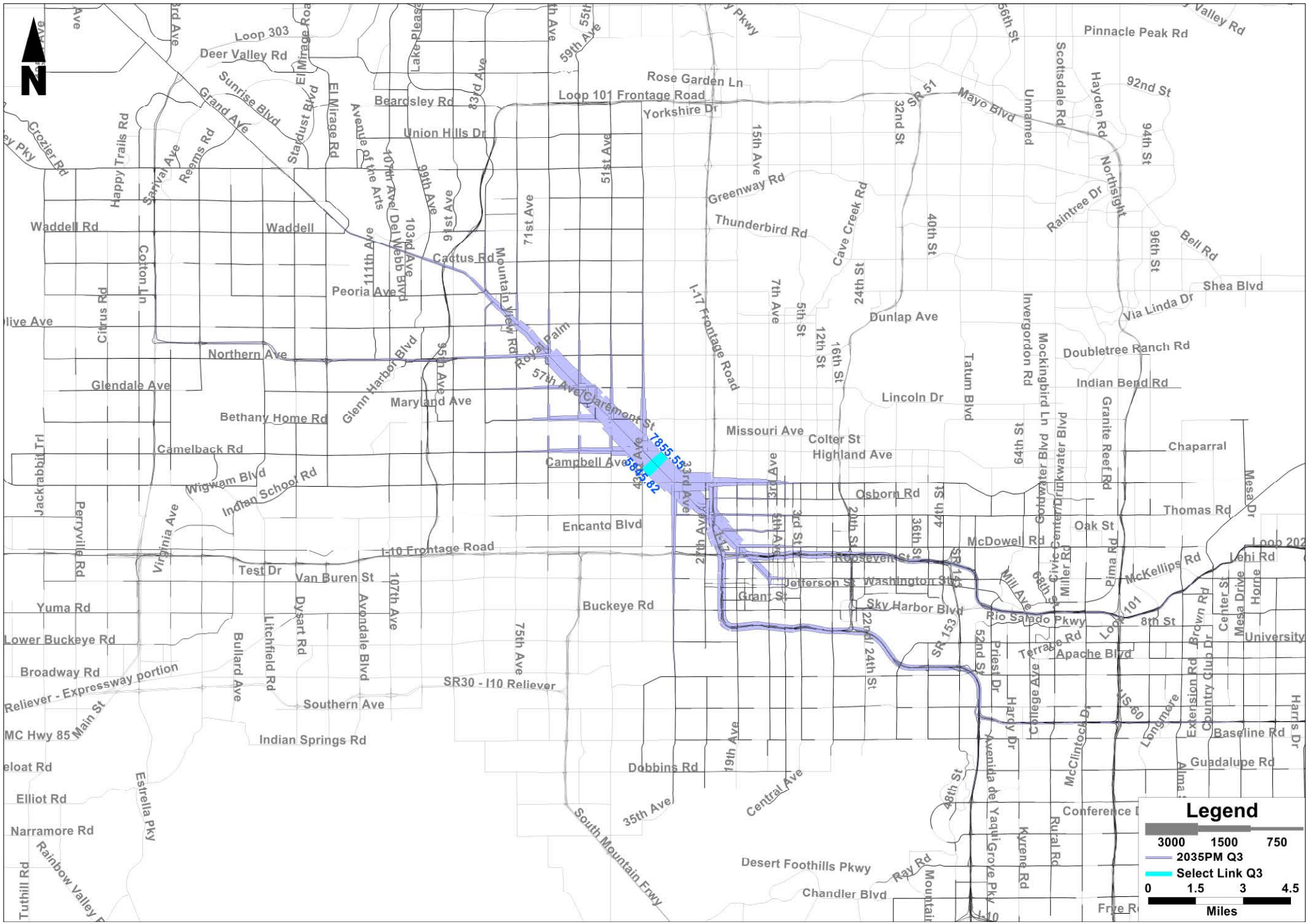
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Perryville Rd
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Verrado Way
Virginia Ave
Litchfield Rd
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Sun Valley Pky
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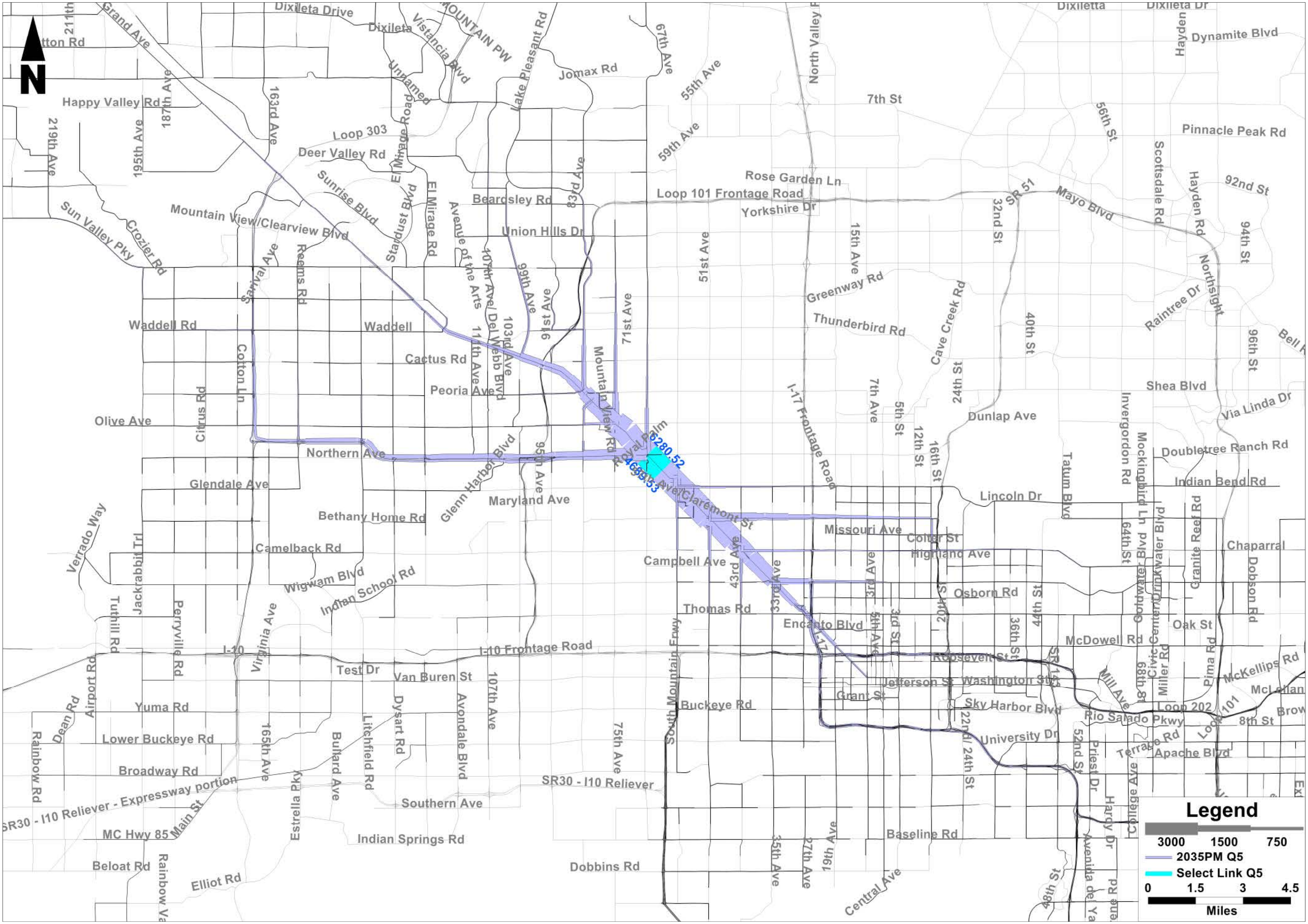
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Colter St
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Hardy Dr
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Litchfield Rd
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Estrella Pky
165th Ave
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Dean Rd
Airport Rd
Tuthill Rd
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Sarival Ave
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219th Ave
195th Ave
187th Ave
163rd Ave
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Stardust Blvd
