

Rio Verde Small Area Transportation Study

Final Report

Prepared For:



Prepared By:



December 2018

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Abbreviations

Average Daily Traffic	ADT
Dwelling Unit	DU
Institute of Transportation Engineers	ITE
Level of Service	LOS
Maricopa Association of Governments	MAG
Maricopa County Department of Transportation	MCDOT
Regional Analysis Zone	RAZ
Small Area Transportation Study	SATS
Traffic Analysis Zone	TAZ



Executive Summary

Study Purpose

The Rio Verde area has continued to experience growth including planned communities. This growth has resulted in concerns regarding roadways and access into, out of, and within the community. In response to these concerns, MCDOT commissioned this Small Area Transportation Study.

The Rio Verde Small Area Transportation Study analyzed existing conditions, identified potential growth, and evaluated existing and future traffic volumes to develop a recommended roadway network.

The study recommendations are meant to inform jurisdictional agencies, residents, and developers of the planned/future roadway network.

Study Area

The SATS study area includes unincorporated Maricopa County from 136th Street to just beyond Forest Road on the east, and between McDowell Mountain Road on the south and Stagecoach Pass Road to the north. Refer to **Figure 1** for a map of the study area.

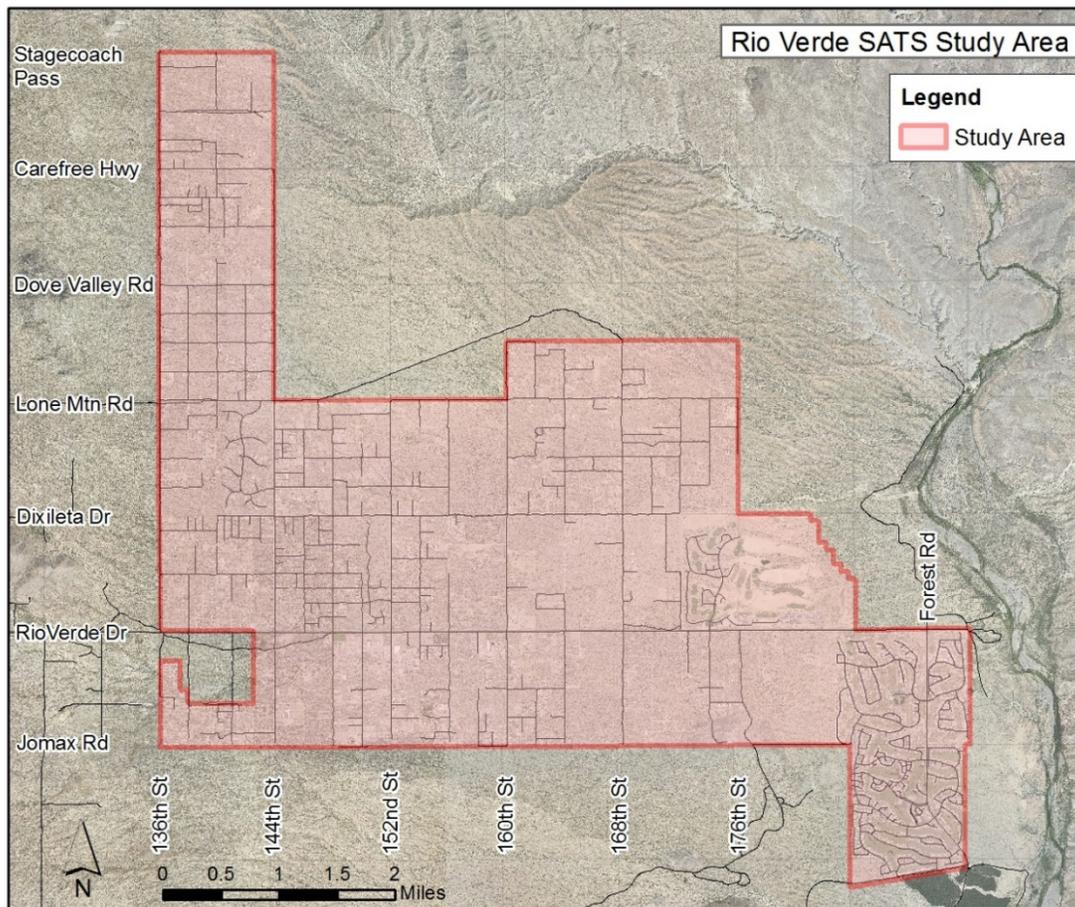


Figure 1 SATS Study Area

Existing Roadway Network



The majority of the existing roadways within the study area are unpaved and privately owned. There are several paved roadway segments including Rio Verde Drive and parts of 136th, 144th, 152nd, 160th and 172nd Street. The residential roadways within the Rio Verde, Tonto Verde, Trilogy and Granite Mountain developments are also paved.

Recommended Future Roadway Network

The study area was broken down into Traffic Analysis Zones (TAZ) to assign future traffic volumes throughout the study area. The number of trips per dwelling unit (2.61 trips per dwelling unit per day) was determined by taking the total Average Daily Traffic (ADT) of the area and dividing it by the number of existing houses within the study area. Traffic distribution assumptions were made based on the 2016 ADT values reported on the MCDOT traffic count website and the City of Scottsdale website. This data indicated that 80% of all traffic exits and enters the study area using Rio Verde Drive west of 136th Street and the other 20% of traffic exits and enters the Rio Verde area using Forest Drive north of McDowell Mountain Road.

The future number of dwelling units (DU) was estimated by reviewing the total number of parcels and the zoning designation for each TAZ. It was assumed that at build-out the total DU would be the higher of either the number of existing parcels or 70% of the maximum zoning density of each TAZ. The future ADT was calculated by multiplying the trip generation rate of 2.61 trips by the estimated number of DU at build-out. A 20% factor of safety was also applied to the future ADT.

The future ADT was manually assigned throughout the study area using the distribution assumptions discussed above, by considering study area constraints and the existing number of lanes. Future roadway network recommendations were made based upon minimum number of lanes required to achieve the desired level of service (LOS) for each roadway. The recommended roadway network is provided in **Figure 2**.

For a more detailed look at how the recommended future roadway network was developed, refer to Appendix B.

Prioritization of Roadway Improvements

Rio Verde Drive will require phased improvements to maintain acceptable levels of service as development occurs. The first phase of improvements to Rio Verde Drive between 136th Street and 152nd Street will likely be required by 2025 assuming build out occurs in 2040 and a linear growth rate. A potential second phase of improvements to Rio Verde Drive between 152nd Street and 172nd Street may not be required until 2030 assuming a similar growth rate. The final phase of improvements to between 172nd and Forrest Road won't likely be required until full build out.

Many residents from Rio Verde stated that they would prefer to preserve the rural character of their community and would rather not see the existing dirt roadways paved. The recommended roadway network presented in **Figure 2** is not intended to indicate that all of the local roadways must be paved at some point in the future. Instead, the purpose of the recommended roadway network is to inform County staff what the future required roadway network might look like for planning purposes.



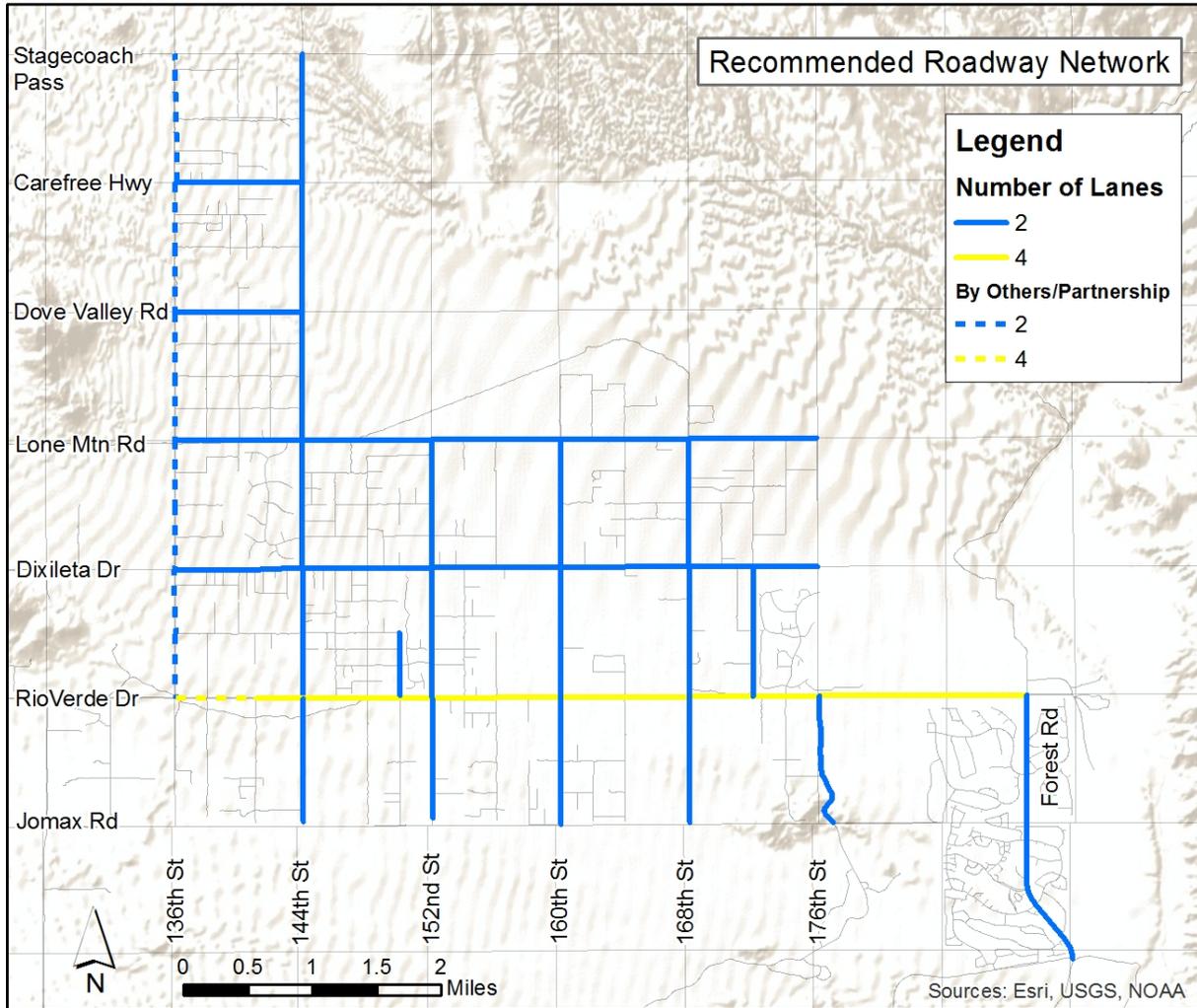


Figure 2 Recommended Future Roadway Network



1.0 Existing Conditions

Working paper #1 provides a description of the existing conditions of the Rio Verde SATS study area (see Appendix A for the full report).

Jurisdictional Control

The study area falls entirely within the jurisdictional control of Maricopa County.

Land Ownership

All of the land within the study area is privately owned.

Land Use

Existing land use can be divided into four general categories: Residential (35%), Employment (2%), Golf Course (5%), and Vacant (58%).

Development

There are six existing Planned Area Developments (PADs) within the study area: Sunrise Desert Vistas, Granite Mountain Ranch, Rio Mountain Estates, Vista Verde (Trilogy), Tonto Verde, Rio Verde. Collectively, these PADs have a total of 3000 Dwelling Units (DU).

Nearly all of the remaining unplanned study area (9792 acres) is zoned RU-43 indicating one DU per acre (DUA). However, it may be difficult to achieve that density of development for much of the land in the study area due to existing floodplain and terrain constraints.

Drainage

Approximately 35% of the study area falls within Federal Emergency Management Agency (FEMA) floodplains or floodways.

There are no major drainage facilities within the Rio Verde study area except for a few culverts, including a system of culverts and channels located in the Rio Verde and Tonto Verde subdivisions that direct flow toward to the Verde River to the east.

A regulatory approach to addressing the floodplains within the study area was recommended in the 2007 Rio Verde ADMP. This approach focuses on mitigating flood damage by regulating development within the adopted Zone AE floodplains.

Utilities

Arizona 811 was contacted to identify the utility stakeholders within the Rio Verde SATS study area. Twelve different utility providers were identified as stakeholders within the study area. Working paper 1 provides descriptions of these utilities.

Existing Right-of-way

The existing right-of-way varies between 0ft and 200ft throughout the Rio Verde SATS study area.

Existing Roadways

The existing arterial roadway network is depicted in **Figure 3**. The majority of roadways are unpaved, and all paved roadways are 2-lanes.



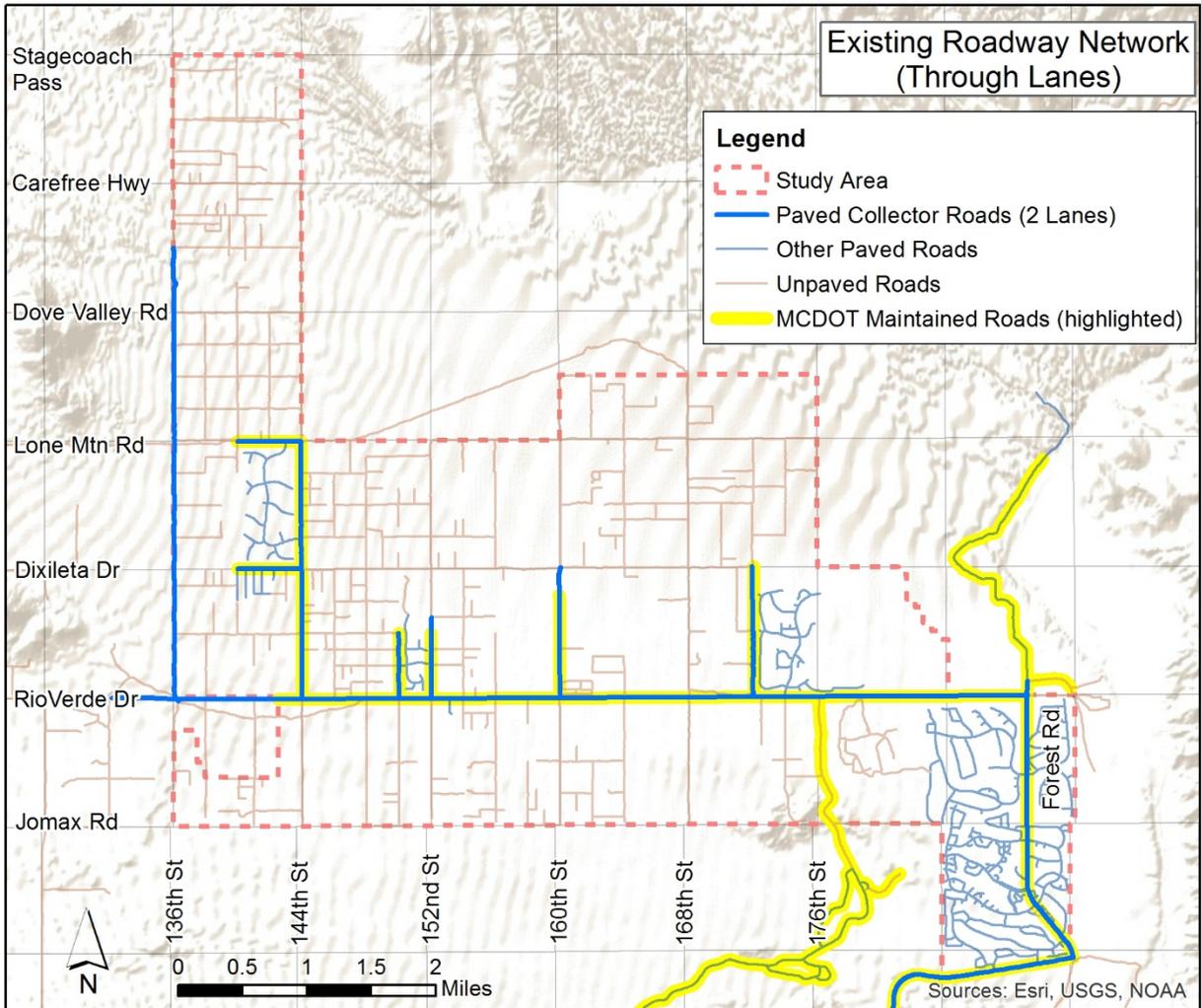


Figure 3 Existing Roadway Network/Number of Lanes

Direct Access Driveways

Direct access driveways represent potential points of conflict as vehicles enter and leave roadways at reduced speeds. There are approximately 625 direct access driveways that were identified through analyzing aerial photographs within the study area. The greatest number of direct access driveways are bounded by Dixileta Drive, Rio Verde Drive, 140th Street, and 148th Street.

Programmed Roadway Improvements

The only ongoing project identified in the study area is a scoping project for Rio Verde Drive between 136th Street and 152nd Street (TT0563). The purpose of this study is to identify ways to increase capacity on Rio Verde Drive and reduce traffic congestion.

Crash Analysis

A total of 106 crashes were reported within the study area between January 12, 2012 and September 29, 2017. The majority of these were “no injury”. Three fatal crashes were reported during the time period. Over half of the total number of collisions (53.8%) have occurred on Rio Verde Drive, including 14 of the 17 incapacitating injury and two of the three fatality.



Environmental Summary

The Rio Verde SATS study area encompasses a large area of relatively undisturbed Sonoran Desert scrub habitat. List of endangered, threatened, proposed, and candidate species for Maricopa County were reviewed by a qualified biologist to determine which species may occur in the study area. Though species may occur within the study area, no critical habitat is present.

Approximately six percent of the study area has been surveyed for cultural resources. Based on the evaluation of the existing conditions within the study area, additional research, analysis, coordination and/or permitting will be required before construction of any proposed roadway improvements. For details and information on the identified environmental considerations, including cultural and biological resources within the study area, refer to Appendix A.

2.0 Network Recommendations

In the second working paper, *Transportation Network Recommendations*, a recommended roadway network was developed. Refer to Appendix B for the full working paper.

Socioeconomic Analysis

The socioeconomic data for the MAG Regional Travel Demand Model within the Rio Verde SATS study area (Table 1) was reviewed for the 2015 and 2040 model years.

