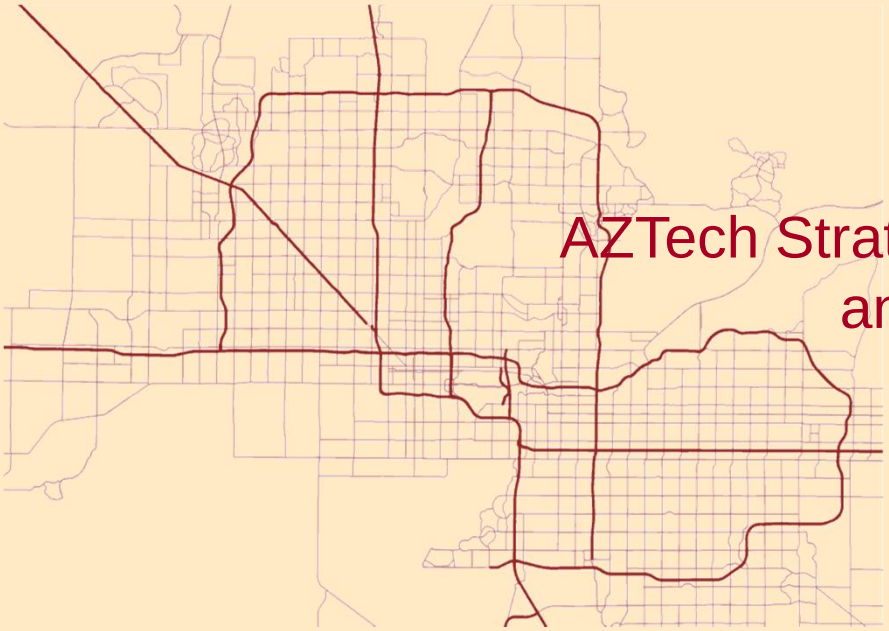
AZTech TRAFFIC MANAGEMENT AND OPERATIONS PERFORMANCE INDICATORS BOOK – 2015

Phoenix Metropolitan Region

FREEWAYS • ARTERIALS • INTEGRATED CORRIDORS • INCIDENTS
TRAVELER INFORMATION • SPECIAL EVENTS • TRANSIT



Developed by the
AZTech Strategic Steering Committee
and Operations Committee

AZTech
Moving Forward Together

REGIONAL INTELLIGENT TRANSPORTATION SYSTEM PARTNERSHIP

PARTNERS / CONTRIBUTORS

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FOREWORD

EXECUTIVE COMMITTEE

"What gets measured gets done, what gets measured and fed back gets done well..." — John E. Jones

This region and the AZTech Partnership have made significant traffic operations investments and impressive strides in advancing traffic management and operational strategies. For nearly two decades, local, county and state agencies in the region have been very focused on improving the way we manage and operate the transportation network. We all strive to improve these functions within our jurisdiction and are also focused on how decisions influence our neighboring agencies...and most importantly, the travelers.

AZTech has elevated the need within our own region to actively measure the operational performance of our transportation network. The region developed the AZTech Operations Implementation Plan that identifies strategies for the region to pursue and a near-term AZTech Action Plan in order to translate those strategies into tangible projects or activities that can be completed. The goal of this 2015 Book is to continue to measure operational performance in the region in order to see gaps and opportunities for improvement as well as areas where successes have been achieved. Many agencies are closely monitoring, evaluating and enhancing their individual systems. The collective effort by the partners to report on traffic management and operations performance was represented within the initial Performance Indicators Book in 2011 and is updated in this third generation AZTech Traffic Management and Operations Performance Indicators Book for 2015 data. Important next steps include taking these results to improve how we do things, and taking a closer look at where we need to improve.

Fixing America's Surface Transportation Act (FAST Act), our current highway authorization, as well as Moving Ahead for Progress in the 21st Century (MAP-21), the previous highway authorization, emphasizes performance management and monitoring across multiple transportation modes, and in particular, identifies reducing congestion and improving reliability of our transportation system among the priority performance goals. We see our efforts here as an important step toward achieving holistic operational performance status over time.

The 2015 Performance Indicator Book is a snapshot of where we are today. Many thanks to those agencies and partners that provided the data and analysis for this third publication of a regional traffic management and operations focused performance report. There is a concerted effort at the AZTech Executive Committee to continue to refine those measures that are meaningful and create a framework for ongoing measuring, reporting, and improving how we operate our transportation network.

Traffic management and operations encompasses a lot of activities, and through incremental improvements and focusing our efforts on those activities that will yield the greatest benefits, we will truly provide our travelers with a safe and seamless experience on our transportation network every day.