El Mirage Rd
El Mirage Road
Avenue of the Arts
107th Ave/ Del Webb Blvd
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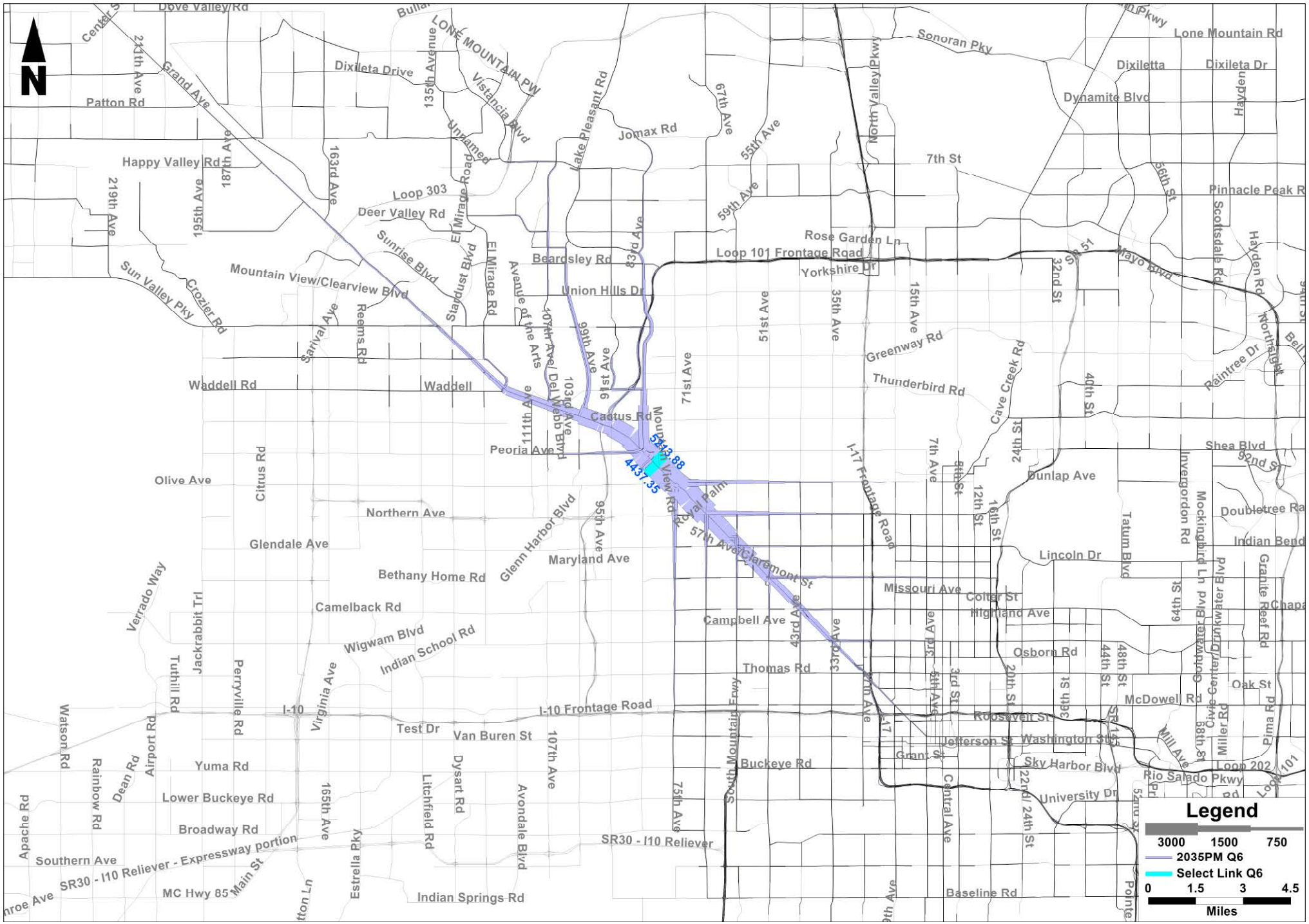
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Mountain View Fwy
Colter St
Highland Ave
Invergordon Rd
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Tatum Blvd
Mockingbird Lane Blvd
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Civic Center/Drinkwater Blvd
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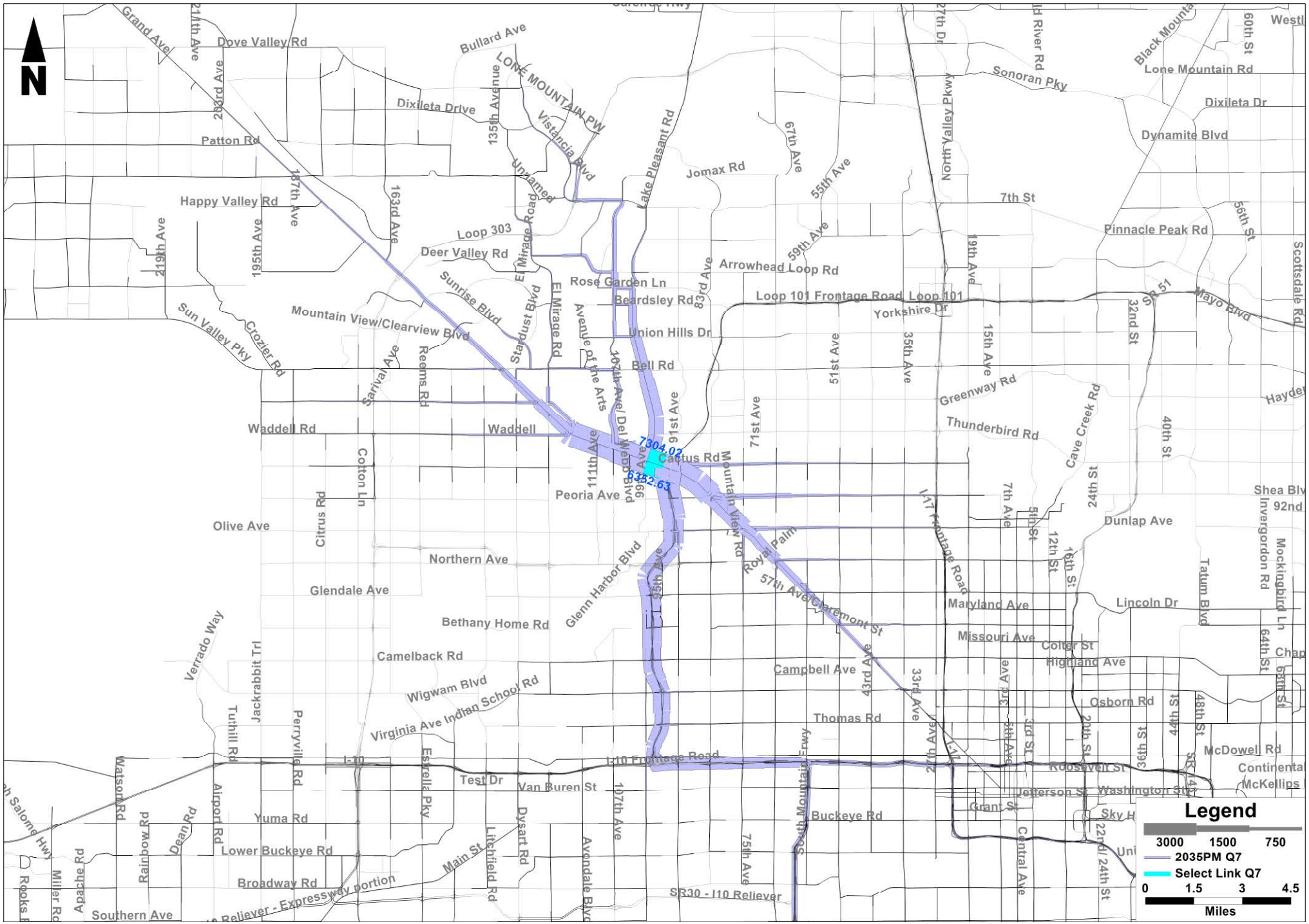
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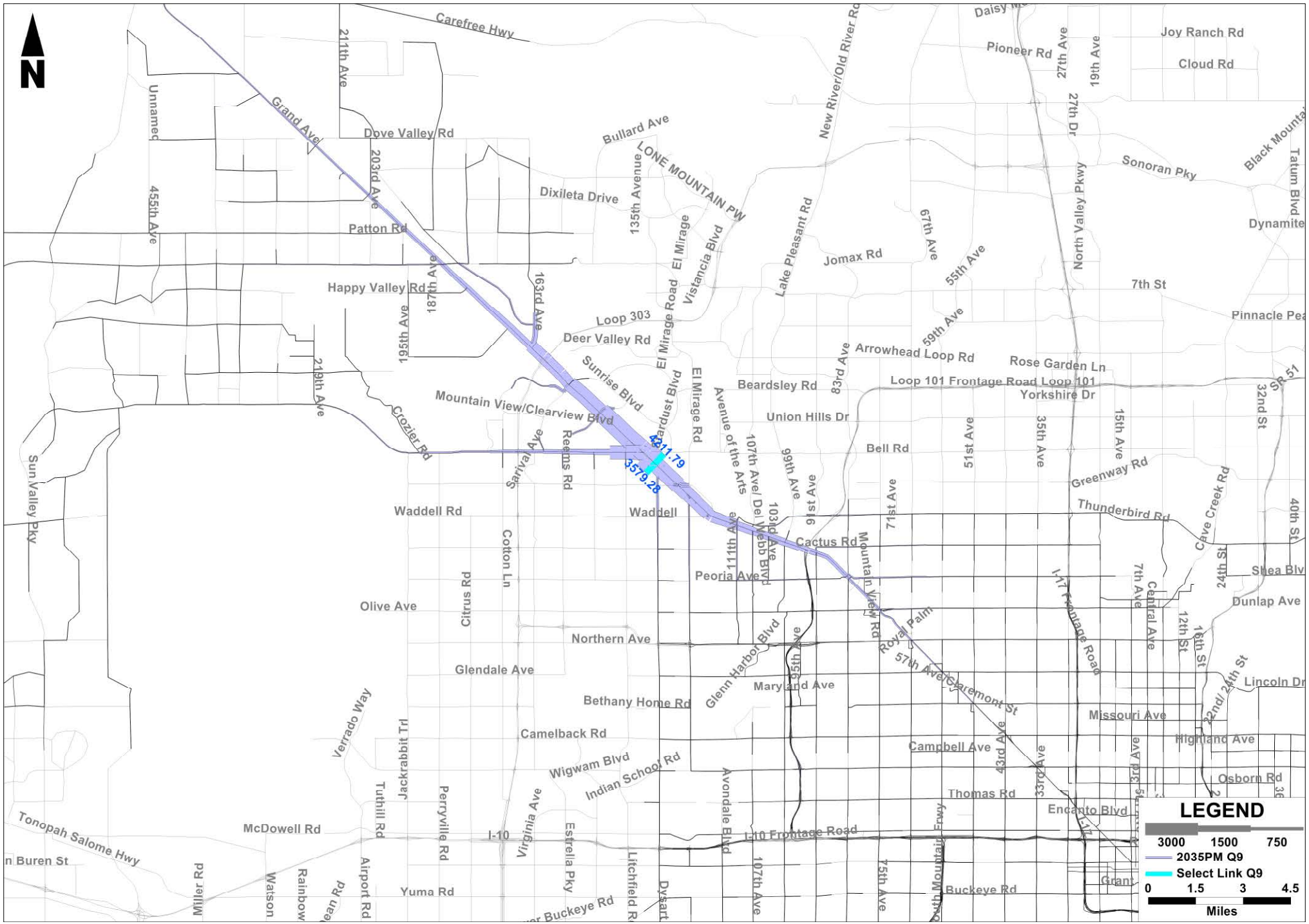
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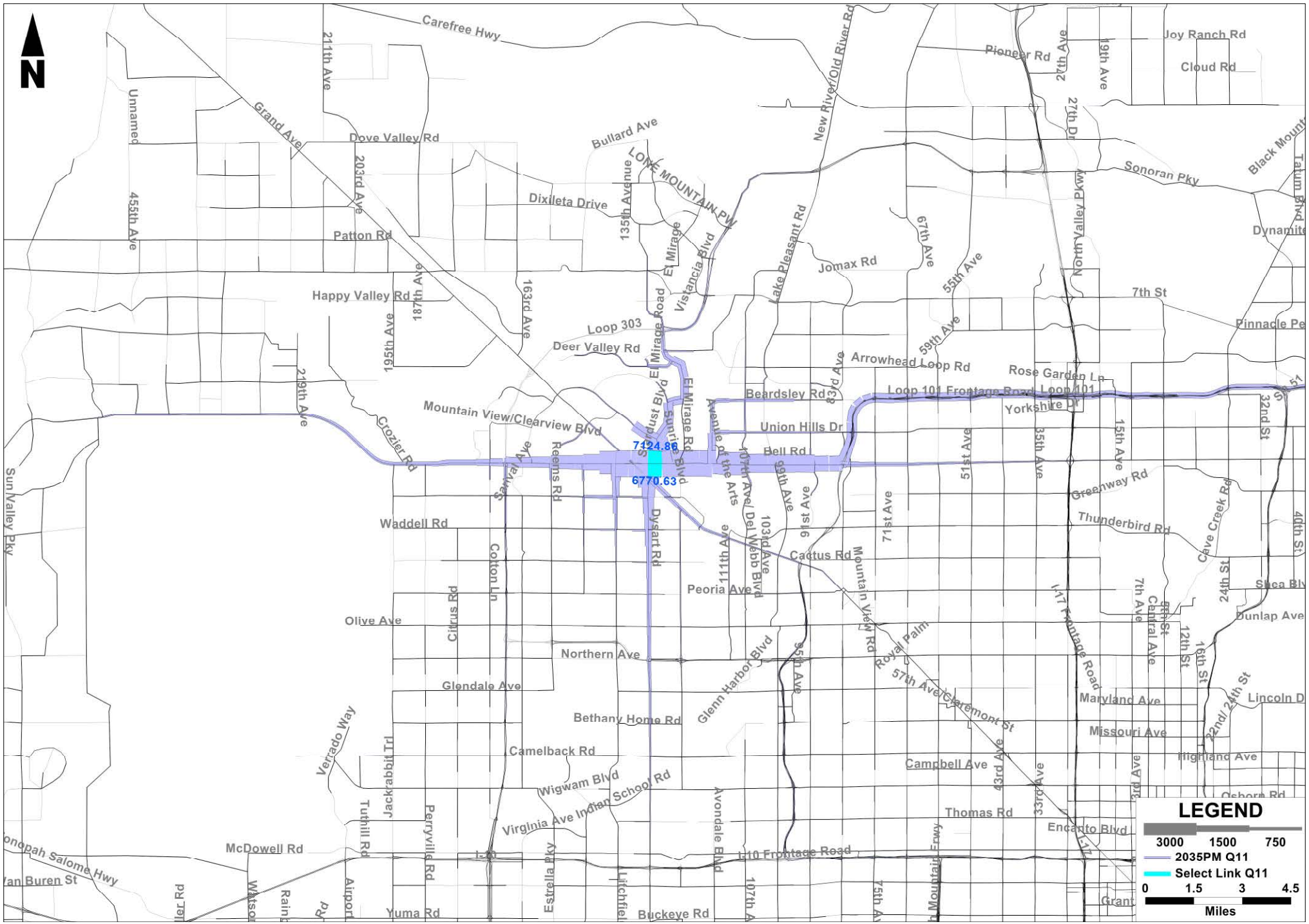
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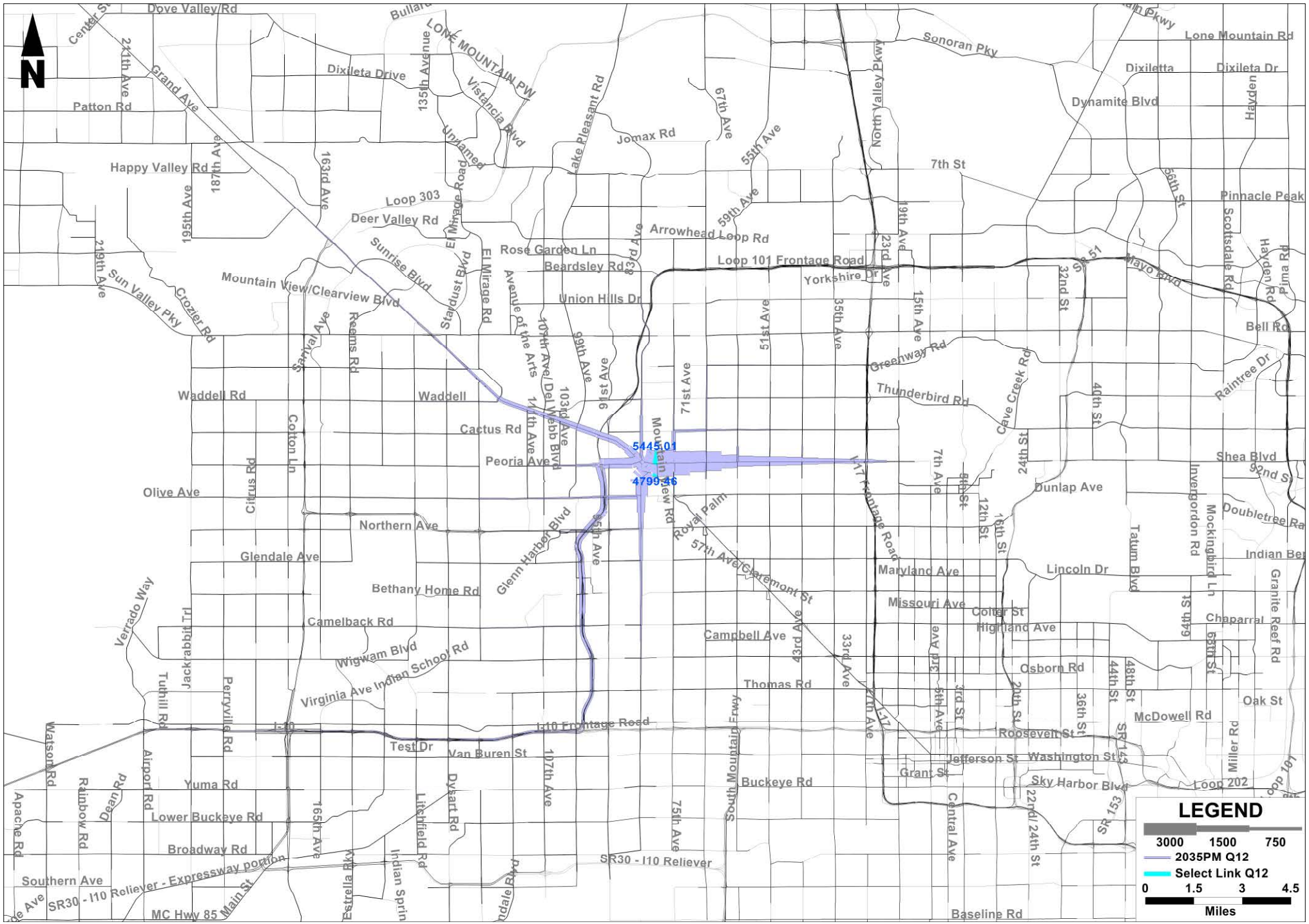
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APPENDIX TM1-10