Table 1 Summary of 2015 and 2040 MAG Socioeconomic Data for the Study Area

	Total Area (mi ²)	Total Population	Total DU	Total Employment	Population per mi ²	Population per DU	Employment per mi ²	DU per acre
2015	19.33	3725	1566	376	193	5.38	19	0.13
2040	19.33	8440	3389	1019	437	2.49	53	0.27
Delta (%)		127%	116%	171%	127%	5%	171%	116%

The majority of the Rio Verde study area falls within a single Traffic Analysis Zone (TAZ) in the MAG model. It was determined that there was not enough resolution in the available MAG socioeconomic data to develop a recommended roadway network based upon that data alone.

The study area was manually subdivided into twenty smaller TAZs to help assess the existing and proposed travel demands. Recent aerial imagery was used to count the total number of DU within each TAZ and assess how the total population was distributed throughout the study area.

Transportation Network Analysis

Figure 3 illustrates the existing roadway network within the Rio Verde study area. The MCDOT Major Streets and Routes Plan classifies Rio Verde Drive as a minor arterial roadway, 136th Street as a minor collector and 144th Street as a major collector. All other one-mile roadways are planned as major collectors.

Existing average daily traffic (ADT) volume counts for the study area roadways were compiled from the MCDOT Traffic Counts website. These volumes were used to



determine the existing Level of Service (LOS) within the study area. Refer to **Table 2** for an excerpt of MCDOT’s daily two-way traffic volume LOS thresholds.

Table 2 Planning Level Volume Thresholds

Rural				
Functional Classification	# of Lanes	Median Type	Max LOS	Service Volume*
Principal Arterial	4	Divided	C	24,400
Minor Arterial	4	Divided	C	22,000
Major Collector	2	Undivided	B	5,600
Minor Collector	2	Undivided	B	5,000

All of the study area’s existing roadways with available traffic count data performed at a level of service C or better under existing conditions.

Future Travel Demand

The study area was broken down into twenty smaller, more defined TAZs to be able to assign future traffic volumes throughout the study area.

Initially, a model iteration was developed using the Institute of Transportation of Engineers (ITE) *Trip Generation Guidelines*, but this model yielded unrealistically high future volume projections. Therefore, a different method was used to determine future trip volumes.

First, the existing number of dwelling units within the study area was determined through examining aerial photographs. The number of trips per dwelling unit (2.61 trips per dwelling unit per day) was determined by taking the total Average Daily Traffic (ADT) of the area and dividing it by the number of existing houses within the study area. The total ADT was calculated by combining the total ADT on Rio Verde Drive west of 136th Street and on Forest Road north of McDowell Mountain Road.

Traffic distribution assumptions were made based on the 2016 ADT values reported on the MCDOT traffic count website and the City of Scottsdale website. This data indicated that 80% of all traffic exits and enters the study area using Rio Verde Drive west of 136th Street and the other 20% of traffic exits and enters the Rio Verde area using Forest Drive north of McDowell Mountain Road.

Next, the future number of dwelling units (DU) was estimated by reviewing the total number of parcels and the zoning designation for each of the twenty TAZs. It was assumed that at build-out the total DU would be either the number of existing parcels or 70 percent of the maximum zoning density of each TAZ, whichever value is higher. The future ADT was calculated by multiplying the rate of trips per DU, 2.61, by the estimated number of DU at build-out. A 20 percent factor of safety was also applied to the future ADT.

The future ADT was manually assigned throughout the study area using the distribution assumptions discussed above and by considering study area constraints and the existing number of lanes. This manual distribution was compared to the 2040 MAG Travel Demand Model ADT. MAG’s Travel Demand Model assumes different volume distribution percentages entering and exiting the site- 63% on Rio Verde Drive west of 136th Street and 37% on Forest Road north of McDowell Mountain Road. The Model also assumes that both Rio Verde Drive and Forrest Road are 4-lane minor arterial roadways. The differences seen between the 2040 MAG Travel Demand Model and the



manual future projected traffic volume distribution developed for the study area can be attributed to these variances in assumptions.

Recommended Arterial Roadway Network

The recommended arterial roadway network was based off of the minimum number of lanes required to accommodate the projected future volumes developed through manual calculation and assignment and the Study Area constraints identified in the existing conditions working paper.

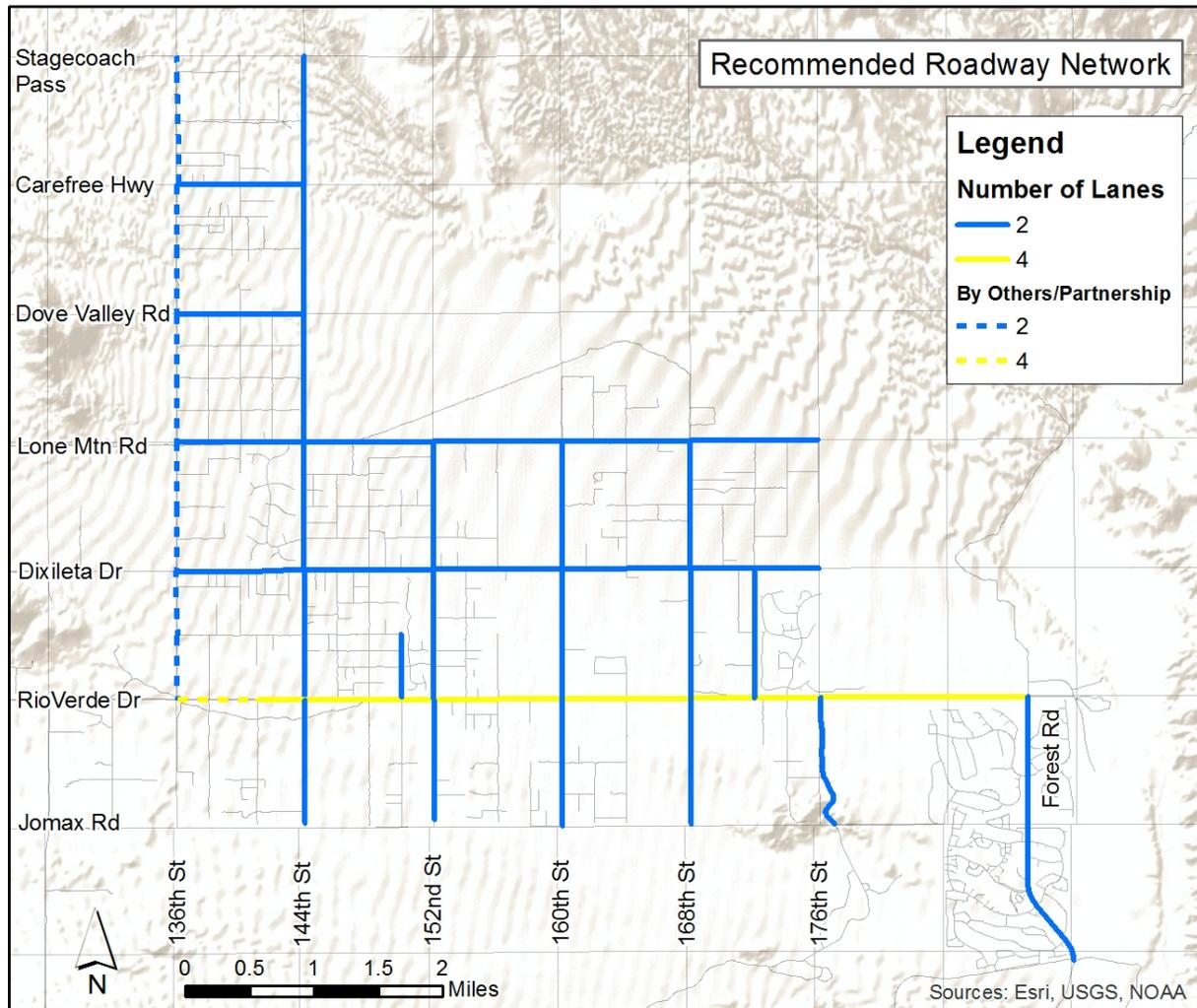


Figure 4 Recommended Roadway Network

The recommended arterial roadway network highlights the general location of planned roadway connections and may serve as a guide to preserve right-of-way. The network is primarily made up of two lane arterial roadways. A four-lane roadway would be warranted for Rio Verde Drive from 136th Street to Forest Road.

3.0 Public Feedback

MCDOT held a public meeting on May 2, 2018 to introduce the study to residents and gather information about the existing study area constraints and concerns. Working



paper #2, Transportation Network Recommendations, in Appendix B provides a brief summary of the feedback that was received at this public open house.

Residents were notified that the recommendations for the future roadway network were available for comment during March 2019. MCDOT received comments via phone, e-mail and on-line. Appendix C provides a summary response to the feedback that was received.

4.0 Prioritization Program

The majority of the roadways within the Rio Verde SATS study area will be improved as needed. Rio Verde Drive will likely require phased improvements to maintain acceptable levels of service as development occurs. These potential phased improvements were analyzed by comparing the existing and future manual traffic assignments developed in the second working paper, Transportation Network Recommendations. A growth rate was determined through this comparison. That growth rate was then applied to the existing manual traffic assignment volumes to calculate approximately when sections of Rio Verde Drive would experience an ADT that was greater than the LOS volume thresholds outlined in the second working paper.

The first phase of improvements to Rio Verde Drive between 136th Street and 152nd Street will likely be required by 2025 assuming a growth rate of approximately 7.8%. A potential second phase of improvements to Rio Verde Drive between 152nd Street and 172nd Street may not be required until 2030 assuming a similar growth rate. The final phase of improvements to Rio Verde Drive between 172nd and Forrest Road won't likely be required until full build out. It is suggested that improvements to Rio Verde be implemented based upon LOS needs and not contingent upon the timing of any City of Scottsdale improvements to Rio Verde Drive west of the study area.

It is also recommended that a corridor improvement study on 136th Street from Rio Verde Drive to Stagecoach Pass be considered in coordination with the City of Scottsdale.

Many residents from Rio Verde stated that they would prefer to preserve the rural character of their community and would rather not see the existing dirt roadways paved. The recommended roadway network presented in **Figure 2** is not intended to indicate that all of the local roadways must be paved at some point in the future. Instead, the purpose of the recommended roadway network is to inform County staff what the future required roadway network might look like for planning purposes.



Appendix A

Existing Conditions Report



Rio Verde Small Area Transportation Study

Existing Conditions Report

Prepared For:



Prepared By:



June 2018

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- Appendix A – Class I Cultural Resources Inventory
- Appendix B – Biological Database Inquiry
- Appendix C – Summary of Public Hearing Comments May 2nd 2018

Abbreviations

Area Drainage Master Plan	ADMP
Arizona Department of Water Resources	ADWR
Arizona Public Service	APS
Cable TV	CATV
Dwelling Unit	DU
Dwelling Unit per Acre	DUA
Federal Emergency Management Agency	FEMA
Flood Control District of Maricopa County	FCDMC
Geographic Information System	GIS
Maricopa Association of Governments	MAG
Maricopa County Department of Transportation	MCDOT
National Registry of Historic Places	NHRP
Planned Area Development	PAD
Residential Unit	RU
Salt River Project	SRP
Small Area Transportation Study	SATS
Transportation Improvement Program	TIP



1.0 Introduction

1.1 Background

The Rio Verde area is a large rural area that has been experiencing substantial unplanned growth. There is increasing concern that this unplanned growth will lead to irregular or unanticipated traffic patterns that will constrain projected future roadway networks.

The Maricopa County Department of Transportation (MCDOT) has commissioned this Small Area Transportation Study (SATS) to compare how future roadway networks correlate to available/existing conditions within the proposed study area. Potential modifications to future roadway networks will be recommended based on future travel demands, opportunities and constraints identified in the study area.

The purpose of this report is to document existing conditions within the study area with the intent to identify potential constraints to future roadway improvements.

1.2 Study Area

The SATS study area includes unincorporated Maricopa County from 136th Street to just beyond Forest Road on the east, and between McDowell Mountain Road on the south and Stagecoach Pass Road to the north.

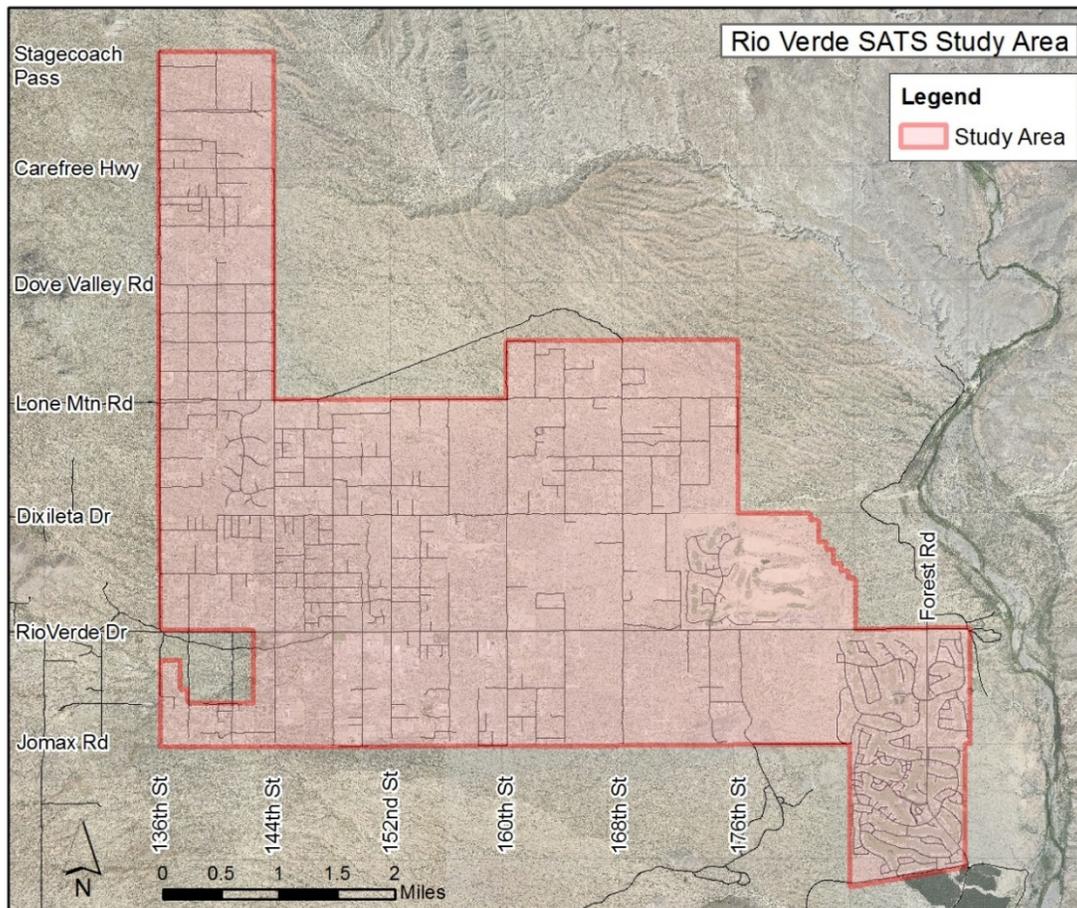


Figure 1-1 SATS Study Area



2.0 Jurisdictions, Ownership, and Land Uses

2.1 Jurisdictional Control

The Rio Verde SATS study area falls entirely within the jurisdictional control of Maricopa County (refer to Figure 2-1).

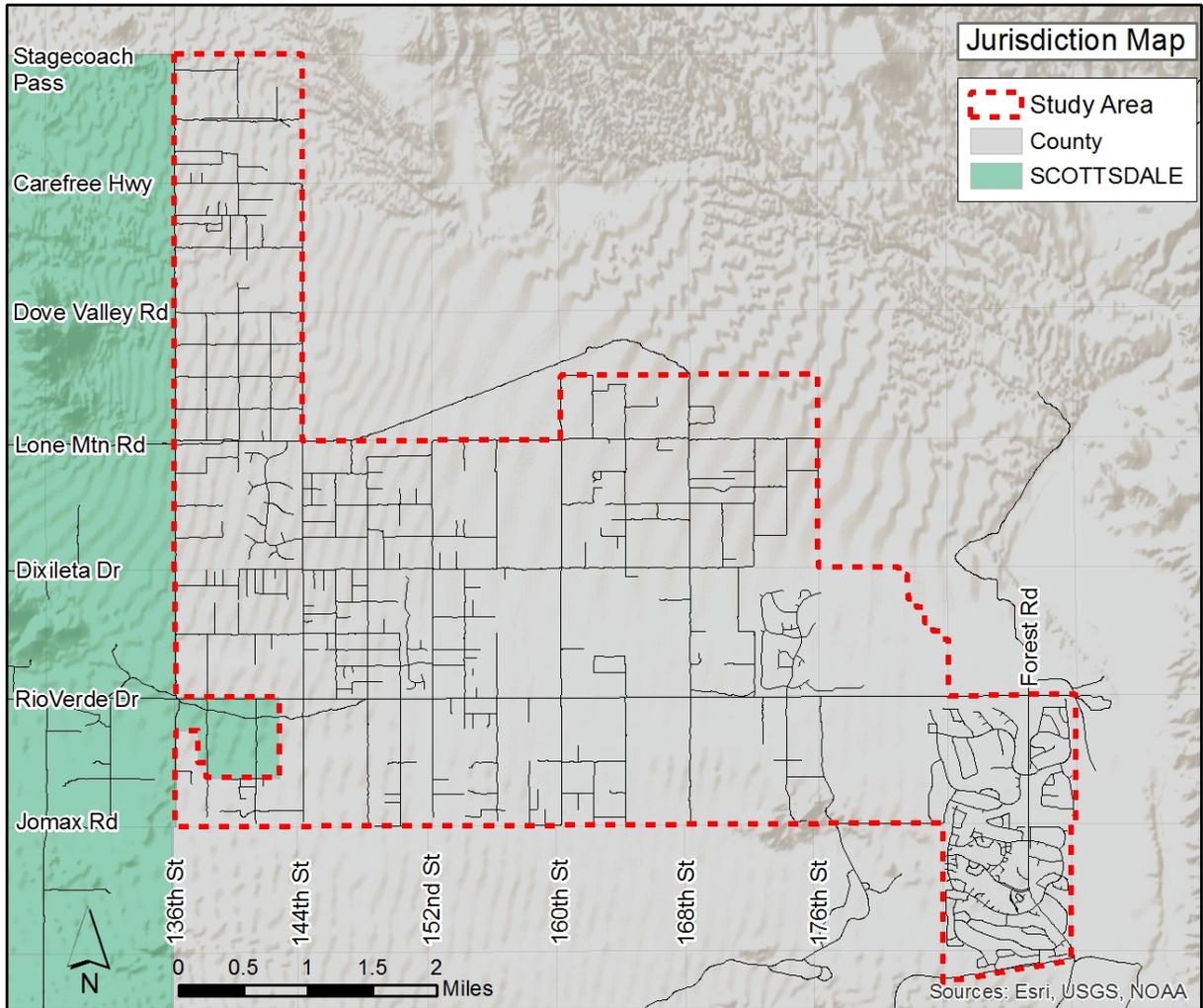


Figure 2-1 Jurisdictional Control



2.2 Land Ownership

All of land within the study area is privately owned (refer to Figure 2-2).

