Maricopa County
Department of Transportation

DRAFT
Transportation System Plan 2035

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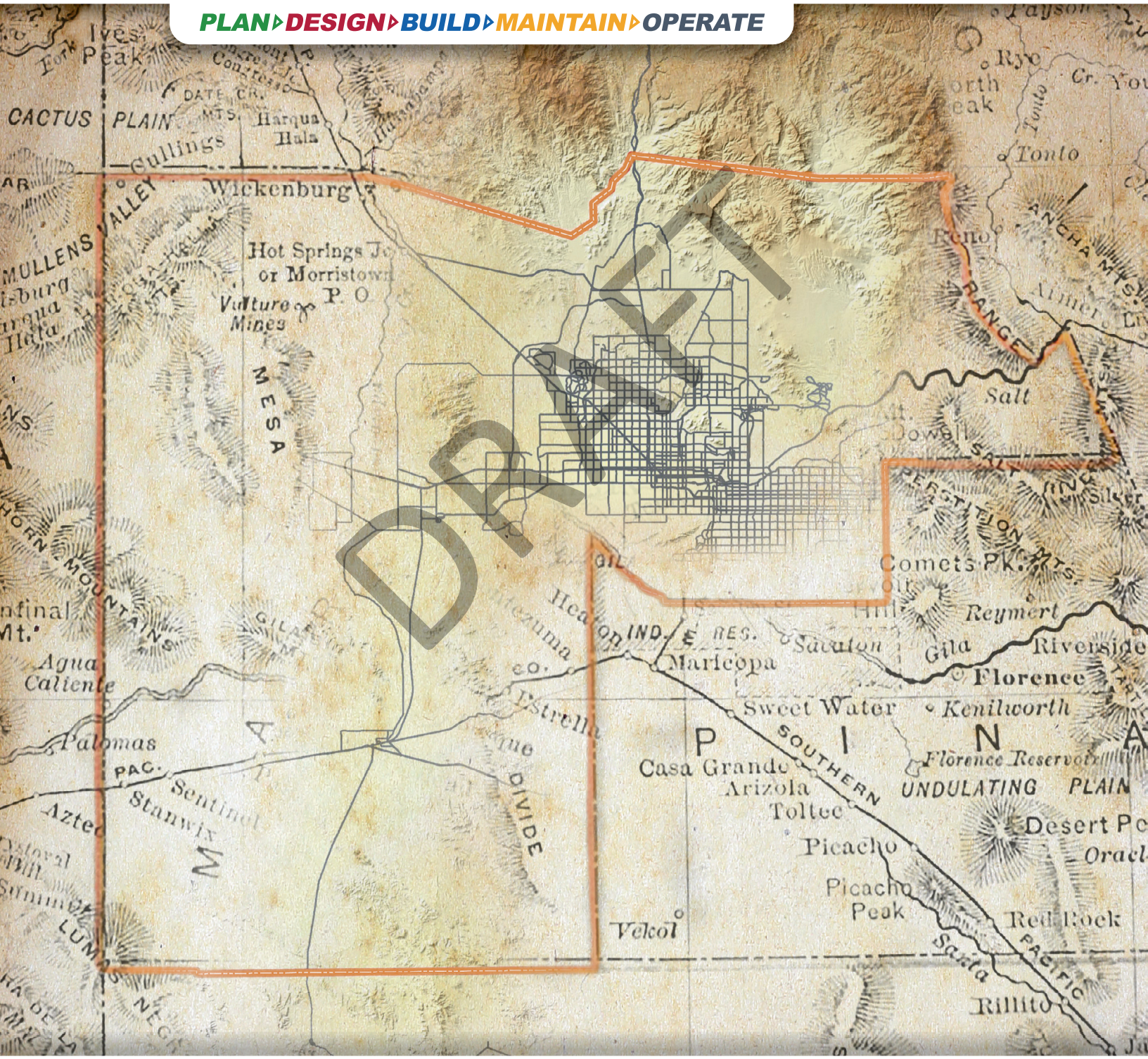

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Acknowledgements

The Transportation System Plan 2035 was a collaborative process among the stakeholders, public and project team. The Maricopa County Department of Transportation would like to thank the following groups for their efforts in developing this plan.

Maricopa County Board of Supervisors

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Maricopa County Departments
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Salt River Pima – Maricopa Indian Community
Sun City
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Tonopah
Tonto Apache Tribe
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Town of Cave Creek
Town of Fountain Hills
Town of Gila Bend
Town of Gilbert
Town of Paradise Valley
Town of Queen Creek
Town of Wickenburg
Yavapai County
Youngtown

State Departments
Arizona Department of Transportation
Arizona Game and Fish Department
Arizona Public Service
Arizona State Land Department

Federal Departments
Bureau of Land Management
Federal Highway Administration

Other Government
Central Yavapai Metropolitan Planning Organization
Maricopa Association of Governments
Central Arizona Project

Transportation Entities
BNSF-Railway
Union Pacific Railroad
Valley Metro

Consultants
Burgess & Niple, Inc.
Central Creative™
EPS Group, Inc.
Jacobs Engineering Group, Inc.
Kimley-Horn & Associates, Inc.

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Acronyms

AASHTO – American Association of State Highway and Transportation Officials
ABS – Annual Business Strategies
ADA – Americans with Disabilities Act
ADOT – Arizona Department of Transportation
ADT – Average Daily Traffic
ALCP – Arterial Life Cycle Program
ALERT – Arizona Local Emergency Response Team
ALISS – Accident Location Identification Surveillance System
ARS – Arizona Revised Statutes
ATIS – Advanced Traveler Information System
ATP – Active Transportation Plan
AZDPS – Arizona Department of Public Safety
AZSHSP – Arizona Strategic Highway Safety Plan
BIS – Bridge Investment Study
BOS – Board of Supervisors
CAD – Computer-Aided Dispatch
CAR – Candidate Assessment Report
CCTV – Closed-Circuit Television
CIS – Corridor Improvement Study
CMAQ – Congestion Mitigation and Air Quality Improvement Program
CTL – Center Turn Lane
DMP – Development Master Plan
DMS – Dynamic Message Sign
DSRC – Dedicated Short Range Communications
FHWA – Federal Highways Administration
FMS – Freeway Management System
FRI – Fuel Revenue Indexing
FS – Feasibility Study
FY – Fiscal Year
GO – General Obligation
HCRS – Highway Condition Reporting System
HOA – Homeowners Association
HURF – Highway User Revenue Fund
I – Interstate
ICM – Integrated Corridor Management
IGA – Intergovernmental Agreement
IRI – International Roughness Index
ITS – Intelligent Transportation Systems
LOS – Level of Service
LVR – Low Volume Roads
MAG – Maricopa Association of Governments
MCDOT – Maricopa County Department of Transportation
MDI – Model Deployment Initiative
MMITSS – Multimodal Intelligent Traffic Signal System
MSRP – Major Streets and Routes Plan
MUTCD – Manual on Uniform Traffic Control Devices
NUG – National Unified Goal
P3 – Public Private Partnership
PCR – Pavement Condition Rating
PDM – Project Development Manual
PM-10 – Particulate Matter greater than 10 microns
PRS – Project Rating System
PRC – Project Review Committee
PORA – Property Owners and Residents Association
RADS – Regional Archived Data System
RDM – Roadway Design Manual
REACT – Regional Emergency Action Coordinating Team
RMS – Road Management System
RTP – Regional Transportation Plan
RTS – Regional Transportation Study
RTSP – Regional Trail System Plan
SAC – Stakeholder Advisory Committee
SATS – Small Area Transportation Study
SHOA – Sun City Homeowners Association
SMART – Systematically Managed ARTerial
SMS – Safety Management System
SOS – State of the System
SR – State Route
STSP – Strategic Transportation Safety Plan
TAB – Transportation Advisory Board
TAC – Technical Advisory Committee
TDM – Travel Demand Model
TIF – Tax Increment Financing
TIM –Traffic Incident Management
TIP – Transportation Improvement Program
TIRZ – Transportation Increment Reinvestment Zone
TMC – Traffic Management Center
TOC – Traffic Operations Center
TRZ – Transportation Reinvestment Zone
TSP – Transportation System Plan
USDOT – United States Department of Transportation
V/S – Volume to Standard
V2I – Vehicle to Infrastructure
V2V – Vehicle to Vehicle
VLT – Vehicle License Tax

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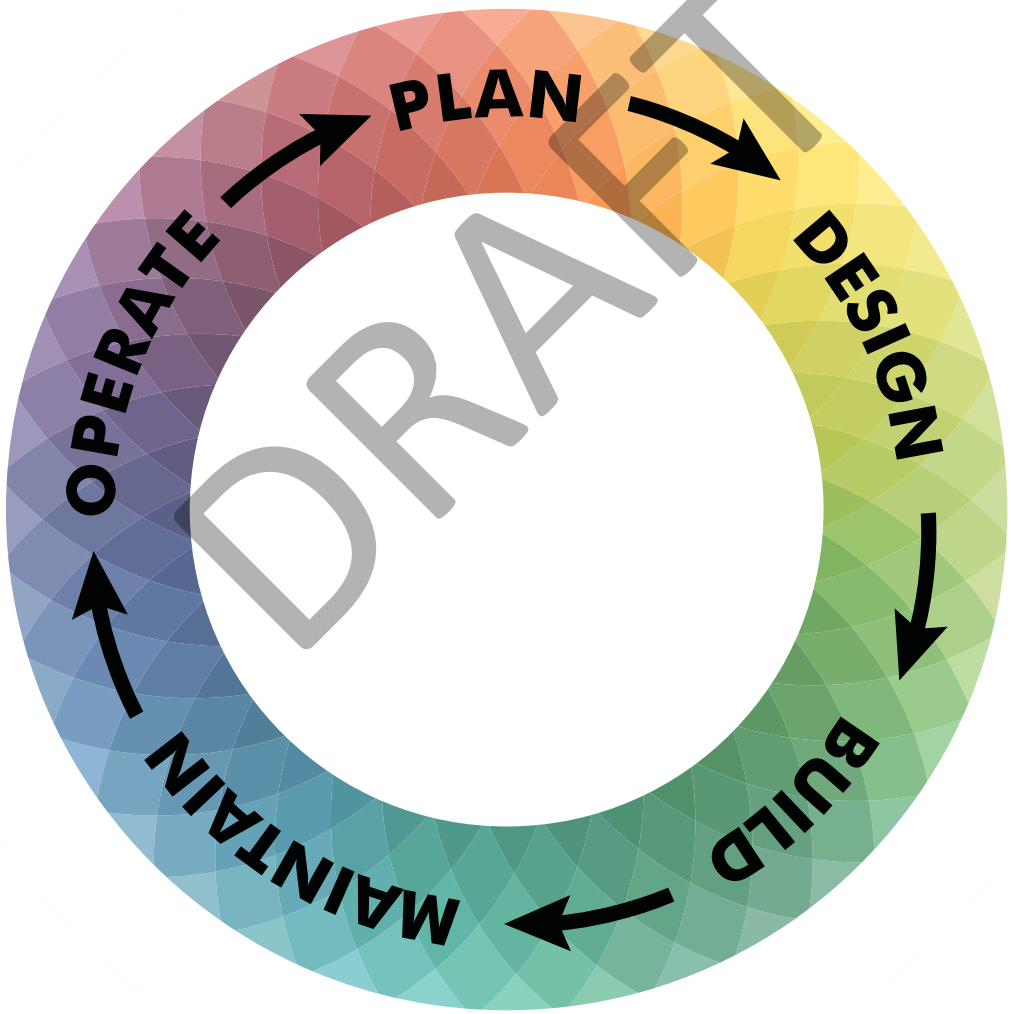
INTRODUCTION



This spectrum represents the method in which Maricopa County Department of Transportation manages the transportation system. This process includes five categories; Plan for short and long term needs, Design based upon conditions and community need, Build to accommodate need utilizing latest technology, Maintain the system to ensure longevity, and Operate the system to a level of service standard that best meets the needs of the traveling public.

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INTRODUCTION

Guided by the Core Purpose, "Providing connections that improve people's lives," the Maricopa County Department of Transportation (MCDOT) is responsible for the County transportation system. As staff plans, designs, builds, maintains, and operates the County transportation system, they embrace MCDOT's values of being service minded, team builders who get it (the job) done with a smile.

Core Purpose
Providing Connections that Improve People's Lives

Core Values
Service Minded
Team Builder
Get it Done with a Smile

To accomplish its core purpose, MCDOT develops its Transportation System Plan (TSP) that guides the planning of limited resources in a large geographic area. The County's roadway network must support safe and efficient movement of goods and people, be environmentally compatible with its surrounding conditions, and support economic development activities. TSP 2035 reviewed the County transportation system, planning documents and processes, stakeholder plans, and funding information to establish a plan for the future transportation needs of County residents across three planning horizons: 2020, 2025, and 2035.

TSP 2035 sets the overall goals, objectives, and strategies for current and future transportation needs and investments, and compliments the County's Comprehensive Plan guidelines for transportation.

The fluctuation of the housing market, economic conditions, and growth projections warrant a complete update to the existing TSP adopted in 2007. Additionally regional plans and construction of facilities, as indicated in the following bullet points, have changed the transportation framework and travel patterns.

- Completion of the Maricopa Association of Governments (MAG) Interstate 10 *(I-10)/Hassayampa Valley Transportation Framework Study* in 2008 and the *I-8 and I-10 Hidden Valley Transportation Framework Study* in 2009. These studies recommended a comprehensive roadway network in the areas west of the White Tank Mountains and south of I-10 (the Hassayampa Valley region) and west of Sierra Estrella Mountains and south of I-10 (the Hidden Valley region) to meet projected travel demands.
- Construction, reconstruction, and expansion of regional transportation facilities located within or in proximity to unincorporated County areas, such as State Route (SR) 303 in the West Valley and SR-202, from Arizona Avenue to Gilbert Road, in the East Valley.

Expansion of Transportation Facilities in Maricopa County: Northern Parkway from SR-303 to US-60/Grand Avenue on Northern Avenue

The TSP 2035 Purpose, Goals, Objectives, and Strategies were derived through a collaborative process with various stakeholders, including the Arizona Department of Transportation (ADOT), MAG, Valley Metro, Arizona Department of Public Safety (AZDPS), cities, towns, tribal communities, and other partners.

TSP 2035 Purpose
Plan a transportation network to meet the changing needs of a growing population.

The following Goals, Objectives, and Strategies support the overall purpose of TSP 2035, "Plan a transportation network to meet the changing needs of a growing population".

GOAL: PROMOTE QUALITY OF LIFE AND ECONOMIC VITALITY

Objective: Anticipate and accommodate the needs of a growing population

Strategies:

- Design the transportation system to accommodate drivers with different needs and abilities, including aging and inexperienced drivers
- Identify all user needs (physical, social, and economic abilities) and create networks and systems that respond to the needs
- Develop designs that are context sensitive

Objective: Develop Intelligent Transportation System (ITS) technologies

Strategies:

- Continue to participate in and enhance the coordination and connectivity of ITS systems across jurisdictions
- Incorporate connected vehicle technologies into ITS systems
- Continue to co-lead AZTech partnership and participate in ITS committees

Objective: Monitor the transportation system as warranted; enhancing capacity and safety

Strategies:

- Enhance corridor monitoring and improve communication, including advanced traveler information, with the traveling public
- Prioritize new projects based on safety and capacity performance goals
- Collaborate and advance traffic incident management through the Regional Emergency Action Coordinating Team (REACT)

GOAL: ENCOURAGE A SEAMLESS REGIONAL TRANSPORTATION NETWORK

Objective: Develop and integrate operational technology throughout transportation corridors by partnering with other agencies

Strategies:

- Continue traffic management and operations leadership in AZTech and work to achieve its goals and strategies
- Expand the MCDOT ITS network and support other local agencies' ITS activities and increase communication across jurisdictions

Objective: Facilitate coordination for regional projects

Strategies:

- Keep partners informed of regional projects and clearly identify roles and expectations
- Provide adequate time and information for each plan and project to allow adequate input from all affected
- Establish regularly scheduled coordination meetings with all partners

Objective: Build and sustain regional partnerships and relationships

Strategies:

- Provide regular forums for information sharing amongst TSP partners
- Facilitate the sharing of information and data
- Develop and maintain partnerships with private entities to ensure proper land use development, economic development, and community investment

GOAL: PROTECT PAST AND FUTURE TRANSPORTATION INVESTMENTS THROUGH STRATEGIC SYSTEM PRESERVATION

Objective: Preserve capacity through efficient traffic management

Strategies:

- Update and adopt access management guidelines
- Foster and create opportunities for regional and corridor traffic management through signal timing, ITS, technical updates, Integrated Corridor Management (ICM), or other emerging methods
- Apply Transportation Systems Management & Operations (TSMO) principles to optimize existing infrastructure and respond to future transportation needs

Objective: Manage and maintain infrastructure that meets or exceeds widely accepted industry standards

Strategies:

- Update methodology used to monitor the maintenance needs of the existing system
- Balance funding priorities between capital investment and maintenance and operational needs
- Periodically evaluate and improve facility standards; seek opportunities for innovation
- Consider lifecycle costs when assessing whether to maintain or reconstruct a facility
- Develop performance measures and assess annual achievements
- Apply dust mitigation strategies for dirt roads within the PM-10 (particulate matter less than 10 microns) Nonattainment Area

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PLAN for the Future

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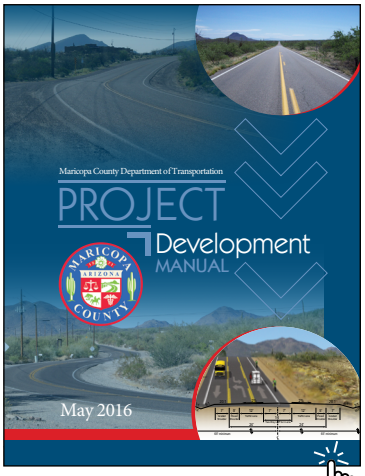
PLAN for the Future

Maricopa County, the fourth most populous county in the nation according to the 2010 Census, covers more than 9,200 square miles. MCDOT planning efforts focus on the more than 7,000 square miles of unincorporated area. These efforts include coordination with 24 cities and towns, which make up the incorporated areas, to ensure a seamless transportation network.

This chapter presents an overview of the MCDOT planning processes and the methods used in the development of TSP 2035.



MCDOT Project Development Manual

1.1 PLANNING PROCESS

MCDOT plans, designs, builds, maintains, and operates roadways within the County's unincorporated areas. MCDOT is responsible for the operation and maintenance of approximately 2,000 miles of roadway and 424 structures.

The MCDOT Systems Planning Branch (Planning Branch) identifies transportation improvements to meet the needs of County residents now and into the future. Planning is the first step in the Project Development Process as outlined in the MCDOT Project Development Manual (PDM). The PDM provides guidance on project development and specifies the steps required to streamline Transportation Improvement Program (TIP) project delivery, as outlined in ***Figure 1***. The MCDOT Planning Branch prioritizes and recommends projects for programming based upon need and available funding using tools such as the TSP, recurring reports, and planning studies. Recommended projects then continue through the Project Development Process including scoping, design, and construction.

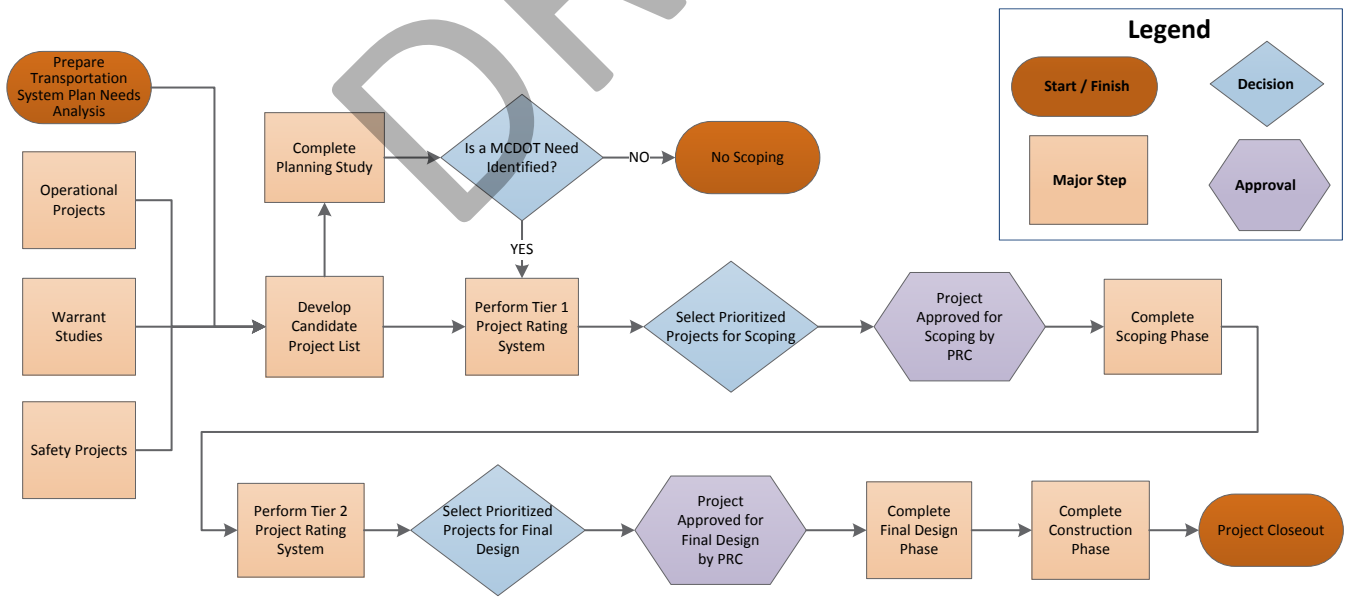


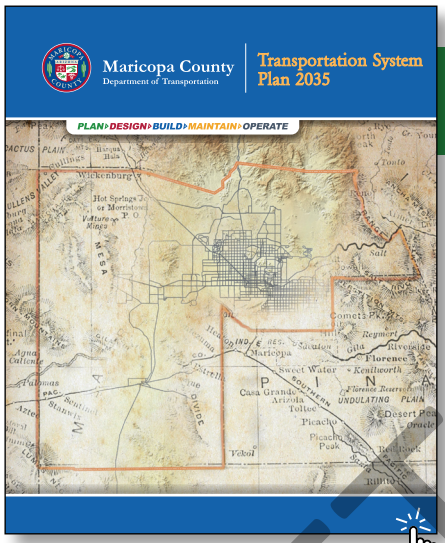
Figure 1 – MCDOT Project Development Process

1.1.1 Systems Planning

The MCDOT Planning Branch generates reports that are cyclical in nature to assist in identifying needs for the roadway network. These reports include the TSP, State of the System (SOS) Report, and Major Streets and Routes Plan (MSRP).

Transportation System Plan (Five-Year Cycle)

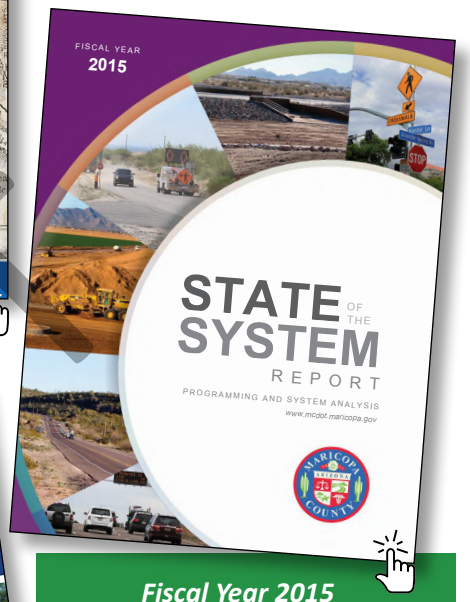
The TSP identifies short-, mid-, and long-range roadway improvements and is updated on a five-year cycle. The development of TSP 2035 is discussed in more detail in ***Section 1.2***.



Transportation System Plan 2035

State of the System Report (Annual Cycle)

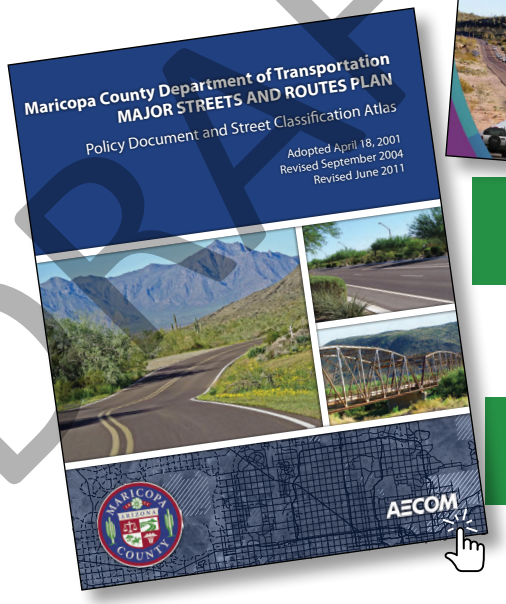
The SOS Report is a compilation of the physical inventory, status, and performance of the County transportation system including: road, bridge, bicycle, traffic management, and other facilities.