Executive Committee Chairs

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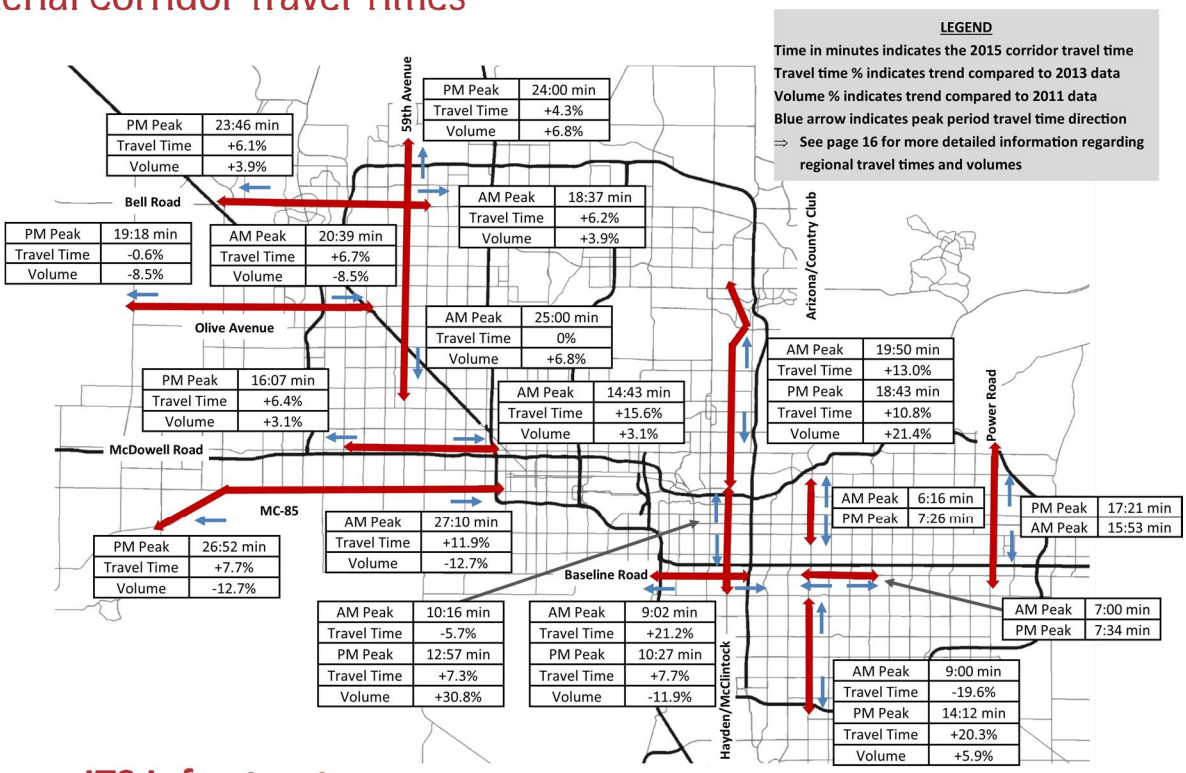
AZTECH PERFORMANCE DASHBOARD

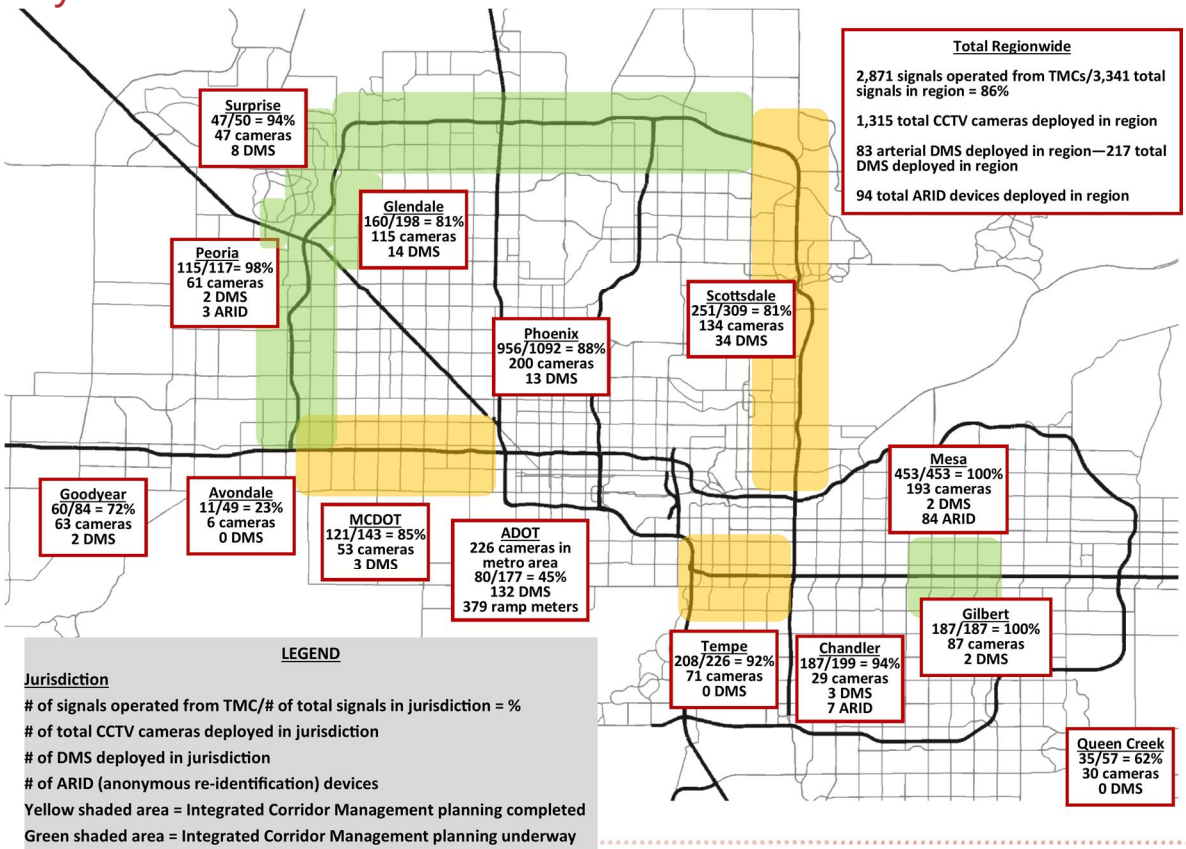
Performance trending in favorable direction. *Performance is trending in an unfavorable direction.*