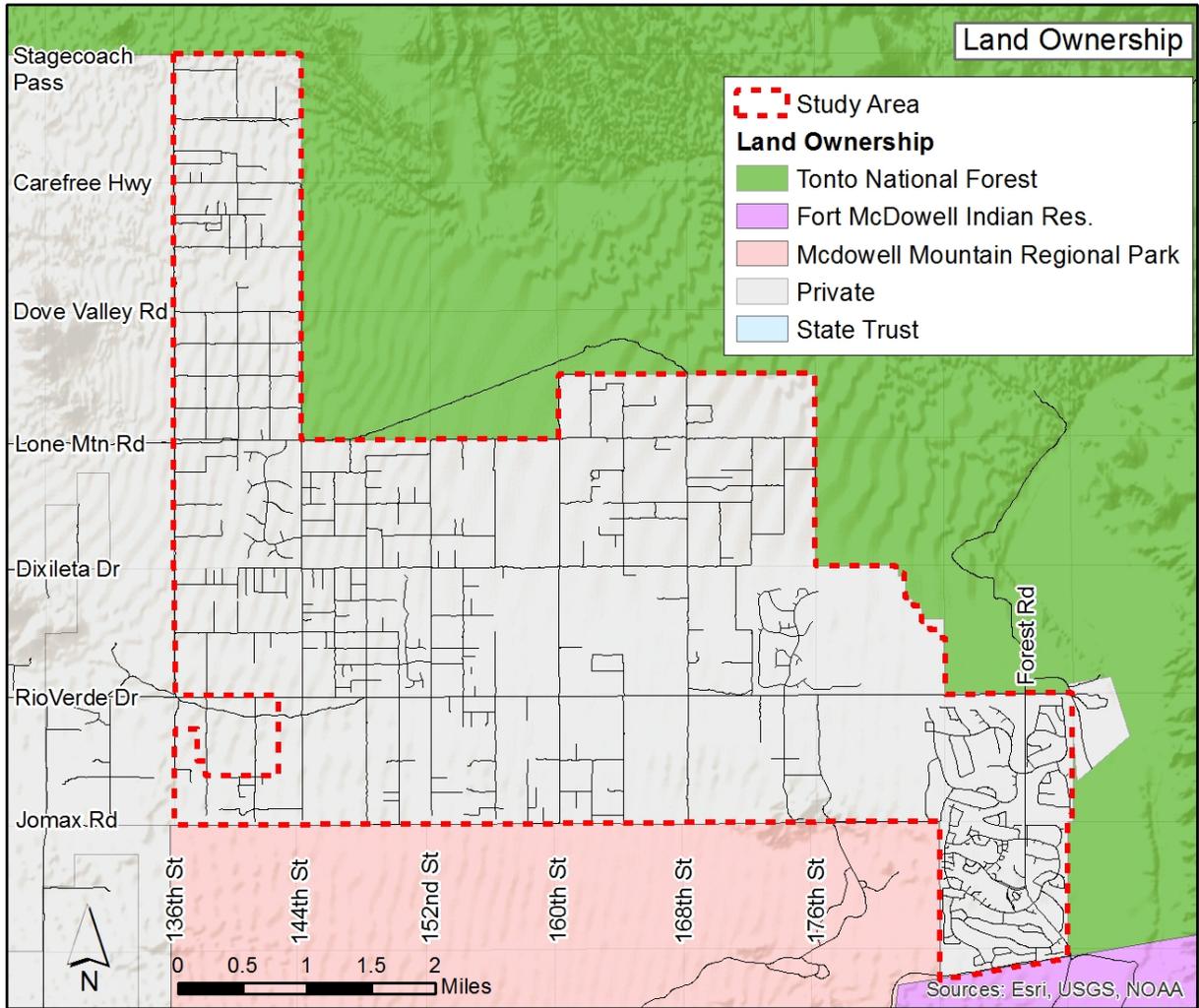


Figure 2-2 Land Ownership



2.3 Existing Land Use

Existing land uses were assessed via the 2014 MAG Land Use Shapefile and adjusted using aerial photography. Figure 2-3 illustrates the distribution of observed land uses.

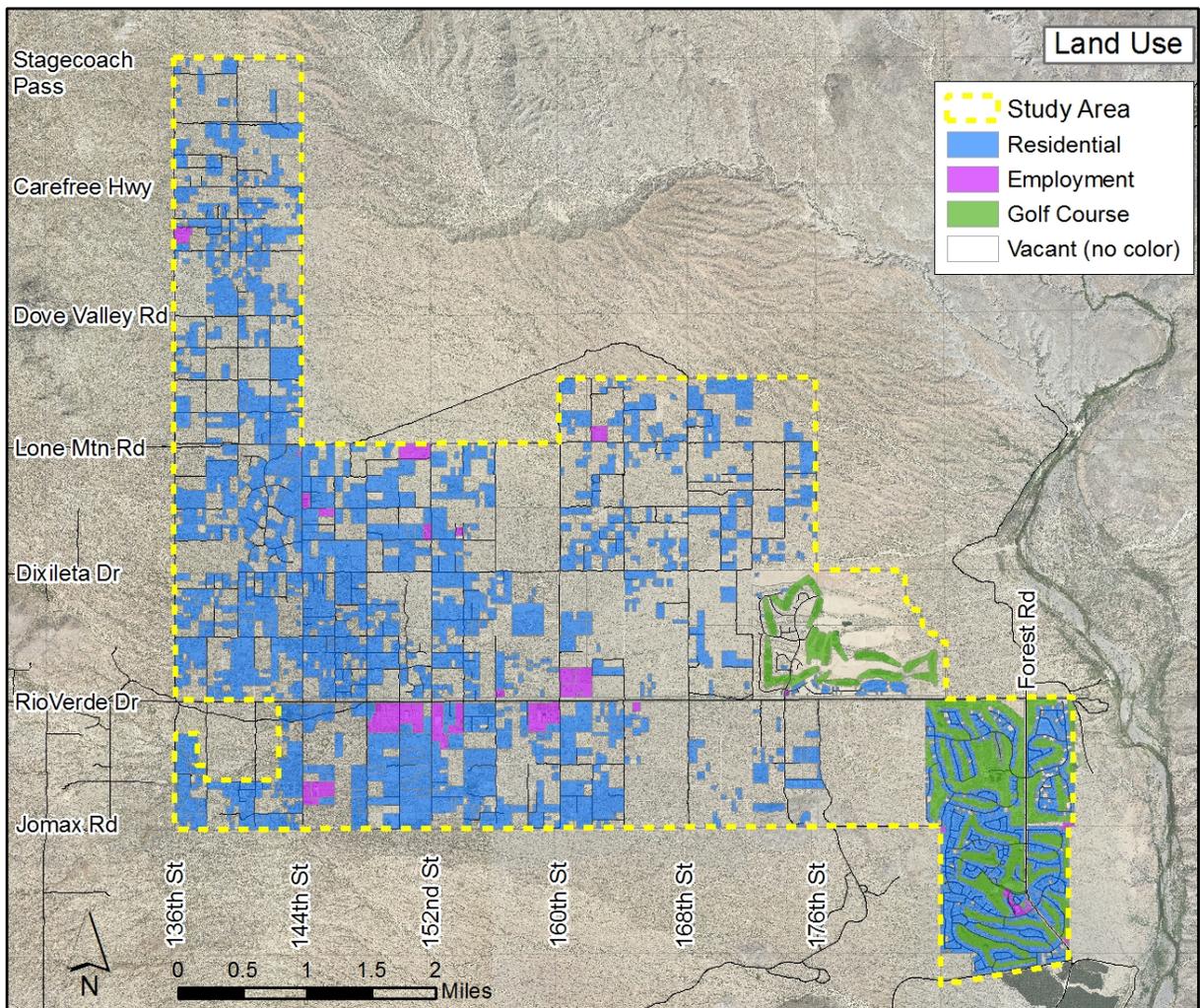


Figure 2-3 Existing Land Use

Residential

There are several developed communities within the Rio Verde SATS study area. These residential areas make up 35% of the study area (5025 acres).

Employment

Employment related parcels are located throughout the study area. Employment land uses were estimated to make up 2% of the study area (268 acres). Many of the employment parcels are related to the horse industry.

Golf Course

Approximately 5% (750 acres) of the study area is currently being used as golf courses.

Vacant

Over half of the study area consists of vacant/undeveloped Sonoran Desert land. Vacant lands make up 58% (8185 acres) of the study area.



2.4 Existing Zoning

The existing zoning patterns within the Rio Verde SATS study area are illustrated in Figure 2-4. Existing zoning was determined by review the zoning shapefile provided by MCDOT and comparing it to the Maricopa County Assessor's webpage.

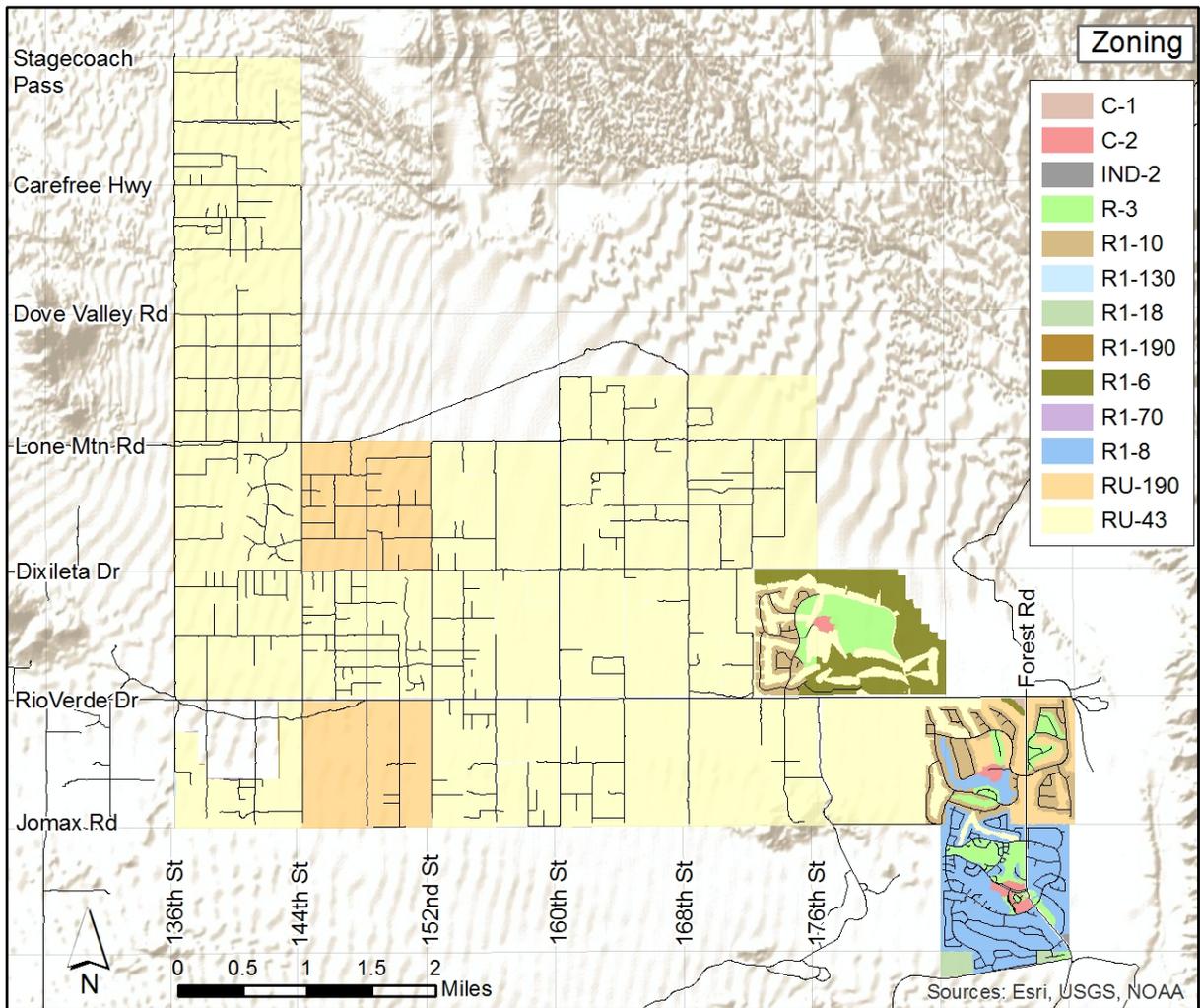


Figure 2-4 Existing Zoning

The majority of the study area is zoned RU-43 (Rural Residential). The RU-43 zoning districts permit one dwelling unit per 43,000 square feet. Other lands within the county are zoned in accordance with proposed Planned Area Developments (PAD) and other existing residential developments. Zoning districts associated with these PADs include:

- RU-190 (Rural Residential- 190,000 square feet per dwelling unit);
- R1-6 (Single Family Residential- 6,000 square feet per dwelling unit);
- R1-8 (Single Family Residential- 8,000 square feet per dwelling unit);
- R1-10 (Single Family Residential- 10,000 square feet per dwelling unit);
- R1-18 (Single Family Residential- 18,000 square feet per dwelling unit);
- R1-70 (Rural Zoning District- 70,000 square feet per dwelling unit);
- R1-130 (Rural Zoning District- 130,000 square feet per dwelling unit);
- R1-190 (Rural Zoning District- 190,000 square feet per dwelling unit)



- R-3 (Multiple-Family Residential- 3,000 square feet per dwelling unit);
- C-1 – Neighborhood Commercial;
- C-2 – Intermediate Commercial;
- Ind-2 – Light Industrial

2.5 Approved Master Plans

The majority of the SATS study area is rural, unplanned, and has developed asymmetrically. This development pattern is expected to continue. However, in order to effectively anticipate future travel demands, the projected number of homes/dwelling units (DU) will be required. Identifying and documenting the number of DU associated with Planned Area Developments and final plats can help guide this determination.

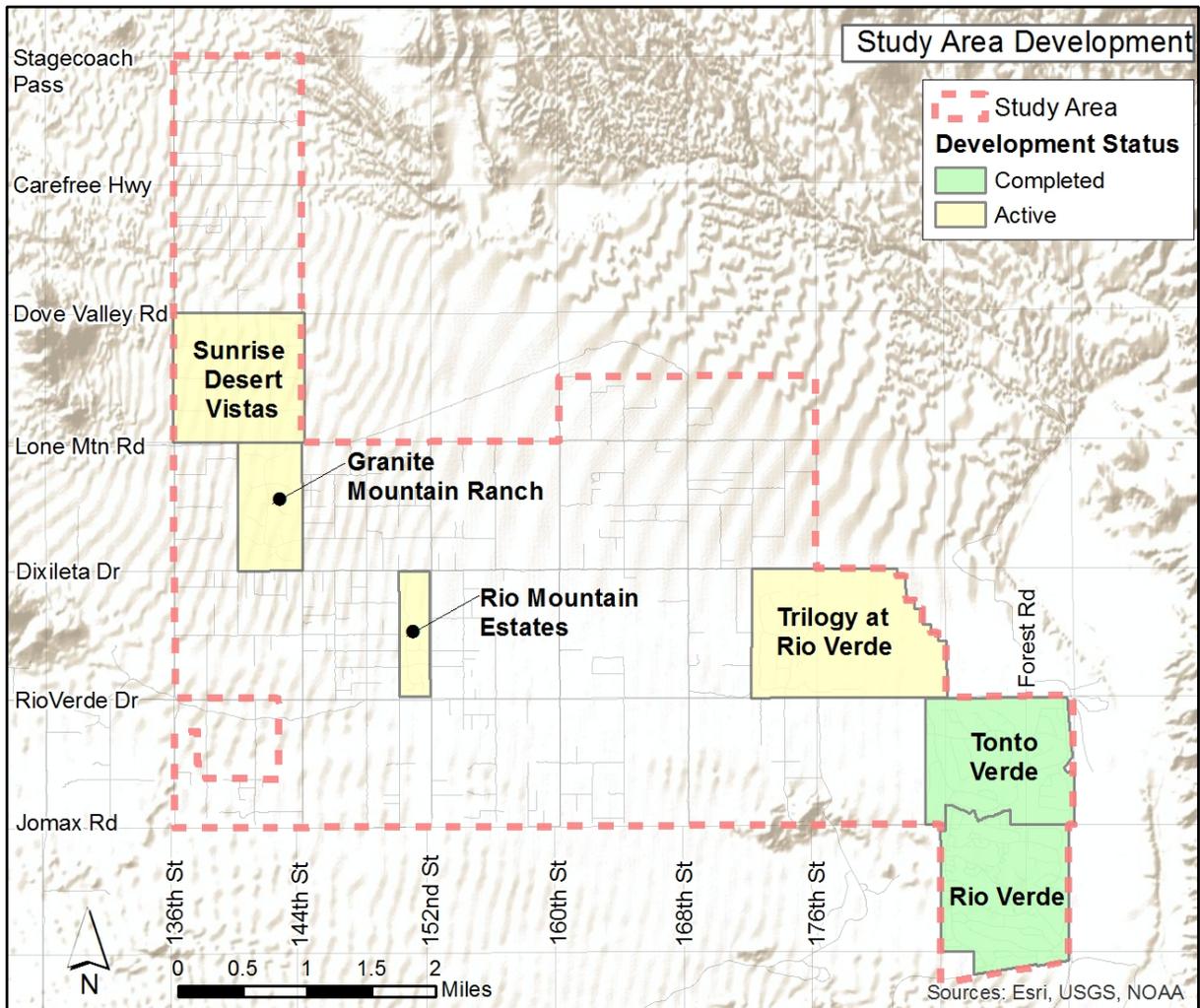


Figure 2-5 Study Area Developments

PADs are zoning documents that serve as master plans and development guides for larger developments. PADs often include a maximum number of potential units that may be achieved in final buildout. Final Plats as recorded at the Maricopa County Assessor's office provide the most specific lot count as subdivisions must be built in accordance with the Final Plat.