Fiscal Year 2015 State of the System Report

Major Streets and Routes Plan (Two- to Three-Year Cycle)

The MSRP identifies future roadway classifications for County roads and facilitates right-of-way preservation for future roadways. Functional classifications are determined by utilizing national classification criteria, MCDOT service volume standards, and regionally accepted growth rates. Typical cross sections for each functional classification are included based on the MCDOT Roadway Design Manual standards.



MCDOT Major Streets and Routes Plan

Planning Studies (As Needed)

Planning studies are high level evaluations of specific locations, corridors, or areas and may include conceptual engineering plans (typically less than 15 percent design). There are varying levels of planning evaluations and studies including:

- **Candidate Assessment Report (CAR):** A CAR is used to evaluate a specific improvement such as a canal crossing, roadway improvement, or low volume road (LVR) analysis and is typically less than one mile in length.
- **Corridor Improvement Study (CIS):** A CIS is used to evaluate the need for improvements for existing roadways or for roadways with gaps in connectivity and is typically greater than one mile in length. Recommendations may include short-, mid-, and long-range improvements.
- **Feasibility Study (FS):** A FS is used to evaluate a potential corridor with limited, gapped, or nonexistent right-of-way. FS may include an identified roadway alignment, enabling MCDOT and other jurisdictional agencies to preserve right-of-way for the future roadway.

- **Small Area Transportation Study (SATS):** A SATS is used to evaluate an existing or potential network of roadways serving a designated area, usually in a rural community. This enables MCDOT and other jurisdictional agencies to plan appropriately for the future roadway network.
- **Regional Transportation Study (RTS):** A RTS is used to evaluate regional connections between multiple communities, jurisdictional agencies, and unincorporated Maricopa County. The purpose of this study is to ensure preservation of future right-of-way. This study may include multiple partners.

The primary objectives of planning studies are to:

- Evaluate and determine need
- Clearly define and assess the study area to identify strategic issues
- Develop and evaluate candidate alternatives or alignments within the study area
- Recommend a preferred alternative or alignment
- Subsequently define characteristics of the preferred alternative or alignment in greater detail
- Identify and include opportunities for project partnerships

Planning studies typically include the following elements:

- Existing and future conditions
- Environmental overview
- Drainage overview
- Development and evaluation of candidate alternatives or alignments
- Detailed preferred alternatives or alignment
- Public outreach
- Phasing plan (when appropriate)
- Planning level project costs

Planning Studies determine whether a need exists that will warrant a project advancing to the Project Rating System (PRS) in the Project Development Process.

1.1.2 Project Rating System

MCDOT employs the PRS to identify and prioritize roadway improvements. The PRS has been used since 1998 and is updated periodically, most recently in 2016, to keep the process aligned with current needs and goals. The PRS uses the following five categories to evaluate a project.

The PRS uses target scores in 5 different categories to evaluate a project.

- **Traffic Volumes and Congestion:** Average Daily Traffic (ADT) is compared to roadway level of service (LOS) expectations to define the volume to standard (V/S) ratio for both existing and future conditions.
- **Safety:** The number of crashes from the latest three years of available crash data provided by ADOT, length of roadway to be improved, and the current ADT. This data is used to calculate the crash rate per million vehicles.
- **Cost per Future Vehicle Miles of Travel:** The estimated project cost, length of roadway to be improved, and number of users anticipated to benefit from the improvement. This data is combined to determine an estimated cost per vehicle miles of travel.
- **Regional Travel:** The role the project plays in supporting regional travel is determined based on the percent of all trips on the roadway segment that are more than 10 miles long.
- **Land Use:** The roadway type and category of adjacent land use is defined by the matrix in ***Table 1*** and explained in the following paragraph.

The Land Use category is subject to the following investment potential matrix, shown in ***Table 1***. This matrix provides guidance on the investment of County funds. The matrix considers the land development area and type of project to identify the priority for investment. Investment priority is defined as follows:

- MCDOT will participate in "(**H**)igh" priority projects for planning, design, and construction. Under this scenario, the availability of partnering opportunities is an advantage, but is not always a requirement.
- MCDOT will participate in "(**M**)edium" priority projects for planning, design, and construction. Under this scenario, partners are required.
- MCDOT will participate in "(**L**)ow" priority projects for planning and design. Under this scenario, partners are required.
- MCDOT will not (**N**) participate in secondary or local road projects in incorporated areas, and will require project developers (**DR**) to assume primary responsibility for road projects within Development Master Plans (DMPs).

Table 1 – Investment Potential Matrix

Land Development Area	Primary/ Prop. 400	Secondary	Local
Urban Service Area	**H**	**M to H****	**L**
Rural Development Area	**H**	**L**	**L**
Established Areas/Existing DMP	**H**	**L**	**L**
General Plan Development Area	**M**	**L**	**L**
Incorporated Area	**L to M***	**N**	**N**
New Development Master Plan	**DR**	**DR**	**DR**

* Priority will vary based on percentage of adjoining land under county jurisdiction.
** Priority will vary based on continuity of corridor and percentage of adjoining land under county jurisdiction.

1.2 TRANSPORTATION SYSTEM PLAN 2035 DEVELOPMENT

TSP 2035 identifies future roadway capacity needs of the County across three planning horizons: short- (2020), mid- (2025), and long-range (2035). TSP 2035 was developed by the MCDOT Planning Branch with support from County staff and planning partners, including regional partners, transportation planning and engineering consultants, and input from various stakeholders and the public. The planning process included technical tasks and meetings with stakeholders and the public. Through this collaboration, MCDOT developed TSP 2035 to address future capacity needs and facilitate the creation of a seamless regional transportation network. TSP 2035 development generally followed the process outlined below.

- Phase I Research and Data Collection – Phase I consisted of gathering information on the County's existing and planned transportation system, analyzing the information, and developing forecasts for future transportation needs. This phase also included identifying the members of the Working Group, Technical Advisory Committee (TAC), and Stakeholder Advisory Committee (SAC). During Phase I, methodologies for public outreach were developed and a series of public open houses were conducted.
- Phase II Plan Development – Phase II consisted of organizing the information gathered during Phase I and developing a draft TSP 2035 document for technical and public review.
- Phase III Plan Adoption – Phase III consisted of reviews by the public and the Transportation Advisory Board (TAB), followed by a final review and formal adoption by the Maricopa County Board of Supervisors (BOS).

1.2.1 Project Post-Processing

As part of TSP 2035, capacity needs were identified and processed through the PRS to score and prioritize potential projects, as shown in ***Figure 2***.

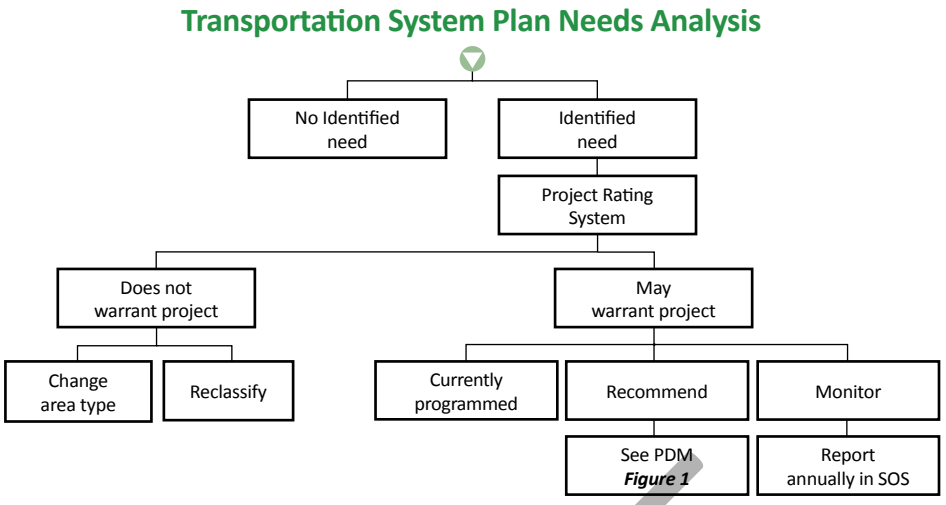


Figure 2 – Transportation System Plan Needs Analysis Process

The MCDOT Planning Branch reviewed each identified capacity need to determine potential project impacts, including land use, development potential, safety concerns, and others. During post-processing, the following criteria were used to refine roadway ranking:

- Programmed: Identified project is currently programmed in the TIP.
- Recommend: Requires further analysis of roadway capacity needs.
- Monitor: Inconsistencies were identified and the project will be monitored and reported annually as a part of the SOS Report. For example, the project has identified capacity constraints, inconsistent horizon year ADTs, development potential, centroid connection issues, or is unattainable due to other circumstances.
- Change Area Type: Roadway setting classification, urban or rural, is incorrect. The reclassification of the roadway changes the service volume standard and the roadway is now within standard. For example, the roadway is currently classified as rural, but is either currently or projected to be in an urban setting.
- Reclassify: Roadway is currently classified incorrectly for the functionality of the roadway. Changing the functional classification also changes the service volume standard and the roadway is now within standard. For example, the roadway is currently classified as a collector when it should be an arterial.

Once the potential projects were reviewed and MCDOT recommendations for project classifications and rankings were finalized, they were published for public review and input. At the close of the public comment period, all comments were considered and a Final Project Recommendation List was developed. Recommended projects will continue through the Project Development Process and will be reviewed to determine further recommendation and potential programming. It is anticipated that some projects may not advance to funding but will continue to be monitored through the SOS annual report.

1.2.2 Technical Advisory Committee

As with most documents and plans, it was important to establish a TSP 2035 TAC. The TAC was responsible for guiding technical aspects of the TSP including data collection, research, and review. The following MCDOT divisions aided in the development of TSP 2035:

- Roadway Maintenance
- Transportation Systems Management
- Engineering
- Permitting, Construction and Inspections
- Financial Services
- Strategic Communications and Outreach

Consultant firms were engaged to provide additional technical assistance in specific areas. The following is a list of the consulting firms and their roles during the TSP 2035 process.

- *Burgess & Niple, Inc.* – Transportation System Plan 2035 document and program management; and Financial Element
- *Central Creative™* – Partnering and Public Involvement
- *EPS Group, Inc.* – Alternative Modes Element
- *Jacobs Engineering Group, Inc.* – Socioeconomic Profile, Inventory of Existing Transportation System, and Future Travel Demand and Capacity Needs Analysis
- *Kimley-Horn & Associates, Inc.* – Fiscal Year 2015 State of the System Report

The following technical documents were prepared as part of the Transportation System Plan 2035.

- Public Participation Plan
- Existing Conditions
  - Socioeconomic Profile
  - Transportation System Profile
- Future Travel Demand and Needs Analysis
- Alternative Modes Element
  - Existing Studies Overview of
  - Goals and Objectives for Bicycle and Pedestrian Facilities
  - Bicycle Gaps Identification Report
- State of the System Report - Fiscal Years 2013, 2014, and 2015
- Existing and Potential Revenues White Paper
- Life Cycle System Costs and Funding Analysis White Paper

1.2.3 Partnering Process

In an effort to ensure MCDOT evaluated the roadway network with regional connectivity in mind, MCDOT embraced and engaged planning partners in the TSP 2035 process. Planning partners included representatives of the County, local and regional governments within and surrounding the County, private utilities and railroads, and state agencies.

Planning partners attended stakeholder workshops to represent agency and constituency interests. In addition to participating in the review process and stakeholder engagement process, MAG provided technical data, including the regional travel demand model. The following lists a summary of the regional coordination process.

- A stakeholder meeting was held at plan initiation to provide an introduction to the process, a presentation on the work plan, and a preview of information for the Phase I public open houses.
- Stakeholders were invited to participate in five workshops. The focus of each workshop corresponded to the progression of TSP 2035 development. Workshop titles were as follows:
  - Establishment of Partnership and Identification of Transportation System Needs
  - TSP Purpose, Goals, Objectives, and Strategies

Stakeholders During Partnering Workshop

- Project Rating System
- Draft TSP Project Recommendations
- Draft TSP Document

1.2.3.1 Partnering Agreement

The Partnering Agreement was developed during the April 21, 2015, Stakeholder Partnering workshop. The stakeholders agreed that their partnership is important to collectively support MCDOT in developing a solid and effective plan for the future. Stakeholders committed to:

Stakeholder Meeting

- Setting and achieving common goals and viewing the TSP as OUR plan
- Collaborating rather than pushing individual agendas
- Seeking opportunities to share information and resources
- Encouraging one another to bring forth new, innovative, and creative ideas;
- Participating in the planning process and providing timely review and feedback on questions and elements of the plan as requested
- Sharing information within their agency on behalf of all of the partners to promote the TSP 2035 effort
- Holding one another accountable for collective success

1.2.3.2 Goals of Partnership

The Partnering Goals included:

Schedule: The partners have a clear understanding of the schedule for the TSP 2035 efforts and are making every effort to ensure the schedule is met.

Responsiveness: The partners will respond in a timely manner to requests for information or input related to development of TSP 2035.

Coordination: The partners will work well together to ensure TSP 2035 reflects or is incorporated into plans developed by partner agencies, and to avoid redundancy and overlap in planning efforts.

Sharing/communication: The partners clearly demonstrate a desire and willingness to collaborate and share information and resources for the benefit of TSP 2035 as well as all transportation system planning efforts occurring within the County.

Good outcome: It is clear throughout its development that TSP 2035 will support each individual partner and helps their agency/entity in ongoing efforts to develop and maintain a transportation system that performs well for the travelling public. The plan will provide a clear framework and path for implementation of system improvements over the next two decades.

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

TRANSPORTATION SYSTEM PLAN 2035

A Long Range Plan for Maricopa County

PARTNERING AGREEMENT

Developed April 21, 2015 at a TSP Partnering Workshop attended by more than 40 people representing local governments, federal, state, regional, and county agencies, private utilities, and tribes with jurisdictional responsibility throughout and adjacent to Maricopa County.

"The Partners for the Maricopa County Department of Transportation (MCDOT) Long Range Transportation System Plan (TSP) include MCDOT along with representatives of local, county, and regional governments within and surrounding Maricopa County, private utilities and railroads, State agencies, and other County Departments situated within Maricopa County and with jurisdictional responsibility related to the County-wide transportation network. The Partners agree that their partnership is important to collectively support MCDOT in the development of a solid and effective plan for the future, and commit to:

- *Setting and achieving common goals and viewing the TSP as a collaborative effort and plan,*
- *Collaborating and bringing forth regional issues,*
- *Seeking opportunities to share information and resources,*
- *Encouraging one another to bring forth new, innovative, and creative ideas,*
- *Participating in the planning process and providing timely review and feedback on questions and elements of the plan as requested,*
- *Sharing information within their agency to promote the TSP effort, and*
- *Holding one another accountable for collective success."*

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Signed Partnering Agreement

1.2.4 Public Outreach

In an effort to ensure MCDOT was evaluating the roadway network with County residents in mind, MCDOT embraced and engaged the public in the TSP 2035 process. Public outreach and involvement was a critical element of MCDOT planning efforts; the public was continually encouraged to be engaged and informed through MCDOT's overall communication strategy. This included the use of relevant tools such as online engagement, media, social media, and community events. Public outreach for TSP 2035 was divided into three phases.

Phase I - Phase I of public outreach was conducted in the spring of 2015 and provided opportunity for comment on any roadway throughout the County (***Figure 3***). The following is a summary of the Phase I of public outreach.

- **Public Open Houses** - MCDOT hosted 13 public open houses with over 200 attendees in areas where County facilities are most prominent, including the following:
  - Anthem
  - Arlington
  - City of Goodyear
  - City of Mesa
  - City of Surprise
  - City of Tempe
  - New River
  - Rio Verde
  - Sun City
  - Tonopah
  - Town of Fountain Hills
  - Town of Queen Creek
  - Town of Wickenburg
- **Interactive Map** - MCDOT developed an interactive map allowing the public to provide input across seven categories. 750 comments were received.
- Public input helped MCDOT understand the main issues to be addressed on the system overall: connectivity, traffic (congestion), and safety.

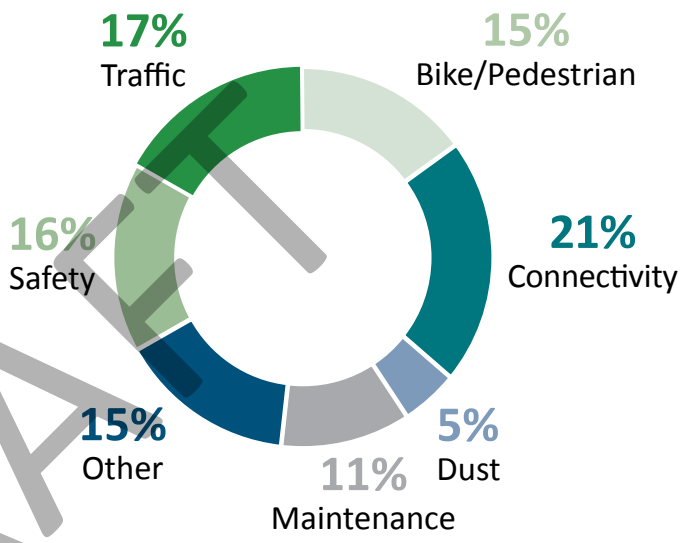

Figure 3 – Phase I Comment Summary

Phase II - Phase II of public outreach was conducted in the spring and summer of 2016. The draft list of projects through 2035 and the project ranking methodology were presented for public comment. The following lists a summary of Phase II of public outreach.

- **Meetings** - MCDOT attended 14 meetings with stakeholders, including the following:
  - City of Avondale
  - City of Buckeye
  - City of Glendale
  - City of Goodyear
  - City of Peoria
  - City of Phoenix
  - City of Surprise
  - Laveen
  - New River/Desert Hills Community Association

- Rio Verde Homeowner Association
- Sun City Home Owners Association (SHOA)
- Property Owners and Residents Association (PORA) of Sun City West
- Town of Queen Creek
- Town of Wickenburg

Interactive Map - Phase II of the interactive map received 22 responses on potential projects identified in the needs analysis.

Phase III - Phase III of public outreach is being conducted in fall 2016, which includes publishing the Draft TSP 2035 to the MCDOT website to solicit public input. This section will be revised upon the completion of Phase III.

Public Outreach Meeting

Word Cloud of Comments Received from Stakeholders and Public Input

Source: Central Creative, Inc.

1.3 NEXT STEPS

In support of the TSP 2035 Goals MCDOT should continue to hold stakeholder workshops on an annual basis. These workshops will bring together jurisdictional agencies to discuss existing and future transportation facilities and identify potential for project partnering.

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DESIGN a Seamless Network

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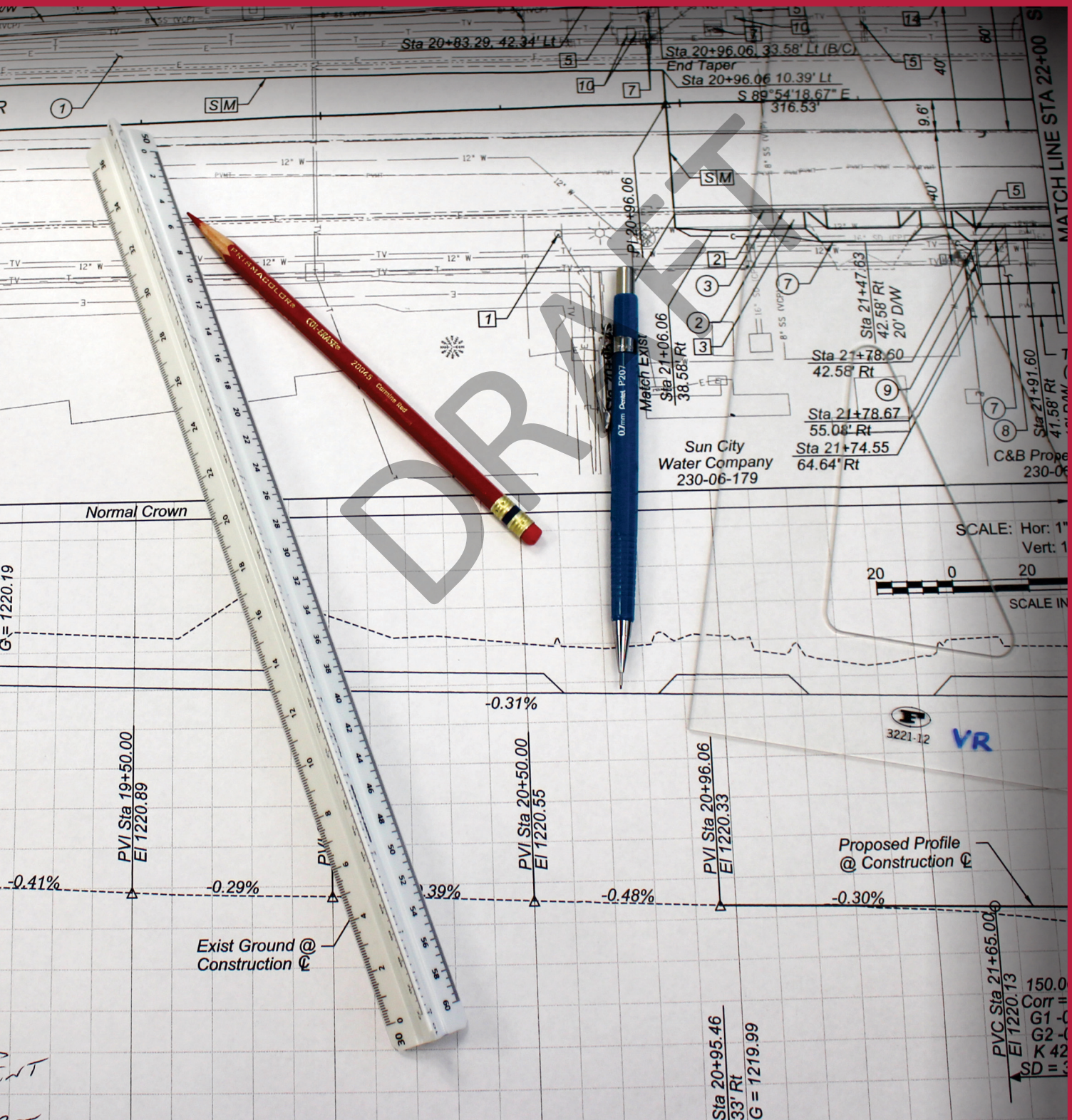

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DESIGN a Seamless Network

MCDOT develops standards and designs roads and bridges to safely and efficiently accommodate all modes of travel across a complex network. Population and employment growth will stress the existing transportation system. MCDOT has a responsibility to consider multiple factors to determine roadway design that will increase functionality, consider safety, and provide a network that works now and into the future.

This chapter presents an overview of the projected growth patterns and transportation system functionality to identify improvements that address current and future system needs. These trends directly impact projected roadway design needs.

2.1 SOCIOECONOMIC PROFILE

Socioeconomic trends help identify existing and future demographics, including where County residents live and work. Identifying existing land use, population, and employment, and their predicted changes and intensification will help determine the number of vehicle trips, their origin, and their destination. This provides the foundation for identifying current and future transportation needs to develop and implement improvements to the transportation system.

MCDOT has developed a robust Title VI program with the goal to ensure all people have a meaningful role in processes associated with the delivery of MCDOT projects. This program outlines the roles, method of administration, and analysis that supports equity in transportation projects, planning, and programs. MCDOT continues to reach out to people in all corners of the County to ensure processes at MCDOT reflect the voices and visions of our diverse population. Title VI activities are mandated by the federal government to ensure that people of all races, income levels, ages, and abilities have an equal voice in the planning and project delivery processes and receive equal benefit from the results of such planning. The MCDOT Title VI Program is an integral part of developing transportation projects, plans, and programs that are responsive to the needs and priorities of the County's diverse population. The process effectively engages the public, fully integrates their feedback, analyzes the benefits and burdens of various alternatives, and recommends the most equitable solutions.

2.1.1 Land Use

MAG land use data (2012) was compiled in cooperation with its member agencies. This data was modified to compliment the County Comprehensive Plan. Predominant land use types include:

Recreation
Approximately 37 percent of unincorporated County is designated as recreation. This includes mountain preserves such as wilderness and forest areas, regional parks, restricted open spaces, washes and/or floodplains, limited open space, golf courses, and other outdoor opportunities. Large tracts of passive/restricted open spaces occupy the southern and northeastern portions of the County, including the Maricopa Mountains and Tonto National Forest.