Trip Reduction Survey Results

Where People Living in Avondale Work

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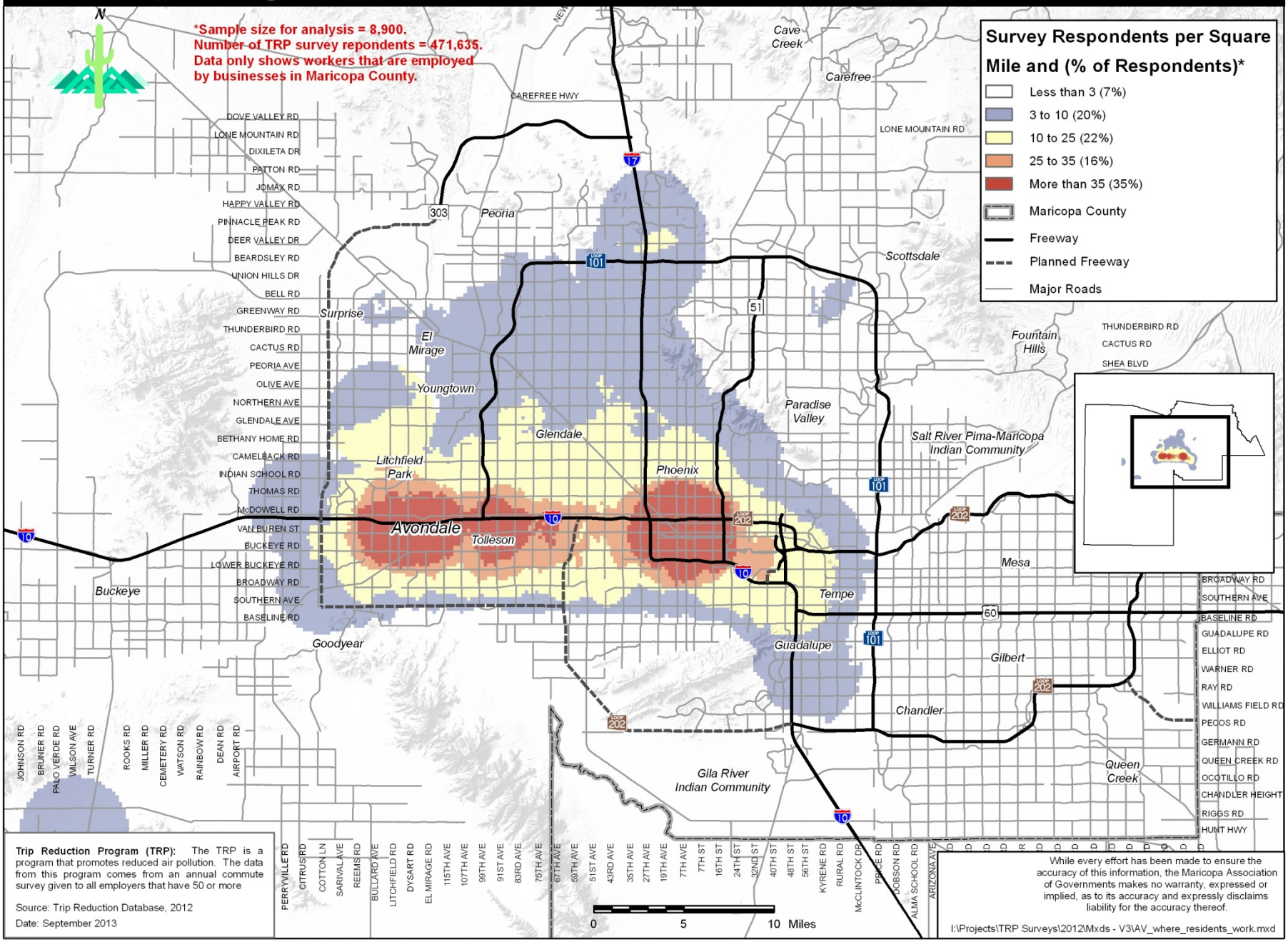
MARICOPA ASSOCIATION of GOVERNMENTS



Trip Reduction Program (TRP): The TRP is a program that promotes reduced air pollution. The data from this program comes from an annual commute survey given to all employers that have 50 or more