Sunrise Desert Vistas

Sunrise Desert Vistas can be categorized as a wildcat subdivision in that it was originally platted with a fewer number of parcels but has since been subdivided into smaller parcels. The neighborhood has a total of 173 residential lots that began development in 2003 but is still being developed.

Granite Mountain Ranch

The Granite Mountain Ranch Final Plat was approved in 2000 and was amended in February of 2002. It is marketed as a luxury gated equestrian community with two units. Unit 1 contains 100 residential lots, and unit 2 contains 55 residential lots.

Rio Mountain Estates

The Rio Mountain Estates Final Plat was approved in December of 2003. It is a gated community with 54 residential lots in the first unit, and 45 residential lots in the second unit.

Vista Verde (Trilogy)

The Vista Verde Development Master Plan was approved on April 18, 2001. It is currently under construction and its name has since been changed to Trilogy. The development is located at Rio Verde Drive and 184th Street. It is 856 acres and has 842 residential lots. It is a retirement community with golf courses, a club house, recreational facility, and single family attached and detached homes.

Tonto Verde

Tonto Verde is an active adult (retirement) community that is completely developed. It contains 716 residential lots, a club house, and golf courses.

Rio Verde

Rio Verde is the second retirement community within the Rio Verde SATS study area that is fully developed. Like Tonto Verde and Trilogy, it has golf courses and a club house. It has the most residential lots (1015) of any of the other completed, in progress or proposed developments in the area.

Collectively, these PADs have a total of 3000 DU.

Lacking any development plan for the remaining residential and vacant property within the study area (9792 acres), assumptions based on current zoning were made for the future number of DU within this portion of the study area. Nearly all of the unplanned study area is zoned RU-43 indicating one DU per acre (DUA). However, much of the land in the study area cannot support that housing density due to floodplains and terrain. Additionally, it is unlikely that all of the parcels will be developed during the study period or that all homes will be situated on solely one acre. Many homes in rural areas support equestrian/livestock and consequently comprise multiple acres. Given these considerations, it is assumed that the unplanned residential and vacant Rio Verde study area will be 70% developed by the design year at a density of 0.7 DUA. This would result in an additional 4798 DU for a total of 7798 DU in the study area.



3.0 Physical Features

3.1 Drainage

The purpose of this section is to summarize key drainage elements that have the potential to impact future roadway improvements. The study area is characterized by braided washes flowing from the west toward the Verde River to the east. The study area falls within the Rio Verde Area Drainage Master Plan (ADMP) that was completed in 2004 and updated in 2007. The updated ADMP used 2-dimensional flow routing software to delineate where floodplains were located within the study area.

3.1.1 Existing Floodplains

100-year floodplain delineations have been determined for the large and medium watercourses in the region. Figure 3-1 shows the delineated floodplains and floodways in the area.

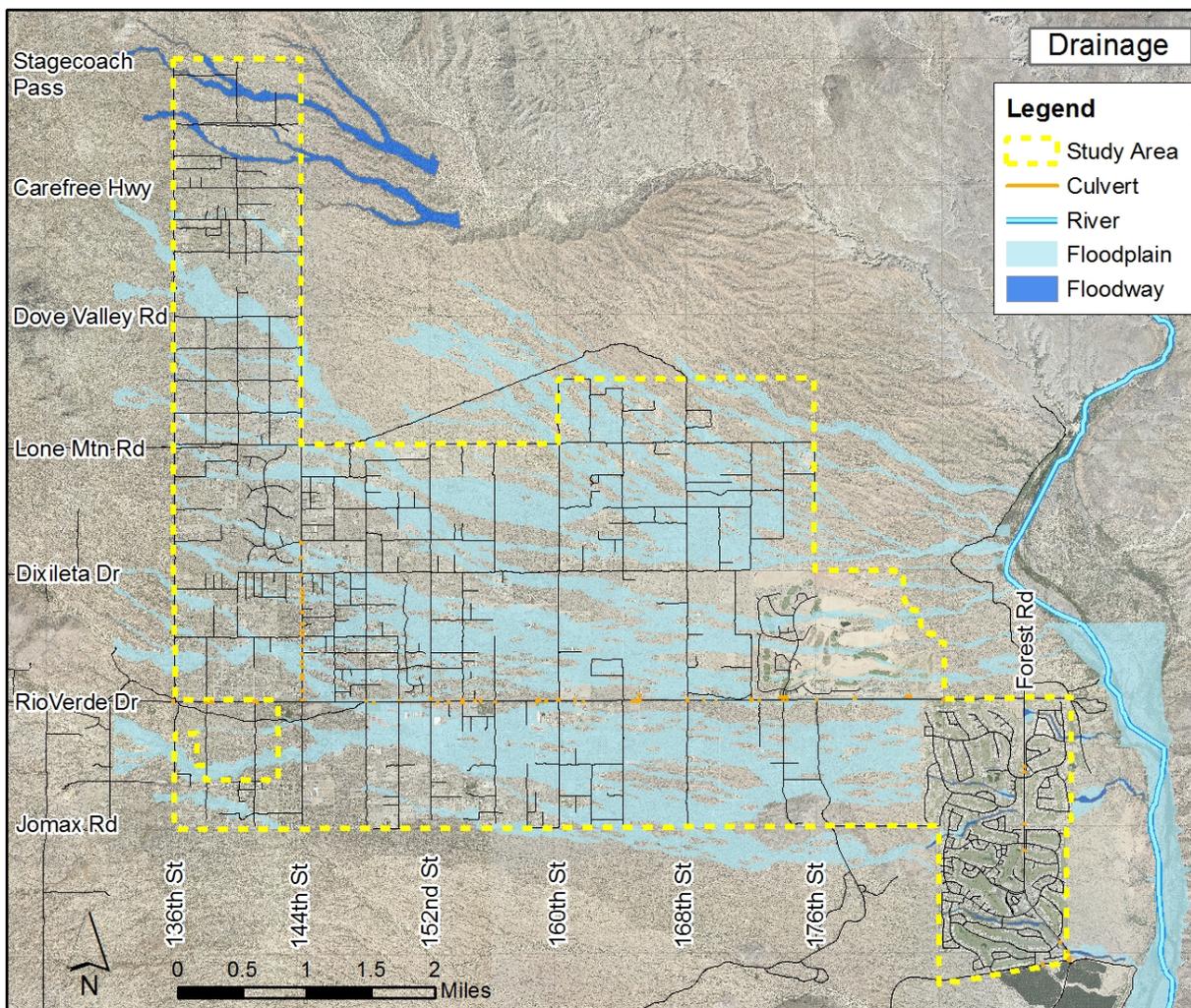


Figure 3-1 Drainage

A majority of the study area falls within Federal Emergency Management Agency (FEMA) zones X and AE. FEMA zone X states that there is less than a 0.2% chance of



annual flooding. Zone AE is considered a Special Flood Hazard Area and is subject to flooding by the 1% annual change flood. Base flood elevations have been determined for Zone AE. Floodplains and floodways dominate the study area and are highlighted in Figure 3-1 with light and dark blue shaded areas.

3.1.2 Existing Drainage Facilities

There are no major drainage facilities within the Rio Verde Study Area, except for a few culverts. There is a system of culverts and channels located in the Rio Verde and Tonto Verde subdivisions that direct flow from the open land to the west to the Verde River to the east.

3.1.3 Future Drainage Facilities

The 2007 Rio Verde ADMP explored a channelized approach, a detention basin approach and a regulatory approach to addressing floodplains within the Rio Verde study area. Ultimately, the regulatory approach was recommended for the Rio Verde Area. This approach does not propose any new drainage structures to minimize floodplains within the study area. Instead, it focuses on mitigating flood damage by regulating development within the adopted Zone AE floodplains (Floodways were not used within the study area).

3.2 Existing Utilities

Arizona 811 was contacted to identify the utility stakeholders within the Rio Verde SATS study area. Table 3-1 contains a list of the utility owners and utility types identified by Arizona 811 within the study area.

Table 3-1 Existing Utility Providers

Utility Company	Type of Utility
Arizona Public Service - Contract Locator West Side	Electric
City of Scottsdale	Reclaimed Water, Sewer, Water
City of Scottsdale Facilities Department	Communications, Electric, Fiber, Sewer, Water
Cox Communications – Maricopa	CATV, Fiber
CTLQL – CenturyLink	Coaxial, Fiber
Global Water/Water Util. of Northern Scottsdale	Water
Midvale Telephone Exchange-Granite Mtn	Coaxial, Fiber
Rio Verde Utilities, Inc.	Sewer, Water
Salt River Project – Maricopa County	Communication, Electric, Fiber, Irrigation
Southwest Gas Contract Locator NE	Gas
Town of Cave Creek Water Sabrosa	Water
Zayo Group fka AGL	Communication Vault, Conduit, Fiber

Given the large number of utility providers and size of the study area, descriptions of existing utilities were limited to those that have the greatest potential to impact future roadway alignments. High voltage overhead transmission lines and existing wells are depicted in Figure 3-2.

Arizona Public Service (APS) operates a 345kV transmission line that follows the Lone Mountain Road alignment between 136th Street and 144th Street, then continues northeast.



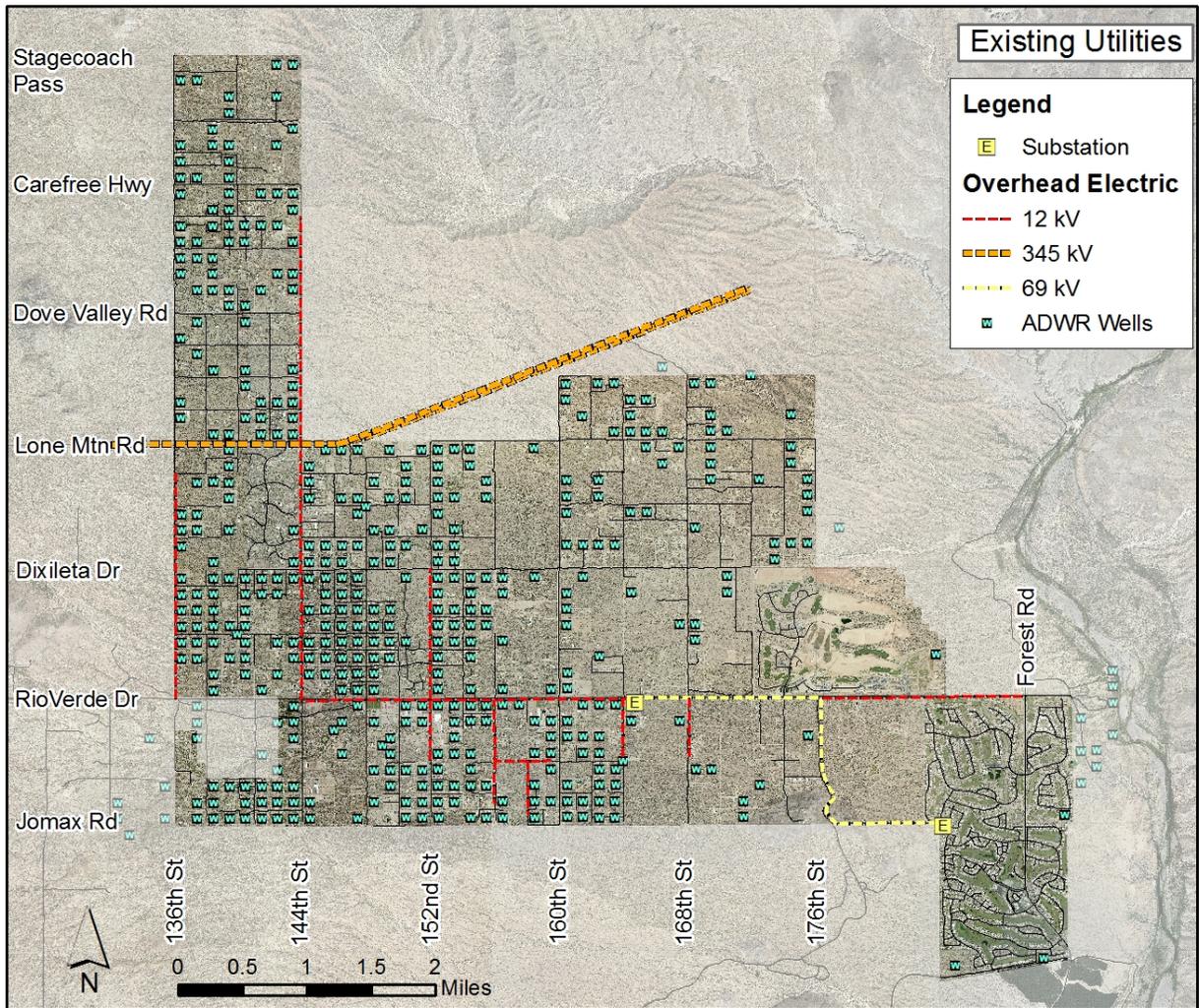


Figure 3-2 Existing Utilities

Salt River Project (SRP) also owns a 69kV transmission line that follows East Jomax Road between North Aguila Drive and 176th Street, then continues along 176th Street until Rio Verde Drive where it follows Rio Verde Drive on the south side of the roadway and ends at the substation located at the intersection of Rio Verde Drive and 164th Street.

There are also SRP 12kV distribution lines that follow the 136th Street, 144th Street, 168th Street, and Rio Verde Drive alignments

The Rio Verde SATS study area has a large number of well sites, many of which are located along the existing arterial streets. The majority of these wells serve individual residential parcels or a combination of several parcels. These wells represent a potential constraint to future roadways as they are not easily moved when in conflict. The Arizona Department of Water Resources (ADWR) well registry identifies 664 existing well sites within the study area. Reported water level depths of the existing wells vary between 0 feet and 1000 feet (The mean well depth is 478 ft with a standard deviation of 331 ft).



4.0 Roadway Features

4.1 Existing Roadways

The existing arterial roadway network is depicted in Figure 4-1. The number of lanes were determined by reviewing aerial photographs and through onsite visits. The number of lanes depicted in Figure 4-1 includes turn lanes.

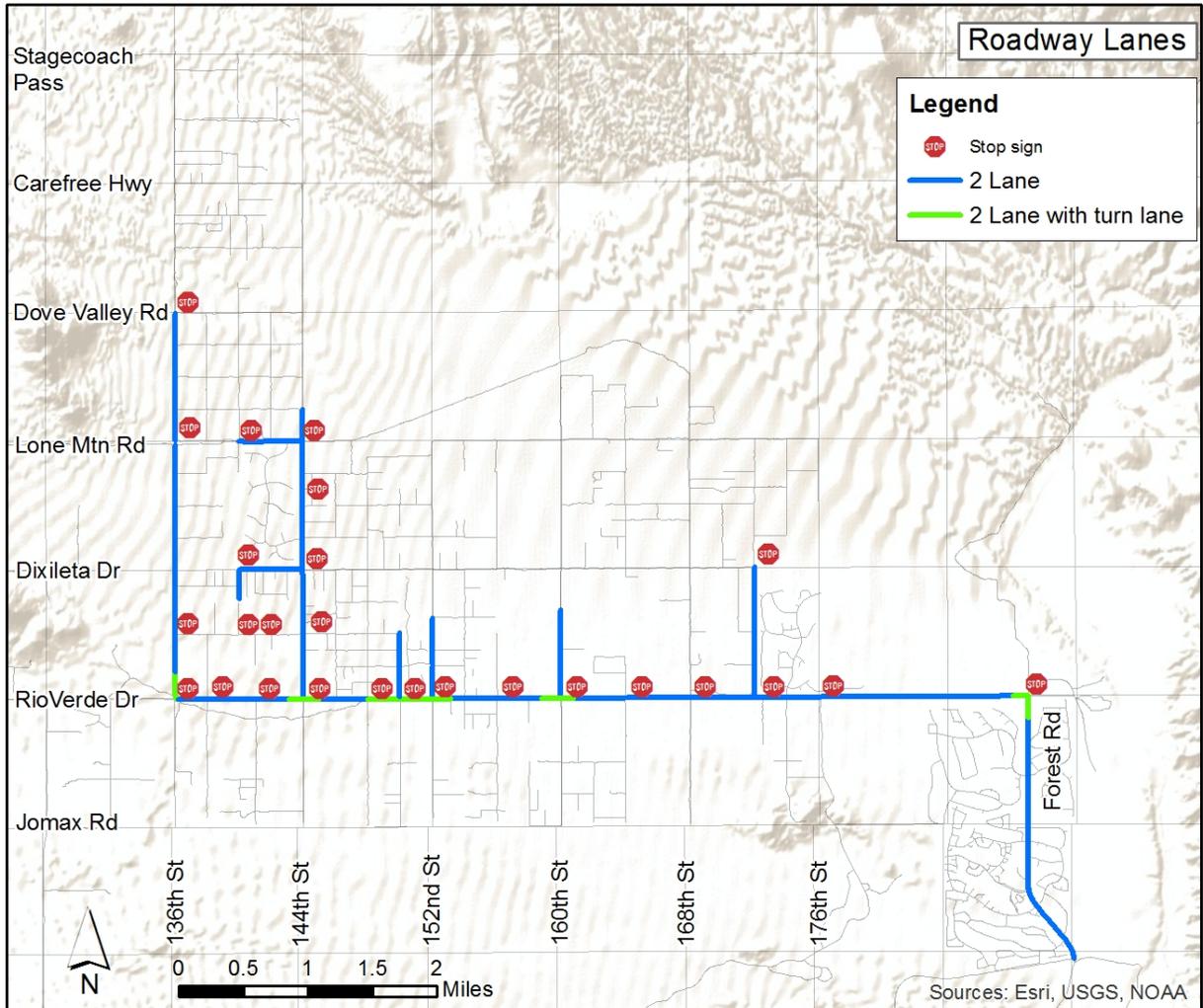


Figure 4-1 Existing Roadway Network/Number of Lanes

The majority of roadways within the study area are unpaved with no defined laneage. Rio Verde Drive and a few segments of various other roadways are paved, two lane roadways. The following provides a breakdown of the number of miles of roadways with varying numbers of lanes.