Vacant
Approximately 37 percent of unincorporated County is classified as vacant land. This includes undeveloped and/or underused land, as well as unused agricultural land. Vacant land is predominantly found west of the City of Buckeye, although pockets of vacant land are scattered throughout unincorporated County.

White Tank Mountain Regional Park

Agricultural Land
An estimated four percent of the unincorporated County is designated as agricultural land. This includes land and/or buildings associated with agriculture such as field crops, orchards, feedlots, and dairies. Agricultural land primarily occupies the central and western portions of the County, with several large tracts clustered along the Salt River.

Agricultural Land Use

Less Prominent Land Uses
Less prominent land uses within unincorporated County include Other, Residential, Water, Employment, and Retail Commercial uses. The "Other" land use designation includes uses such as medical nursing facilities, educational facilities, military bases, and transportation facilities. ***Figure 4*** shows the 2012 land use designations in unincorporated County; these are also listed in ***Table 2***.

Table 2 – 2012 Land Use

Land Use Designation	Percent of Unincorporated County
Recreation	37.1%
Vacant	36.7%
Other	16.8%
Agriculture	4.4%
Residential	2.4%
Water	1.9%
Employment	0.7%
Retail Commercial	0.1%

*Small portions of incorporated County may be reflected in percent totals.

Retail Center

Existing land use within incorporated areas of the County was not reviewed. However, the County as a whole was included in the demographic analysis; as transportation needs in unincorporated County may be driven by growth within unincorporated and incorporated County. While land use planning in adjoining jurisdictions is outside of the County's purview, it influences the County transportation network.

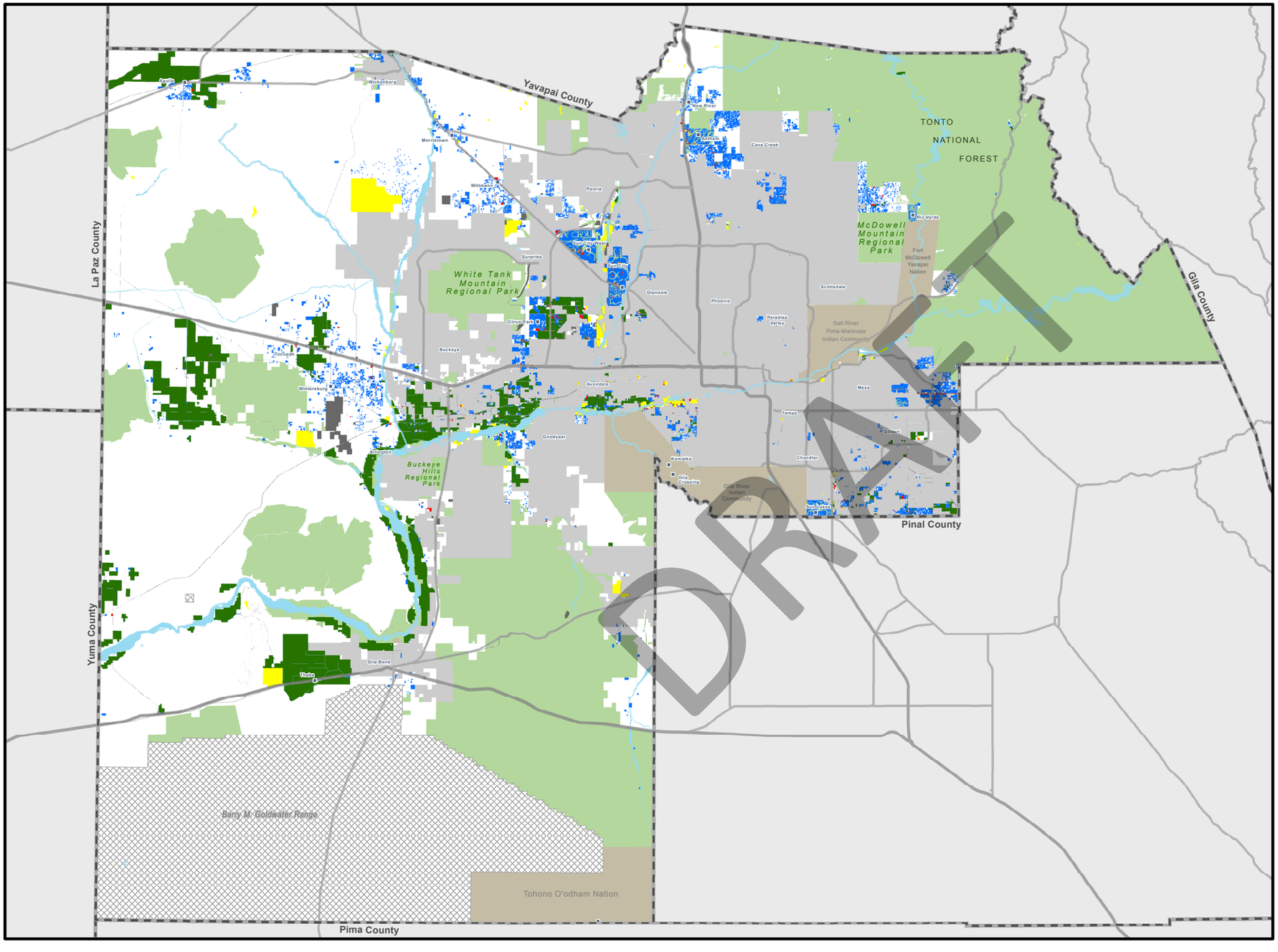
2.1.2 Major Destinations

Areas of unincorporated County with the highest population and employment concentrations are located in Sun City and Sun City West in the northwest portion of the County, Anthem in the northern portion of the County, Sun Lakes in the southeast portion of the County, and near the City of Mesa in the eastern portion of the County. The Palo Verde Nuclear Generating Station and Lockheed Martin are major employers in the far west portion of the County. The subsections below provide a summary of the major destinations within unincorporated County including employment areas, regional recreational facilities, and health care facilities.

2.1.2.1 Employment Areas

Large concentrations of businesses are located in Sun City, Anthem, and Sun Lakes. The largest employment sectors in unincorporated County are health care and social assistance (20 percent), construction (12 percent), and retail (8 percent). Examples of each include hospitals, heavy and civil engineering construction, and food and beverage stores, respectively.

Figure 4 – Unincorporated Maricopa County Existing Land Use (2012)



Existing Land Use (2012)

- Agriculture
- Employment
- Other
- Recreation
- Residential
- Retail Commercial
- Vacant
- Water

REFERENCE LAYERS

- Interstate
- State Route/US Highway
- Lake/Reservoir
- River or Major Wash
- Indian Reservation
- Military
- Incorporated Areas
- County Boundary

0 10 20 Miles

N

Source: Maricopa County; Flood Control District of Maricopa County (FCD); Arizona Department of Transportation (ADOT); Arizona State Land Resource Information System (ALRIS); Source: Jacobs

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2.1.2.2 Regional Recreational Facilities

A variety of recreational/open space areas are located throughout the unincorporated County including, but not limited to:

- Regional parks
- Conservation areas
- Wilderness areas
- Arizona Trust Land
- Tonto National Forest
- Wildlife areas

Banner Del E. Webb Medical Center

2.1.2.3 Health Care Facilities

There are more than 160 medical/health care facilities in unincorporated County. Banner Health is the largest employer in unincorporated County with 3,578 employees. Its facilities include Banner Boswell Medical Center, Banner Del E. Webb Medical Center, Banner Sun Health Research Institute, Banner Arizona Medical Clinic - Sun City West, Restora Hospital of Sun City, and Dignity Health.

2.1.3 Demographic Trends

Table 3 summarizes the County socioeconomic data. The largest growth in the County occurred in areas identified as partially in the unincorporated County and partially within a city/town, or partial areas. The total population and total residential population in the partial areas increased at a rate of 1.5 and 1.7 percent per year, respectively, nearly five times faster than unincorporated County. Within unincorporated County areas, projected population and employment are anticipated to intensify in Sun City, Sun City West, Anthem, and Sun

Table 3 – 2012 Maricopa County Population, Housing Units, and Employment

Geographic Area	Year	Total Population[a]	Total Residential Population[b]	Total Occupied Housing Unit	Total Employment
Unincorporated Area	2010	174,639	173,870	80,191	
	2012	175,702	174,933	80,750	35,431
	% GR/YR[e]	0.3%	0.3%	0.3%	
Incorporated Area[c]	2010	3,088,870	3,068,785	1,144,293	
	2012	3,138,414	3,115,826	1,164,011	1,595,319
	% GR/YR[e]	0.8%	0.8%	0.9%	
Partial Area[d]	2010	553,608	545,394	187,099	
	2012	570,554	563,591	192,956	149,853
	% GR/YR[e]	1.5%	1.7%	1.6%	
Maricopa County Total	2010	3,817,117	3,788,049	1,411,583	
	2012	3,884,670	3,854,350	1,437,717	1,780,603
	% GR/YR[e]	0.9%	0.9%	0.9%	

[a] includes group quarter populations (i.e. correctional, institutional, and military), but does not include seasonal and transient populations; [b] does not include group quarter populations; [c] includes Indian Reservations; [d] consists of areas that are partially in the County and partially in the city/town boundary; [e] percent growth per year
Source: MAG Year 2012 Socioeconomic Data and U.S. Census Bureau

Lakes. In the last two years, the total population and total residential population in the incorporated portion of the County grew nearly three times faster than in the unincorporated areas.

The total population shown in ***Table 3***, which consists of all residential and group quarter populations (i.e. correctional, institutional, and military population) in unincorporated County, increased less than one percent over the last two years, with an average growth of 0.3 percent per year. This could be attributed to the slow economic recovery from the 2008 recession. This is evident in that nearly 66 percent of planned housing units in active developments in unincorporated County have not been built.

2020, 2025, and 2035

Residential and employment populations in the County are projected to intensify in existing concentration areas.

2020, 2025, and 2035 Population and Employment Growth Trends

Employment or the number of jobs provided in unincorporated County accounted for only two percent of the total employment in the County and was primarily a mix of other, retail, office, and non-site specific employees. The majority of employment (90 percent) in the County was in incorporated areas, while eight percent was in partial areas.

Table 4 summarizes the 2020, 2025, and 2035 population, housing unit, and employment data for the County and provides the growth rate from the previous horizon data. MAG socioeconomic data for years 2020, 2025, and 2035 was obtained and evaluated for the County. Similar to the 2012 socioeconomic data, future data was comprised of population, housing unit, and employment estimates aggregated by areas. The data was revised

Table 4 – Projected Population, Occupied Housing Units, and Employment

Geographic Area	Year	Total Population[a]	% Growth	Total Occupied Housing Unit	% Growth	Total Employment	% Growth
Unincorporated Area	2020	199,460	14%	89,387	11%	50,378	42%
	2025	224,760	13%	98,478	10%	58,238	16%
	2035	287,207	28%	122,149	24%	81,152	39%
Incorporated Area[b]	2020	3,565,513	14%	1,324,192	14%	2,025,630	27%
	2025	3,843,588	8%	1,427,901	8%	2,152,795	6%
	2035	4,358,882	13%	1,619,101	13%	2,421,756	13%
Partial Areas[c]	2020	738,310	29%	248,565	29%	235,347	57%
	2025	863,422	17%	291,674	17%	279,302	19%
	2035	1,128,308	31%	384,085	32%	388,602	39%
Maricopa County Total	2020	4,503,283	16%	1,662,144	16%	2,311,355	30%
	2025	4,931,770	10%	1,818,053	9%	2,490,335	8%
	2035	5,774,397	17%	2,125,335	17%	2,891,510	16%

[a] includes group quarter populations (i.e. correctional, institutional, and military), but does not include seasonal and transient populations [b] includes Indian Reservations; [c] consists of areas that are partially in the County and partially in the city/town boundary; Source: MAG Year 2020, 2025, and 2035 Socioeconomic Data (Data as of May 2014), U.S. Census Bureau, Maricopa County and Arizona Department of Administration, Office of Employment and Population Statistics

to more accurately depict travel demand based on updated trends and/or projections obtained from the State Demographer Office, and input from MCDOT. The County is expected to experience an increased density in population and employment in developed areas, rather than a more sprawling development pattern.

2.2 EXISTING ROADWAY NETWORK

TSP 2035 inventoried transportation facilities owned, operated, and/or maintained by the County. County roadway facilities vary from unpaved two-lane local roads in rural areas to six-lane principal arterials that provide intercity travel in urbanized areas.

93% of County Maintained Roads **are 2 Lanes**

83% of County Maintained Roads **are Paved**

County Maintained Roads Statistics

The data and information presented herein is based on the MAG travel demand model (TDM), unless noted otherwise. The MAG TDM is focused on regional travel and is generally limited to arterials and some collector roadways. The data and information obtained for TSP 2035 reflects the conditions at the time the data was received in July 2015. Not all roadway segments highlighted in the figures below are County maintained roadways. Some roadways identified in the 2015 network and SOS Report Fiscal Year (FY) 2015 are not highlighted in the figures.

For the comprehensive roadway network inventory, see the latest SOS Report.

2.2.1 Roadway Measurements

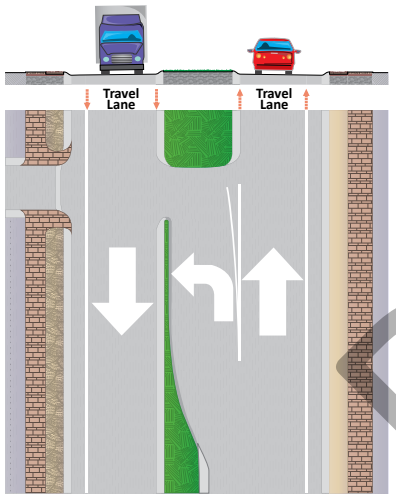

Figure 5 – Travel Lanes
Source: Jacobs Engineering

TSP 2035 uses several measurements to analyze roadways. The total number of lanes within a segment of roadway refers to the total number of travel/through lanes; turn lanes and auxiliary lanes are not included. For example, the roadway cross section shown in ***Figure 5*** has one travel/through lane in each direction for a total of two lanes. Lane miles are defined as the number of lanes in a one mile long roadway segment. For example, a one mile segment of the roadway cross section shown ***Figure 5*** is two lane miles. Centerline miles are defined as the linear distance of a length of roadway, regardless of the number of lanes. For example, a one mile segment of the roadway cross section shown ***Figure 5*** is one-centerline mile.

The amount of roadway lanes data and information compiled for TSP 2035 reflects 2012 conditions. A majority of County maintained roads, 93 percent, are two-lane roadways and 83 percent of all County maintained roads are paved. The remaining seven percent are either four or six-lane roadways. The existing number of lanes is shown in ***Figure 6***.

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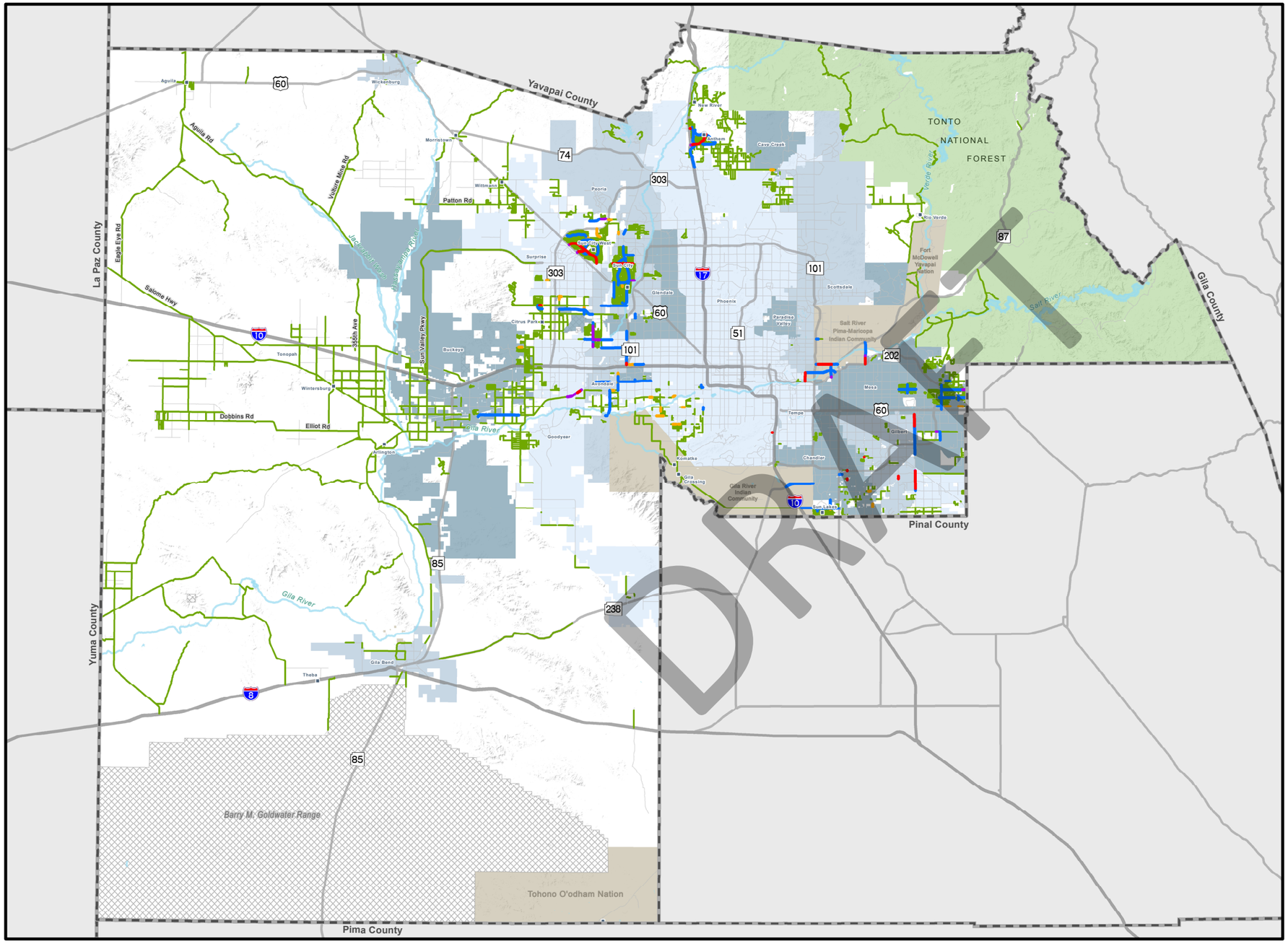
Figure 6 – Existing Number of MCDOT Lanes



NUMBER OF LANES (2012)

- 6-Lanes
- 5-Lanes
- 4-Lanes
- 3-Lanes
- 2-Lanes
- 1-Lane

REFERENCE LAYERS

- Interstate
- State Route/US Highway
- Other Major Roadway
- Lake/Reservoir
- River or Major Wash
- National Forest
- Indian Reservation
- Military
- Incorporated Areas
- County Boundary

0 10 20 Miles

N

Source: Maricopa County; Flood Control District of Maricopa County (FCD); Arizona Department of Transportation (ADOT); Arizona State Land Resource Information System (ALRIS);
Source: Jacobs

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2.2.2 Functional Classification

Functional classification is the identification and grouping of roads into classes based on their particular role in moving traffic through the roadway network. Traffic is channeled through a hierarchy of inter-connected roads that progress from higher classifications, where trips are longer and connect to regional traffic generators, to lower classifications, where trips are shorter and localized. Functional classification is used by transportation planners and engineers as the basis for establishing design standards, speed limits, access control, and adjacent land use development.

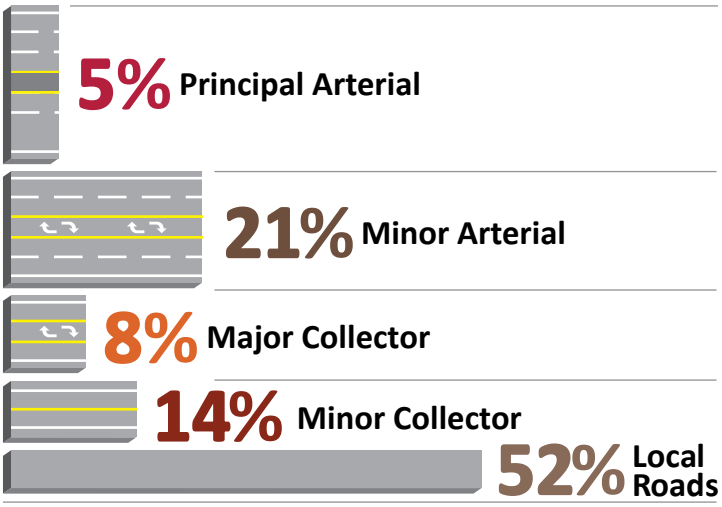

Figure 7 – Functional Classification of County Maintained Roads

The functional classification of a roadway also determines a road's eligibility for federal or state funding for improvements or maintenance. Federal funding is generally restricted to roads with a federal functional classification of major collector or higher in a rural area or minor collector or higher in an urban area.

The functional classification data obtained for TSP 2035 reflects information as of February 2015. Functional classification information is updated every two to three years in the MSRP. Currently, the majority of the County maintained network is local roads (52 percent), followed by minor arterials (21 percent), minor collectors (14 percent), major collectors (8 percent), and principal arterials (5 percent). ***Figure 7*** depicts the functional classification of MCDOT roadways.

The MCDOT functional classifications are described in ***Table 5*** and shown in ***Figure 8***.