Source: Trip Reduction Database, 2012

Date: September 2013

While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

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Where People Working in Avondale Live

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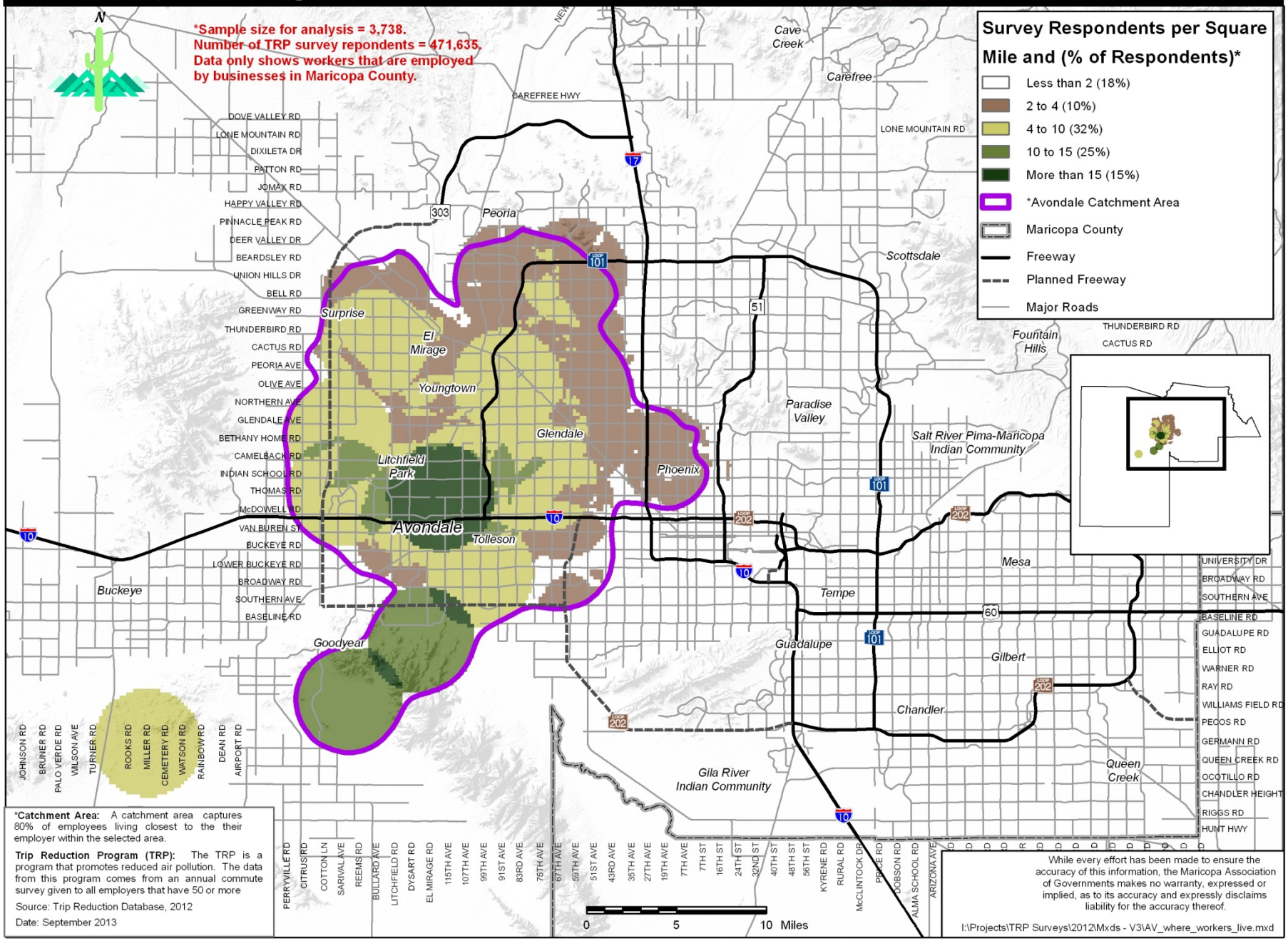
MARICOPA ASSOCIATION of GOVERNMENTS



Where People Living in Glendale Work

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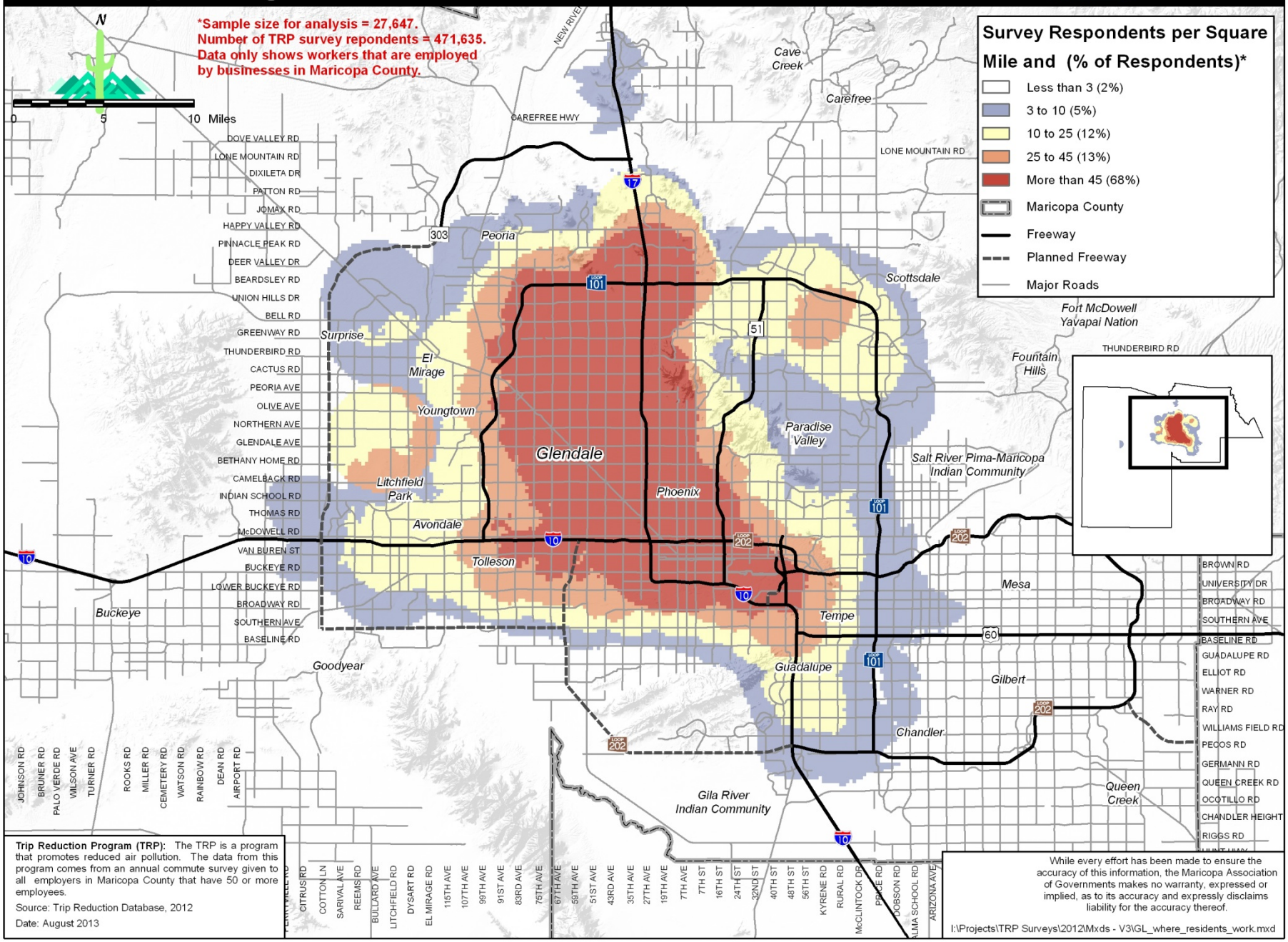

Where People Working in Glendale Live

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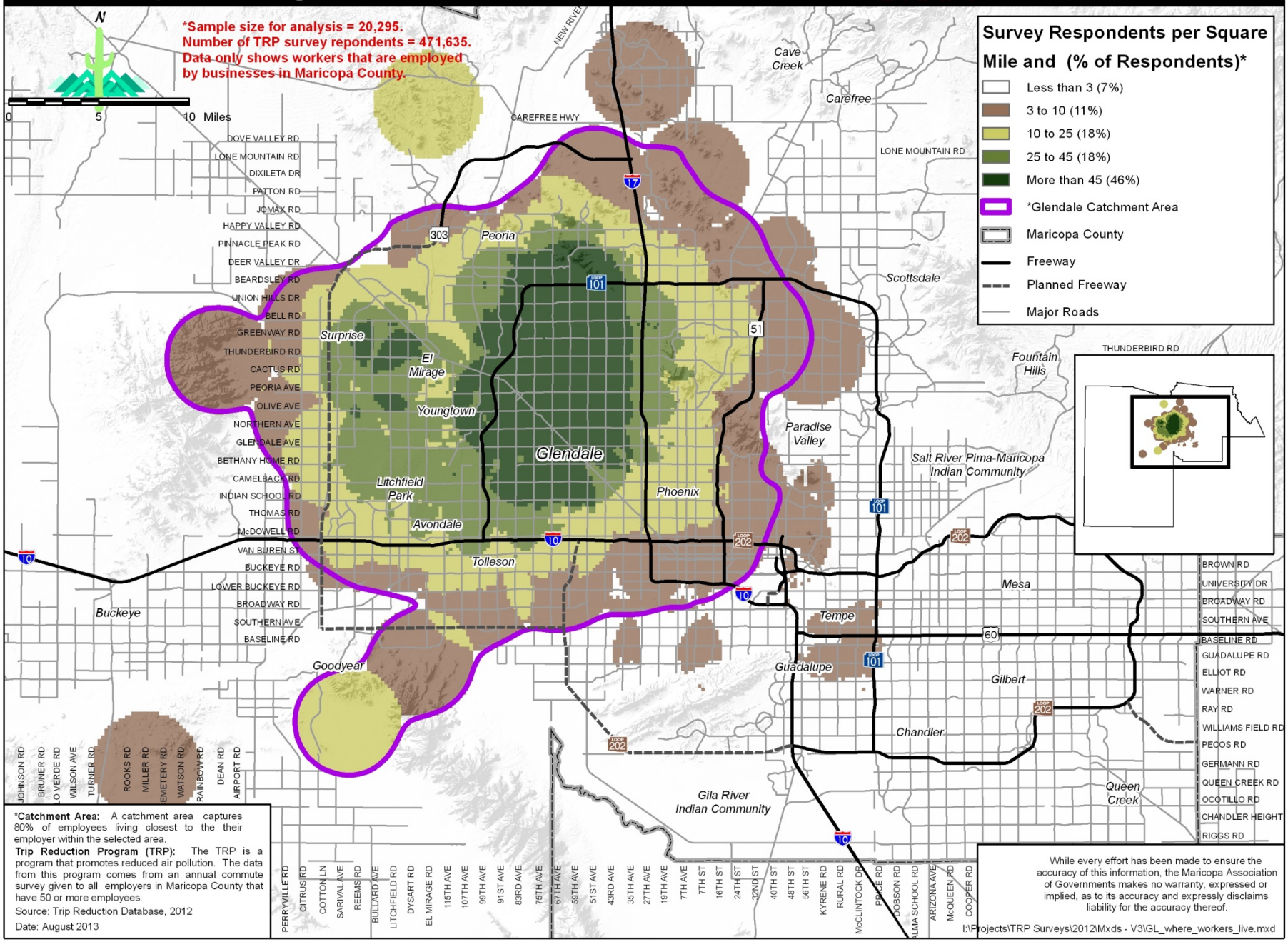

***Catchment Area:** A catchment area captures 80% of employees living closest to the their employer within the selected area.