Lanes	Miles
Unpaved	55.5
2	17.5
3	1.6

4.2 Existing Right-of-way

The existing right-of-way varies between 0ft and 200ft throughout the study corridor. Right-of-way data was gathered by reviewing the Maricopa County Assessor's maps, GIS data. Table 4-1 provides an overview of the existing right-of-way.



Table 4-1 Overview of Existing Right-of-way

Road	Segment			ROW Width	Comment
Stagecoach Pass Rd	136 th St	to	144 th St	55ft	Verified
Hawknest Rd	136 th St	to	144 th St	80ft	Verified
Carefree Hwy	136 th St	to	144 th St	0ft	Verified
Westland Rd	136 th St	to	144 th St	0ft	Verified
Dove Valley Rd	136 th St	to	144 th St	0ft	Verified
Asher Hills Dr	136 th St	to	144 th St	0ft	Verified
Lone Mountain Rd	136 th St	to	144 th St	55ft	Verified
	152 nd St	to	176 th St	0ft	Verified
Montgomery Rd	144 th St	to	152 nd St	0ft	Verified
	160 th St	to	172 nd St	0ft	Verified
Dixileta Dr	140 th St	to	156 th St	55ft	Unverified
	156 th St	to	176 th St	110ft	Unverified
Peak View Dr	136 th St	to	144 th St	40ft	Verified
	144 th St	to	150 th St	0ft	Verified
Rio Verde Dr	136 th St	to	142 nd St	200ft	Unverified
	142 nd St	to	Forest Rd	200ft	Verified
Jomax Rd	148 th St	to	150 th St	0ft	Verified
	156 th St	to	160 th St	55ft	Verified
	175 th St	to	Aguila Rd	0ft	Verified
136 th St	Jomax Rd	to	Redbird Rd	55ft	Unverified
	Pinacle Vista	to	Rio Verde Dr	80-85ft	Unverified
	Rio Verde Dr	to	Dove Valley Rd	55ft	Unverified
138 th St	Dove Valley Rd	to	Stagecoach Pass Rd	55ft	Verified
	Jomax Rd	to	Quail Track Rd	0ft	Verified
140 th St	Rio Verde Dr	to	Peak View Rd	0ft	Verified
	Peak View Rd	to	800ft north	40ft	Verified
	800ft north	to	1200ft north	0ft	Verified
	1200ft north	to	1570ft north	40ft	Verified
	1780ft north	to	Dixileta Dr	0ft	Verified
141 st St	Wildcat Dr	to	Red Range Way	0ft	Verified
	Westland Rd	to	Villa Cassandra	0ft	Verified
	Jomax Rd	to	Quail Track Rd	0ft	Verified
144 th St	Rio Verde Dr	to	Peak View Rd	0ft	Verified
	Jomax Rd	to	Cavedale Dr	0ft	Verified
	Cavedale Dr	to	Dixileta Dr	55ft	Verified
	Rio Verde Dr		Dixileta Dr	110ft	Unverified
	Dixileta Dr	to	Windstone Trl	110ft	Verified
148 th St	Windstone Trl	to	Stagecoach Pass Rd	55ft	Verified
	Rio Verde Dr	to	Rancho Del Oro Dr	0ft	Verified
150 th St	Jomax Rd	to	380ft north	30ft	Verified
	380ft north	to	900 ft south of Rio Verde Dr	0ft	Verified
	900 ft south of Rio Verde Dr		Rio Verde Dr	30ft	Unverified
152 nd St	Rio Verde Dr	to	Peak View Rd	40ft	Verified
	Jomax Rd	to	Rio Verde Dr	80ft	Verified
	Rio Verde Dr	to	Skinner Dr	55ft	Verified
	Rio Verde Dr		Dixileta Dr	110ft	Unverified
	Dixileta Dr	to	Lone Mountain Rd	0ft	Verified
156 th St	Jomax Rd	to	Rio Verde Dr	80ft	Verified
	Rio Verde Dr	to	Dixileta Dr	80ft	Unverified
	Dixileta Dr		Lone Mountain Rd	40ft	Unverified
158 th St	Jomax Rd	to	Pinnacle Vista Dr	60ft	Verified
160 th St	Jomax Rd	to	Morning Vista Ln	110ft	Verified
	Morning Vista Ln	to	Asher Hills Dr	55ft	Unverified



164 th St	Jomax Rd	to	Rio Verde Dr	40ft	Verified
	Rio Verde Dr	to	Ranch Rd	80ft	Unverified
	Ranch Rd		Asher Hills Dr	40-80ft	Unverified
168 th St	Jomax Rd	to	Rio Verde Dr	110ft	Verified
	Rio Verde Dr	to	Morning Vista Ln	110ft	Unverified
	Morning Vista Ln		Dixileta Dr	55ft	Unverified
	Dixileta Dr		Asher Hills Dr	110ft	Unverified
172 nd St	169 th Way	to	Rio Verde Dr	0ft	Verified
	Rio Verde Dr	to	Dixileta Dr	40ft	Verified
	Dixileta Dr	to	Ranch Rd	80ft	Unverified
	Ranch Rd		Asher Hills Dr	40ft	Unverified
176 th St	Jomax Rd	to	Rio Verde Dr	200ft	Verified
	Montgomery Rd	to	Lone Mountain Rd	0ft	Verified
Forest Rd	McDowell Mountain Rd	to	Tonto Trl	132ft	Verified
	Tonto Trl	to	Rio Verde Dr	110ft	Verified

4.3 Direct Access Driveways

One constraint that has the potential to impact roadway improvements is the presence of residential driveways that have direct access to an arterial roadway. Driveways represent potential points of conflict as vehicles enter and leave roadways at reduced speeds. Nevertheless, access to these residential parcels must be maintained with future roadway improvements.

Figure 4-2 highlights where these driveways are located. A total of 625 direct access driveways were identified. The greatest number of direct access driveways are bounded by Dixileta Drive, Rio Verde Drive, 140th Street, and 148th Street.

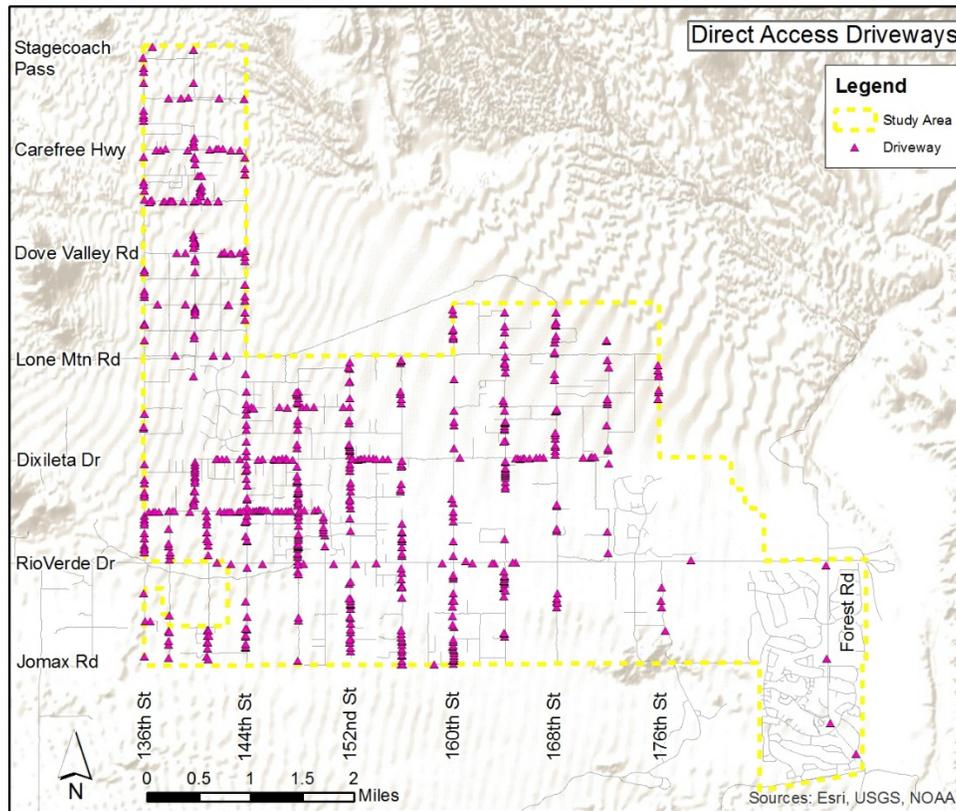


Figure 4-2 Direct Access Driveway Locations



4.4 Programmed Roadway Improvements

MCDOT's interactive project information map (<http://gis.maricopa.gov/Projects/>) was referenced to identify ongoing County projects within the study area. The only ongoing project that was identified was a scoping project Rio Verde Drive between 136th street and 152nd street (TT0563). The purpose of this scoping study is to identify alternatives to increase capacity and reduce traffic congestion on this roadway segment that has been modeled to exceed roadway service volume thresholds by 2020.

The most recently available Transportation Improvement Programs (TIP) for MCDOT was also reviewed to identify other programmed transportation improvement projects within the study area. No additional projects were identified.

The perimeter of the study area is bounded by the McDowell Sonoran Preserve (west), Tonto National Forest (north/east), and McDowell Mountain Regional Park (south). There are no proposed roadway improvements adjacent to the Rio Verde Study Area.

4.5 Crash Analysis

Crash data from 2012 to 2017 was reviewed for the study area and is depicted in Figure 4-3 by crash type.

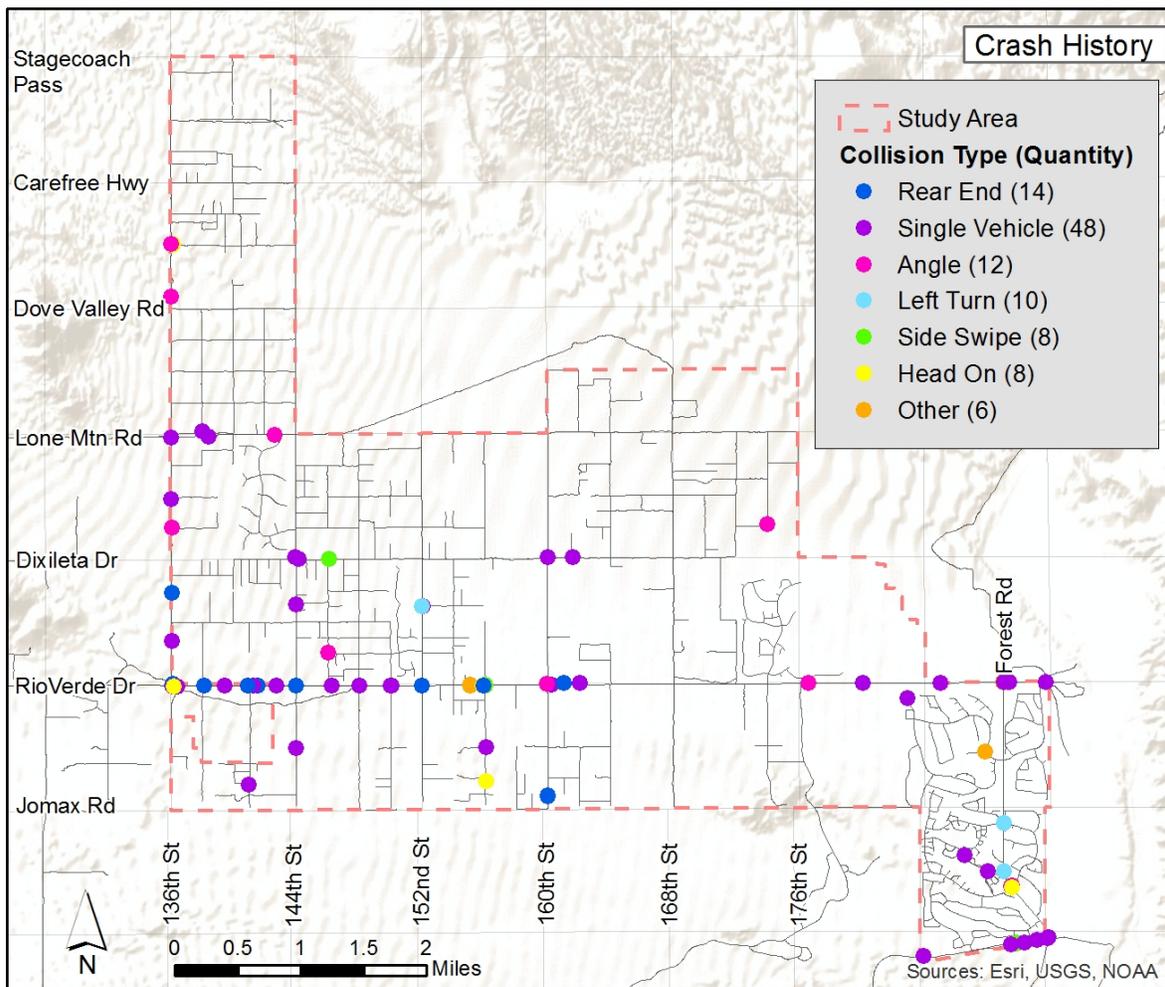


Figure 4-3 Crash History



A total of 106 crashes were reported within the study area between January 12, 2012 and September 29, 2017. The following list presents the number and percentage of the different crash types:

Type	#	%
Single Vehicle	48	45.3
Rear End	14	13.2
Angle	12	11.3
Left-turn	10	9.4
Sideswipe	8	7.5
Head-on	8	7.5
Other	6	5.7

Severity	#	%
No injury	50	47.2
Possible injury	14	13.2
Non-incapacitating injury	22	20.8
Incapacitating injury	17	16.0
Fatality	3	2.8

The data was also reviewed for crash severity. The majority of the crashes were “no injury” crashes. Three fatal crashes were reported during the time period. Over half of the total number of crashes (53.8%) have occurred on Rio Verde Drive, including 14 of the 17 incapacitating injuries and two of the three fatalities.

The collision data reviewed for this report did not contain consistent data on pedestrian or cyclist related accidents. Therefore, no observations are made about the frequency of bicycle or pedestrian crashes within the study area.

5.0 Environmental Summary

Based on the evaluation of the existing conditions within the study area, additional research, analysis, coordination, and/or permitting will be required before construction of any proposed roadway improvements. The following is a brief summary of identified environmental considerations within the study area. For more detail and information on the cultural and biological resources within the Rio Verde Study Area refer to Appendices A and B respectively.

5.1 Cultural Resources

Approximately 6 percent of the current study area (including a one-mile buffer) has been surveyed between 6 and 54 years ago. There are 59 previously recorded cultural resources within a 1-mile buffer of the 22-square mile study area. Of these, there are 20 previously recorded archaeological sites within the study area 18 of which have not been evaluated for A/NRHP eligibility. Documented sites include:

- An archaeological village site that has been determined eligible for inclusion in the A/NRHP under Criterion D as reported in AZSITE.
- A second site was determined not eligible for A/NRHP status as reported in AZSITE.

It is recommended that a new Class III cultural resources inventory be conducted prior to any anticipated ground disturbing activities.

5.2 Natural Resources

The study corridor encompasses a large area of relatively undisturbed Sonoran Desert scrub habitat. This vegetation supports numerous species of plants and wildlife that have the potential to be impacted by project activities.



The project area has an elevational range of 1,545 feet above mean sea level in the southeast corner near the river to 2,702 feet above mean sea level in the northwest corner.

The Arizona Game and Fish Department's Heritage Data Management System and the U.S. Fish and Wildlife Service list of endangered, threatened, proposed, and candidate species for Maricopa County were reviewed by a qualified biologist to determine which species may occur in the study area. Though species may occur within the study area, no critical habitat is present. Prior to surface disturbing activities, an Arizona Native Plant Law, Sonoran Desert tortoise, and western burrowing owl surveys would be required; additional informal consultation with each agency may include additional survey requirements such as a migratory bird nesting survey.

6.0 Public Feedback

A public open house was conducted on Wednesday, May 2, 2018. During this public meeting residents were given the opportunity to express any concerns they have regarding existing conditions and constraints within the Rio Verde SATS study area. Almost all of the feedback that was received was in response to the proposed 4 lane roadway on Rio Verde Road. Another common comment was the desire to have a bypass road from Rio Verde Drive into Fountain Hills via the 176th Street alignment. Many residents also expressed concerns regarding the Forest Service introducing staging areas to allow for Tonto National Forest access at the north end of a few of the existing residential streets in the area. The only feedback received that would potentially pertain to the Rio Verde SATS is that most of the residents did not want any of the current dirt roads to be paved. Please reference Appendix C for a summary of all public comments received at the public meeting.



Appendix B

Transportation Network Recommendations Report



Rio Verde Small Area Transportation Study

Final Transportation Network Recommendations

Prepared For:



Prepared By:



September 2018

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Abbreviations

Average Daily Traffic	ADT
Dwelling Unit	DU
Institute of Transportation Engineers	ITE
Level of Service	LOS
Maricopa Association of Governments	MAG
Maricopa County Department of Transportation	MCDOT
Regional Analysis Zone	RAZ
Small Area Transportation Study	SATS
Traffic Analysis Zone	TAZ



1.0 Introduction

1.1 Background

The Rio Verde area is a large rural area that has experienced growth over the past couple of decades. There is concern that development, without a clear understanding of future roadway network needs, may lead to residential and/or commercial improvements that constrain right-of-way needed for future roadways.

The Maricopa County Department of Transportation (MCDOT) has commissioned this Small Area Transportation Study (SATS) to compare how future roadway networks correlate to available/existing conditions within the proposed study area. The potential future roadway network will be recommended based on future travel demands, opportunities and constraints identified in the study area.