Table 5 – MCDOT Functional Classification

Rural	Urban
Parkway	
▷ Traffic movements intended for regional and statewide travel ▷ Typically four lanes divided with wide median to accommodate U-turn movements ▷ Traffic signals at all intersections operate on a two-phase system ▷ Restricted left turn movements ▷ Posted Speed: 45 mph or less ▷ LOS Standard: C	▷ Traffic movements intended for regional and statewide travel ▷ Typically four lanes divided with wide median to accommodate U-turn movements ▷ Traffic signals at all intersections operate on a two-phase system ▷ Restricted left turn movements ▷ Posted Speed: 45 mph or less ▷ LOS Standard: D

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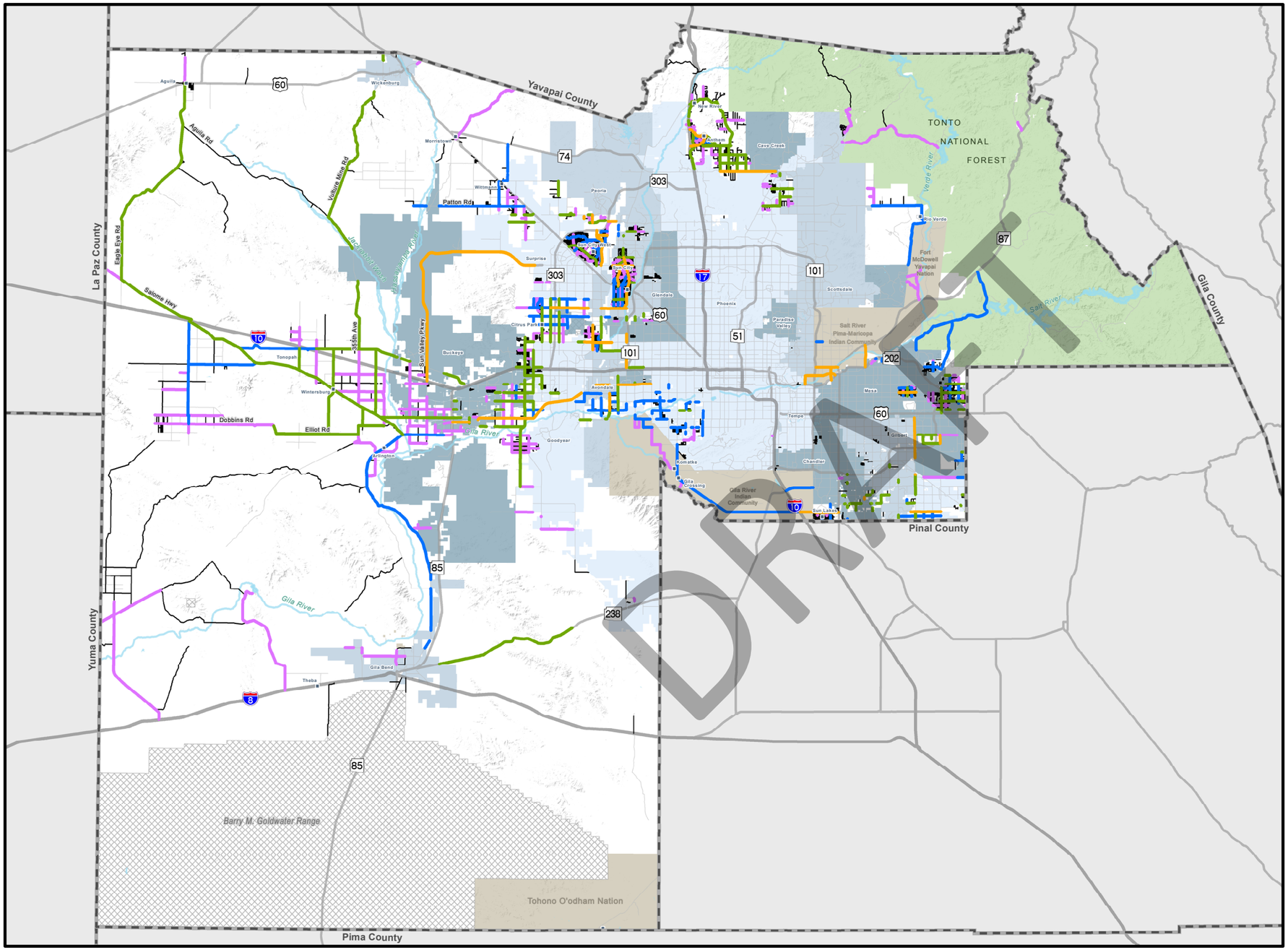
Rural	Urban
Principal Arterial	
▷ Traffic movements intended for travel between rural and urban communities ▷ Typically four lanes divided with median and exclusive turn lanes where applicable ▷ Posted Speed: 45 mph or less ▷ LOS Standard: C	▷ Traffic movements intended for travel between rural and urban communities ▷ Typically four to six lanes divided with median and exclusive turn lanes where applicable ▷ Posted Speed: 45 mph or less ▷ LOS Standard: D
Minor Arterial	
▷ Traffic movements intended for land access, intra-community travel, and connecting local traffic to the arterial network ▷ Typically four lanes undivided with a CTL ▷ Posted Speed: 45 mph or less ▷ LOS Standard: C	▷ Traffic movements intended for land access and connecting local traffic to the arterial network ▷ Typically four lanes undivided ▷ Posted Speed: 45 mph or less ▷ LOS Standard: C
Major Collector	
▷ Traffic movements intended for intra-community continuity and connectivity to the arterial network ▷ Typically varies from two to four lanes depending on the adjacent land use and density. A CTL may be included for additional capacity ▷ Posted Speed: 40 mph or less ▷ LOS Standard: B	▷ Traffic movements intended for moderate trip lengths and connectivity to the arterial network ▷ Typically two lanes undivided with a CTL ▷ Posted Speed: 30 mph or less ▷ LOS Standard: C
Minor Collector	
▷ Traffic movements intended for moderate to short trip lengths in rural areas and connectivity to the arterial network ▷ Typically two lanes undivided in rural areas ▷ Posted Speed: 35 mph or less ▷ LOS Standard: B	▷ Traffic movements intended for intra-community continuity and connectivity to the arterial network ▷ Typically varied from two to four lanes depending on adjacent land use and density ▷ A CTL may be added for additional capacity ▷ Posted Speed: 30 mph or less ▷ LOS Standard: B
Local	
▷ Traffic movements intended for short trip lengths and connectivity to routes with higher classification ▷ Typically two lanes undivided ▷ Posted Speed: 25 mph ▷ LOS Standard: A	▷ Traffic movements intended for short trip lengths and connectivity to routes with higher classification ▷ Typically two lanes undivided ▷ Posted Speed: 25 mph ▷ LOS Standard: A

Figure 8 – Functional Classification of MCDOT Roadways



FUNCTIONAL CLASSIFICATION (2015)

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Local

REFERENCE LAYERS

- Interstate
- State Route/US Highway
- Other Major Roadway
- Lake/Reservoir
- River or Major Wash
- National Forest
- Indian Reservation
- Military
- Incorporated Areas
- County Boundary

0 10 20 Miles

N

Source: Maricopa County; Flood Control District of Maricopa County (FCD); Arizona Department of Transportation (ADOT); Arizona State Land Resource Information System (ALRIS); Source: Jacobs

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2.2.3 Crash Rates

The crash analysis conducted for TSP 2035 identified the following:

- Cause of roadway crashes
- Potential safety improvements to minimize the frequency and/or severity of roadway crashes due to roadway/traffic operational characteristics

A complete safety analysis which considers driver behavior, weather conditions, and the influence of other elements was not conducted.

Crash data for TSP 2035 was obtained from the ADOT Accident Location Identification Surveillance System (ALISS) database from September 2009 to September 2014. During the 5-year period, a total of 13,024 crashes occurred on County maintained roadways. The number of crashes per year steadily increased through 2013 as shown in ***Figure 9***.

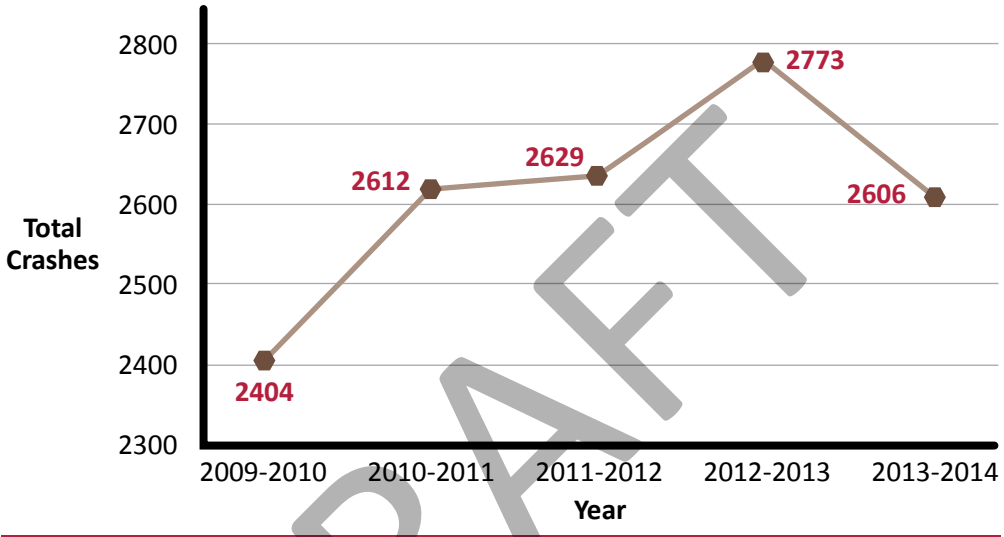


Figure 9 – Crash History per Year

A summary of the five-year crash data obtained is below.

Crash Severity

- Property damage only crashes at 65 percent
- Injury crashes at 34 percent
- Fatal crashes at one percent

Collision Manner

- Collisions with motor vehicles at 70 percent
- Collisions not with motor vehicles, such as with fixed or non-fixed objects, ran off road, and overturn/rollover at 20 percent
- Collisions not reported or categorized as other at seven percent
- Collisions with pedestrians or bicyclists at two percent
- Collisions with animals at one percent

Collision Type

The following collision types are the most common crashes occurring on County maintained roads:

- Rear end crashes at 30 percent
- Single vehicle crashes at 20 percent
- Angle crashes at 19 percent
- Left turn crashes at 14 percent

Intersection/Interchange

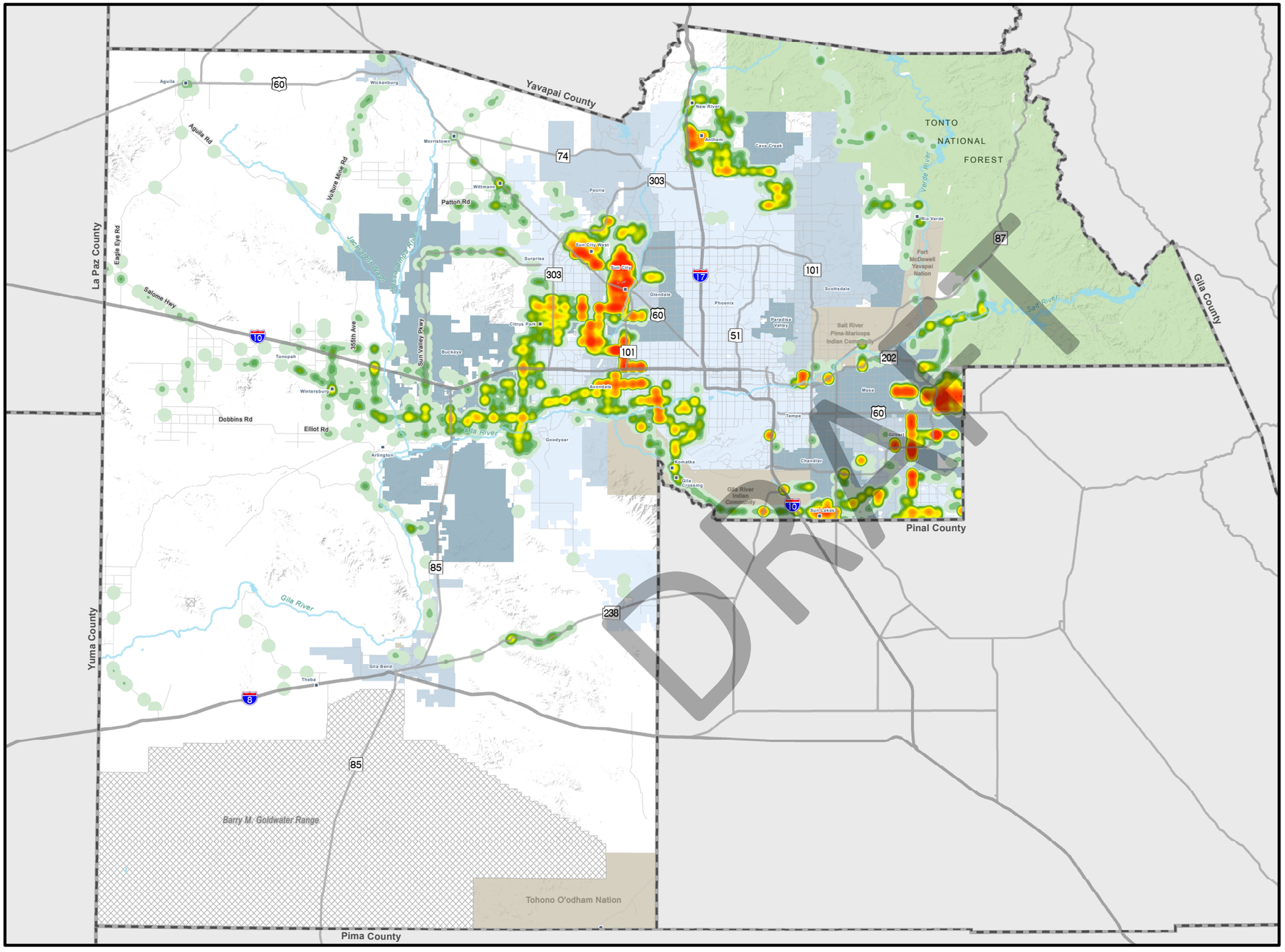
- Intersection crashes at 50 percent
- Interchange crashes at 11 percent

Common Driver Citations

- Driver inattention or distraction at 23 percent
- Failure to yield right-of-way at 16 percent
- Speed too fast for conditions at 13 percent

Figure 10 displays the overall density of crashes. Large concentrations of crashes occurred in the eastern portion of the County and in Sun City and Sun City West.

Figure 10 – Crash Density on MCDOT Roadways



CRASH DENSITY (2009 - 2014)

High

Low

REFERENCE LAYERS

- Interstate
- State Route/US Highway
- Other Major Roadway
- Lake/Reservoir
- River or Major Wash
- National Forest
- Indian Reservation
- Military
- Incorporated Areas
- County Boundary

0 10 20 Miles

N

Note: Crash data was obtained from ADOT's Accident Location Identification Surveillance System (ALISS) database - Sept. 2009 to Sept. 2014 and include crashes with vehicles only.

Source: Maricopa County; Flood Control District of Maricopa County (FCD); Arizona Department of Transportation (ADOT); Arizona State Land Resource Information System (ALRIS);
Source: Jacobs

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2.3 TRAFFIC ANALYSIS

The purpose of the traffic analysis conducted for TSP 2035 was to establish an understanding of the deficiencies on existing and committed roadways currently owned or maintained by the County, with the exception of County park roads. Future needs were determined based on forecasted population and employment growth in the County.

Traffic on Bell Road

2.3.1 Traffic Count Program

MCDOT annually collects 24-hour, AM peak hour, and PM peak hour traffic counts for County maintained arterials to analyze traffic operations and other network features. Traffic count data is also collected regularly for County owned roadways in developments such as Sun City, Sun City West, and Sun Lakes. This collection process results in raw data which is then converted to ADT volumes. The ADT volumes, combined with projected socioeconomic conditions, serve as a base to develop future traffic volume projections. Traffic count data is available on the ***MCDOT website***.

2.3.2 Methodology

The 2012 MAG TDM was utilized for TSP 2035. The socioeconomic and roadway network data were revised and updated to more accurately depict the current travel demand and patterns in unincorporated County. The MAG socioeconomic data helped MCDOT forecast realistic traffic volumes for future horizon years and anticipate changes in future travel demand and trip patterns. The MAG socioeconomic data for the years 2012, 2020, 2025, and 2035 was presented in ***Section 2.1***. The existing roadway network information was presented in ***Section 2.2***.

2.3.3 Future Traffic Volume Projections

Traffic volume projections were developed for the projected 2020, 2025, and 2035 socioeconomic conditions. The projected socioeconomic data was used to assess the effects of increased population and employment on the transportation system with the existing roadway network plus committed and funded projects. This is referred to as the "No-Build" scenario. ***Table 6*** lists the committed projects incorporated into the No-Build network.

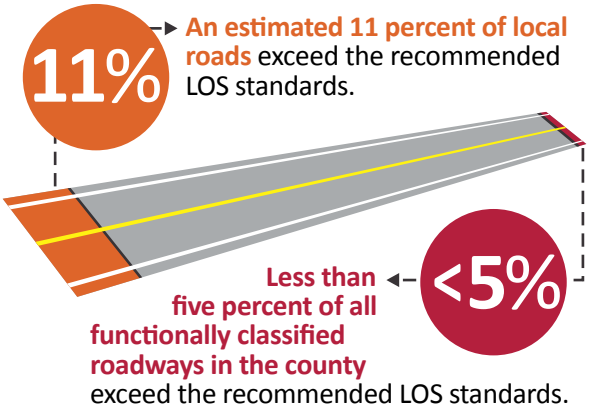
Table 6 – Committed Roadway Improvement Projects

Project Location	Capacity Improvement
Deer Valley Rd: 117th Ave to 109th Ave	Construct 4-lane road with CTL
Riggs Rd: Ellsworth Rd to Meridian Rd	Construct 2-lane road with CTL
Riggs Rd: Hawes Rd to Ellsworth Rd	Widen road to 4-lanes with CTL
Riggs Rd: Power Rd to Hawes Rd	Widen road to 4-lanes with CTL
Riggs Rd: Recker Rd to Power Rd	Widen road to 6-lanes with CTL
Olive Ave: Citrus Rd to Cotton Ln	Widen road to 4-lanes with CTL
Northern Pkwy: Dysart Rd to 111th Ave	Widen road to 4-lanes
El Mirage Rd: Northern Ave to Peoria Ave	Widen road to 4-lanes
McQueen Rd: Ocotillo Rd to Riggs Rd IGA	Contribute to Chandler project (Widen to 4-lanes)

Source: MCDOT, Data as of July 2015

2.3.4 Level of Service

LOS is a qualitative measure used to relate the quality of traffic service. LOS is divided into six letter grades: A through F, indicating best to worst service respectively (see ***Figure 11***). LOS provides a generalized and conceptual planning measure that assesses service inside the roadway right-of-way. LOS is a critical measurement allowing planners and engineers to determine the level of traffic a given facility can accommodate. Service volumes represent the maximum threshold of vehicles for a given LOS.



Existing Level of Service Statistics

The MCDOT roadway LOS information reflects data as of December 2015. To improve planning efforts, MCDOT recently developed service volume tables with LOS standards for County maintained roadways by functional classification, number of lanes, median type, and area type (rural or urban). Currently, based on the updated service volumes, excluding local roads, less than five percent of all MCDOT roadways currently exceed the recommended LOS standard. An estimated 11 percent of local MCDOT roadways currently exceed the recommended LOS standard.

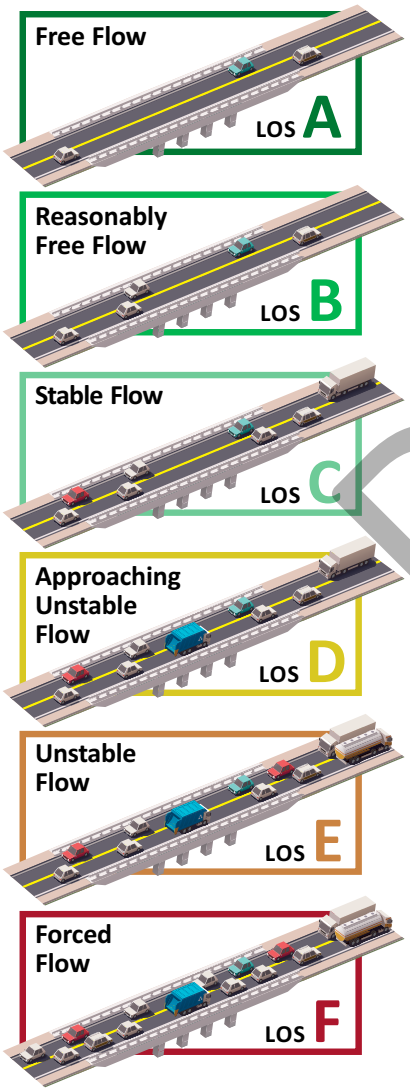


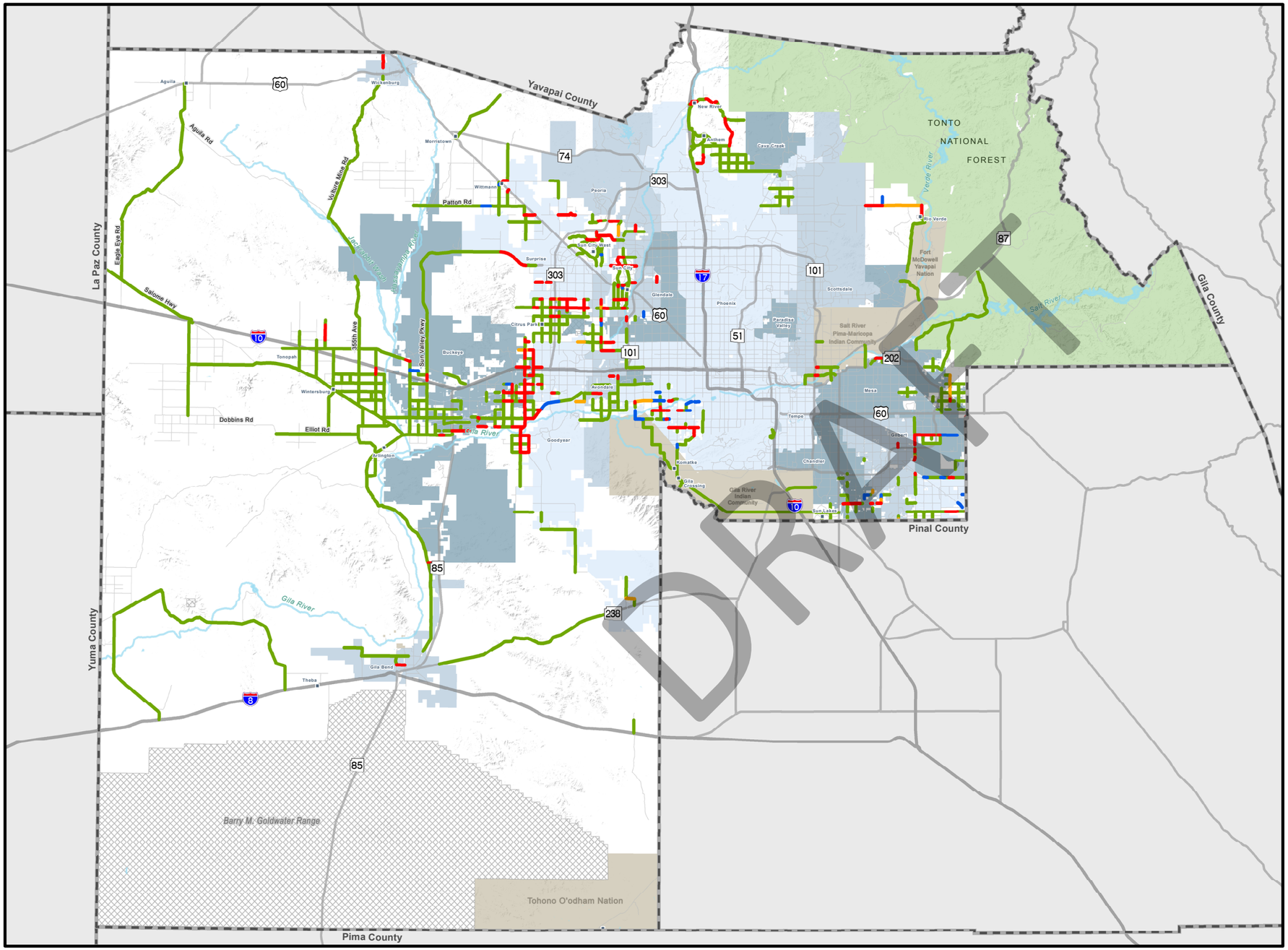
Figure 11 – Level of Service

The future traffic volume projections for 2020, 2025, and 2035 were correlated to the updated LOS standards to determine if the County maintained roadways meet or exceed the recommended roadway LOS standards. ***Table 7*** provides a summary of the percentage of roadways projected to exceed recommended LOS standards based on the No-Build scenario. This information is also presented in ***Figure 12***. Congestion is expected to increase with population if no additional improvements are made to the transportation network. Local roads are expected to experience the greatest impact to LOS.

Table 7 – Percentage of Roadways Exceeding Acceptable Level of Service by Horizon Year

Functional Class	2020	2025	2035
Principal Arterial	2%	8%	31%
Minor Arterial	4%	8%	19%
Major Collector	7%	10%	18%
Minor Collector	5%	9%	28%
Local	13%	32%	55%

Figure 12 – 2020, 2025, and 2035 Roadway Conditions



CONDITIONS (2015)

- Meets LOS Standard
- 2020 Exceeds LOS Standard
- 2025 Exceeds LOS Standard
- 2035 Exceeds LOS Standard

REFERENCE LAYERS

- Interstate
- State Route/US Highway
- Other Major Roadway
- Lake/Reservoir
- River or Major Wash
- National Forest
- Indian Reservation
- Military
- Incorporated Areas
- County Boundary

0 10 20 Miles

Note: Not all roadway segments highlighted are MCDOT Maintained roadways. Roadway segments identified in the 2015 network and State of the System Report FY 2015 are not included in the map.

Source: Maricopa County; Flood Control District of Maricopa County (FCD); Arizona Department of Transportation (ADOT); Arizona State Land Resource Information System (ALRIS);
Source: Jacobs

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Alternative Modes of Transportation

2.4 ALTERNATIVE MODES

Alternatives modes of transportation include bicycling, walking, and mass transit. Many people choose to leave their cars at home and commute using alternative modes of transportation. These active people and their alternative mode choices have led to the development of the term "active transportation." The County recognizes this transition and will be creating the MCDOT Active Transportation Plan (ATP) to support the Goals, Objectives, and Strategies developed for TSP 2035 as they relate to pedestrian and bicycle facilities.

Since the ATP will not be complete by the time TSP 2035 is finalized, this section serves as an introduction to the more detailed document. The ATP will update the 1999 MCDOT Bicycle Transportation System Plan; the MCDOT Americans with Disabilities Act (ADA) Transition Plan; and identify gaps in regional pedestrian and bicycle networks, including accessible routes to transit, that are on, adjacent to, or intersect with MCDOT right-of-way.

The ATP will serve to develop ranking methodologies and identify a list of recommended projects for near-term, mid-term, and long-term funding similar to the TSP process for identifying roadway needs. Federal funding for bicycle and pedestrian projects is generally determined by functional classification. Some programs target local routes, such as Safe Routes to School, while others target higher functionally classified facilities, such as the Surface Transportation Block Grant Program. The ATP will identify existing MCDOT policies and other local, regional, and state agencies that have an interest in the implementation of active transportation projects, and provide recommendations for policy modifications.