Policy Goal/ Performance Measure	CY 2012-2013 Period	CY 2014-2015 Period		Description
Freeways				
Percent of Miles Congested (Out of Total of 240 Miles Measured)	31.6%	36.7%	↓	Overall freeways are experiencing more congestion where average vehicle speeds drop below 50 mph
Percent of Time Congested Per Mile (Out of Total of 240 Miles Measured)	25.2%	32.1%	↓	Overall freeways are experiencing more congested time where average vehicle speeds drop below 50 mph
Arterials				
Bell Road Westbound PM Peak Travel Time—35th Avenue to US-60	22:23 min	23:46 min	↓	Took over 1 minute longer to travel along this corridor
McDowell Road Eastbound AM Peak Travel Time—83rd Avenue to I-17	12:44 min	14:43 min	↓	Took over 2 minutes longer to travel along this corridor
Hayden Road/McClintock Drive Northbound PM Peak Travel Time—Loop 202 to Shea Boulevard	17:33 min	18:43 min	↓	Took over 2 minutes longer to travel along this corridor
Arizona Avenue/Country Club Drive Travel Time AM Peak—Guadalupe Road to Loop 202	11:12 min	9:00 min	↑	Took almost 2 minutes shorter to travel along this corridor
Average Arterial TMC Hours with Ability to Respond Per Week	44 hours	44 hours	↑	77% of agencies also have on-call after hours support
Incident Management—Freeways and Arterials				
Percentage of Secondary Vehicular Crashes Out of Total Crashes (as reported by DPS)	6% (as of 2011)	6.3% (as of 2015)	↓	Arizona continues to be below the national average of 20% of all crashes being secondary in nature
Total Crashes (as reported by ADOT Motor Vehicle Division)	103,637	109,554	↓	Increase of almost 6% may be partially due to freeway volumes increasing by 2%-4% in recent years
Number of Secondary Crashes when REACT is Present	0	0	↑	Continue to meet goal
Traveler Information				
% of Freeway DMS and % of Arterial DMS Posting Travel Times	30% freeway 5% arterial	58% freeway 8% arterial	↑	Increased number of DMS posting travel times
Social Media Followers	68,037	232,512	↑	Increase of approximately 240% in Social Media followers of agencies providing information to the public
Phoenix Fire CAD and Mesa 911 to HCRS	32,199	31,199	↑	Information shared on 511 is consistent OR less reported incidents on roadways
Transit				
Transit Schedule Adherence (Percent of Time Transit Meets Schedule)	95.0%	92.7%	↓	Less schedule adherence
Number of Bus Transit Boardings Per Year	59.12 million	56.48 million	↓	Lower usage of Bus Transit by small margin
Number of Light Rail Transit Boardings Per Year	14.29 million	14.28 million	↓	Lower usage of Light Rail Transit by small margin

Arterial Corridor Travel Times



Agency ITS Infrastructure



AZTech and the Performance Indicators Book

AZTech is a regional traffic management and operations partnership in the Phoenix metropolitan area that includes all major governmental transportation agencies in the region, along with public safety agencies and several private technology and media companies. The coalition, led by Maricopa County Department of Transportation (MCDOT) and Arizona Department of Transportation (ADOT), guides the application of intelligent transportation systems (ITS) technologies for managing regional traffic. The goal is to achieve more efficient mobility, less congestion, and a higher level of safety for travelers throughout the metropolitan area.

The 2015 AZTech Performance Indicator Book is a compilation of key regional transportation management and operations performance measures that provide a snapshot of the regional transportation network. The successes that have accompanied AZTech efforts and partner agency investments has elevated the need to actively measure the operational performance of the regional transportation network. In order to share these findings, AZTech partners have collaborated to develop the 2015 Book.

The 2015 PI Book is organized into the following sections, which represent the key performance areas in the region:

Freeway Management — Addressing traffic and incidents using freeway management system components such as detection systems, ramp meters, dynamic message signs, and cameras.