The purpose of this report is to provide an understanding of the study area's future roadway network needs.

1.2 Study Area

The SATS study area includes unincorporated Maricopa County from 136th Street to just beyond Forest Road on the east, and between McDowell Mountain Road on the south and Stagecoach Pass Road to the north. Refer to **Figure 1-1** for a map of the study area.

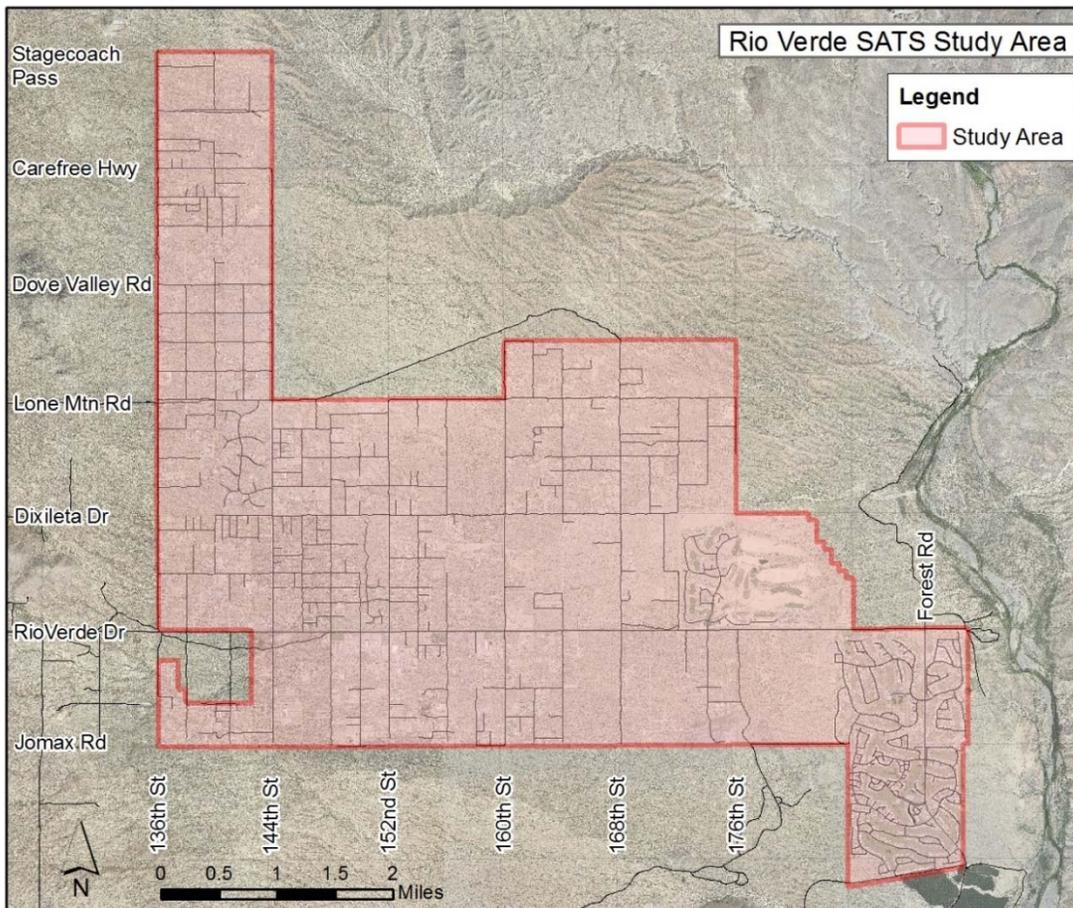


Figure 1-1 SATS Study Area



2.0 Analysis of Socioeconomic Data

Socioeconomic data for the study area was provided by the Maricopa Association of Governments (MAG) for the years 2015 and 2040. These datasets are used by MAG to forecast travel demand for the MAG planning area which includes Maricopa County. The datasets were analyzed focusing on total population, total employment, and total dwelling units. These are the primary factors that drive the daily trip estimates used in generating the daily traffic forecasts. **Table 2-1** provides the elements of the MAG travel demand model database that each factor consists of.

Table 2-1 MAG Travel Demand Model Elements

Population		Employment		Dwelling units	
POP1	Resident populations in households	EMP1	Other employment**	DU 9	Dwelling units <10 years old
POP2	Resident populations in Group Quarters*	EMP2	Public employment	DU 19	Dwelling units 10-19 years old
POP3	Transient Households	EMP3	Retail employment	DU 29	Dwelling units 20-29 years old
POP4	Seasonal Households	EMP4	Office employment	DU 30	Dwelling units 30+ years old
POPCORR	Population in correctional facilities	EMP5	Industrial employment		
POPINST	Population in institutional facilities	WAHEMP	Work at home employment		
POPMINST	Population in military group facilities	CONSTEMP	Construction employment		
		PUBOFF	Public employment on office land use		
		PUBPUB	Public employment on public land use		
		NSEMP	Non-standard employment		

*excluding institutional, military and correctional facilities

**excluding Work-at-Home and Construction employment

MAG subdivides socioeconomic data into small geographic areas called Traffic Analysis Zones (TAZ). These TAZ boundaries often coincide with US census block boundaries and represent the smallest geographical unit of data that is used in transportation planning studies. The Rio Verde Study area falls within a single TAZ per the MAG model. The surrounding TAZs coincide with the Tonto National Forest, McDowell Mountain Preserve, and McDowell Mountain Regional Park - all of which are assumed to be undevelopable for the foreseeable future. **Table 2-2** is a summary of the socioeconomic data for the Rio Verde Study area.

Table 2-2 Summary of 2015 and 2040 MAG Socioeconomic Data for the Study Area

	Total Area (mi ²)	Total Population	Total DU	Total Employment	Population per mi ²	Population per DU	Employment per mi ²	DU per acre
2015	19.33	3725	1566	376	193	5.38	19	0.13
2040	19.33	8440	3389	1019	437	2.49	53	0.27
% Change		127%	116%	171%	127%	5%	171%	116%

Due to the fact that the entire study area is encompassed in one TAZ, there is not enough resolution in the socioeconomic data available to develop a recommended



roadway network based upon this data alone. An alternative approach to anticipating growth within the study area is presented in Section 3.2.

3.0 Transportation Network Analysis

3.1 Existing Roadway Network

3.1.1 Number of Lanes and Functional Class

The existing roadway network for the SATS Study Area is shown in **Figure 3-1**. The roadways represented with blue linework are two-lane, collector roadways. The roadways highlighted in yellow are maintained by MCDOT. All other roadways are largely unpaved and privately maintained. The residential roadways within the Rio Verde, Tonto Verde, Trilogy and Granite Mountain developments are privately owned and paved.

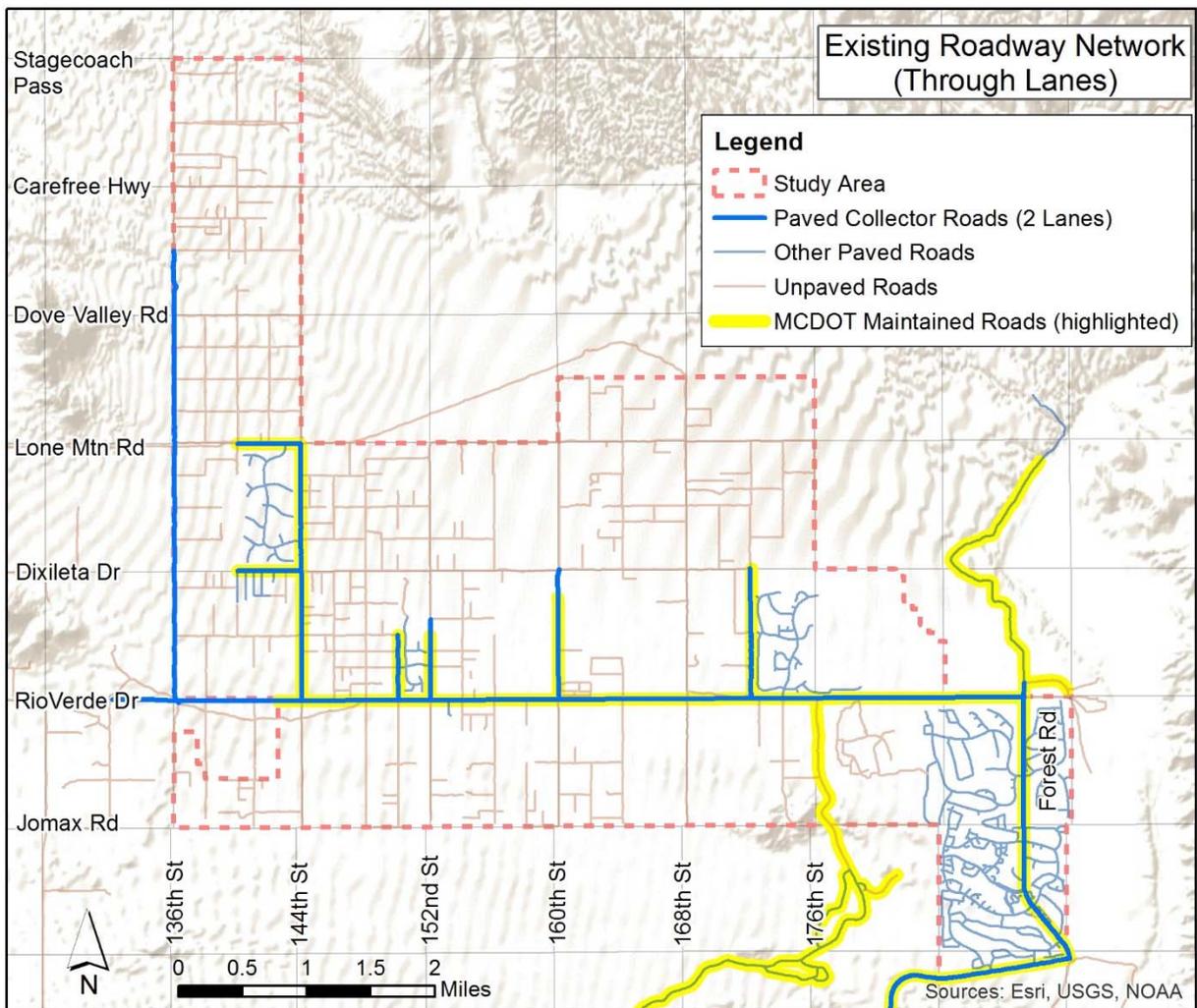


Figure 3-1 Existing Roadway Network

The functional classification of the existing and future roadway network is provided in **Figure 3-2** from the MCDOT Major Streets and Routes Plan (2011 draft). Currently, Rio

Verde Drive is classified as a minor arterial roadway, 136th Street is classified as a minor collector and 144th Street is classified as a major collector. The MSRP classified all other mile roadways as planned major collectors.

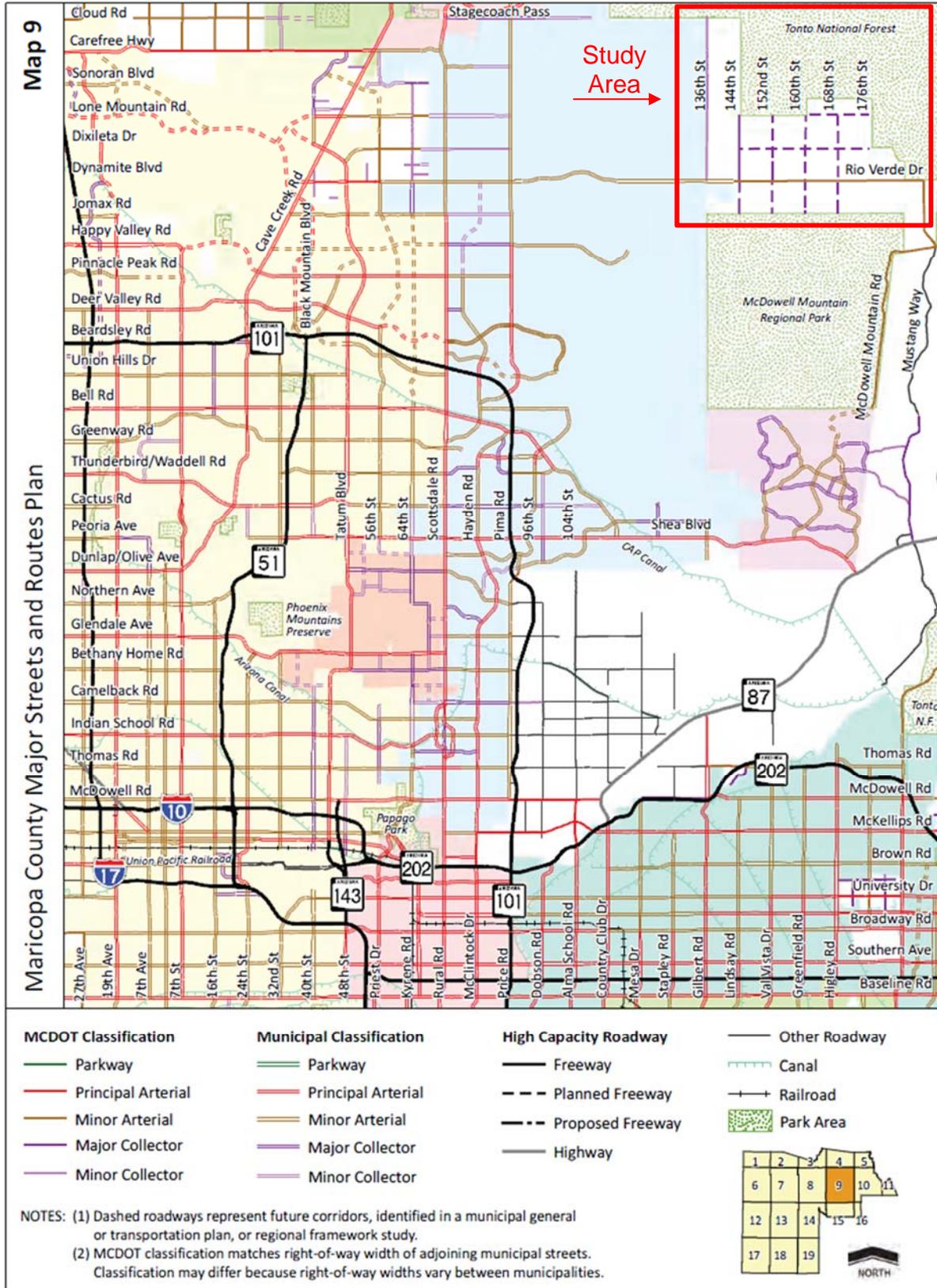


Figure 3-2 Functional Classification Map per the MSRP



3.1.2 Summary of Existing Traffic Count Data

Existing average daily traffic (ADT) volume counts for the study area roadways were compiled from the MCDOT Traffic Counts website. A map with the existing ADTs is provided in **Figure 3-3**.

3.1.3 2017 Roadway Network Traffic Counts

MAG provided output data for the study area roadways from the MAG Regional Travel Demand Model for the 2015 “base year”. The data provided included the number of lanes for the roadway links in the model and the forecast traffic volume data associated with each link. The 2015 traffic volumes were used in order to make a lateral comparison to the 2015 MAG model ADT. The 2015 roadway network and forecast two-way daily traffic volumes are provided in **Figure 3-3**.

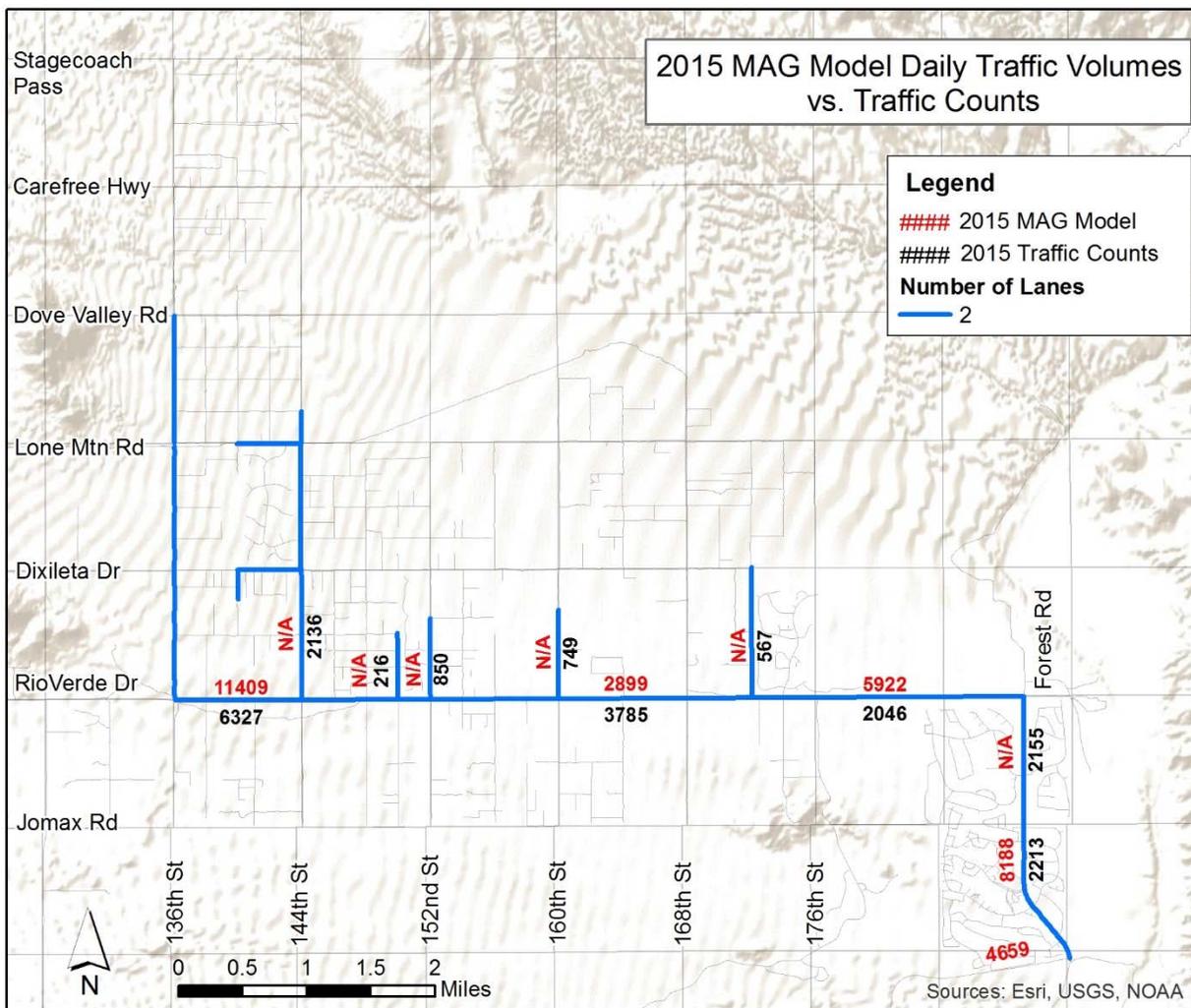


Figure 3-3 Existing Roadway Network Traffic Counts and 2015 Forecast Traffic Volumes

3.1.4 Comparison of 2015 Counts to MAG 2015 Forecast Traffic Volumes

The 2015 MAG Regional Travel Demand Model only contained forecasted ADT volumes for Rio Verde Drive and Forest Road. The MAG Regional Travel Demand Model estimated ADT values between 1.8 and 3.7 times larger than the measured traffic

counts for Rio Verde Drive between 136th Street and 152nd Street, and between 172nd Street and Forest Road. The MAG Regional Travel Demand Model underestimated the ADT for Rio Verde Drive between 152nd Street and 172nd Street.