The following subsections provide an overview of the existing active transportation facilities in the County including bicycle, pedestrian, and transit infrastructure.

Pedestrian Hybrid Beacon

2.4.1 Bicycle Facilities

Existing bicycle facilities within the County can be grouped into two general categories: facilities that are integrated

into the existing roadway system and facilities that are located off of the roadway system. On-roadway bicycle facilities in the County typically consist of dedicated bicycle lanes, paved shoulders, and bicycle routes; these are described in ***Table 8***. Off-roadway bicycle facilities in the County typically include shared use paths (paved/unpaved) and other recreational trails; these are shown in ***Table 9***.

Table 8 – On-Roadway Bicycle Facilities

Bicycle Lane

- A portion of the roadway designated for the exclusive use of bicycles
- Separated from motor vehicle traffic with a white line
- Designated by word, symbol, and arrow pavement markings
- Must meet certain standards for width, striping, and markings

Buffered Bicycle Lane

- A portion of the roadway designated for the exclusive use of bicycles
- Separated from motor vehicle traffic with two white lines
- Designated by word, symbol, and arrow pavement markings

Separated Bicycle Lane or Cycle Track

- Exclusive bicycle facility
- Separated from motor vehicle traffic with a vertical element
- May be one-way on each side of the street or two-way on one side

Contra-Flow Bicycle Lane

- Typically added to one-way streets to allow cyclists to travel in the opposite direction of all other traffic
- Designated with same markings as bicycle lane
- May be separated with vertical barrier

Left-Side Bicycle Lane

- Conventional bicycle lane placed on the left side of one-way streets or two-way median divided streets

Paved Shoulder

- A portion of a highway contiguous to the roadway that can be used by bicyclists, pedestrians, equestrians, stopped vehicles, and emergencies

Bicycle Route

- On-street, off-street, or combination of facility types
- Designated for bicycle travel by mapping or signage

Colored Bicycle Facility

- Colored pavement, usually green, used to increase the overall visibility of a bicycle facility along the length, as a spot treatment, or intersection crossing marking

Bike Box

- A designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase

Bicycle Boulevard

- A street with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority
- Typically on residential streets
- Use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles and create safe, convenient bicycle crossings of busy arterial streets

Sidewalk

- Sidewalk is the portion of a street between the curb lines or the lateral lines of a roadway and the adjacent property lines and that is intended for the use of pedestrians.
- Can be used by bicyclists except where “No Bicycle” signs are posted or restricted by local statutes

Marked Shared Lane

- Designated with shared lane marking
- Assists bicyclists with lateral positioning in lanes too narrow for a motor vehicle and bicycle to travel side-by-side
- Assists bicyclists with lateral positioning in a shared lane with on-street parallel parking to reduce the chance of a bicyclist impacting the open door of a parked vehicle

Table 9 – Off-Roadway Bicycle Facilities

Shared Use Path

- Non-motorized use only except for personal mobility devices
- May be paved or unpaved
- If paved, intended for use by bicyclists, pedestrians, people on skateboards or using inline skates
- If unpaved, intended for use by bicyclists, pedestrians, and equestrians
- Primarily located within parks or along canals, rivers, and green belts
- If paved may be striped with center line and/or edge lines
- May have paved and unpaved surfaces adjacent to each other in same corridor
- May function as sidewalk when located within street right-of-way
- Should be designed to meet nationally recognized criteria and must comply with all ADA requirements when no other ADA route exists

Recreational Trail

- Does not serve a transportation function by connecting an origin with a destination
- Typically provides a loop starting and ending at the same location
- Non-motorized use only except for personal mobility devices
- Intended for use by bicyclists, pedestrians, and equestrians
- Usually unpaved but may be treated with stabilized decomposed granite

Other facilities that promote regional connectivity and safety on existing bicycle facilities include:

- **Grade-separated crossing**
  - Overpass – Crosses over the top of freeway, street, canal, river, or wash
  - Underpass – Crosses underneath a bridge using a path or trail typically located in a river, wash, or drainage corridor
  - Tunnel – Provides a sub-grade crossing of freeway, street, or other barrier usually installed to facilitate continuous access along a path or trail corridor
- **At-grade crossing**
  - Signalized trail and path crossings
  - Pedestrian Hybrid Beacon (HAWK - High Intensity Activated Crosswalk)
  - Pedestrian refuge locations

There are approximately 3,500 centerline miles of existing bicycle facilities within the County, including incorporated areas, as illustrated in ***Figure 13***. ***Table 10*** summarizes the existing bicycle facilities within the County.

Table 10 – Bicycle Facilities in Maricopa County

Bicycle Facilities (in centerline miles)	Total
Bike Lane	1,690
Bike Route	558
Shared Use Path Paved	379
Share Use Path Unpaved	350
Paved Shoulder	258
Recreational Trail	351
Local	**3,586**

Source: Bike Pathways Map Dataset 2014 – MAG

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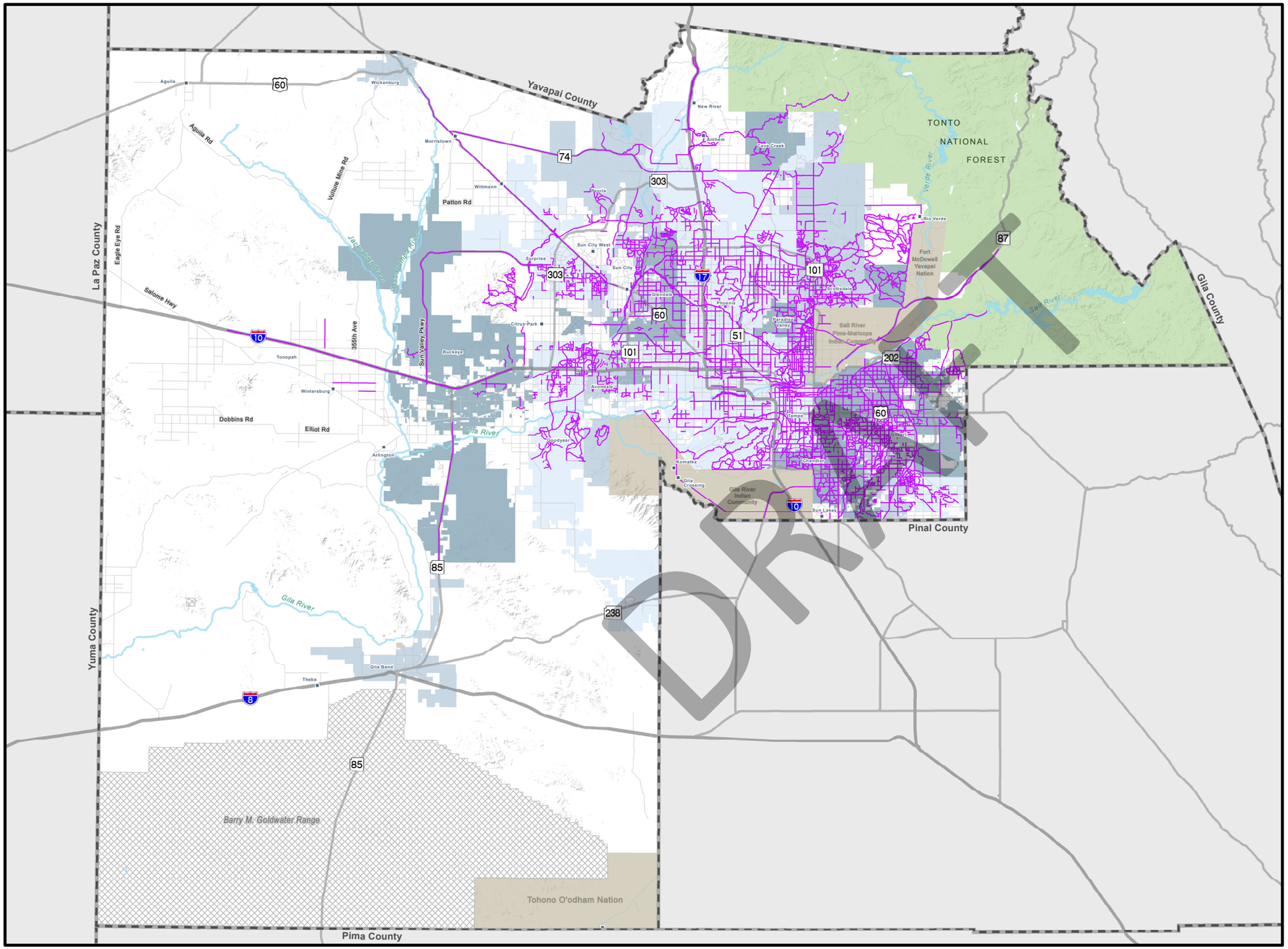
Figure 13 – Maricopa County Existing Bicycle Facilities



EXISTING BICYCLE FACILITIES (2014)

- Facility Locations

REFERENCE LAYERS

- Interstate
- State Route/US Highway
- Other Major Roadway
- Lake/Reservoir
- River or Major Wash
- National Forest
- Indian Reservation
- Military
- Incorporated Areas
- County Boundary

0 10 20 Miles

N

Source: Maricopa County; Flood Control District of Maricopa County (FCD); Arizona Department of Transportation (ADOT); Arizona State Land Resource Information System (ALRIS);
Source: EPS Group

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2.4.2 Pedestrian Facilities

Pedestrian facilities within the County include walkways, sidewalks, shared use paths, crosswalks, curb ramps, traffic calming and control devices, grade separations, wide shoulders in rural areas, and furnishings that create a pedestrian friendly atmosphere, such as benches. Other features include traffic calming devices such as traffic circles and speed humps, planting strips, bus shelters, public art, and pedestrian scale lighting.

Maricopa County Maricopa Trail

Trails are shared use paths intended for use by pedestrians and bicyclists. The Maricopa County Regional Trail System Plan (RTSP), completed in 2004, identified over 1,500 miles of proposed trail corridors throughout the County, designated the Maricopa Trail, and confirmed the importance of the Sun Circle Trail. The plan recommended 114 trail segments for improvements and prioritized them into four groups. The highest priority was given to Sun Circle and Maricopa trail corridors. ***Figure 14*** presents the trail improvements recommended by the RTSP along with existing County trails. These trails are sorted by priority and summarized in ***Table 11***.

Table 11 – Existing and Proposed Pedestrian Trails

Trails	Total Miles
Existing Trails	406
Priority 1 Trail Project	311.1
Priority 2 Trail Project	170.3
Priority 3 Trail Project	258.5
Priority 4 Trail Project	781.6
Total	**1927.5**

Source: Regional Trail System Plan Dataset 2004 – Maricopa County Trail Commission

The Maricopa County Parks and Recreation Department is responsible for the coordination, development, construction, and maintenance of the Maricopa Trail and other trail segments within County parks and unincorporated County. The Maricopa County Parks and Recreation Department coordinates with MCDOT to provide trail crossings on County roadways. Many of the trail segments identified by the RTSP are located within and under the jurisdiction of numerous federal, state, tribal, and local agencies. These agencies are working with utilities, water districts, and the County to implement a unified and connected trail system.

Maricopa County Regional Trail System Plan

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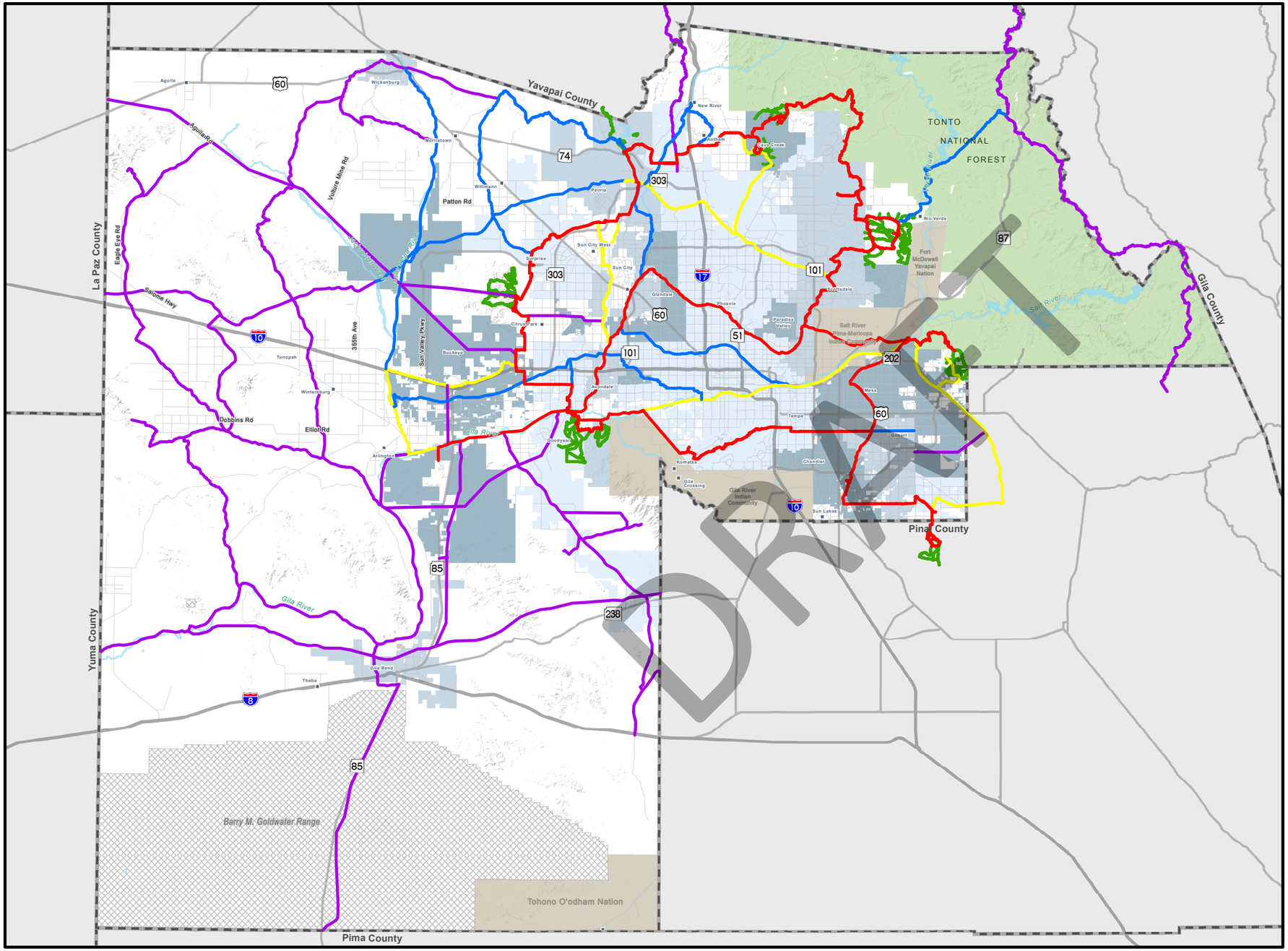
Figure 14 – Maricopa County Regional Trails System Plan (2004)



PRIORITY TRAIL PROJECTS

- Priority 1 Trail Project
- Priority 2 Trail Project
- Priority 3 Trail Project
- Priority 4 Trail Project
- Existing Park Trails

REFERENCE LAYERS

- Interstate
- State Route/US Highway
- Other Major Roadway
- Lake/Reservoir
- River or Major Wash
- National Forest
- Indian Reservation
- Military
- Incorporated Areas
- County Boundary

0 10 20 Miles

N

Source: Maricopa County; Flood Control District of Maricopa County (FCD); Arizona Department of Transportation (ADOT); Arizona State Land Resource Information System (ALRIS);

Source: EPS Group

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2.4.3 Transit Facilities

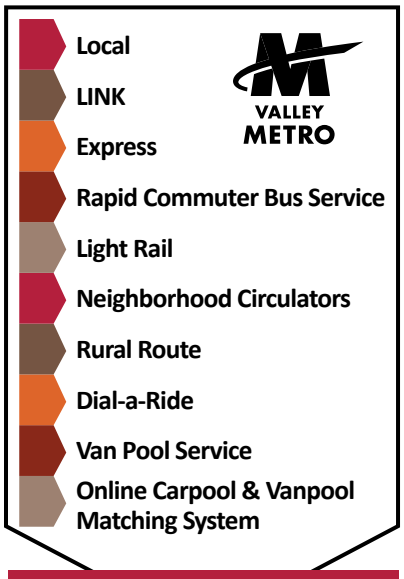
MCDOT does not operate or provide regional transit services. Valley transit providers operate under a unified public brand known as "Valley Metro." The regional transit network is comprised of Local, LINK, Express, and Rapid commuter bus service, light rail, neighborhood circulators, rural route, Dial-a-Ride, van pool service, and an online carpool and vanpool matching system. Existing transit facilities are summarized in ***Table 12***.

Table 12 – Existing Transit Facilities

Existing Transit Facilities	Total
Light Rail Line (miles)	23
Light Rail Stops (stops)	33
Metro Bus Routes (miles)	2,275

Source: Valley Metro Bus & Light Rail datasets 2014 – MAG

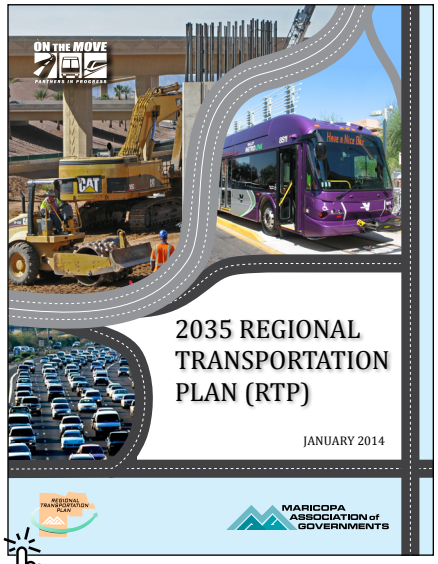
The regional bus network operates on roadways and freeways. Future bus route expansion projects are outlined in the MAG 2035 Regional Transportation Plan (RTP). While many of the expansions will be need/population driven, general expansion plans in the western portion of the County, super grid routes in the eastern portion of the County, and other express/LINK routes were highlighted in this plan.



Types of Regional Transit Network Facilities

The Metro Light Rail provides service to Phoenix, Tempe, and Mesa. Future Light Rail expansions are planned to extend service further into Phoenix, Mesa, and the western portion of the County. The recently constructed Sky Train connects the Light Rail to Sky Harbor International Airport.

Paratransit services provide transportation to people with disabilities. This form of transit is demand-based and provides greater flexibility than conventional fixed-route transit. Within the County, paratransit services are provided by Dial-a-Ride and private organizations.



Maricopa Association of Governments 2035 Regional Transportation Plan

2.4.4 Future Accommodations

The County recognizes there is a general trend towards active transportation. A Goal of TSP 2035 is to provide a seamless network with connectivity between different modes of travel. TSP 2035 provides a brief overview of pedestrian, bicycle, and transit facilities in the County and is intended to serve as an introduction to the ATP. The ATP will set goals for future visioning for multimodal facilities and will primarily focus on pedestrian and bicycle modes of transportation. The ATP is anticipated to be completed in late 2017.

2.5 NEXT STEPS

In support of the TSP 2035 Goals, MCDOT should consider developing a Complete Streets Policy allowing consideration for all roadway users.

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BUILD a Connected Community

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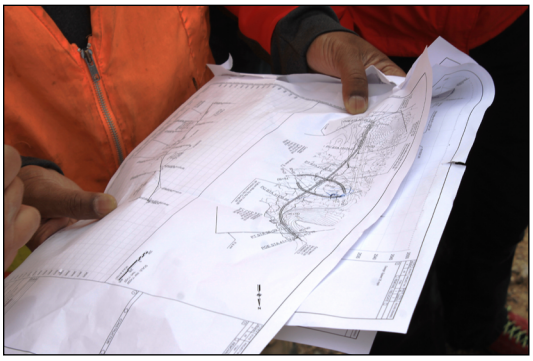
BUILD a Connected Community

Based on the TSP 2035 Needs Analysis discussed in the Design chapter, MCDOT needs to build over 1.5 billion dollars in transportation improvements over the next 20 years, to address capacity and safety needs. Nearly 900 million dollars of additional revenue will be needed to maintain the transportation system. This will require MCDOT to be prudent and resourceful with its revenues.

This chapter presents an overview of potential projects, projected MCDOT revenues and expenditures, and potential additional revenue sources.

3.1 POTENTIAL PROJECTS



Plans

Two basic sources were used to identify potential projects.

TIP Projects – Projects identified in the TIP spanning FY 2016 to FY 2021. Projects currently programmed for scoping and/or design may move to construction based on input from various MCDOT branches. A list of current TIP projects can be found on the MCDOT website.

Identified Needs Analysis –The capacity needs analysis was conducted utilizing the MAG TDM output for each planning horizon to determine growth on roadways owned, operated, and/or maintained by the County. The data was then correlated to the service volume standards to identify roadways exceeding the LOS standard. This process and information was presented in the Design chapter. The complete list of potential projects identified through this process is included in the ***Appendix***.

The TIP, project lengths, and input from various MCDOT branches were used to develop project costs and project lengths to determine probable life cycle system costs for programmed and anticipated projects. Project lengths, in lane miles, projected for each horizon are shown in ***Table 13***.

Table 13 – Potential Projects (Lane Miles)

	FY 2016 to 2020	FY 2021 to 2025	FY 2026 to 2035
Identified Needs Analysis Projects	91.11	19.96	136.63
TIP Projects	73.56	6.60	0.00
TOTAL	**164.67**	**26.56**	**136.63**

The lane miles presented in ***Table 13*** and the raw data from the needs analysis presented in the ***Appendix*** are current as of August 2016. The data, such as project lengths, may be revised as appropriate during the MCDOT Project Development Process described in the Plan chapter. TIP Project lane miles in ***Table 13*** may not include already programmed lane miles that will be annexed after construction.

3.2 FUNDING ANALYSIS

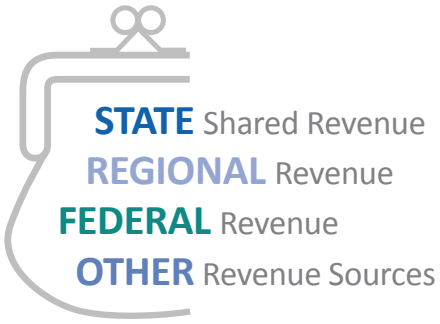
MCDOT conducted a funding analysis for TSP 2035 based on typical revenues and expenditures through FY 2035. The results from the funding analysis indicated the level of funding available to support the transportation

system. Projected revenues and expenditures are divided in three horizons corresponding with the project implementation schedule: FY 2016 to FY 2020, FY 2021 to FY 2025, and FY 2026 to FY 2035. Funding information is presented in 2016 dollars and does not consider inflation.

3.2.1 Projected Revenue

Revenue projections were developed for the 20-year planning period based on existing sources of funding. Existing revenue sources are categorized as follows:

- **State Shared Revenue**
  - Highway User Revenue Fund (HURF)
  - Vehicle License Tax (VLT)
- **Regional Revenue**
  - MAG Arterial Life Cycle Program (ALCP)
- **Federal Revenue**
  - Congestion Mitigation and Air Quality Improvements Program (CMAQ)
- **Other Revenue Sources**
  - Permits
  - Intergovernmental Charges
  - Interest Earnings
  - Asset Sales
  - Miscellaneous Revenue
  - Grants
  - Other Partnership Revenue



Revenue Sources

In general, it is anticipated that existing revenue sources will be available through the TSP 2035 planning period in comparable scale to today's values. Forecasted MCDOT revenues are projected to be nearly 3.8 billion dollars through FY 2035. ***Table 14*** summarizes the projected revenue from each source by planning period through FY 2035.

Table 14 – Summary of Estimated Revenue (In Thousands)

Revenue Source		FY 2016 to 2020	FY 2021 to 2025	FY 2026 to 2035	Total Projected Revenue	% of Total
State Shared	HURF	$542,860	$664,110	$1,797,190	$3,004,160	80%
	VLT	$55,380	$66,230	$170,930	$292,540	8%
Regional	ALCP	$107,530	$100,420	$114,340*	$322,290*	9%
Federal	CMAQ	$8,530	$8,530	$17,060	$34,120	<1%
Other Sources	Permits	$4,750	$4,750	$9,500	$19,000	<1%
	IGA	$910	$80	$160	$1,150	<1%
	Interest Earnings	$2,500	$2,500	$5,000	$10,000	<1%
	Asset Sales	$1,000	$1,000	$2,000	$4,000	<1%
	Miscellaneous	$1,000	$1,000	$2,000	$4,000	<1%
	Grants	$0	$0	$0	$0	<1%
	Other Partnerships	$28,280	$13,810	$27,620	$69,710	2%
TOTAL		$752,740	$862,430	$2,145,800	$3,760,970	

*Funds projected based on the current ALCP through FY 2026. After FY 2026, half of the funds are projected but not guaranteed.