Trip Reduction Program (TRP): The TRP is a program that promotes reduced air pollution. The data from this program comes from an annual commute survey given to all employers in Maricopa County that have 50 or more employees.

Source: Trip Reduction Database, 2012

Date: August 2013

Where People Living in Goodyear Work

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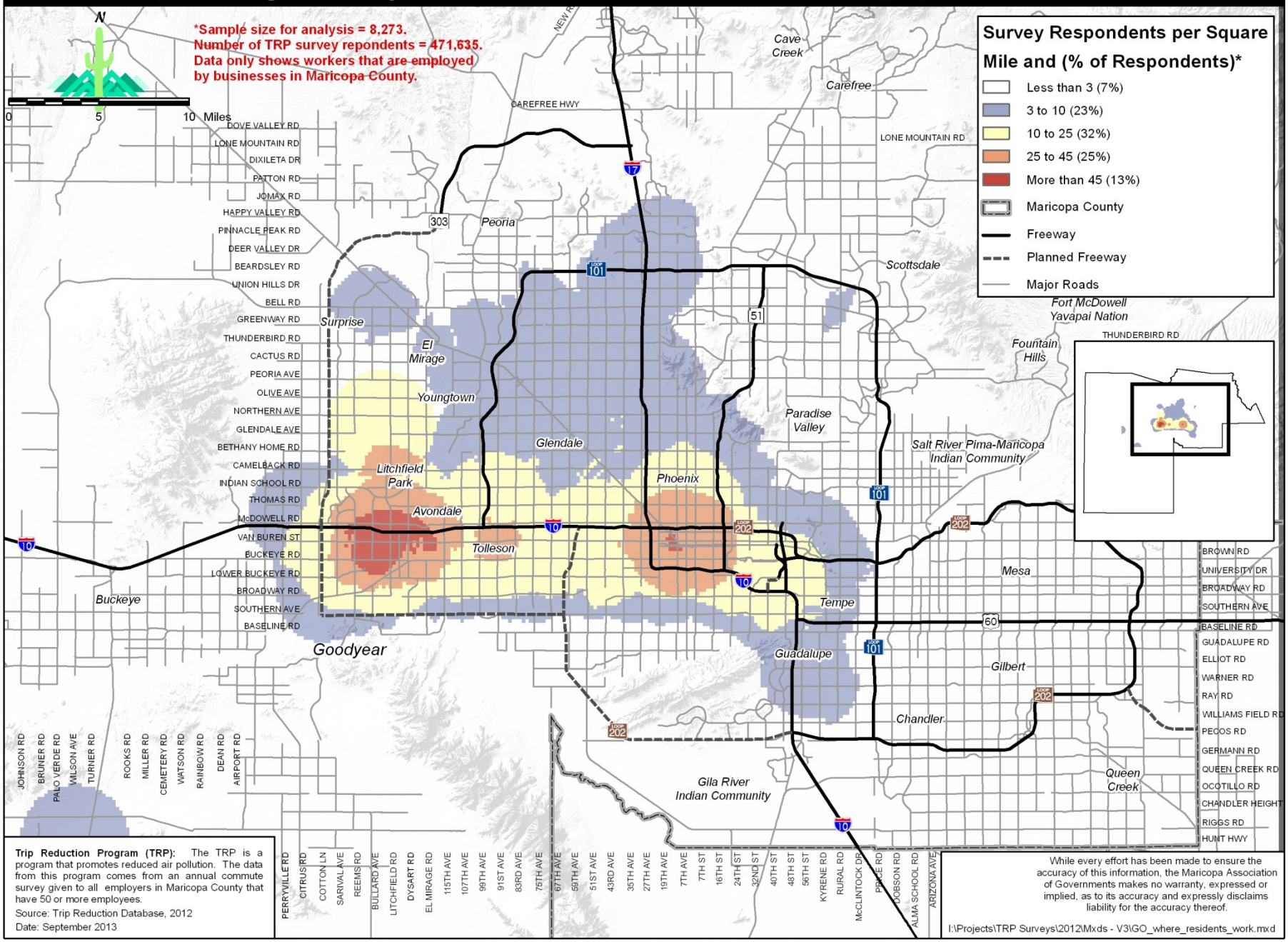
MARICOPA ASSOCIATION of GOVERNMENTS



Trip Reduction Program (TRP): The TRP is a program that promotes reduced air pollution. The data from this program comes from an annual commute survey given to all employers in Maricopa County that have 50 or more employees.

Source: Trip Reduction Database, 2012

Date: September 2013

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Where People Working in Goodyear Live

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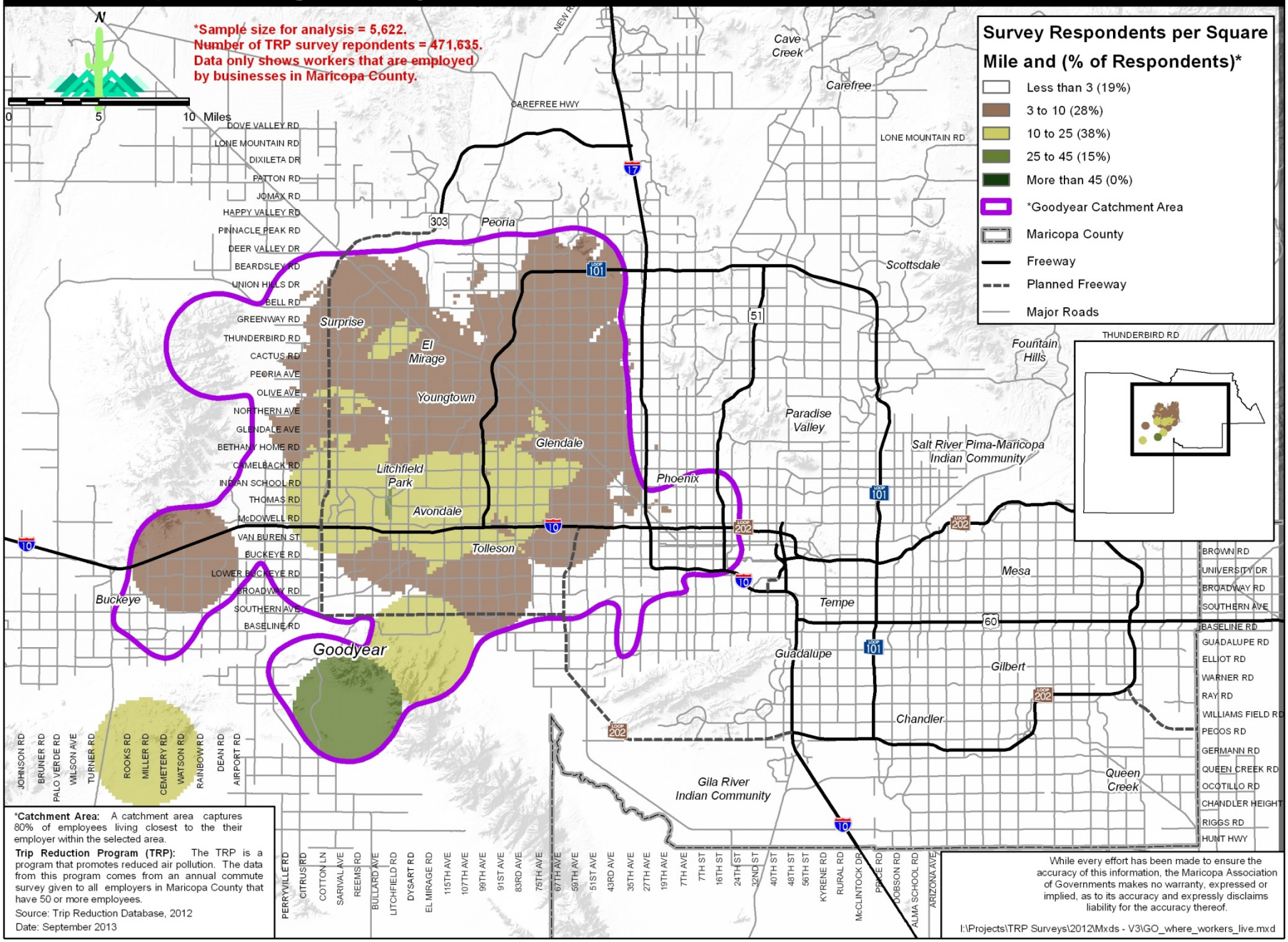

*Catchment Area: A catchment area captures 80% of employees living closest to the their employer within the selected area.

Trip Reduction Program (TRP): The TRP is a program that promotes reduced air pollution. The data from this program comes from an annual commute survey given to all employers in Maricopa County that have 50 or more employees.

Source: Trip Reduction Database, 2012

Date: September 2013

While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.