The MAG Regional Travel Demand Model assigns traffic to the roadway network based on algorithms that distribute traffic between the various trip generators and attractors according to several input criteria and constraints. Therefore, it is not unusual for many links to under or over-predict the traffic volume on the study area roadways. For the purposes of this study the ADT obtained from the MCDOT Traffic Count website will be used.

3.1.5 2015 Study Area Level of Service

The ability of a transportation system to transmit the transportation demand is characterized as its level-of-service (LOS). Level-of-service is a rating system from “A”, representing the best operation with the least delay, to “F”, representing the worst operation with the greatest delay. Typically, level-of-service “D” is considered the minimum acceptable operation. The appropriate reference for level-of-service operation is the *Highway Capacity Manual*, published by the Transportation Research Board.

Generalized Annual Average Daily Service Volume Tables were prepared for MCDOT in conjunction with the *Transportation System Plan 2035*. The data was presented in the Generalized Annual Average Daily Service Volume Tables Technical Memorandum. A summary table of the volume thresholds used for this transportation study is provided in **Table 3-1**. The desired LOS for each functional classification, per the MCDOT Roadway Design Manual has been highlighted.

Table 3-1 Daily Two-Way Traffic Volume Level of Service (LOS) Thresholds

RURAL				
Functional Classification	# of Lanes	Median Type	Max LOS	Service Volume*
Parkway	4	Divided	C	36,900
	6	Divided	C	55,500
	8	Divided	N/A	N/A
Principal Arterial	2	Undivided	C	10,600
		Divided	C	11,200
	3	Undivided	C	16,800
		Divided	C	17,800
	4	Undivided	C	22,900
		Divided	C	24,400
	5	Undivided	C	28,800
		Divided	C	30,700
	6	Undivided	C	34,700
		Divided	C	36,900
8	Divided	N/A	N/A	
Minor Arterial	2	Undivided	C	9,500
		Divided	C	10,100
	3	Undivided	C	15,100
		Divided	C	16,100
	4	Undivided	C	20,700
		Divided	C	22,000
	5	Undivided	C	26,000
		Divided	C	27,600
	6	Undivided	C	31,200
		Divided	C	33,210



Table 3-1 Daily Two-Way Traffic Volume Level of Service (LOS) Thresholds (Continued)

RURAL				
Functional Classification	# of Lanes	Median Type	Max LOS	Service Volume*
Major Collector	2	Undivided	B	5,600
		Divided	B	5,900
	3	Undivided	B	8,600
		Divided	B	9,100
	4	Undivided	B	11,500
		Divided	B	12,200
	5	Undivided	B	14,200
		Divided	B	15,000
	6	Undivided	B	16,800
		Divided	B	17,900
Minor Collector	2	Undivided	B	5,000
		Divided	B	5,300
	3	Undivided	B	5,500
		Divided	B	8,200
	4	Undivided	B	10,300
		Divided	B	11,000
	6	Undivided	N/A	N/A
		Divided	N/A	N/A
Local	2	Undivided	A	700
		Divided	A	800

*Average Annual Daily Traffic Volume

The resulting study area roadway LOS is shown in **Figure 3-4**. The figure shows two roadways (140th Street and Lone Mountain Road) with a LOS of “N/A” which represent roadway links without daily traffic volume counts. It should be noted that these roadways are courtesy graded roadways, which is why there are no available counts. All other existing roadways managed by MCDOT are anticipated to operate at LOS C or better.



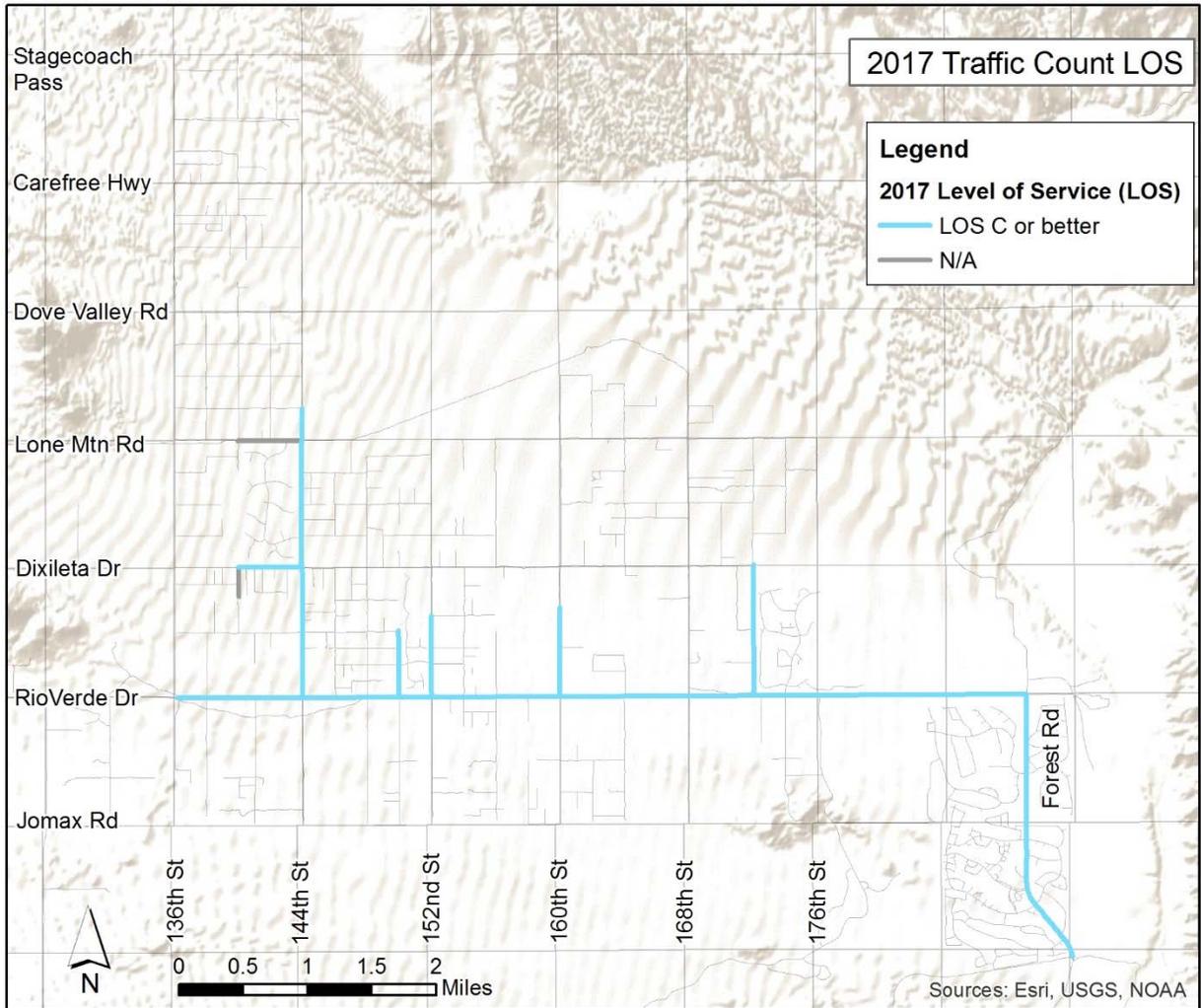


Figure 3-4 Existing LOS based on Available Daily Traffic Count Volumes

3.2 Future Roadway Network

3.2.1 Traffic analysis Zones

As stated previously, MAG identifies the entire Rio Verde SATS study area as a single TAZ. This does not provide enough resolution to identify a recommended collector and arterial roadway network within the study area. Therefore, the study area was broken down into smaller analysis zones in order to develop a travel demand model. A map of the study area depicting the smaller TAZs developed for this study can be seen **Figure 3-5**.



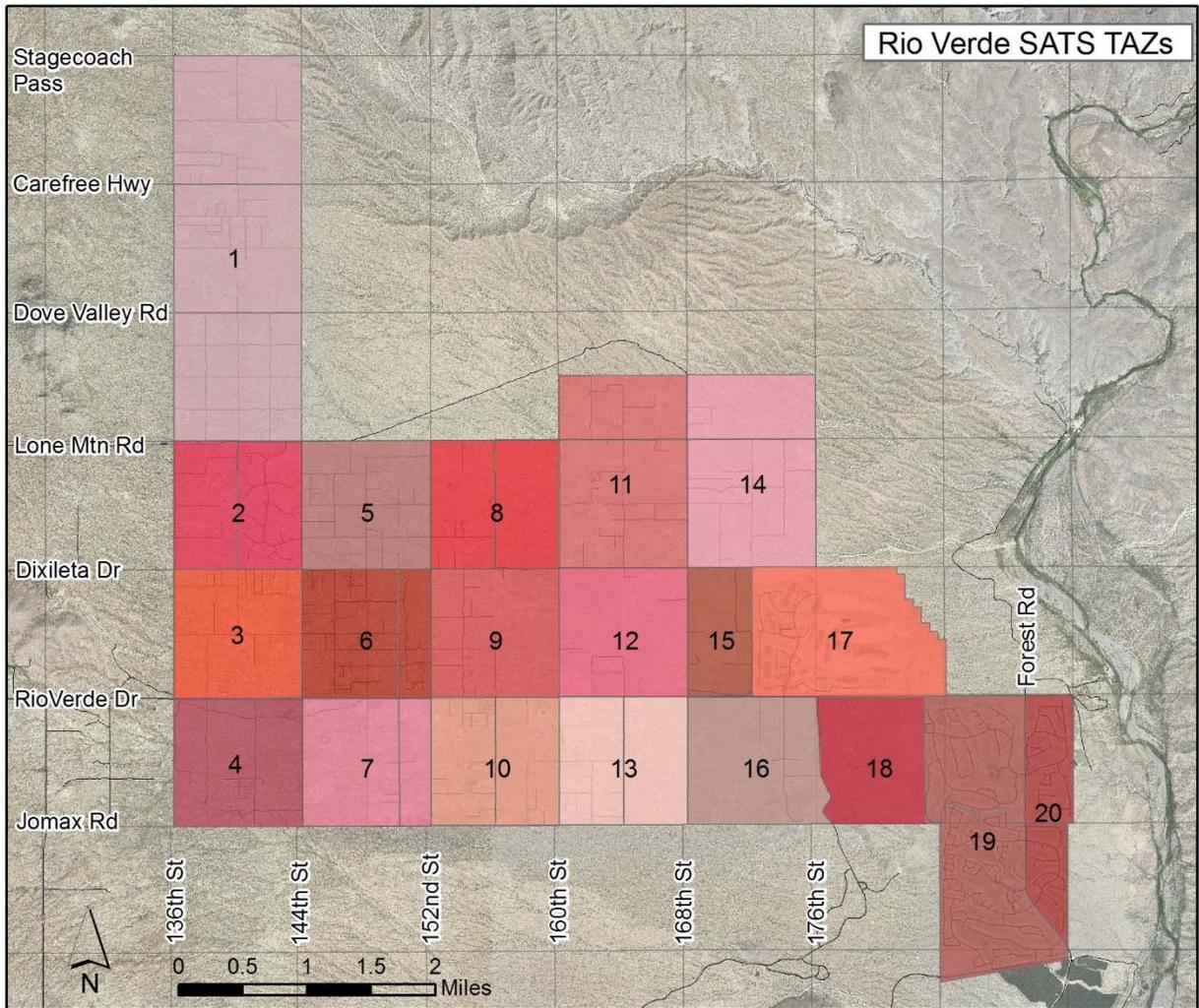


Figure 3-5 Rio Verde SATS Traffic Analysis Zones

3.2.2 Existing Travel Demand Model

Due to the low resolution of socioeconomic data, the travel demand model for this study was not based directly on the MAG TAZ data. Similarly, a model iteration developed using the Institute of Transportation Engineers (ITE) *Trip Generation Guidelines* resulted in unrealistically high trip volume projections. For this study, a different approach was used in order to develop a travel demand model that felt more appropriate.

The number of trips per dwelling unit was determined by taking the total ADT of the study area and dividing it by the number of existing houses within the study area.

- The total ADT was calculated using the 2016 ADT on Forest Road (2410) north of McDowell Mountain Road reported on the MCDOT traffic count website combined with the 2016 ADT on Rio Verde Drive (10900) west of 136th Street reported on the City of Scottsdale website. A monthly adjustment factor of 1.05 for July was applied to the 2016 ADT count on Rio Verde Drive to account for seasonal traffic. The total number of houses currently within the study area was determined through aerial imagery.



Through this methodology it was determined that the Rio Verde SATS study area experiences 2.61 trips per dwelling unit per day, which is approximately 80 percent less than what is reported by ITE.

It was also assumed that 80 percent of all traffic would be entering and exiting the study area using Rio Verde Drive west of 136th Street and 20 percent would be entering and exiting the site using McDowell Mountain Road south of Forest Road. This assumption was developed by calculating the percentage of the total 2016 ADT referenced above at each end of the study area.

ADT values for 2017 are available on the MCDOT Traffic Count website, however, 2017 traffic counts are not available through the City of Scottsdale website. Furthermore, there is not a significant difference between the 2016 and 2017 traffic counts reported by MCDOT for the study area. In fact, some roadways were reported to have lower ADT values in 2017 than in 2016. Therefore, 2016 ADT was used for this methodology.

In order to verify that these assumptions are accurate calculated traffic volumes were manually distributed and assigned per the developed TAZs. The calculated 2.61 trips per dwelling unit per day was applied to the existing number of houses for each TAZ. It was assumed that 50 percent of the total trips would be entering and 50 percent would be exiting. The volumes were then distributed throughout the entire study area using the previously stated assumptions. The existing travel demand model can be seen in **Figure 3-6**.

The assigned traffic volumes are higher than the ADT traffic counts pulled from MCDOT's website in every location except for 144th Street, 152nd Street, 160th Street and 172nd Street. These roadway segments were evaluated for other potential sources traffic generation. All four roadways have small equestrian sites that could be generating slightly more traffic than a standard residential home.

The traffic count data for all locations reported by MDCOT are single day counts and could potentially be higher if continuous counts were taken within the study area. Therefore, the existing calculations of travel demand that were developed are a conservative representation of the Rio Verde SATS study area under existing conditions.



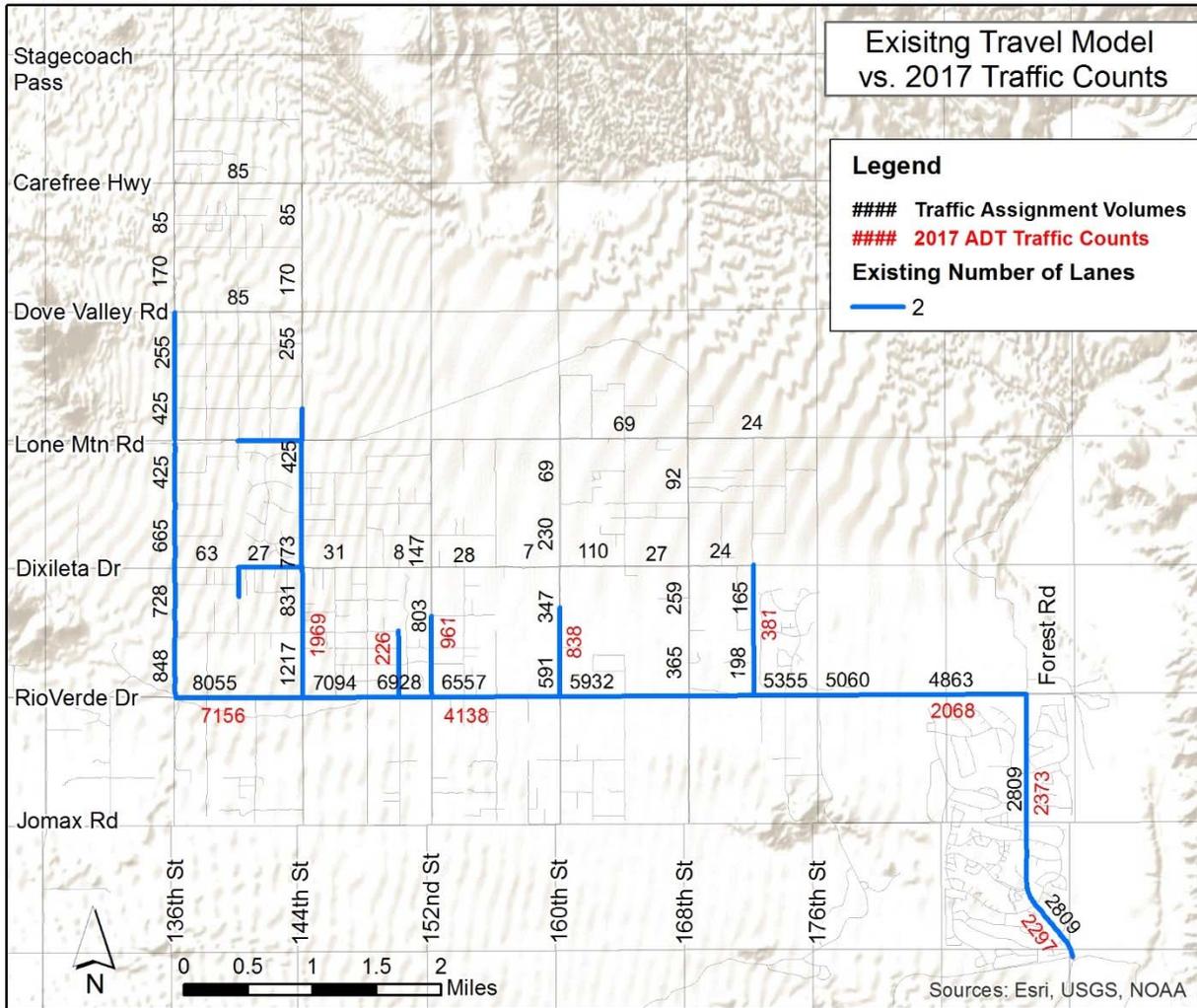


Figure 3-6 Existing Travel Model vs. 2016 Traffic Counts

3.2.3 Future Travel Demand Model

Once the existing travel model was developed and verified, the population inputs were modified to develop a future conditions traffic volume estimate.