Based on projections, state shared revenue is the largest contributor to the MCDOT budget, providing approximately 88 percent of the total revenue for the duration of the program. HURF constitutes 80 percent of state shared revenues, while VLT constitutes 8 percent. The next largest contributor is the MAG ALCP, providing nearly nine percent of the total revenue. Federal revenue from CMAQ constitutes less than one percent of the total. Other revenue, including permits, intergovernmental agreements (IGAs), interest earnings, asset sales, miscellaneous revenue, grants, and partnership revenue collectively contribute less than three percent of the total.

ALCP funds, which account for over $320 million in revenue over 20 years, expire in 2026.

3.2.2 Projected Expenditures

Life cycle system costs were developed based on three categories: capital, operations and maintenance, and other. Capital and operations and maintenance costs were developed using the current network size, TIP Projects, and the TSP 2035 Identified Needs Analysis Projects. Other, includes costs attributed to personnel, supplies, and overhead costs defined in the Maricopa County Annual Business Strategies (ABS).

Operations and maintenance costs were calculated using the existing network size, 5,309 lane miles (March 2016). ***Table 13*** identifies new roadway lane miles from the TIP and TSP 2035 Identified Needs Analysis Projects. These lane miles were multiplied by unit costs to estimate capital improvement costs for each horizon. Once added to the network, new lane miles will become part of the existing network and must be maintained. New lane miles were assumed to be constructed by the midpoint of the planning horizon to average maintenance costs across the period. New lane miles (at the midpoint of the planning horizon) and the existing network lane miles at the start of the horizon were multiplied by unit costs provided by MCDOT to estimate operations and maintenance costs. ***Figure 15*** illustrates the process for determining capital, operations, and maintenance costs for each horizon.

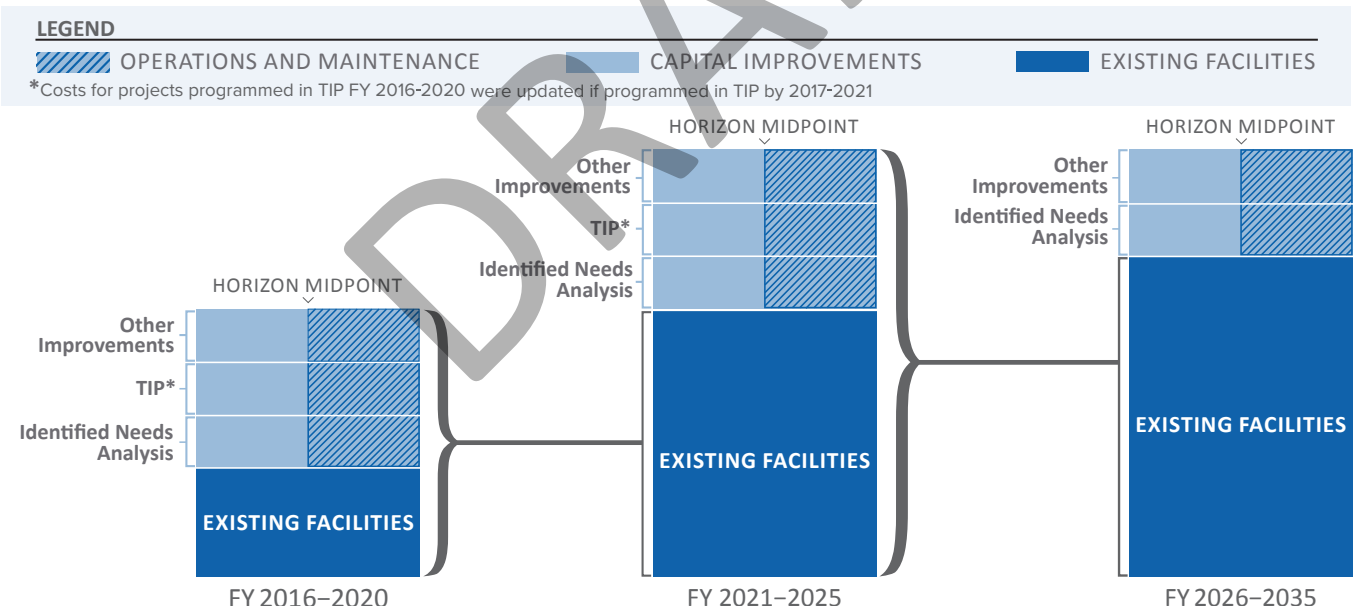


Figure 15 – Breakdown of Expenditures by Horizon

Capital Costs

Capital improvements include projects that increase capacity and/or connectivity, encompassing both enhancements to existing infrastructure and construction of new facilities. An average project construction unit cost of 2.2 million dollars per lane mile was developed by reviewing recent engineering estimates. The estimates included costs for items such as new roadway, roadway widening, structures, drainage, utilities, and right-of-

way. Projected capital costs include an additional 66 million dollars per five-year period for other improvements, including new roads and structures. Capital expenditures were projected using the average project construction unit cost per lane mile for TIP Projects, Identified Needs Analysis Projects, and other improvements.

Roadway Construction

Operations and Maintenance
Operations and maintenance includes the cost of keeping the transportation system functioning and efficient. Operations and maintenance expenditures were projected based on an ideal unit cost per lane mile. The unit cost was increased 10 percent in the mid-term planning horizon and 15 percent in the long-term planning horizon. A separate cost was developed for operations and maintenance of traffic signals and structures.

Other
Other costs include personnel, supplies, and overhead costs. Personnel costs, including pay, overtime, and fringe benefits, were developed using the budgeted total in the ABS FY 2015 Adopted Budget at 30 million dollars annually. Supplies costs, including general supplies, fuel, and non-capital equipment, were developed using the budgeted total in the ABS FY 2015 Adopted Budget at three million dollars annually. Overhead costs, including travel, education and training, freight, utilities, and legal services were developed using the budgeted total in the ABS FY 2015 Adopted Budget at 40 million dollars annually.

Table 15 shows projected MCDOT expenditures by capital, operations and maintenance, and other. It is projected that MCDOT will expend approximately 3.9 billion dollars through FY 2035 to address needs, operate and maintain the system, and pay for other items.

Table 15 – Summary of Projected MCDOT Expenditures (In Thousands)

	FY 2016 to 2020	FY 2021 to 2025	FY 2026 to 2035	TOTAL
Capital	$749,310	$226,170	$594,330	**$1,569,810**
Operations and Maintenance	$195,170	$218,670	$463,440	**$877,280**
Other	$365,000	$365,000	$730,000	**$1,460,000**
TOTAL	**$1,309,480**	**$809,840**	**$1,787,770**	**$3,907,090**

3.2.3 Funding Analysis

Table 16 shows a summary of revenue and expenditure projections. Based on the revenue and life cycle system costs projections, a funding shortfall of 557 million dollars was identified from FY 2016 to 2020. MCDOT will experience a total funding shortfall of approximately 146 million dollars through FY 2035.

Table 16 – Summary of Projected Revenues and Expenditures (In Thousands)

	FY 2016 to 2020	FY 2021 to 2025	FY 2026 to 2035	TOTAL
Revenue Projections				
State Shared	$598,240	$730,340	$1,968,120	**$3,296,700**
Regional	$107,530	$100,420	$114,340	**$322,290**
Federal	$8,530	$8,530	$17,060	**$34,120**
Other Sources	$38,440	$23,140	$46,280	**$107,860**
TOTAL	**$752,740**	**$862,430**	**$2,145,800**	**$3,760,970**
Life Cycle System Costs				
Capital	$749,310	$226,170	$594,330	**$1,569,810**
Operations and Maintenance	$195,170	$218,670	$463,440	**$877,280**
Other	$365,000	$365,000	$730,000	**$1,460,000**
TOTAL	**$1,309,480**	**$809,840**	**$1,787,770**	**$3,907,090**
Balance	($556,740)	$52,590	$358,030	**($146,120)**

The current projected shortfall of 146 million dollars will likely increase when ITS, bicycle, and pedestrian improvements are included in the analysis. In order to address the shortfall, additional revenue sources were identified.

3.2.4 Additional Revenue Sources

Additional revenue sources were investigated to mitigate the shortfall identified for the planning period. This includes identifying new sources of revenue used by similar entities and modifying existing revenue sources to generate additional revenue. These sources were categorized as authorized or not authorized by the State of Arizona legislation.

3.2.4.1 State Authorized Sources

The State of Arizona legislation authorizes various funding mechanisms that are not being utilized by MCDOT, but could generate new revenue. This includes Public Private Partnerships (P3)s, bonds, and tax levies for County roads.

Public Private Partnerships – P3s are allowed under Title 28 of the Arizona Revised Statutes (ARS) and enable a public agency and a private sector entity to enter into an agreement allowing the private sector partner to have an increased level of participation in a public project. This may include funding, design, construction, operation, and/or management with terms agreed upon by the two entities. MCDOT does not currently have any P3 projects planned. The amount of funding available from this mechanism would vary on a project specific basis.

Bonds – Counties and municipalities have the authority to issue bonds under Title 28 of the ARS. There are two types of bonds generally used by counties: General Obligation (GO) and revenue bonds. GO bonds are secured by a full faith and credit of repayment from general revenue as well as by the ability to increase taxes to recover debt. The Arizona Constitution limits county debt to six percent of a county's taxable property per Article 9, Section 8. Revenue bonds allow counties to issue bonds against their revenues to accelerate project construction, although they are higher risk because repayment is not guaranteed. This reduces the short-term impacts of funding capital improvement projects and distributes the costs over the life of the project. There is no statutory limit on revenue bonds. The amount of funding available from bonds would depend on the type of bond.

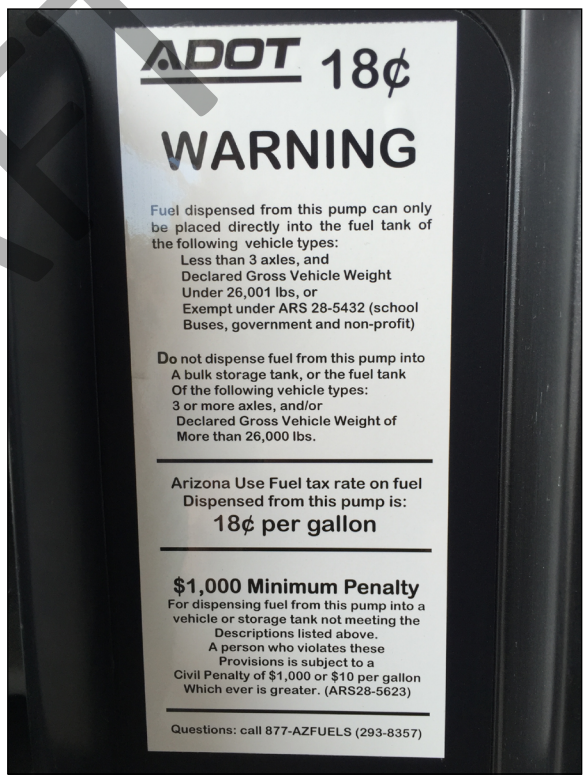
Property Tax Levy – The BOS may levy a property tax of up to 25 cents per 100 dollars of property in the County per Title 28 of the ARS. The County Treasurer would collect the tax money for the County to use for highways and roads. The amount of funding available from this mechanism would vary based on assessed property values in the County.

3.2.4.2 State Non-Authorized Sources

The following funding mechanisms, including Fuel Revenue Indexing (FRI), Tax Increment Financing (TIF)/ Tax Increment Reinvestment Zone (TIRZ), and Transportation Reinvestment Zones (TRZ), are not currently authorized in Arizona. If favorable legislation was passed, MCDOT could generate additional revenue.

Fuel Revenue Indexing – FRI is the process of increasing the fuel tax over time by indexing the tax to inflation. Arizona state excise gasoline tax (18 cents per gallon) is below the national average, the eighth lowest in the nation and is below the average in the western region. Based on a review of other state gasoline tax rates using the American Petroleum Institute monthly publications of gasoline tax in the nation, an increase is reasonable to consider. Two scenarios were investigated to potentially generate additional revenue. Scenarios included increasing the state gasoline tax to the regional average; and increasing the state gasoline tax and indexing the tax to inflation from FY 2016 to FY 2024. The additional new revenue was compared to the projected HURF revenues from Section 3.2.1 to identify the additional MCDOT revenue.

Scenario 1 illustrates the effects of increasing the gasoline tax by 11 cents per gallon to the western region average of 29 cents per gallon. In FY 2016, the modified tax rate would increase statewide revenue from 474 million dollars to 763 million dollars; nearly a 300 million dollar increase in revenue in one year in present dollar value. The total revenue generated from the gasoline tax from FY 2016 to FY 2024 would increase from 4.6 billion dollars to 7.4 billion dollars, a 2.8 billion dollar difference in present dollar value. The County would receive an additional 217 million dollars from HURF based on the total revenue projected from FY 2016 to FY 2024 in Scenario 1.



State Excise Tax

Scenario 2 illustrates increasing the gasoline tax by 11 cents per gallon to the western region average of 29 cents per gallon and indexing the gas tax to inflation based on the consumer price index. The inflation rate was determined to be 2.225 percent, which was used to index the tax rate starting in FY 2016 at 29 cents per gallon. The total revenue generated by the gasoline tax, indexed to inflation, from FY 2016 to FY 2024 total would increase from 7.4 billion dollars to 8.1 billion dollars. This is a 1.7 billion dollar difference from Scenario 1 and a 3.5 billion dollar difference compared to the projected revenue based on the current tax rate. Based on the total revenue projected through FY 2024 from Scenario 2, the County would see an additional 273 million dollars from HURF.

Figure 16 shows the HURF revenue that would be generated for the two potential scenarios and the current projected revenue. In the eight-year period, the tax rate would increase to approximately 35 and 44 cents per gallon, respectively, by the end of 2035.

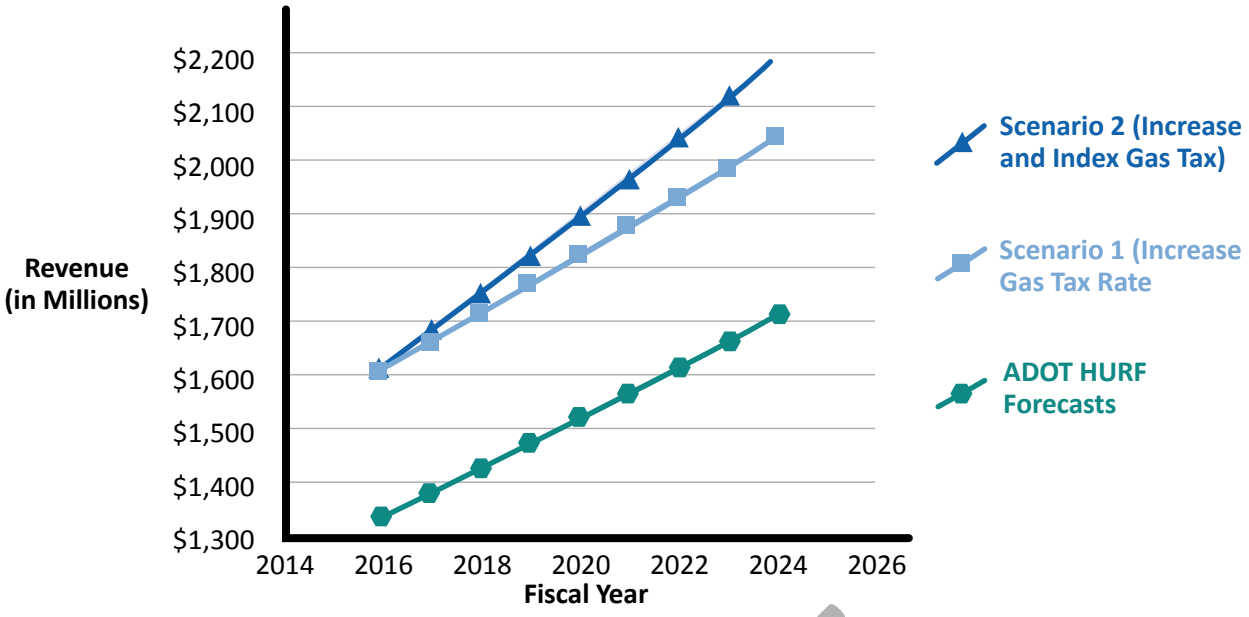


Figure 16 – Potential Highway User Revenue Fund Scenarios (Millions ($2015))

Tax Increment Financing/Tax Increment Reinvestment Zone –TIF/ TIRZs are intended to provide funding for underdeveloped or blighted lands that would otherwise remain unimproved. A tax district is established around the proposed area of improvement, and once improvements are complete, increased property values are attributed to said improvement. The property tax revenue collected on properties within the tax district when the improvement is complete continues to be funneled through existing channels; the incremental property tax increase due to increased property value is collected into a separate fund used to repay the cost of improvements. The amount of funding available from this mechanism would vary on a project specific basis.

Transportation Reinvestment Zone – TRZs are similar to TIF/TIRZ, but require the tax increment funding collected to be used for transportation projects. The amount of funding available from this mechanism would vary on a project specific basis.

3.3 NEXT STEPS

In support of the TSP 2035 Goals MCDOT should continue to annually prioritize projects based upon available funding. This review should include projections for the TIP.

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MAINTAIN through Strategic System Preservation

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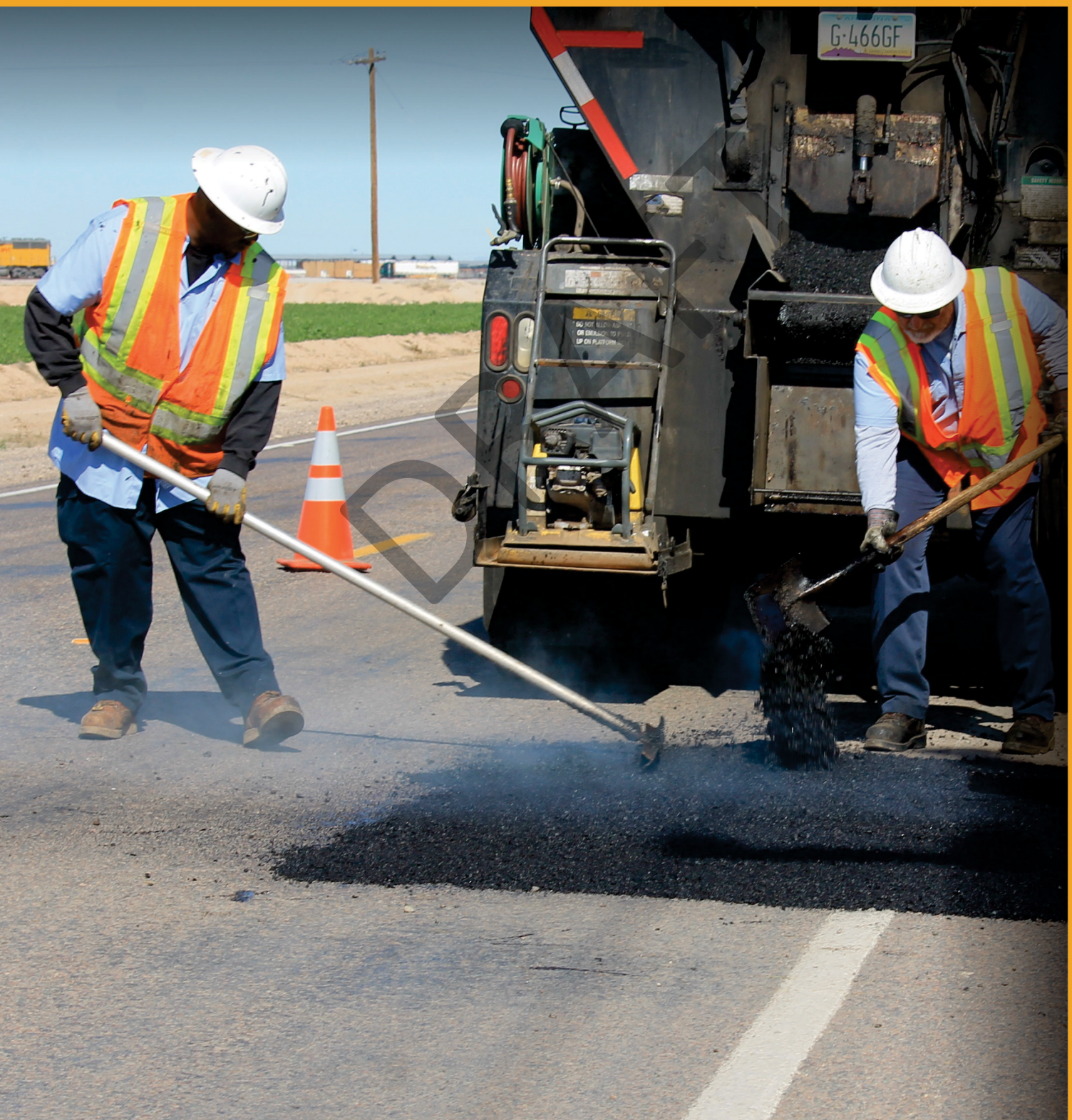

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MAINTAIN through Strategic System Preservation

MCDOT proactively monitors and evaluates the County transportation system, consisting of nearly 2,000 miles of roadway and 424 structures. This chapter presents an overview of how MCDOT protects past and future investments through system preservation program methods and activities.

System preservation methods allow MCDOT to evaluate the condition of infrastructure and plan for maintenance, rehabilitation, and complete reconstruction when necessary. Through the development and use of system preservation methods the life of infrastructure such as paved and unpaved roads, and structures are extended.

Roadway Clearing

4.1 PAVEMENT MANAGEMENT

All roads deteriorate over time due to environmental conditions and the volume and type of traffic using the road. Routine and preventative pavement maintenance are broadly defined as work accomplished to preserve or extend the functional life of a pavement surface until major rehabilitation or complete reconstruction is performed. County owned roads are maintained at a high level of service through the following MCDOT procedures:

- Continuous monitoring and evaluation of road conditions. Road evaluation ratings are stored in the Road Management System (RMS) database
- Report road conditions annual reports
- Model pavement conditions and maintenance strategies
- Annual and long-term maintenance plans and implementation as funding permits

Pavement Preservation

Preventive maintenance preserves the capacity or strength of the pavement. Timely treatment proves to be the most cost effective because it extends the life of the pavement and provides for better road performance. The majority of treatments for pavement involve sealing the existing surface and providing a new wearing surface for traffic.

MCDOT has used preventive maintenance practices for decades with excellent results. ***Table 17*** shows the breakdown of each treatment that is typically used, the frequency of application, and the observed increase in pavement life per application.

Table 17 – Preventative Maintenance Treatment Longevity

Treatment	Pavement Age at Time of First Application (years)	Frequency of Application (years)	Observed Increase in Pavement Life (years)
Fog Seal/Rejuvenate	3 to 4	3 to 4	3 to 4
Crack Filling/Sealing	8 to 10	4 to 5	4 to 5
Single Chip Seal	10 to 12	5 to 6	5 to 6
Double Chip Seal	10 to 12	5 to 6	5 to 6
Micro Surfacing	10 to 12	5 to 6	5 to 6
Slurry Seal	10 to 12	5 to 6	5 to 6
Arterial – Thin Overlay – (ARHM)	12 to 15	12 to 15	12
Local – Mill & Resurface	35+	To be determined	To be determined

Life Cycle Program

A certain level of maintenance is required to ensure the maximum life of the roadway is achieved resulting in the best return on investment. This is known as a Life Cycle Program. The program provides management and oversight for street projects.

MCDOT projects its five-year pavement preservation and preventative maintenance needs to support the existing serviceability level. Preservation treatments typically considered include: arterial asphalt rubber overlay, local mill and reconstruct or rehabilitation, hot in place recycling, chip seal (low and high volume), microseal, slurry seal, preservative seal, and crack seal. Pavement conditions are evaluated by Pavement Conditions Ratings (PCR), International Roughness Index (IRI), and Sufficiency Ratings. MCDOT uses these scores to monitor pavement conditions and prioritize maintenance activities. ***Figure 17*** shows a comparison of the three methods used to evaluate pavement conditions.