Arterial Management — Managing traffic and incidents at intersections and along segments of surface streets using arterial management systems.

Integrated Corridor Management— Improving agency coordination during recurring and nonrecurring congestion for efficient and safe movement of the traveling public and of first responders.

Incident Management — Using multi-disciplinary Traffic Incident Management (TIM) procedures to decrease the impacts of traffic incidents while improving the safety of motorists, crash victims and emergency responders.

Traveler Information — Providing timely and detailed information about traffic flow, traffic incidents, weather, construction activities, and transit to the traveling public.

Special Event Management— Improving agency coordination and capabilities during major special events and trip generators.

Transit Management — Equipping transit vehicles with tracking and communication technologies to provide real-time information to transit centers and to transit users.

Themes in the 2015 Book

In addition to the measures reported in all Books, three themes arose during the development of the 2015 Book. These represent major regional initiatives for the 2013—2015 time period that had not previously been reported on:

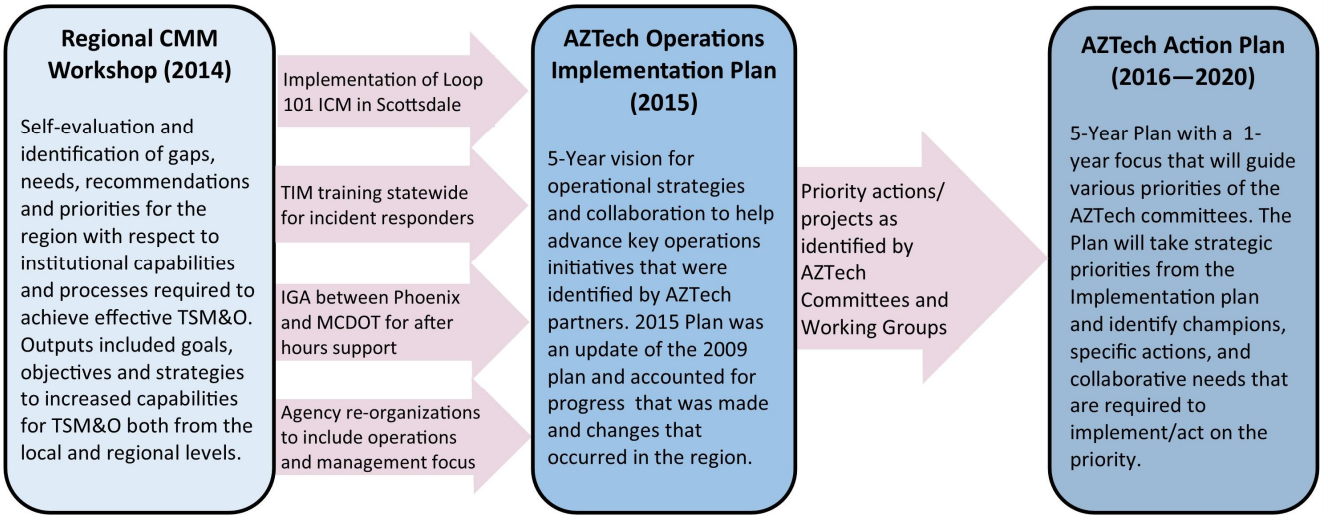
TSMO—Transportation Systems Management and Operations (TSMO) is a performance-driven approach used by agencies that considers operations and maintenance as interrelated and dually important for managing a transportation network. TSMO components are emerging as key components of operational strategies and agency organizational structures throughout the region.

ICM—Integrated Corridor Management (ICM) looks to connect and coordinate operations on the freeway with operations on the arterials to better manage traffic and incident response. ICM has been a focus throughout the region for key corridors to improve incident management and maintain mobility and safety.

Special Event Management—Major, national events have continued to find their way to the region, including the 2015 Super Bowl. These events require regional event coordination to make sure that both event goers and residents can travel safely and efficiently on arterials and freeways throughout the region during the events.

Translating Words into Actions

During the timeframe of this edition of the Book, AZTech has undergone a series of planning exercises to identify needs, goals and objectives related to operations and management that would better support and enhance the regional transportation network. The figure below outlines this series of activities:



In 2014, as part of a federal Strategic Highway Research Program 2 (SHRP2) assistance project, AZTech agencies participated in a Regional Capability Maturity Model (CMM) workshop. The CMM workshop is a tool to assess the state of an organization or region with respect to TSM&O from six dimensions. Based on the self-assessment, AZTech participants identified a set of key goals and recommendations to advance TSM&O in the region.

Based on some of the CMM outcomes in addition to AZTech and regional priorities, AZTech developed its Operations Implementation Plan in 2015. The Implementation Plan is a five-year vision for operational strategies and collaboration to help advance key, regional operations initiatives. The Plan was organized into seven focus areas, such as having a well informed traveling or leveraging regional infrastructure and partnerships to support system management. For each focus area, a set of implementation strategies was identified.