The future number of dwelling units (DU) was determined by comparing the number of parcels and the zoning designation for each TAZ. It was assumed that at build-out the total DU would either be the number of existing parcels or 70 percent of the maximum zoning density multiplied by the area of each TAZ in acres. The higher of these two numbers was chosen as the future DU. The maximum zoning density of each TAZ was discounted by 30 percent to capture the fact that many parcels in the area may never be subdivided to the maximum density allowed by zoning or may never be developed due to site constraints (i.e. drainage, water availability, etc.).

The calculated trip generation rate of 2.61 trips per DU was then applied to the future DU to come up with the future ADT for each TAZ. A 20 percent factor of safety was also applied to the future ADT. This ADT was then distributed throughout the study area according to the trip distribution developed for the existing conditions traffic model.

Figure 3-7 provides the ADT from the future travel model.

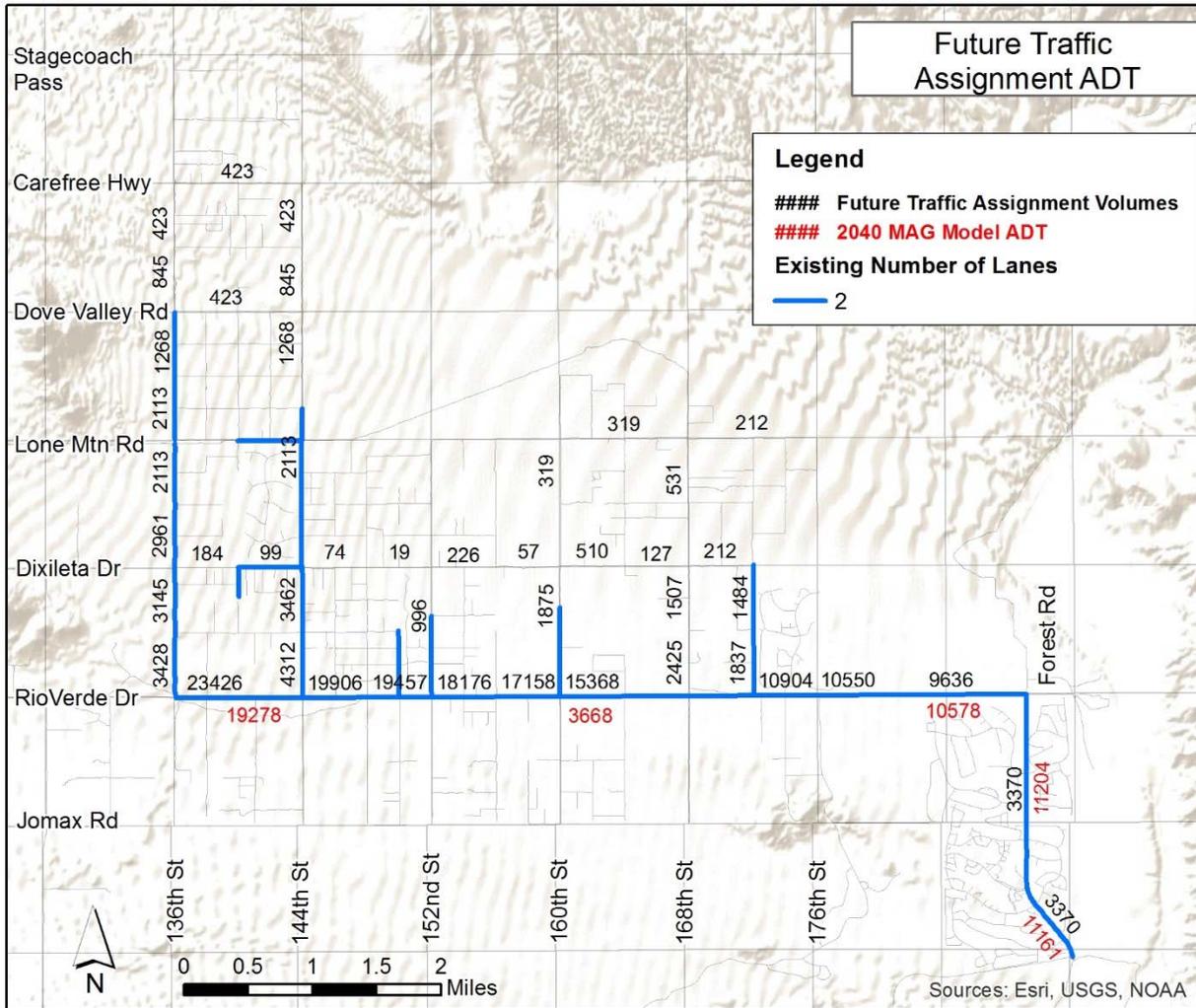


Figure 3-7 Future Travel Model Traffic Volumes

The 2040 MAG Travel Demand Model ADT is also shown in **Figure 3-7**. The 2040 MAG Travel Demand Model estimates that 63 percent of all traffic entering and exiting the study area does so on Rio Verde Drive west of 136th Street and 37 percent of all traffic entering and exiting on McDowell Mountain Road south Forest Road. MAG’s 2040 travel demand model assumes that both Rio Verde Drive and Forrest Road are 4-lane minor arterial roadways.

3.2.4 Recommended Future Roadway Network

Several factors were considered when determining recommendations for the study area roadway network. The existing number of lanes was taken into account to ensure that the recommended roadway network did not contain any sections of roadway with fewer lanes that currently exist within the study area. The minimum number of lanes required to accommodate the future travel demand model was considered to ensure that the recommended roadway network could adequately serve the forecast traffic demand. In addition to these criteria, the study area constraints were also evaluated. The study team also reviewed comments received from the May 2nd public open house when developing the recommended future roadway network.



The minimum number of lanes was determined using the values in **Table 3-2** which was adapted from **Table 3-1**.

Table 3-2 Planning Level Volume Thresholds

Rural				
Functional Classification	# of Lanes	Median Type	Max LOS	Service Volume*
Principal Arterial	4	Divided	C	24,400
Minor Arterial	4	Divided	C	22,000
Major Collector	2	Undivided	B	5,600
Minor Collector	2	Undivided	B	5,000

The recommended roadway network is provided in **Figure 3-8**.

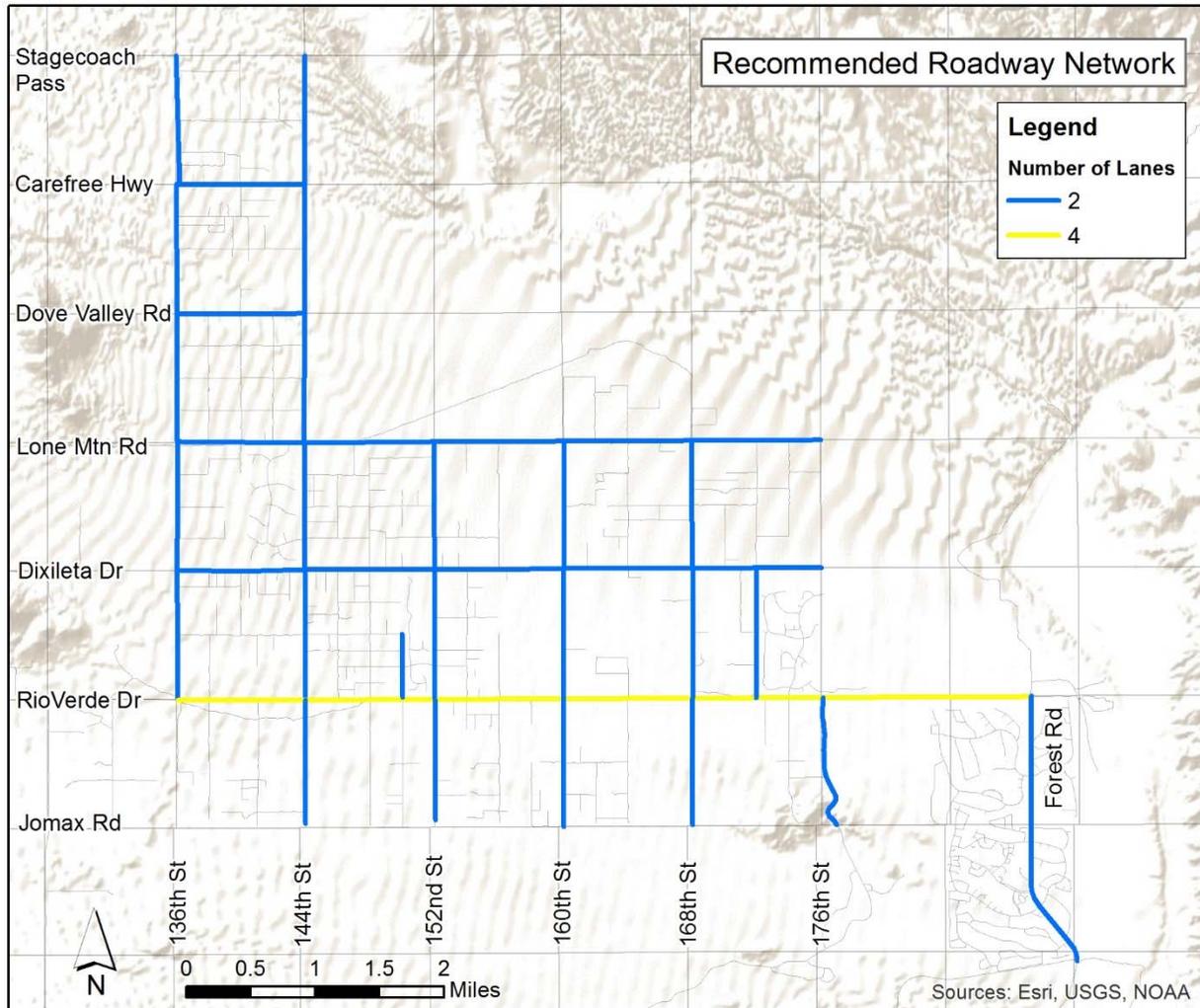


Figure 3-8 Recommended Future Roadway Network

3.2.5 Additional Observations

Although the recommended network is based on future conditions within the study area, it should be noted that many residents said that they wanted to maintain the rural nature of the area and preferred the existing local, dirt roadways to paved roadways. The recommended roadway network presented in **Figure 3-8** is not intended to indicate that



these roadways must all be paved at some point in the future. The purpose of the recommended roadway network is solely to inform County staff what the future required roadway network might look like for planning purposes.

Another common comment from residents of the Rio Verde and Tonto Verde communities was the request for a paved connection from 176th Street to McDowell Mountain road through the McDowell Mountain Regional Park to provide an alternate route out of the study area and bypass Forest Road. This connection was not included in the recommended roadway network based upon feedback from MCDOT and Maricopa County Parks and Recreation staff.

Residents also expressed the concern that traffic on 160th would be negatively impacted by people accessing the national forest roadways. The design team considered the possibility of additional outside traffic on this roadway but did not feel that it would be enough to warrant a higher capacity roadway recommendation.



Appendix C

Second Public Meeting Feedback





Maricopa County

Department of Transportation

Transportation Systems
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June 3, 2019

Rio Verde Area Resident

RE: Rio Verde Small Area Transportation Study

Thank you for your comments on the Maricopa County Department of Transportation (MCDOT) Rio Verde Small Area Transportation Study (Study). The Study analyzed existing conditions, identified potential growth, and evaluated existing and future traffic volumes to develop a recommended future roadway network for the Rio Verde area.

A response to each roadway was developed based upon comments received.

Rio Verde Drive - 136th Street to Forest Road

The Study results indicate this roadway will ultimately become a 4-lane roadway with a center turn lane and bicycle lanes. This improvement is not currently funded. MCDOT will continue to monitor the traffic on this segment to determine the priority of moving forward with any improvements. Note: improvements may occur in phases.

Rio Verde – 142nd Place to 160th Place

In June 2018, MCDOT completed the *Rio Verde Drive: 142nd Place to 160th Street Scoping and Design Report*. The recommended improvements for this segment include bicycle lanes, center left turn lanes, and drainage, at a cost of \$23.5 million. This project is not currently funded.

Rio Verde Drive from 136th Street to the 142nd

The City of Scottsdale (Scottsdale) owns and operates this segment. It is unknown at this time if Scottsdale will widen Rio Verde Drive to four lanes east of 136th Street.

Scottsdale Roundabouts

Scottsdale approved the construction of two roundabouts on Rio Verde Drive within their jurisdiction. It is important to clarify that while MCDOT works with Scottsdale to coordinate many projects, MCDOT does not have jurisdiction over streets and roads owned by Scottsdale. For additional information on these roundabouts please contact Paul Basha with the City of Scottsdale at 480-312-7696.

Dixileta Drive and Lone Mountain Road

Both of these roadways are identified as future two-lane paved roads from 136th Street to 176th Street.

Dove Valley Road and Carefree Highway

Both of these roadways are identified as future two-lane paved roads from 136th Street to 144th Street.

Roadways west of 136th Street (East/West direction)

Scottsdale's McDowell Sonoran Preserve's eastern boundary runs north from Rio Verde Drive to Stagecoach Pass Road effectively blocking the development of any roads west of 136th Street between Rio Verde Drive and the Tonto National Forest.

No east/west roads are identified as future paved roads south of Rio Verde Drive for MCDOT or Scottsdale. Scottsdale has no plans to construct a new road across their McDowell Sonoran Preserve south of Rio Verde Drive and west of 128th Street.

North/South Alternatives

136th Street from Rio Verde Drive to Dove Valley Road is owned and operated by Scottsdale. MCDOT has some right-of-way north of Dove Valley Road but the road is not "open and declared" (accepted into the County roadway system) and is not maintained by MCDOT. The recommendation is that Scottsdale and MCDOT do a joint study on this corridor from Rio Verde Drive to Stagecoach Pass Road.

MCDOT maintains 144th Street from Rio Verde Drive to Lone Mountain Road. North of Lone Mountain Road to the Tonto National Forest, MCDOT has some right-of-way but the road is not "open and declared" and is not maintained by MCDOT. Speed humps are not considered on roads with a posted speed limit higher than 30 mph or on roads not maintained by MCDOT. 144th Street is currently posted with a speed limit of 35 mph.

McDowell Mountain Regional Park

The McDowell Mountain Regional Park Master Plan Update 2019-2039 identifies a new, paved vehicle access point at 176th Street. It is shown as a low priority project with no time frame or funding identified. When the project is funded, MCDOT will work closely with Maricopa County Parks to coordinate the new access point with the paving of 176th Street from the park entrance to Rio Verde Drive. The park plan can be viewed at the following link.

https://www.maricopacountyparks.net/assets/1/6/ReducedMcDowellMountainRegionalPark_MasterPlanUpdate_Compiled-Final_Draft.pdf

Noise

In compliance with MCDOT Policy No. T3103: Noise Abatement for Roadway Projects, traffic noise analysis are performed upon completion of the 60 percent design plans but before final design of a roadway project. This Study is a long-range planning document to determine future roadway needs and does not contain any roadway designs.

Future Development / Rural Area

Development in the Rio Verde area is guided by the 2005 Rio Verde Foothills Area Plan <https://www.maricopa.gov/2336/Rio-Verde-Foothills-Area-Plan> and implemented by the Maricopa County Planning and Development Department.

Forest Road

Traffic counts on Forest Road have remained consistent for the past few years. The table below shows the average daily traffic counts for the past five years at two locations.

Average daily traffic counts on Forest Road

Year	2018	2017	2016	2015	2014
North of McDowell Mountain Rd.	2227	2297	2410	2213	2699
South of Rio Verde Dr.	2364	2373	2332	2155	1832

<https://www.maricopa.gov/636/Traffic-Counts>

The 2018 MCDOT Active Transportation Plan (ATP) identified the need to evaluate pedestrian crossings at the intersections of Forest Road with Avenida Del Ray, Poco Rio Drive, and Tonto Verde Drive. MCDOT is considering including a Forest Road study in the next budget cycle. For an introduction to the prioritization methodology in the ATP see page 99 at the link below.

<https://www.maricopa.gov/DocumentCenter/View/42628/MCDOT-ATP-Final-Report>

Dust

MCDOT maintains over 400 miles of unpaved roads throughout unincorporated Maricopa County and is committed to reducing airborne dust pollution. To be eligible for MCDOT's Low Volume Roads Program, the road must already be part of the MCDOT roadway maintenance system. Most of the unpaved roads in the Study area are not maintained by MCDOT. For more information about dust abatement on county roads please visit <https://www.maricopa.gov/788/Dust-Abatement>.

Please contact me if you have additional comments or questions.

Reed

MCDOT Project Information: 602-506-3342
mcdotprojects@maricopa.gov

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Senior Planner

Systems Planning Branch

[Maricopa County Department of Transportation](https://www.maricopa.gov/DocumentCenter/View/42628/MCDOT-ATP-Final-Report)

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