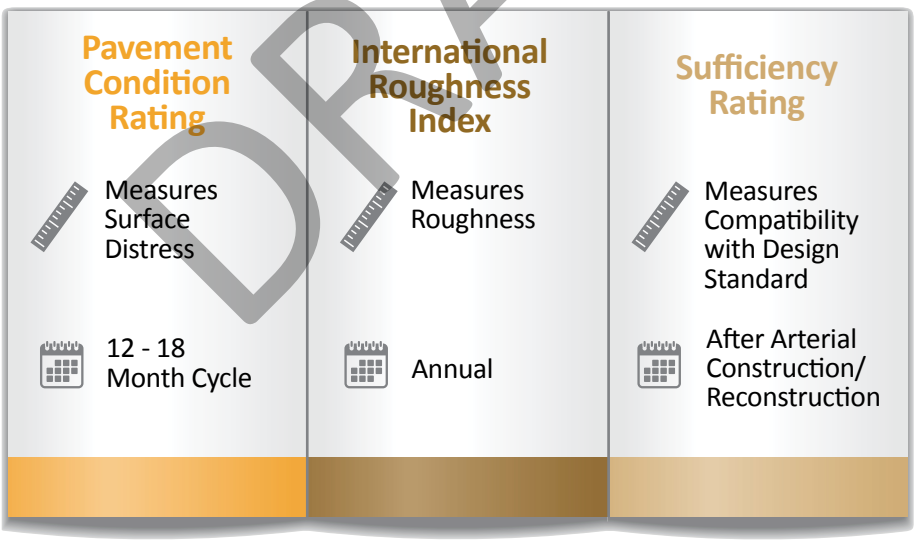

Figure 17 – Pavement Rating Systems

Pavement Condition Ratings – The PCR is a measurement of surface distress such as cracking, weathering, and depressions. MCDOT evaluates pavement conditions for surface distress every 12 to 18 months for arterial and collector roads and every other year for local roads. A field inspection is conducted for each road segment for surface distress type and frequency to determine the PCR. The results provide an indication of the pavement's level of deterioration and can be used in the management and maintenance of paved roads. MCDOT utilizes the PCR ratings to forecast preventive maintenance programs and for TIP planning.

Roadway Resurfacing

International Roughness Index – The IRI is a measurement of the difference of the pavement surface from a flat surface. The IRI indicates the roughness of an arterial road segment on a scale from 1 to 500, with 500 representing an extremely rough road. MCDOT annually collects the IRI for each arterial road segment, with a length greater than a quarter mile and uses the values to forecast preventive maintenance programs and for TIP planning.

Sufficiency Ratings – Sufficiency Ratings identify how well each road segment compares to the MCDOT Roadway Design Manual (RDM) standards. MCDOT identifies a sufficiency rating for each arterial road segment when it is initially constructed. The sufficiency ratings of arterial roads are updated only after major improvements are made to the road or when the road is reconstructed. New construction, widening, or significant improvements of roadways to address safety issues such as bottlenecks, drainage, and vertical and horizontal sight distance will all impact the road's sufficiency rating.

4.1.1 Low Volume Roads Program

Low volume, unpaved roadways are located throughout the County in both urban and rural settings. LVRs, when frequently traveled, can cause air quality concerns. To address these concerns, MCDOT initiated a program in 1998 to identify roadways for dust abatement.

Maricopa County Air Pollution Control Regulations, Section 302, indicates air quality dust control measures must be applied to roadways that exceed 150 vehicle trips per day (August 2010). MCDOT typically evaluates roadways in excess of 100 vehicle trips per day in compliance with Arizona Revised Statute 49-474.01.

Low Volume Road

Identification of unpaved roads is done on a regular basis utilizing existing roadway data, aerial mapping, and annexation information. A list of roadways is developed and traffic counts are performed. Roadways are then evaluated for consideration based on the following:

- County maintained
- Length of roadway segment
- ADT count greater than 100
- Connection to an existing paved road
- Existing right-of-way
- Serves a public facility
- Safety concerns
- Cost/Benefit ratio

Roadways meeting the criteria are then processed through a prioritization procedure. Projects meeting a minimum scoring are considered for dust mitigation measures. Measures may include one or more of the following:

- Dirt road dust suppression
- Shoulder stabilization
- Dirt road paving
- Placement of rock products
- Landscaping
- Erosion control

The MCDOT LVR Program is currently being updated. Additional requirements and prioritization methods may be recommended.

4.2 BRIDGE MANAGEMENT

As of June 2015, the County maintains and inspects 424 structures, including 78 bridges and 346 culverts. Every structure within MCDOT jurisdiction is inspected in accordance with the Federal Highway Administration (FHWA) National Bridge Inspection Standards Recording and Coding Guide. Through this inspection procedure, MCDOT is able to maintain thorough, consistent records on each bridge and structure in the County system when considering how best to appropriate funds and prioritize in-house projects.

Inspection of Historic Gillespie Dam Bridge

MCDOT utilizes the FHWA bridge sufficiency rating formula. The sufficiency rating formula is a method to quantify a bridge's sufficiency to remain in service based on the bridge's structural adequacy and safety, serviceability, and functional obsolescence (including substandard horizontal and/or vertical clearance), and essentiality to the public. Special reductions lower the total rating. This formula is explained in ***Figure 18***. A low sufficiency rating does not necessarily indicate an unsafe condition. If, during annual inspection, a bridge was determined to be unsafe, mitigating actions would be taken immediately. This could range from immediately closing the bridge to reducing the legal load limit allowed on the bridge, based upon the issue.

Figure 18 – Sufficiency Rating Formula

Evaluation Criteria

In 1997, the MCDOT Bridge Investment Study (BIS) recognized the need to evaluate bridges separately from road projects. MCDOT scores and prioritizes bridge projects in the following categories:

- Replacement projects
- Replacement of dip sections with new structures
- Scour protection projects
- New bridge projects (not included in major road projects)

Cotton Lane Bridge

A bridge should be considered for replacement if the following conditions are met:

- The cost of rehabilitation is 50 percent or more than the cost of a new bridge
- The Bridge Engineer agrees replacement is justifiable

The MCDOT Bridge Management System is up-to-date, complete, and meets or exceeds all current Federal National Bridge Inspection Standards. The MCDOT Bridge Management System is included in the ADOT American Association of State Highways and Transportation Officials (AASHTO) Bridge Management software electronic database, AASHTOWare BrM.

4.3 ASSET MANAGEMENT

Asset management is recognized as a way of doing business and is meant to provide a strategic and systematic process in operating, maintaining, upgrading and expanding assets throughout their lifecycle. An Asset Management Plan is typically distinguished by the following:

- **Policy-driven** – Resource allocation decisions based on well-defined policy goals and objectives including evaluation of alternatives using credible and current data.
- **Performance-based** – Policy objectives translated into system performance measures used for both day-to-day and strategic management.
- **Analytical Evaluation of Options and Tradeoffs** – Decisions on allocation of funds and resources based upon how different allocation scenarios will affect achievement of relevant policy objectives.
- **Clear Accountability and Feedback** – Performance is monitored and results are evaluated for both efficiency and effectiveness.

MCDOT is currently updating the Asset Management process which will be identified as the Transportation Asset Management Program. The process will include an analysis to determine where the agency is currently; where it wants to be – goals and objectives; and a roadmap of what steps need to be taken to achieve strategic objectives.

4.4 NEXT STEPS

In support of the TSP 2035 Goals MCDOT should continue to improve the PRS, Asset Management Program, and update the life cycle analysis process.

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OPERATE a Safe and Efficient Transportation System

PLAN▸DESIGN▸BUILD▸MAINTAIN▸**OPERATE**

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OPERATE a Safe and Efficient Transportation System

MCDOT is a regional and national leader in Transportation System Management. This includes a variety of technologies and programs, from ITS technology to incident management. As the nation continues to push autonomous vehicle technology, MCDOT continues to partner and spearhead these and other exciting advanced technologies to promote the quality of life and economic vitality of the County.

This chapter presents an overview of the infrastructure, systems, and programs used to operate the County transportation system.

5.1 TRAFFIC MANAGEMENT SYSTEM

The MCDOT Transportation Systems Management Division is responsible for the traffic management system. This system monitors the operations and management of traffic on County roads, oversees the infrastructure, policies, and procedures to manage traffic congestion, and shares information with other agencies and the traveling public.

The purpose of the traffic management system is to identify and measure:

- Traffic growth and congestion on County roads
- Improvements to traffic operations through innovation, ITS, incident management, and traveler information

5.2 TRAFFIC MANAGEMENT CENTER

The Traffic Management Center (TMC) provides County residents with a safe and efficient transportation system. The TMC is staffed and/or monitored 24 hours a day, 7 days a week. ITS devices, such as traffic signals, closed-circuit television (CCTV) cameras mounted on traffic signals, dynamic message signs (DMS), traffic detection, and communications infrastructure allow MCDOT to respond to roadway incidents and communicate the latest traffic information.

TMC staff members monitor and analyze information from a number of sources including CCTV cameras, road sensors, public safety monitors and radios, the media, and AZTech regional partners. This information allows TMC staff members to respond to traffic incidents by adjusting signal timing, deploying incident management crews, and sending out alerts to travelers through a variety of ways. Access to other jurisdictional agency ITS devices is based upon active IGAs.

MCDOT Traffic Management System

Table 18 compares the FY 2006 and FY 2015 levels of deployment for ITS infrastructure to measure growth in ITS devices.

Table 18 – Growth of Intelligent Transportation System Features for FY 2006 and FY 2015

ITS Feature	FY 2006 Amount	FY 2015 Amount	% Growth 2006-2015
CCTV Cameras	32	56[1]	75%
DMS with Travel Time Posting Capabilities	0	5	-
Traffic Signals with Communication to MCDOT TMC	36	120	233%

[1]In FY 2015, 4 Flood Control District crossing cameras that were previously maintained by MCDOT were no longer maintained.

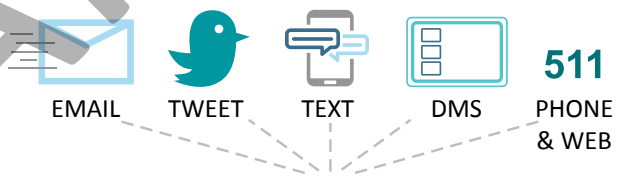
The TMC has access to incident data on freeways from the AZDPS and the Computer-Aided Dispatch (CAD) system of the Phoenix Fire Department for arterial incidents. Incident management is one of the primary functions of the TMC. For incidents occurring on County-owned roads and local agency-owned roads, the TMC supports the County Sheriff's Office, AZDPS, and local public safety agencies via alerts, closure reporting, scene monitoring through camera images (where available), and media relations (if needed).

System Performance

System performance is critical to effective traffic management. TMC staff members routinely perform system health checks and log the status of devices and systems in the Performance Activity Log. MCDOT collects data to support established performance metrics as well as the analysis of incidents and other as needed requests for performance reporting.

Traveler Information

The TMC provides various traveler information functions for the County, as well as the region. This includes e-mail traffic alerts, tweets, text alerts, and travel time messages to DMS. Data is entered into MCDOT's Advanced Traveler Information System (ATIS) for arterial incidents and events for automated posting to the statewide ***511*** traveler information system.



Traveler Information

5.3 REGIONAL COLLABORATION

MCDOT leads and participates in multiple programs developed to enhance connectivity across jurisdictional boundaries, including ITS planning, data sharing, communication, and incident management. Through these efforts, MCDOT partners with municipalities, ADOT, and law enforcement/first responders to better serve the public. The relationship between these programs and their leadership is shown in ***Figure 19*** on the next page.

5.3.1 AZTech

MCDOT, jointly with ADOT, serves as a program leader for the AZTech Regional Transportation Partnership. Through regional collaboration, this partnership aims to integrate and improve regional traffic management. Individual cities and towns deploy, operate, and maintain their ITS systems and equipment; MCDOT helps to integrate these efforts to facilitate better regional traffic management and coordination. The regional AZTech activities that are coordinated through the MCDOT Transportation Systems Management Division include:

- Institutional collaboration and public-private partnerships
- Center-to-Center communications infrastructure development
- Interagency operations
- Regional traveler information support
- Incident management

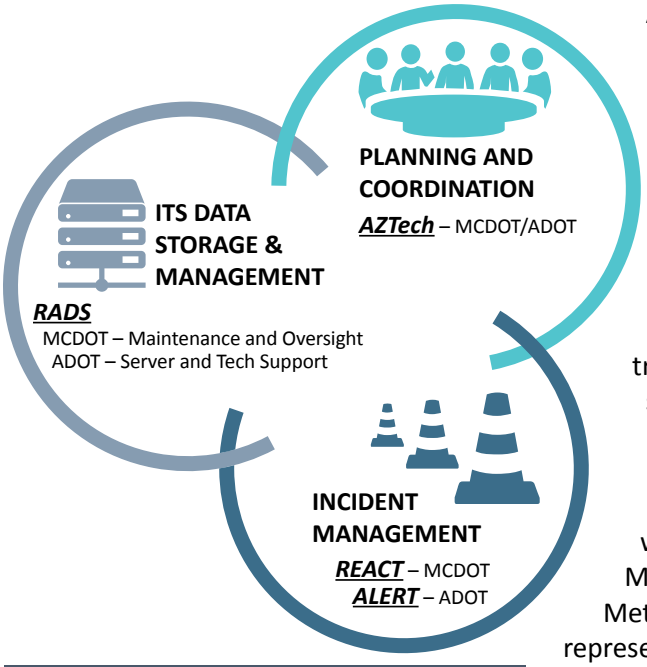


Figure 19 – Regional Coordination

AZTech was established in 1996 as one of four metropolitan areas selected by the United States Department of Transportation (USDOT) for the ITS Metropolitan Model Deployment Initiative (MDI). The AZTech partnership was formed as a result of this MDI to integrate the region's transportation system and give travelers up-to-the-minute traffic information through innovative partnerships among public sector and private sector technology companies. AZTech successfully completed the MDI in 2000 and has transitioned into a permanent partnership that continues to serve as a forum for innovation in transportation systems operations and management in the County.

AZTech brings together decision makers and practitioners with a consensus-based approach to traffic management. Members of AZTech include the MCDOT, ADOT, MAG, Valley Metro, AZDPS, cities, towns, and private partners. Members represent state and county traffic management and operations, regional transit operations, regional planning, municipal traffic and transportation agencies, state and regional law enforcement, and public safety and emergency services.

MCDOT and ADOT continue their leadership roles chairing the AZTech Executive Committee, which sets strategic direction for the AZTech partnership. The AZTech Strategy Task Force is a subgroup of the Executive Committee and is comprised of senior staff from member agencies across the region. AZTech also includes the following committees and working groups, which meet regularly and include representation from multiple partner agencies. These committees include:

- Operations Committee
- Traffic Incident Management Coalition
- Strategic Steering Committee
- ATIS Working Group
- MCDOT TMC Operators Working Group

The AZTech Traffic Incident Management (TIM) Coalition was established in 2011. AZDPS is the lead agency for the TIM Coalition and its members include MCDOT, FHWA, ADOT, MAG, first responders, medical examiners, towing and recovery entities, and public information officers. The focus is to achieve the TIM National Unified Goal (NUG). NUG priorities include:

- Responder safety
- Safe, quick clearance
- Prompt, reliable, interoperable communications

The TIM Coalition has helped to improve cross discipline communications, increase exposure to TIM training courses in Arizona, debrief secondary incidents, and conduct joint training and planning. As of July 2014, the TIM Coalition had conducted 108 TIM 4-hour classes with 2,815 first responders and produced 2 training videos illustrating how traffic reporters play a critical role in reducing congestion and improving safety.

5.3.2 Regional Archived Data System

In 2003, MCDOT, ADOT, and FHWA developed and implemented an innovative archive and retrieval system for ITS data. The Regional Archived Data System (RADS) was designed to provide and maintain valid, classified ITS derived data for use in transportation system planning and modeling. MCDOT is responsible for management and oversight of RADS, and local jurisdictions provide data as appropriate to the RADS server as shown in ***Figure 20***. The RADS server is housed in the ADOT Traffic Operations Center (TOC); ADOT provides technical support for maintenance activities to the server. RADS has become a critical part of the region's data sharing strategy.

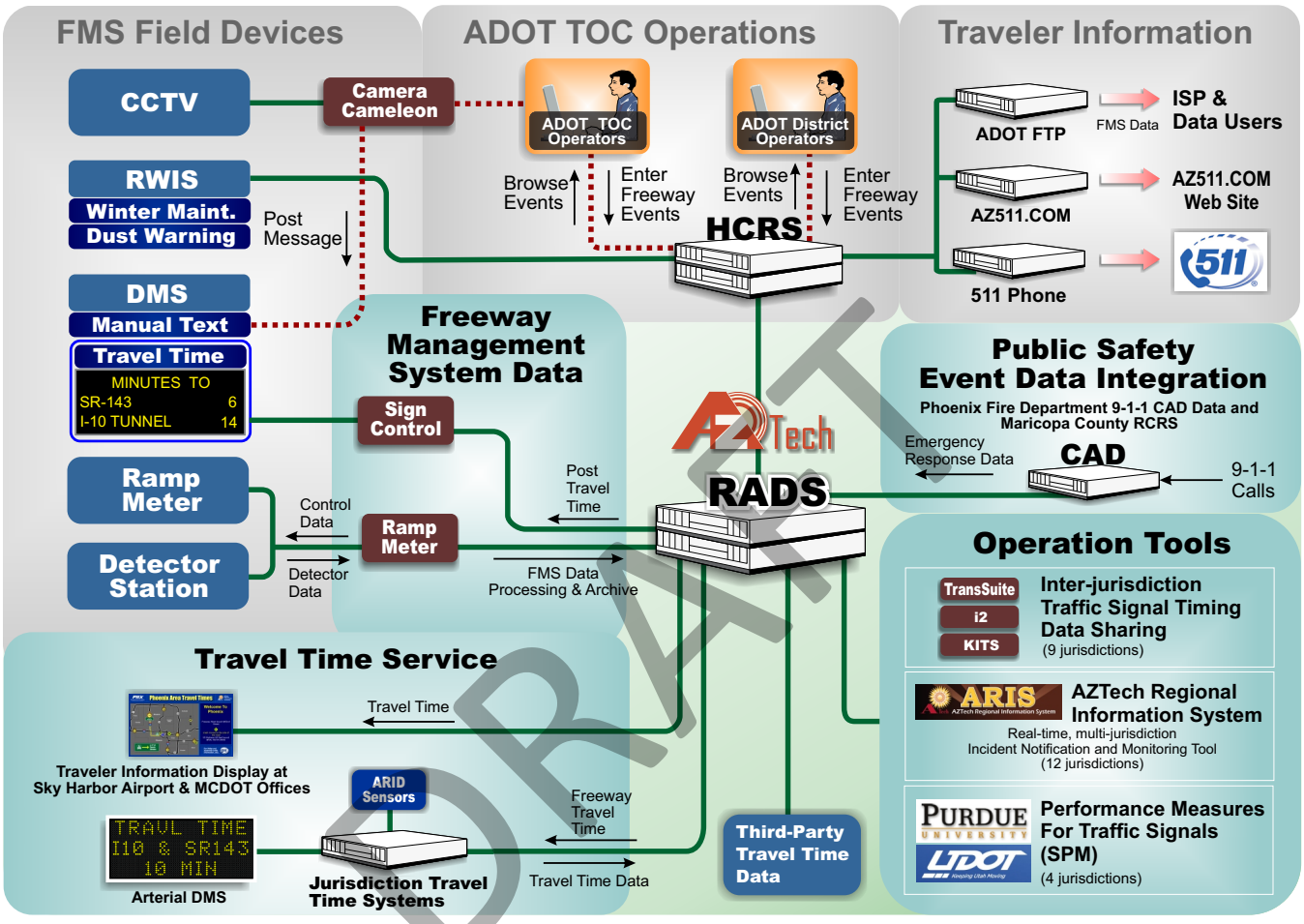


Figure 20 – AZTech Regional Archived Data System (RADS)

Source: *State of the System Report FY 2015*

The RADS is linked with the ADOT Highway Condition Reporting System (HCRS) to provide real time traffic data to support speed maps on the AZ511 website as well as supplemental road condition information collected from public safety agencies and local agencies not already provided through the HCRS. RADS takes ITS data from systems throughout the Phoenix metropolitan area, stores the data in a centralized archived data server, and then makes the data available for a variety of users through a common internet interface. Processes incorporated into the RADS system include:

- ADOT freeway management system (FMS) detector station data
- Travel times from FMS detector station data that are displayed on freeway DMS, at the Sky Harbor International Airport Rental Car Center, and at County buildings in downtown Phoenix
- ADOT HCRS events
- Phoenix Fire incident data
- Traffic signal timing and traffic characteristic data from local jurisdictions

Additional RADS capabilities will be added to the TMC to support regional traffic signal operations and traveler information. The systems at MCDOT will serve as backup to the current systems at ADOT.

5.3.3 Regional Emergency Action Coordinating Team

The REACT Program applies the principles of traffic incident management; a planned and coordinated process to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible. The REACT Program started as an expansion of the AZTech MDI with the goal to assist with traffic management by setting up emergency lane/road closures, installing and maintaining signed detour routes and providing directional information to motorists. REACT provides on-call emergency traffic management services within unincorporated County and partnering local agency jurisdictions.

MCDOT, as the lead agency for the implementation of the REACT Program, has created sustainable partnerships with different communities in the County to promote the traffic incident management principles. REACT also coordinates its activities with the ADOT Arizona Local Emergency Response Team (ALERT) freeway incident response program and is a member of the AZTech TIM Coalition. IGAs have been developed with the following jurisdictions:

- City of Glendale
- City of Peoria
- City of Avondale
- City of Tolleson
- City of Scottsdale

Regional Emergency Action Coordinating Team

REACT benefits include:

- **Reduction in hours of travel time delay**
- **Reduction in gallons of wasted fuel consumption**
- **Reduction in tons of vehicle pollution emissions**

These reductions are primarily achieved by allowing partial closures of roadway versus complete closures and by providing clearly marked detour routes and advanced information through truck mounted DMS.

REACT fosters improved safety for emergency responders and investigators by providing better traffic management at incident scenes, increases safety to the public and reduces secondary accidents through deployment of clear and efficient traffic control.

REACT reduces the adverse economic impacts associated with long-term incident congestion. It provides an efficient use of community resources through interjurisdictional cooperation. Some of the specific benefits include:

- Reduction in hours of travel time delay
- Reduction in gallons of wasted fuel consumption
- Reduction in tons of vehicle pollution emissions

These reductions are primarily achieved by allowing partial closures of roadway versus complete closures and by providing clearly marked detour routes and advanced information through truck mounted DMS.

5.4 SAFETY MANAGEMENT SYSTEM

The County Safety Management System (SMS) is a systematic process that has three goals. These include:

- Document road safety improvements made by the County during the previous fiscal year;
- Identify the location, type, and severity of traffic crashes in the unincorporated portions of the County; and
- Report trends in traffic crashes and recommended improvements to reduce the number and rate of crashes.

MCDOT makes an effort to respond quickly to identified safety problems. These problems are frequently identified through public complaints about unsafe road conditions, first-hand observations by County staff members, and reviews of recent crash records for County roads. When an actual or potential problem is encountered, a detailed engineering analysis may be conducted and recommendations are made to correct the situation. These recommendations are handled in one of three ways:

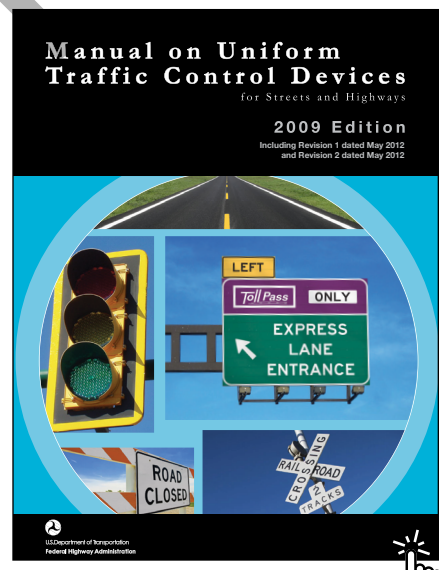
- Relatively simple and inexpensive solutions are handled through the maintenance process.
- More complex problems are handled by the Transportation Systems Management Division.
- Complex problems involving significant changes that require substantial funding amounts are handled through the programming process.

This tiered approach enables MCDOT to respond to needs of all sizes.

5.4.1 Evaluation of Safety

MCDOT continually monitors the system to identify and evaluate potential safety concerns. This allows MCDOT to prioritize and schedule improvements for upcoming years. The initial step each year is to identify locations with potential safety concerns by examining the location and number of crashes, crash rates, injury severity, and the types of crashes occurring on County roads. At these locations, crash history is used to evaluate the road and determine if improvements are required.