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Where People Living in Peoria Work

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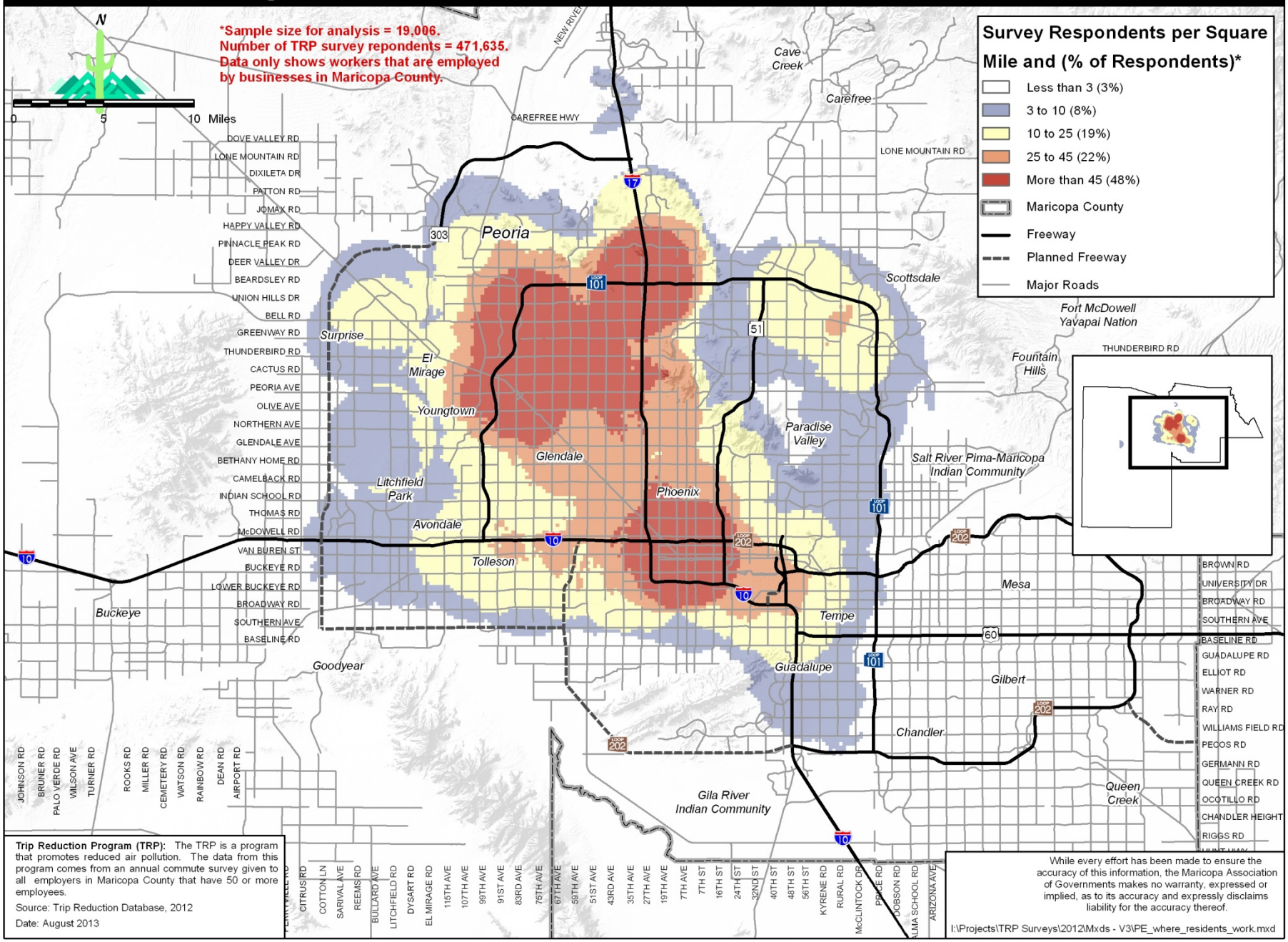
MARICOPA ASSOCIATION of GOVERNMENTS



Trip Reduction Program (TRP): The TRP is a program that promotes reduced air pollution. The data from this program comes from an annual commute survey given to all employers in Maricopa County that have 50 or more employees.

Source: Trip Reduction Database, 2012

Date: August 2013

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Where People Working in Peoria Live

DRAFT

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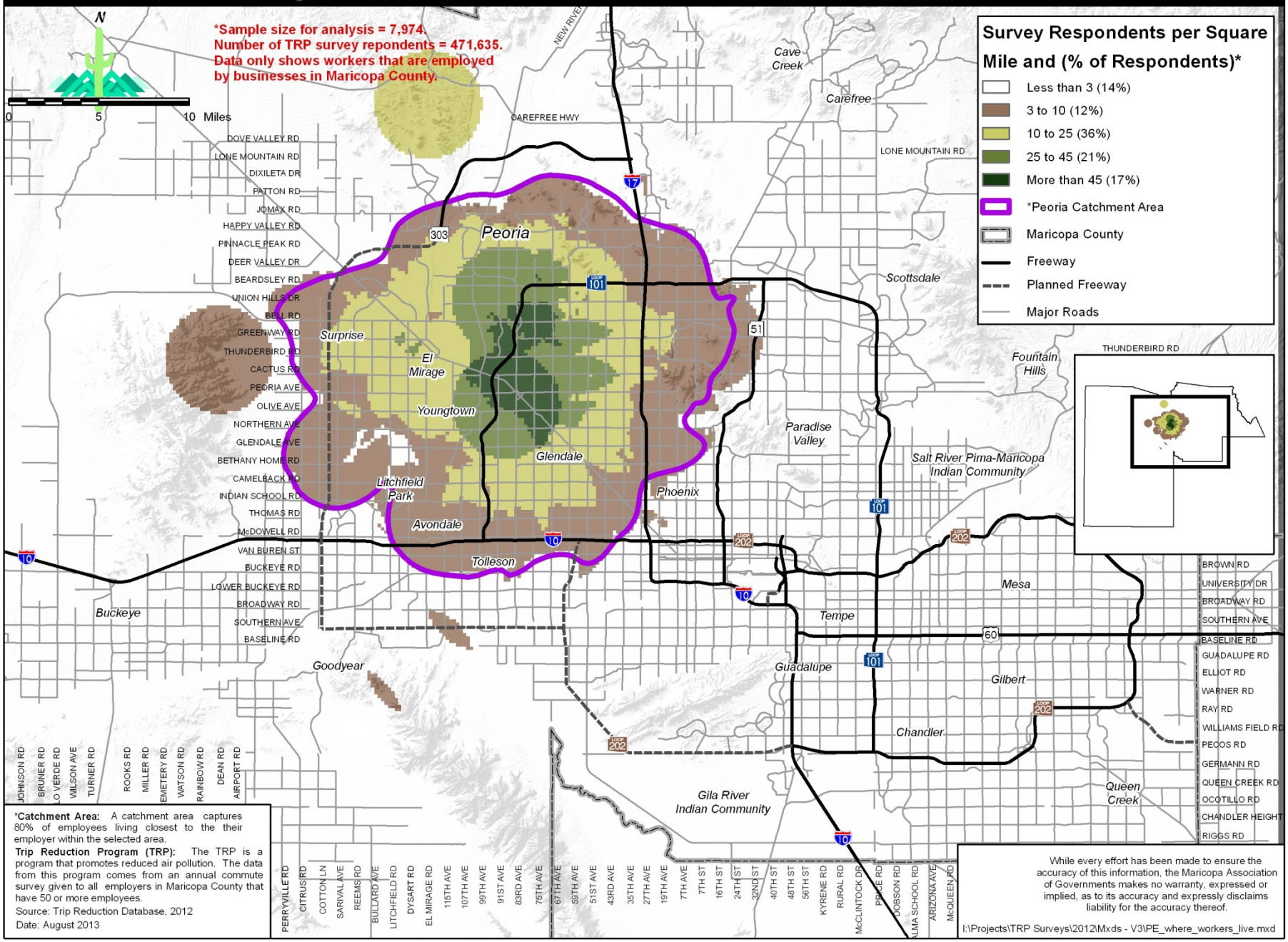

*Catchment Area: A catchment area captures 80% of employees living closest to the their employer within the selected area.

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Where People Living in Surprise Work

DRAFT

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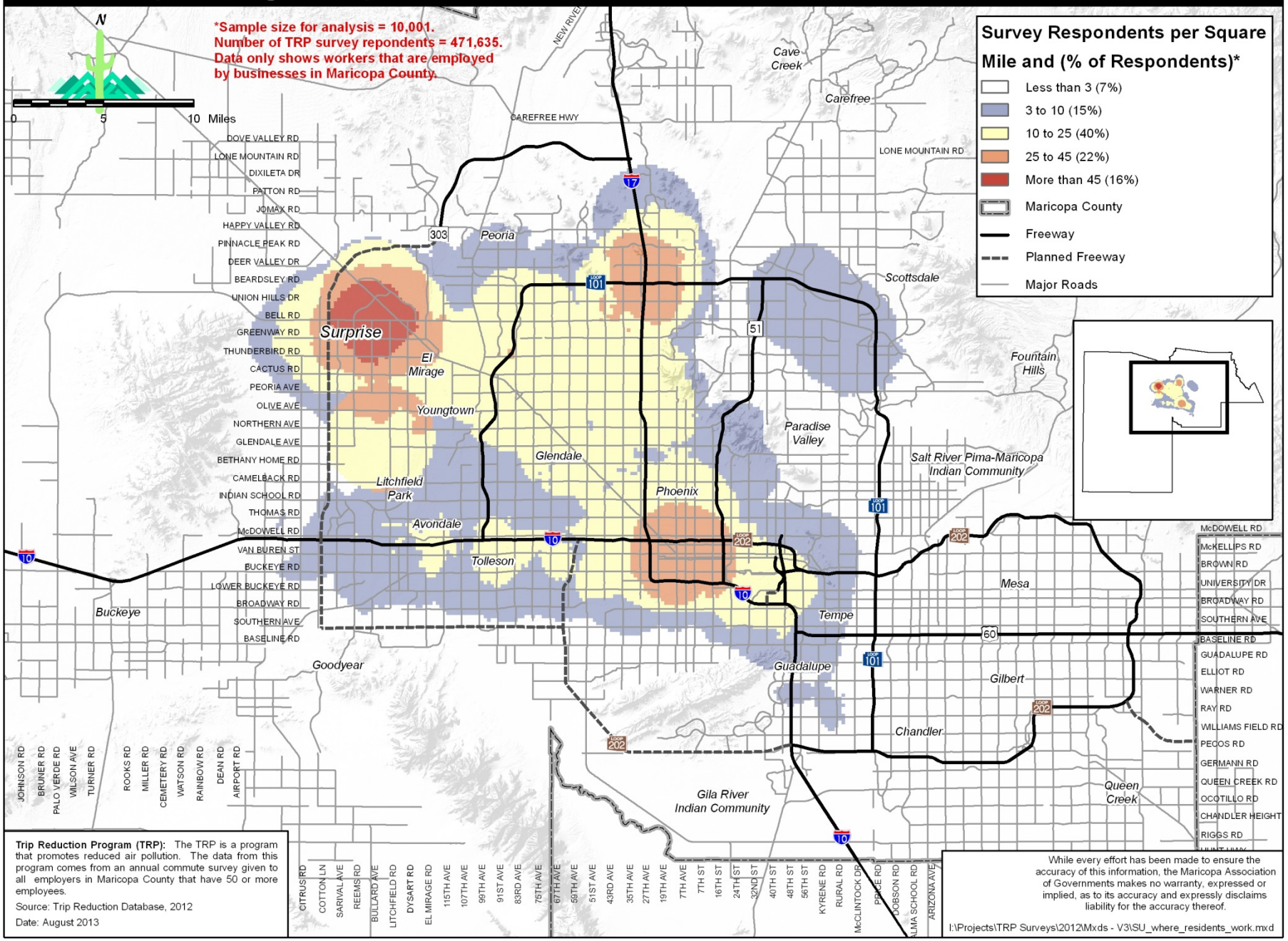