Finally, starting in 2015 and continuing into 2016, AZTech began to develop its first Action Plan. The Action Plan takes the strategies identified in the Implementation Plan and makes them into tangible projects to be completed by the AZTech committees and working groups. Each AZTech committee or working group prioritized the strategies, identified a champion, and identified specific actions to be taken in order to complete or begin the project in FY 2016—FY 2017.

AZTech 20th Anniversary!

In 2016, AZTech is celebrating its 20th Anniversary! As one of four Metropolitan Model Deployment Initiatives launched in 1996, AZTech continues to advance multi-agency operations throughout the Phoenix metropolitan area. AZTech continues to drive important operational initiatives through partnering, including the successful Loop 101 ICM and incident management plans, operational strategies for the Southwest Valley, and continued focus on improving Bell Road through multi-agency adaptive traffic signal control. With continued focus on low-cost, high impact operational improvements and multi-agency collaboration, AZTech demonstrates the value of the sustaining partnership.

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Overview

This AZTech Traffic Management and Operations Performance Indicators Book is the third edition combining key regional traffic management, traffic operations, and transit performance measures that are tracked and reported throughout the Phoenix metropolitan region. The first AZTech Performance Indicators Book was developed in 2011 and an updated Book is published every two years. AZTech partners have collaborated to complete this 2015 Book that accounts for the active measurement of the success of agency investments in increasing the efficiency of the freeway and arterial networks. It also provides trends in various performance elements within the management components which are described below:

Freeway Management —

To improve safety and mobility, state agencies address traffic and incidents using freeway management system components such as detection systems, ramp meters, dynamic message signs, and cameras.

Arterial Management —

To improve safety and operations of surface streets, local agencies manage the traffic and incidents at intersections and along segments of surface streets using arterial management systems.

Integrated Corridor Management—

To improve agency coordination of the entire transportation network during recurring and nonrecurring congestion periods, agencies have partnered to develop integrated corridor management (ICM) plans to ensure the efficient and safe movement of the traveling public.

Incident Management —

To detect, respond to, and remove traffic incidents, agencies use a planned and coordinated multi-disciplinary approach. Successful Traffic Incident Management (TIM) procedures will decrease the impacts of traffic incidents while improving the safety of motorists, crash victims and emergency responders.

Traveler Information —

To enhance travel time and reduce congestion, timely and detailed information is provided about traffic flow, traffic incidents, weather, construction activities, and transit.

Special Event Management—

To improve agency coordination and capabilities during major special events and trip generators, multi-agency efforts in special event planning and execution have become an integral part of special event management.

Transit Management —

To provide quality transit service to the traveling public, transit vehicles are equipped with tracking and communication technologies to provide real-time information to transit centers and to transit users.

Each section includes key measures reported by state, county, and local agencies provided in paragraph, table, or graphic format. Various measures are collected annually and applied toward the success of achieving established regional goals. AZTech partners reported on collection corridors in the region to consistently measure and report operational performance each year.

This book, along with previous publications, is also available electronically for download at:

www.aztech.org/perfmeasure

INTRODUCTION

SECTION 1

What is AZTech

AZTech is a regional traffic management and operations partnership in the Phoenix metropolitan area. All of the major governmental transportation agencies in the region are members, along with public safety agencies and several private technology and media companies. The coalition, led by Maricopa County Department of Transportation (MCDOT) and Arizona Department of Transportation (ADOT) and working through several collaborating committees, guides the application of intelligent transportation systems (ITS) technologies for managing regional traffic. The goal is to achieve more efficient mobility, less congestion, and a higher level of safety for travelers throughout the metropolitan area.

AZTech began as one of four regions selected for a Federally-sponsored Traffic Management Model Deployment Initiative in 1996. Throughout the initial demonstration project and continuing into a permanent partnership, AZTech quickly evolved into a successful regional traffic management and operations entity. The partnership has carefully integrated individual traffic management strategies and technologies for the region's benefit, yet has retained most operational control protocols important to individual units of government. Early on, AZTech adopted several Values, Goals, and Strategies to guide its growth from a demonstration project to what has become a full-fledged regional partnership:

Values

» Collaboration

» Leadership

» Integration

» Results

Goals

» Integrate existing ITS infrastructure into a regional system

» Establish a regional integrated traveler information system

» Expand the transportation management system for the Phoenix metropolitan area

Strategies

» Establish Education and Outreach Programs

» Expand and Strengthen Partnerships

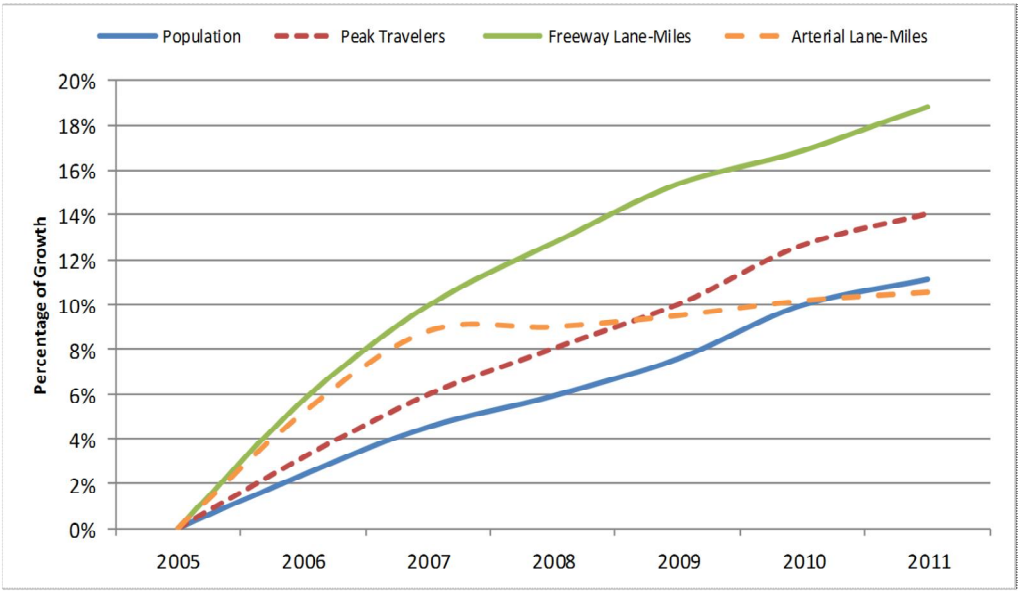
» Optimize Regional Operations and Management

» Plan, Develop, and Deploy Integrated Regional Systems

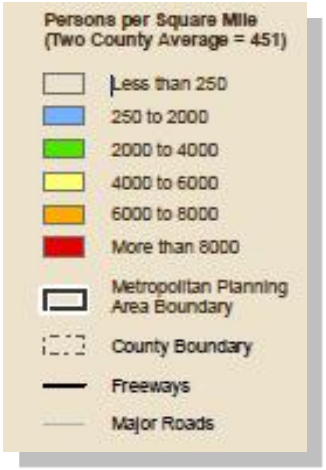
» Research and Test New Technological Opportunities

1.1 PHOENIX METROPOLITAN REGION

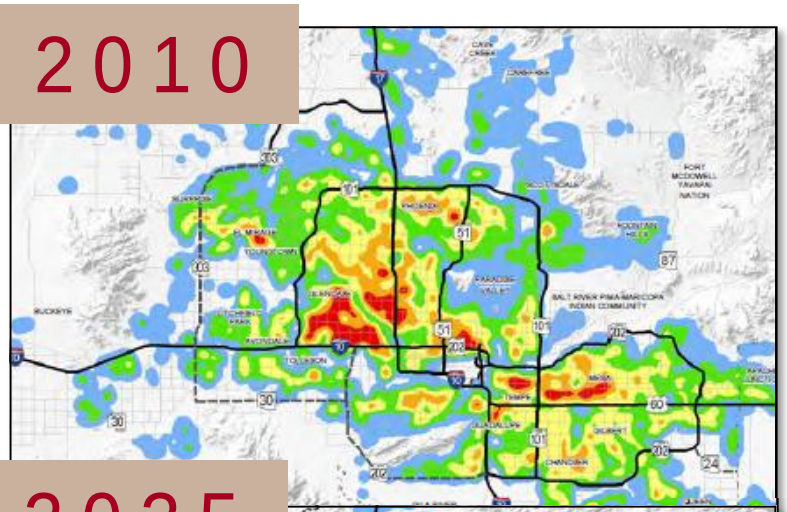
The population for many cities grew more than 11% between 2005 and 2011 (latest available information). Peak travelers, those who begin a trip by any mode during the peak period, are shown in the graph to be growing faster than the general population growth and the growth of arterial lane miles. With funding not readily available for infrastructure expansion, the emphasis is shifting towards more efficient management and operation of the existing transportation system.



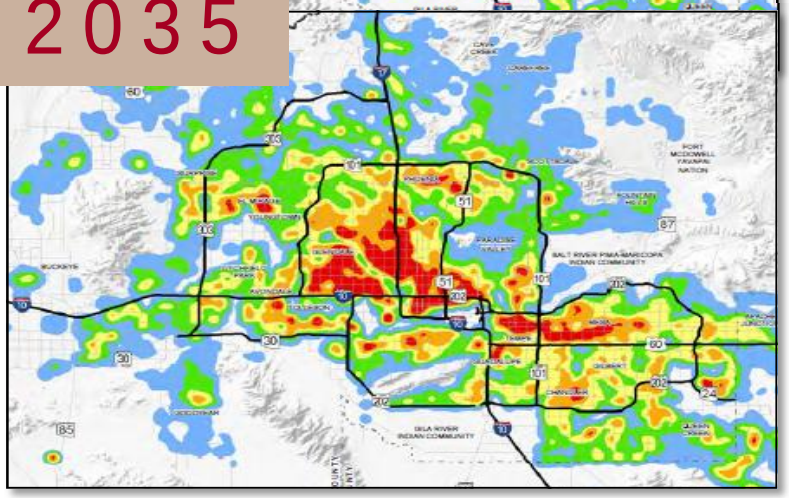
For the past several decades, the region has been one of the fastest growing metro areas in the U.S. From 2010 to 2035 there is an estimated increase in population of 54% to 6,258,452 people. Projections for populations are increasing as the economy and development bounces back in Arizona. Population concentration maps are shown here for 2010 and 2035.