The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance to determine if an identified safety problem meets the warrant criteria for the installation of multi-way stop control or traffic signals. Crash data, ADT count, and posted speed are just a few of the criteria considered in the warrant analysis. Potential projects meeting warrant criteria are typically programmed according to highest need and available funding.



FHWA Manual on Uniform Traffic Control Devices

5.4.2 State and Regional Safety

MCDOT identified 4 main focus areas based on the 12 Emphasis Areas established in the 2014 Arizona Strategic Highway Safety Plan (AZSHSP) and the 6 Action Areas for the 2015 MAG Strategic Transportation Safety Plan (STSP). These focus areas were identified as those that MCDOT, as a transportation agency, could most directly influence and take actions to improve. The MCDOT focus areas are:

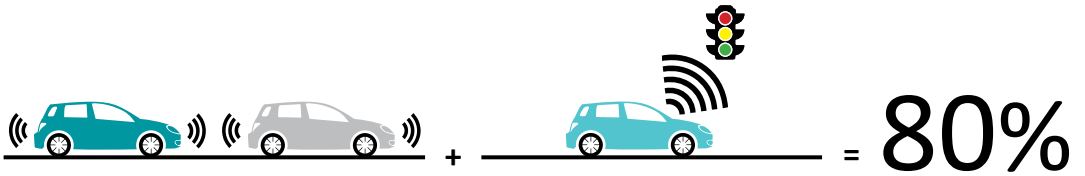
- Intersection crashes
- Fatal and incapacitating injury crashes
- Non-motorized (bicycle and pedestrian) crashes
- Work zone crashes

5.5 MCDOT SMART*DRIVE* PROGRAM[SM]

Through a federal initiative called "Connected Vehicles", USDOT is working to leverage ITS technology to improve traffic operations to support public safety and surface transportation mobility. The Arizona Connected Vehicle initiative is a partnership between MCDOT, ADOT, and the University of Arizona. The initiative has developed and deployed connected vehicle applications that integrate vehicles with Systematically Managed ARTerial (SMART) roadway systems in the County. Through the MCDOT SMART*Drive* Program[SM], MCDOT has invested in planning, designing, and implementing a connected vehicle test bed in Anthem, a community of approximately 25,000 residents. The test bed includes 5.5 miles of roadway and 11 intersections equipped with roadside technology.

With this new technology, vehicles will be able to interact with other vehicles through Dedicated Short-Range Communications (DSRC) radios. They are similar to Wi-Fi, except DSRC communications have less latency. This is what provides vehicles with a 360 degree awareness of their surroundings, as well as awareness of other vehicles that may be around them. Instead of focusing on surviving crashes, the USDOT has concentrated its efforts on helping people avoid crashes. Preventing crashes with other cars could potentially be achieved through Vehicle-to-Vehicle (V2V) Communications; alternatively, Vehicle-to-Infrastructure (V2I) Communications would provide intelligent priority to emergency, transit, and freight vehicles. It will also make drivers cognizant of road infrastructure related advisories and warnings. Drivers will receive messages when their vehicle is entering school zones, construction zones, or even receive recommendations on optimum speed to minimize delays at upcoming traffic signals. Alerts provided through in-vehicle systems will be designed not to distract drivers. V2V and V2I applications are anticipated to address up to 80 percent of crashes that involve unimpaired drivers.

MCDOT SMART*Drive* Program[SM], which originated in 2007, represents an evolution of connected vehicle research, testing, and implementation. Initiated as a research project supported by the Arizona Transportation Research Center, the program has successfully demonstrated live signal priority operations and connectivity at the Anthem test bed.

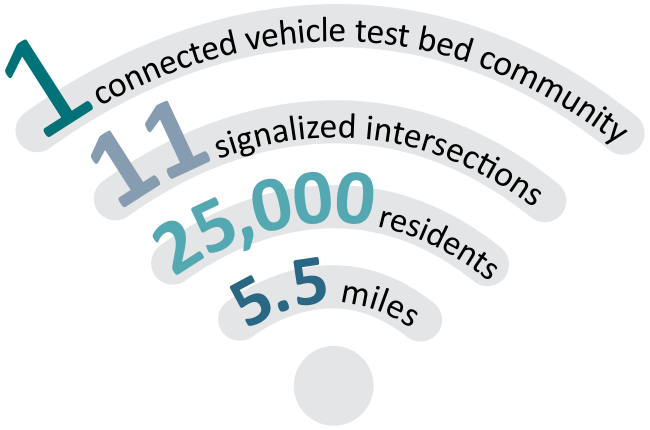


Vehicle-to-Vehicle (V2V) Communications

Vehicle-to-Infrastructure (V2I) Communications

Connected Vehicle Technology

The MCDOT SMART*Drive* Program℠ test bed will continue to focus on traffic signal operations, safety, and mobility applications. MCDOT has deployed applications under the USDOT and the Connected Vehicle Pooled Fund Program Multimodal Intelligent Traffic Signal System (MMITSS) initiative. The test bed in Anthem will continue to be expanded and demonstrated to local, regional state, and national stakeholders in the upcoming years.



MCDOT SMART*Drive* Program℠

Key components of the MCDOT SMART*Drive* Program℠ demonstrations include:

- Eleven signalized intersections equipped with DSRC radios
- Installation of traffic signal priority applications
- Representative emergency vehicle and transit vehicle used to test application priority logic
- Field test for emergency and transit applications
- Pedestrian crosswalk application using smartphones to display crossing status
- Collection of detailed vehicle and traffic operations data for post-operational analysis

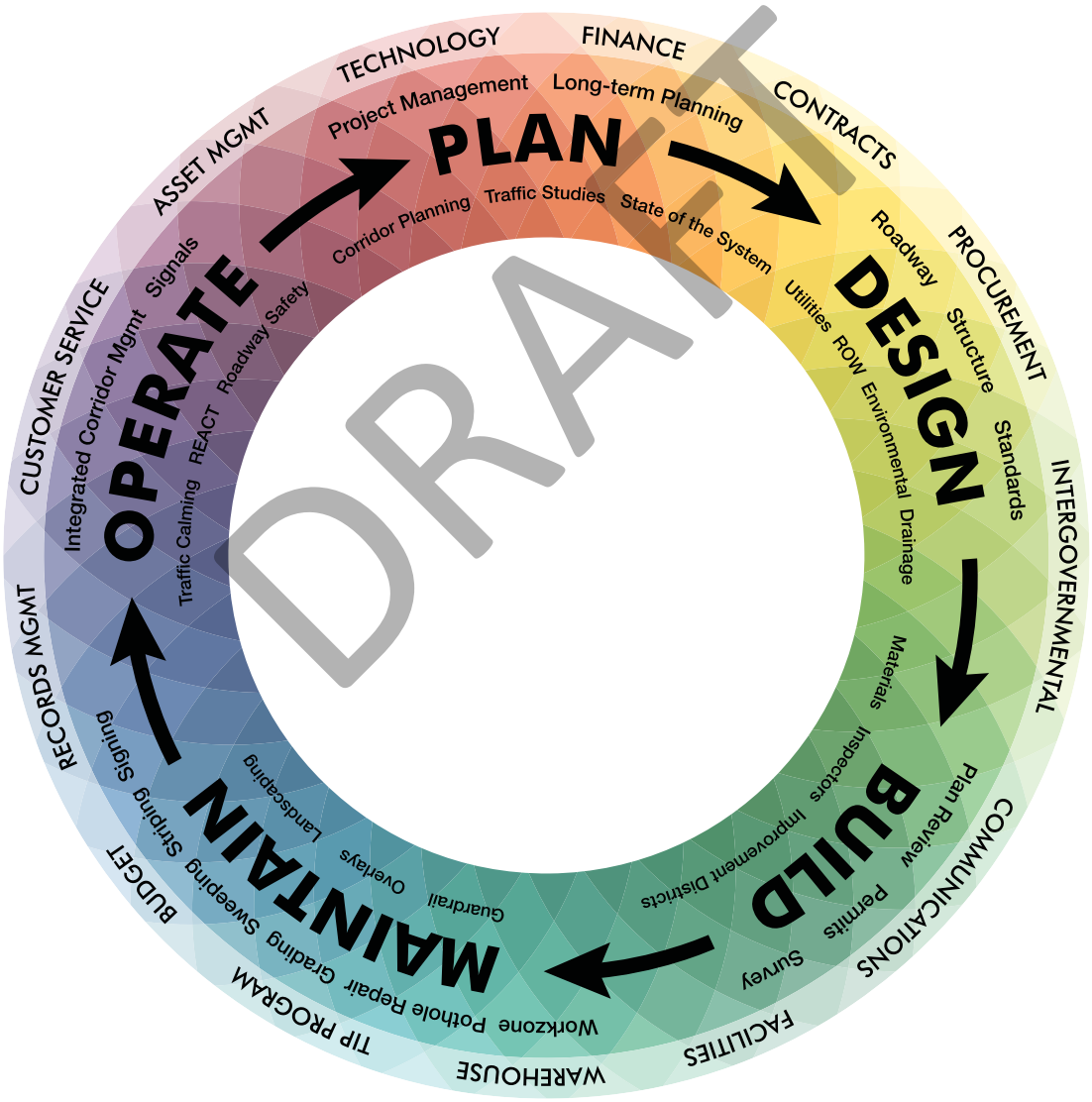
These demonstrations are among the first steps in implementation of autonomous vehicle technology.

Developing technologies and trends such as autonomous vehicles, the virtualization of work environment, and the increasing use of ride-sharing services have the potential to substantially change the way people travel and goods are transported. These changes will likely challenge conventional transportation planning practices and affect the development and investment in the transportation system. The development and implementation of these rapidly evolving technologies will be affected by legislation, policy, insurance industry requirements, and other non-transportation oriented factors. There are numerous unknowns that the industry, through organizations such as the Transportation Research Board, is investigating. What is known is that MCDOT recognizes the changing transportation environment; is proactively tracking and participating in the development of these technologies; and will adapt with the changes to the standards of practice.

5.6 NEXT STEPS

In support of the TSP 2035 Goals MCDOT should continue efforts as a regional and national leader in supporting and discovering new technology to increase roadway operations.

CONCLUSION



The above spectrum identifies activities that support the MCDOT Plan, Design, Build, Maintain and Operate process. These support activities are fully involved to ensure MCDOT can successfully evaluate and monitor the transportation system providing connectivity and service to meet the needs of the traveling public today and into the future.

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CONCLUSION

Throughout chapters *Plan, Design, Build, Maintain,* and *Operate;* research, data, and methods were identified that support the TSP 2035 Goals. The TSP 2035 Goals were established through a proactive partnering process, and drove the overall development of TSP 2035. The following summary outlines how the Goals were or will be achieved.

GOAL: PROMOTE QUALITY OF LIFE AND ECONOMIC VITALITY

TSP 2035 is based on updated socioeconomic data. Existing and future demographic trends, including where County residents live and work, allows MCDOT to anticipate and accommodate the needs of a growing population. Growth trends were identified to develop traffic projections and identify potential projects that support growth, as well as provide opportunities for economic development. Moving forward evaluation of potential impacts to socioeconomic, cultural and natural resources, will be further refined based on the established project development processes.

GOAL: PROVIDE A SYSTEM THAT IS SAFE AND EFFICIENT FOR ALL MODES OF TRAVEL

TSP 2035 establishes potential improvements to the existing roadway network. Alternative modes of transportation, including existing bicycle, pedestrian, and transit facilities, were evaluated. This evaluation led to the kickoff of the County Active Transportation Plan in the fall of 2016. To support efficient and safe County-wide transportation, TSP 2035 continues the support and expansion of the MCDOT ITS program, including regional and national influences. MCDOT's focus on safety is further exemplified through prioritizing projects using safety as a primary measure and facilitating incident management through MCDOT's REACT.

GOAL: ENCOURAGE A SEAMLESS REGIONAL TRANSPORTATION NETWORK

The TSP 2035 foundation is built on the input and information gathered from MCDOT partner agencies. Through multiple meetings and proactive coordination activities, MCDOT continues to sustain and strengthen its regional partnerships and relationships. This includes facilitating regional projects and expanding the regional ITS infrastructure, coordination, and value. Moving forward, MCDOT plans to facilitate the recurring gathering of TSP 2035 partners to ensure plans evolve with the ever developing County-wide needs.

GOAL: PROTECT PAST AND FUTURE TRANSPORTATION INVESTMENTS THROUGH STRATEGIC SYSTEM PRESERVATION

A TSP 2035 focal point is to preserve capacity through efficient traffic management. This will be accomplished through continued support of ITS and TSMO principals to optimize existing infrastructure and respond to future transportation needs. A key component to preserving the County transportation assets is the TSP 2035 incorporation of recurring MCDOT tasks, including the SOS Report and the MSRP, as well as operation and maintenance activities and the LVR programs. Through these activities and established performance measures, MCDOT has the system in place to preserve County investments and maximize the long term success of County development.

As is evidence in the efforts identified in TSP 2035, MCDOT is committed to "Providing Connections that Improve People's Lives" now and into the future.

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APPENDIX

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*Data current as of August 2016

SHORT-TERM HORIZON: FY 2016 TO FY 2020 - Identified Needs

Road Name	At/From	To
51st Ave	Dust Devil Rd	Estrella Dr
67th Ave	Southern Ave	Broadway Rd
83rd Ave	Northern Ave	Las Palmaritas Dr
91st Ave	Baseline Rd	0.50 miles north of Baseline Rd
103rd Ave	US-60	Thunderbird Rd
152nd St	Rio Verde Dr	Peak View Rd
195th Ave	I-10	McDowell Rd
Baseline Rd	71st Ave	0.10 miles east of 61st Dr
Baseline Rd	91st Ave	83rd Ave
Bell Rd	111th Ave	Del Webb Blvd
Beltline Rd	Maricopa Rd	Santa Cruz Rd
Broadway Rd	43rd Ave	39th Ave
Broadway Rd	0.08 miles east of 35th Ave	0.50 miles east of 35th Ave
Broadway Rd	75th Ave	0.02 miles east of 67th Ave
Broadway Rd	0.08 miles east of 67th Ave	63rd Ave
Broadway Rd	59th Ave	0.30 miles east of 59th Ave
Broadway Rd	55th Ave	0.25 miles east of 55th Ave
Camelback Rd	0.02 miles west of Village Pkwy	Valley Glen
Center St	Crozier Rd	Dove Valley Rd
Chandler Heights Rd	Recker Rd	0.13 miles east of 182nd St
Crismon Rd	Broadway Rd	Balsam Ave
Del Webb Blvd	US-60	Thunderbird Rd
El Mirage Rd	Glendale Ave	Northern Ave
Elliot Rd	0.17 miles east of SR-202/Santan Fwy	Signal Butte Rd
Forest Rd	Loredo Ln	Rio Verde Dr
Germann Rd	Ellsworth Rd	212th St
Germann Rd	Sossaman Rd	195th St
Granite Valley Drive	Meeker Boulevard	White Rock Dr
Happy Valley Pkwy	117th Ave	109th Ave

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SHORT-TERM HORIZON: FY 2016 TO FY 2020 - Identified Needs

Road Name	At/From	To
Hunt Hwy	Bell Rd	Sossaman Rd
Hunt Hwy	Higley Rd	Power Rd
Hunt Hwy	Dobson Rd	0.25 miles east of McQueen Rd
Indian School Rd	201st Ave	195th Ave
Johnson Rd	Roosevelt St	Portland St
Litchfield Rd	Northern Pkwy	Peoria Ave
Lower Buckeye Rd	67th Ave	71st Ave
Meridian Rd	US-60	Southern Ave
MC 85	Southern Ave	Sarival Ave
New River Rd	24th Ln	15th Ave
New River Rd	Honda Bow Rd	Wild Field Dr
Ocotillo Rd	138th St	142nd St
Ocotillo Rd	228th St	Meridian Rd
Olive Ave	103rd Ave	99th Ave
Olive Ave	Cotton Ln	0.50 miles east of Litchfield Rd
Patton Rd	235th Ave	224th Ave
Power Rd	Los Altos Rd	Woodside Wy
Power Rd	Orchid Ln	0.05 miles south of SR-202/Santan Fwy
Rio Verde Dr	152nd Ave	Forest Rd
Rittenhouse Rd	0.03 miles south of Riggs Rd	Riggs Rd
Rittenhouse Rd	Signal Butte Rd	Cloud Rd
Roosevelt St	Johnson Rd	299th Ave
Southern Ave	SR-202/South Mountain Fwy	59th Ave
Southern Ave	49th Dr	46th Dr
Southern Ave	46th Ave	45th Ave
Southern Ave	41st Ave	39th Ave
Thomas Rd/Lehi Rd	Thomas Rd	0.10 miles north of Thomas Rd/Lehi Rd
Thunderbird Blvd	103rd Ave	Cedar Drive
Tuthill Rd	Elliot Rd	Beloat Rd
Val Vista Drive	Brooks Farms Rd	Ocotillo Rd
Wescott Drive	Old El Mirage Rd	El Mirage Rd
Yuma Rd	Dean Rd	0.15 miles east of Dean Rd

MID-TERM HORIZON: FY 2021 TO FY 2025 - Identified Needs

Road Name	At/From	To
91st Ave	Pinnacle Peak Rd	Hatfield Rd
107th Ave	Villa Chula	Adela Drive
107th Ave	Avenida Del Sol	Hatfield Rd
Broadway Rd	Bullard Ave	Litchfield Rd
Broadway Rd	91st Ave	75th Ave
Camelback Rd	Valley Glen	Litchfield Rd
Happy Valley Pkwy	SR-303	117th Ave
Hunt Hwy	Mandarin Dr	Bell Rd
Indian School Rd	0.20 miles east of Jackrabbit Trl	Perryville Rd
Jomax Rd	0.20 miles east of 163rd Ave	0.15 miles west of 147th Ave
Lindsay Rd	Spur Rd	Applyby Rd
Lower Buckeye Rd	Dysart Rd	127th Ave
MC-85	Jackrabbit Trl	Perryville Rd
New River Rd	15th Ave	Fig Springs Rd
Northern Ave	Cotton Lane	SR-303
Peoria Ave	Cotton Lane	0.20 miles east of Cotton Ln
Peoria Ave	107th Ave	105th Ave
Peoria Ave	Cortessa Pkwy	Citrus Rd
Power Rd	0.30 miles north of Williams Field Rd	Galveston St
Val Vista Dr	Chandler Heights Rd	Brooks Farm Rd

LONG-TERM HORIZON: FY 2021 TO FY 2025 - Identified Needs

Road Name	At/From	To
27th Ave	0.10 miles north of Carlise Rd	Joy Ranch Rd
27th Ave	29th Ave	0.05 miles north of Maddock Rd
71st Ave	Acoma Dr	Banff Ln
91st Ave	0.35 miles south of Broadway Rd	0.05 miles south of Broadway Rd
99th Ave	0.60 miles north of Glendale Ave	Northern Ave
107th Ave	Roosevelt Pkwy	Van Buren St
107th Ave	Sequoia Dr	Union Hills Dr
195th Ave	Thomas Rd	Indian School Rd
195th Ave	Camelback Rd	Medlock Dr

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LONG-TERM HORIZON: FY 2016 TO FY 2020 - Identified Needs

Road Name	At/From	To
211th Ave	0.10 miles south of Wildcat Dr	US-60
339th Ave	Van Buren St	I-10
387th Ave	Camelback Rd	0.70 miles north of Bethany Home Rd
Baseline Rd	MC-85	Apache Rd
Beloat Rd	0.25 miles east of Apache Rd	Watson Rd
Beloat Rd	Rainbow Rd	Dean Rd
Beloat Rd	Tuthill Rd/Jackrabbit Trl	Verrado Way
Broadway Rd	Dean Rd	Jackrabbit Trl
Camelback Rd	195th Ave	0.30 miles east of 193rd Dr
Camelback Rd	0.50 miles east of El Mirage Rd	0.20 miles west of 111th Ave
Chandler Heights Rd	122nd St	Adams Ave
Cloud Rd	33rd Ave	29th Ave
Crismon Rd	Balsam Ave	McKellips Rd
Dean Rd	Lower Buckeye Rd	0.15 miles north of Lower Buckeye Rd
Deer Valley Access Rd	Deer Valley Dr	El Mirage Rd
Deer Valley Dr	135th Ave	Deer Valley Access Rd
Deer Valley Rd	El Mirage Rd	Lake Pleasant Pkwy
Dobbins Rd	0.25 miles east of 59th Ave	0.10 miles west of 51st Ave
Dobbins Rd	0.10 miles east of 51st Ave	43rd Ave
Dobbins Rd	0.65 miles east of 43rd Ave	0.15 miles west of 35th Ave
Dobbins Rd	33rd Ave	0.45 miles west of 27th Ave
Dove Valley Rd	215th Ave	211th Ave
El Mirage Rd	Denton St	Marshall Ave
El Mirage Rd	Corte Bella Drive	SR-303
Elliot Rd	0.40 miles east of Power Rd	0.01 miles east of Sossaman Rd
Elliot Rd	Tuthill Rd	Rainbow Valley Rd
Elliot Rd	0.75 miles west of Hawes Rd	0.28 miles east of Hawes Rd
Germann Rd	0.50 miles west of Crismon Rd	Merrill Rd
Happy Valley Rd	0.80 miles east of Dysart Rd	El Mirage Rd
Hazen Rd	SR-85	Miller Rd
Indian Rd	Gila Blvd	San Lucy Rd
Indian School Rd	El Mirage Rd	111th Ave
Jackrabbit Trl	Durango St	Yuma Rd

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Road Name	At/From	To
Jackrabbit Trl	Van Buren St	I-10
Jackrabbit Trl	MC-85	Beloat Rd
Jomax Rd	195th Ave	Gordon Wy
Lower Buckeye Rd	127th Ave	El Mirage Rd
Lower Buckeye Rd	Dean Rd	Perryville Rd
Lower Buckeye Rd	East of 170th Ln	167th Ave
McDowell Rd	199th Ave	197th Ave
McDowell Rd	0.05 miles east of SR-101	92nd St
McDowell Rd	0.01 miles west of Jackrabbit Trl	Jackrabbit Trl
Meridian Rd	Warner Rd	Mesquite St
Meridian Rd	Baseline Rd	US-60
New River Rd	I-17	Black Canyon Hwy
New River Rd	Black Canyon Hwy	Coyote Pass Rd
New River Rd	Desert Hills Dr	Honda Bow Rd
Northern Ave	0.30 miles west of Sarival Ave	Sarival Ave
Old US-80	0.50 miles east of Wilson Ave	Turner Rd
Peoria Ave	105th Ave	99th Ave
Perryville Rd	Roosevelt St	McDowell Rd
Power Rd	Galveston St	Ray Rd
Power Rd	Ray Rd	Orchid Ln
Power Rd	0.05 miles south of Ranch Rd	Elliot Rd
Power Rd	0.05 miles north of SR-202/South Mountain Fwy	0.07 miles north of SR-202/South Mountain Fwy
Rainbow Valley Rd	Ray Rd	Elliot Rd
Ray Rd	Tuthill Rd	Rainbow Valley Rd
Reems Rd	Northern Pkwy	Olive Ave
Reems Rd	Olive Ave	Peoria Ave
Riggs Rd	211th Place	Meridian Rd
Rio Verde Dr	142nd St	152nd St
Southern Ave	0.50 miles east of Perryville Rd	MC-85
Southern Ave	69th Ave	SR-202/South Mountain Fwy
Sun Valley Pkwy	0.20 miles north of I-10	Van Buren St
Sun Valley Pkwy	219th Ave	195th Ave

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LONG-TERM HORIZON: FY 2026 TO FY 2035 - Identified Needs

Road Name	At/From	To
Thunderbird Blvd	Sahara Dr	0.30 miles east of Boswell Blvd
Tonopah Salome Hwy	Johnson Rd	0.20 miles east of Hassaympa Dr
Tuthill Rd	Ray Rd	Elliot Rd
Union Hills Drive	107th Ave	99th Ave
Van Buren St	Jackrabbit Trl	Perryville Rd
Verrado Way	Lower Buckeye Rd	Yuma Rd
Vulture Mine Rd	0.05 miles north of Lipinski Ln	County Line
Waddell Rd	0.01 miles east of 175th Ave	0.13 miles west of 172nd Ave
Waddell Rd	0.07 miles east of 182nd Ave	Citrus Rd
Waddell Rd	183rd Ave	0.07 miles east of 182nd Ave
Waddell Rd	0.13 miles west of 172nd Ave	0.12 miles east of 172nd Ave
Woods Rd	Old US-80	0.15 miles west of SR-85
Yuma Rd	181st Ave	Citrus Rd
Yuma Rd	Jackrabbit Trl	Perryville Rd