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Where People Working in Surprise Live

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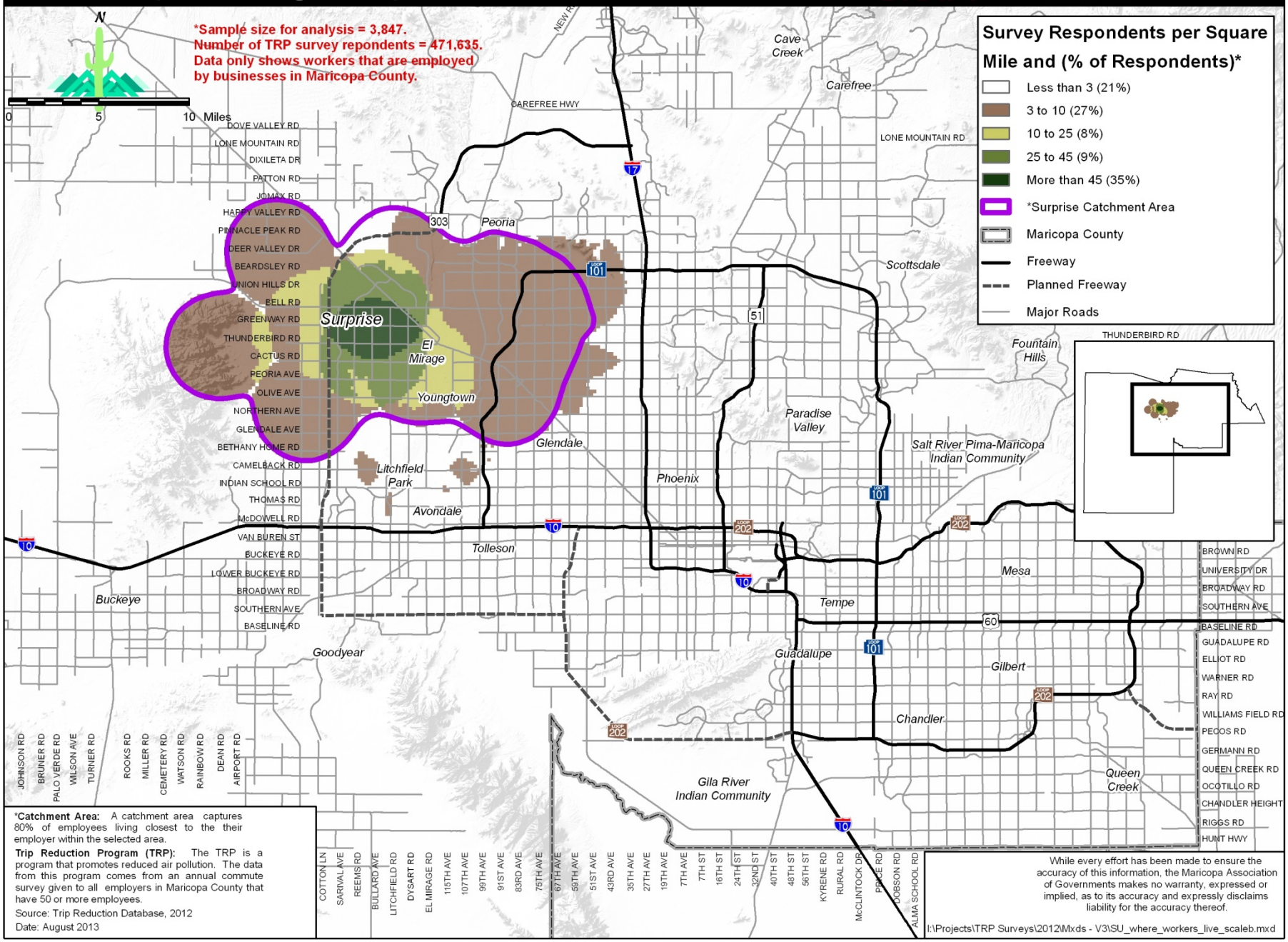
MARICOPA ASSOCIATION of GOVERNMENTS



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Where People Living in the Northwest Valley Work

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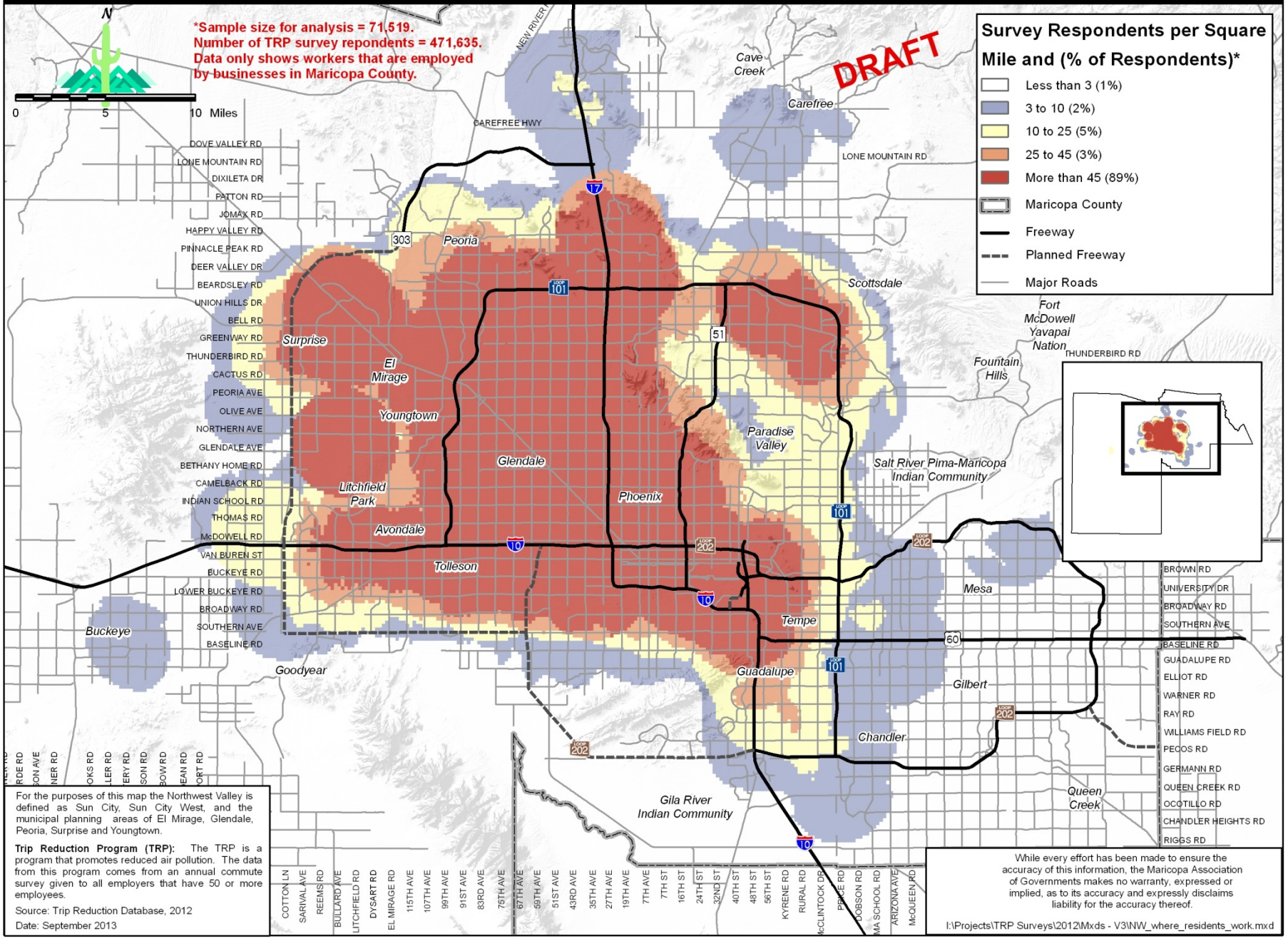

For the purposes of this map the Northwest Valley is defined as Sun City, Sun City West, and the municipal planning areas of El Mirage, Glendale, Peoria, Surprise and Youngtown.