2010



2035



*Source – MAG Regional Transportation Plan Update 2014

1.2 REGIONAL INDICATORS

Characteristics of Performance Indicators

In support of policy and decision making, strategic performance measures monitor the implementation and effectiveness of an organization's strategies, determine the gap between actual and targeted performance, and determine organization effectiveness and operational efficiency. Performance indicator characteristics include:

- Focusing attention on measures that will inform the outcome toward the goal
- Identifying accomplishments, not just work that is performed
- Providing a common language for communication
- Being clearly defined in terms of owner, unit of measure, collection frequency, data quality, expected value (targets), and thresholds
- Are valid - to ensure measurement of relevant metrics relating to goals
- Are verifiable - to ensure data collection accuracy

Key Regional Indicators

The 2015 Annual Urban Mobility Scorecard developed by Inrix revealed that the national congestion recession is over, with urban areas of all sizes experiencing congestion challenges worse than those seen in the pre-recession times (early 2000s). There is no building our way out of congestion.; instead the Country is using better technology and data analytics to relieve congestion.

Phoenix metropolitan region is designated as one of the 15 Very Large Average Urban Areas in the country. Statistics in 2014 listed below highlight the importance of measuring performance to determine the effectiveness of transportation management strategies. Rankings in the country are provided for context.

- 51 Hours of Yearly Delay per Auto Commuter—Ranked 17th
- $1,201 Congestion Cost Per Auto Commuter—Ranked 13th
- 155,730,000 Hours of Travel Delay—Ranked 9th
- 75,938,000 Gallons of Excess Fuel Consumed—Ranked 9th
- 25 Gallons of Excess Fuel per Auto Commuter—Ranked 11th
- $3,641,000 Total Congestion Cost—Ranked 9th
- 1.27 Travel Time Index—Ranked 19th

This information is reported by the Texas Transportation Institute [TTI] and uses the Federal Highway Administration's Highway Performance Monitoring System traffic volume data by road section.

SECTION 2 FREEWAY MANAGEMENT

ADOT Transportation Systems Management and Operations (TSMO)

Rapidly increasing congestion, constraints on capacity expansion, and limited financial resources nationally and locally are causing concern for transportation agencies and their customers. The ADOT planning process has traditionally focused on constructing new roadways and widening existing highways; however, current challenges associated with transportation system reliability, safety, and security require new methodical strategies targeted to improve operations of the existing system. As a result, ADOT formed a new division known as Transportation System Management and Operations (TSMO).

Commuters and freight operators are increasingly sensitive to delays affecting tightly scheduled personal activities and/or manufacturing distribution procedures. Regional growth in traffic volumes often means that even small disruptions can have significant ripple effects on transportation system performance. There is also increasing recognition of the significance of road construction, weather conditions, traffic incidents, special events, and emergency situations and the effects that these events have on the reliability of the transportation system. It is estimated that approximately half of the regional traffic congestion is caused by temporary disruptions that reduce capacity of the roadway ("non-recurring" congestion).

TSMO is an integrated approach to look to optimize the performance of existing infrastructure by implementing multimodal, intermodal, and often cross-jurisdictional systems, services and projects. This includes regional operations collaboration and coordination activities among transportation and public safety agencies. TSMO does not include routine road maintenance like resurfacing or guardrail replacement. TSMO strategies improve system efficiency, enhance public safety and security, reduce traffic delays of road users, and improve access to information for travelers. The emphasis of TSMO is on an outcome driven, performance-based system. It is critical that regional operations objectives can be measured since they have importance on a regional level. TSMO strategies include, but are not limited to, traffic safety, traffic incident management, travel information services, roadway weather information, freeway management, connected and automated vehicles, traffic signal systems and coordination, work zone management, managed lanes, emergency response and Homeland Security, freight management, active traffic management, and new technologies that are rapidly occurring.

Travel Time Program Expansion

In 2014 ADOT expanded the travel time on DMS program to display travel time on 77 DMS. In 2015 they expanded the duration of travel time from only peak travel time to an all-day service. Now travel times are displayed on DMS from 5am -11pm on weekdays and 7am – 9pm on weekends. A few of the signs also display travel times for different destinations with changing traffic conditions. All of the signs are capable of displaying dual panel messages.

Freeway Management System Expansion

FMS coverage has been expanded on the Agua Fria Freeway from I-17 to I-10, on I-10 from Chandler Blvd to Wild Horse Pass, and on SR202L Santan from I-10 to Dobson Rd. With completion of these projects, ADOT has about 15 new DMS, 20 CCTV cameras, more than 50 detection stations, and 26 ramp meters. This new addition provides ADOT with more coverage for real time incident monitoring and management.