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Source: Trip Reduction Database, 2012

Date: September 2013

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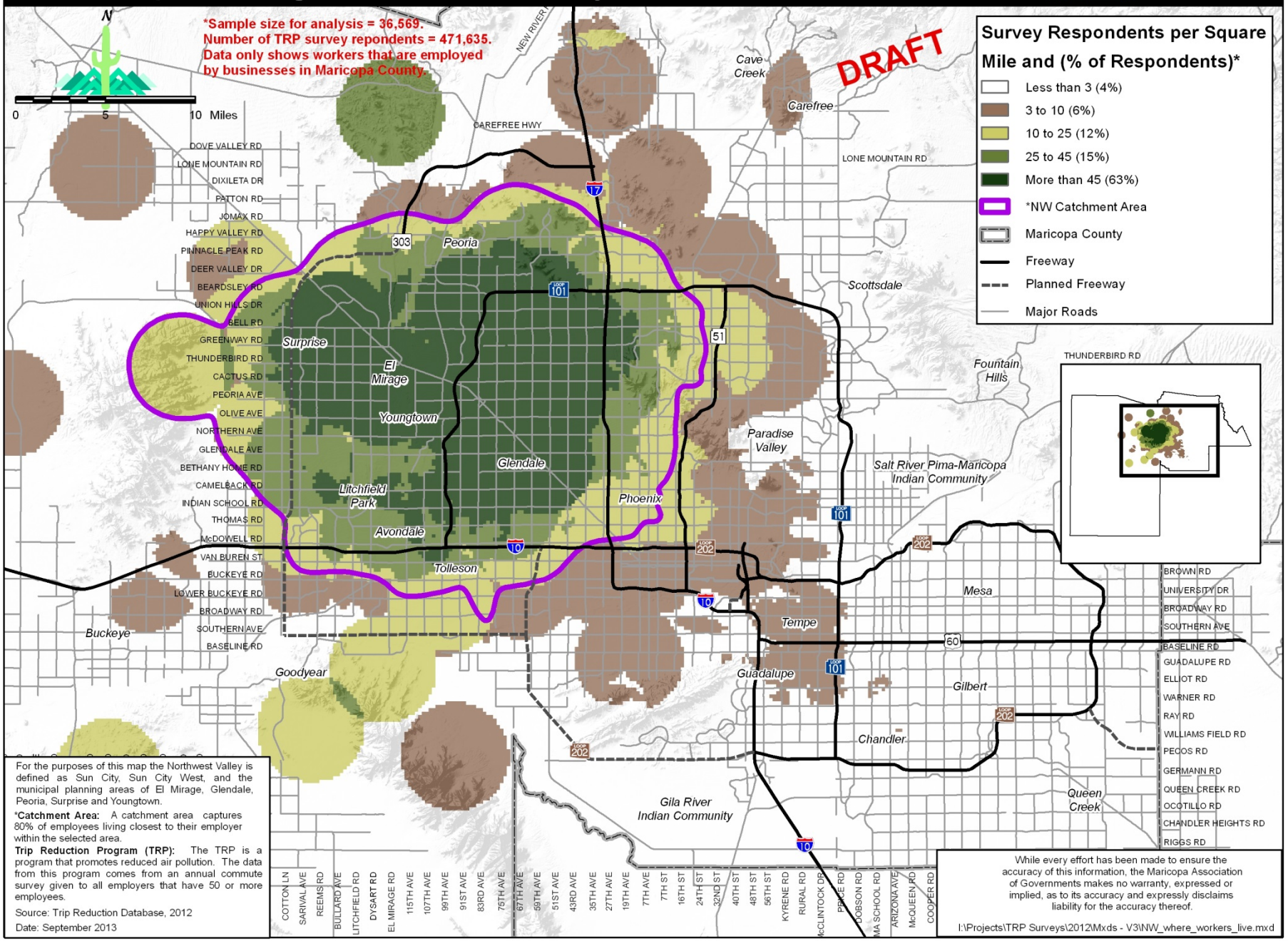
Where People Working in the Northwest Valley Live

MARICOPA ASSOCIATION of GOVERNMENTS



Where People Living Within 1/2 Mile of the Grand Ave Work

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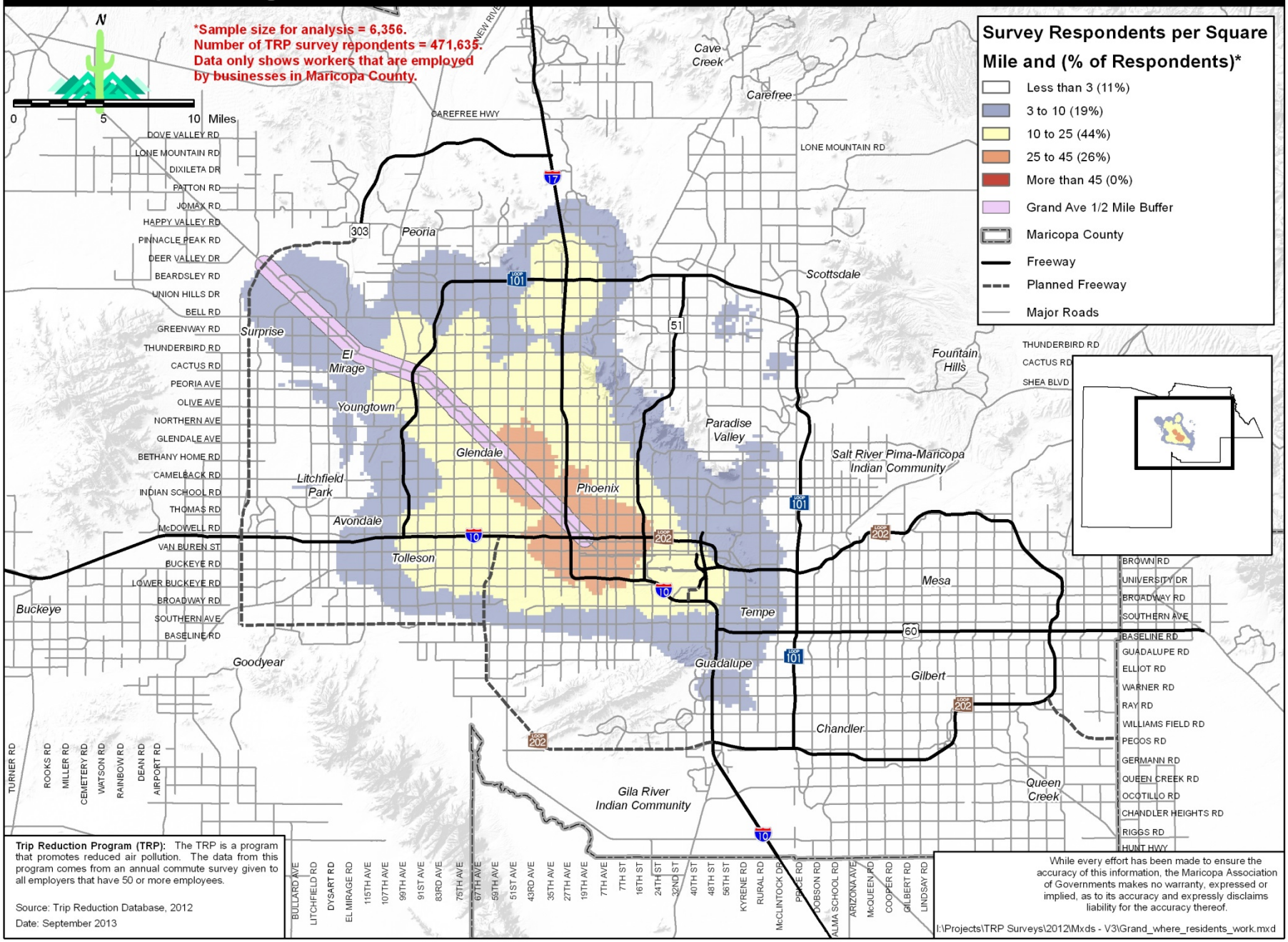

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Where People Working Within 1/2 Mile of the Grand Ave Live

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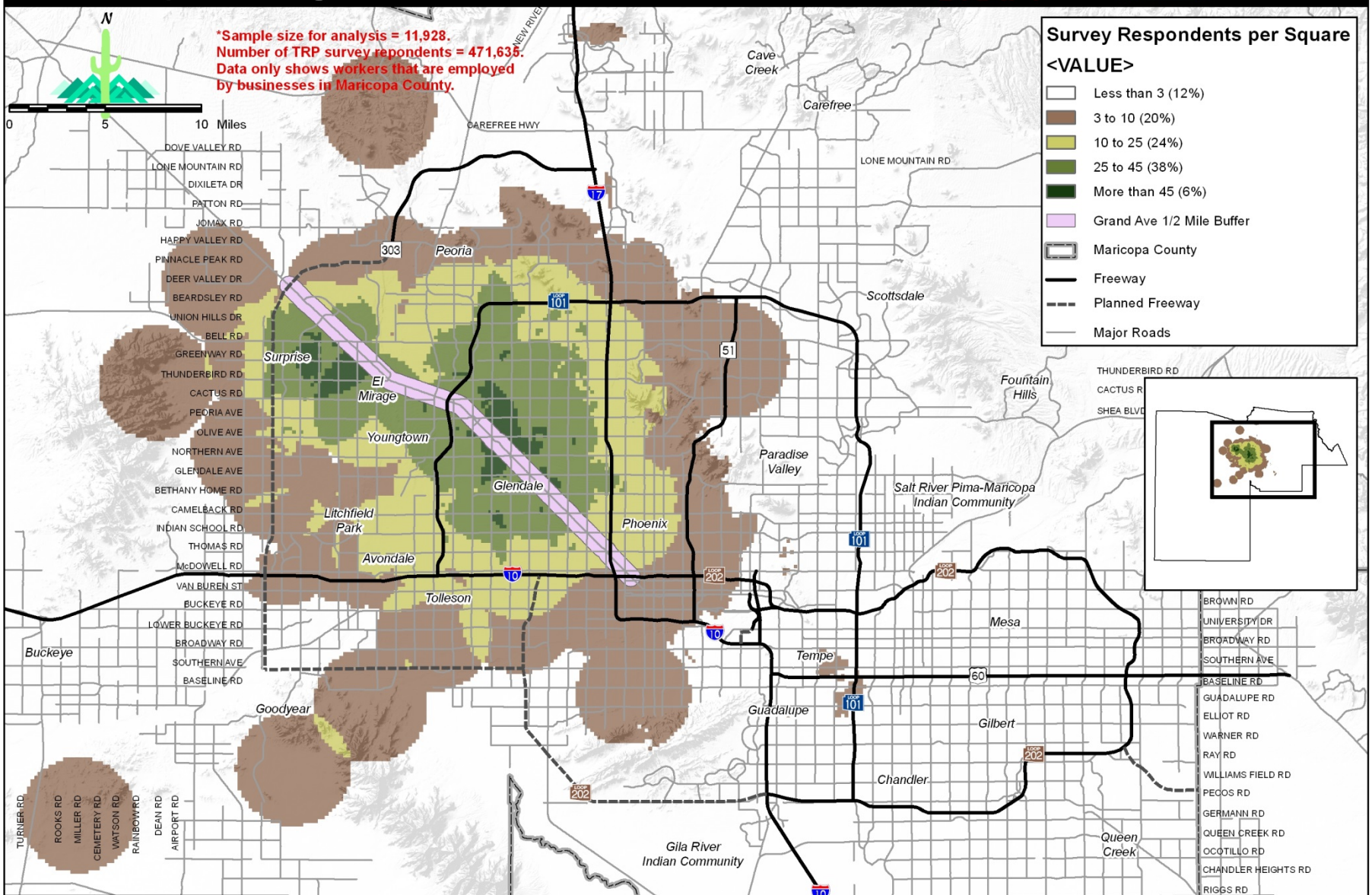
MARICOPA ASSOCIATION of GOVERNMENTS



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