2.1 FREEWAY MANAGEMENT HIGHLIGHTS

ADOT I-17 Spine ITS Near-Term Improvements

As part of the I-17 Spine Near-Term Improvements (NTI), ADOT explored national best practices and local concepts for improving traffic and congestion management along I-17 between I-10 and SR101L. Regional partners involved in the study included ADOT, MCDOT, AZ DPS, City of Phoenix, MAG and FHWA.

The primary goal of the I-17 Spine study was to improve safety, mobility and reliability of this busy corridor by utilizing ITS technology. The segment of the freeway that was considered lies within developed sections of the City of Phoenix with very limited right of way. The ITS components that were explored included variable speed limit (VSL) signs, dynamic lane control, adaptive ramp metering, wrong way detection and additional associated equipment such as detectors and cameras.

One concept that was explored was the use of lane control displays to support incident and work zone management by providing advanced notification of lane restrictions and facilitating controlled merging accompanied by reduced speed limits. The displays could also support congestion management by implementing dynamic speed limits that are set based on thresholds and with adaptive ramp metering that would help maintain traffic flow below a critical threshold and reduce the likelihood of crashes during peak hours. The study also looked at what improvements could be made to significant arterial routes for the corridor. The arterial components that were explored included those that would support ICM, such as trailblazing/wayfinding signs, arterial DMS, arterial CCTVs, and sensors to support collection of travel times. There was also discussion about development of a decision support system to support operation of new signal timing plans for traffic management.

The Spine study involved discussions with other state DOTs who have deployed advanced traffic management systems, such as active traffic management (ATM), VSL and integrated corridor management (ICM). These discussions helped identify critical lessons learned with respect to the planning, construction, operation and maintenance of these systems and provided ADOT with important insights to consider if they choose to undergo such a project in the future.

Highway Condition Reporting System Upgrade

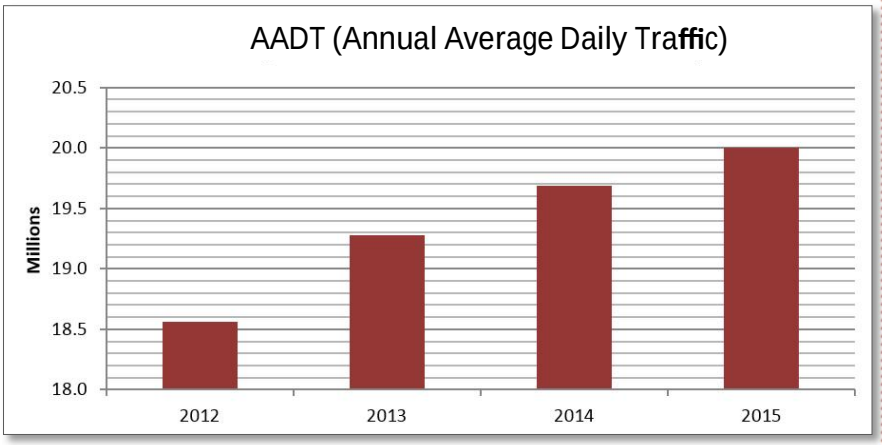
In October 2015 ADOT went through an upgrade of their existing Highway Condition Reporting System (HCRS). The replacement of a 20-year old system enhanced the user functionality and significantly improved application performance. The new system is using a Microsoft SQL platform for the database and is a GIS map-based application. The new system has an integrated reporting and analysis tool for future optimization. The data entry system is also modified to enhance data collection and facilitate the collection of important data for the agency; it is a web browser (IE, Chrome, Firefox) based user interface with NO specialized client software. The overall architecture is compliant with modern IT standards including full redundancy and high availability and disaster recovery for continued operations in the event of an emergency.

ADOT Alternate Route Plans through Phoenix

As an extension of SR101L ICM alternate routing activities through the City of Scottsdale, ADOT has worked with the City of Phoenix to develop arterial alternate routes for the segment of SR101L from Scottsdale Road to 51st Avenue. The detour routes were reviewed by both the Phoenix Police Department and MCDOT REACT teams for geometrics and other concerns if the routes were used for a closer on SR101L. These alternate routes would support freeway detouring through the City of Phoenix along parallel corridors such as Union Hill Drive, Bell Road, and Deer Valley Road depending on the configuration and best possible route to support traffic movement. The goal of ADOT is to provide the alternate routing plans in electronic format for quicker and easier application in real-world incident conditions. It is anticipated that the detour plans will be finalized and available for use in mid-2016.

Freeway Performance Measures

The data source for the freeway performance measures is the Regional Archived Data System (RADS), developed by AZTech. RADS permanently archives operational data produced by the region's ITS systems, including the ADOT freeway traffic detector data and incident information. This source of continuously collected data provides a wealth of information for assessing and monitoring the performance of the freeway system. These freeway performance measures are presented based on the named freeway corridors per commute direction where vehicle detectors are available. The Average Annual Daily Traffic (AADT) has risen 2% to 4% in the past few years in the metro area.



Travel Time Index

Travel Time Index (TTI) is computed by dividing the actual (measured) travel time by the free flow travel time along a corridor of interest. This measure considers the peak-hour periods (6am to 9am and 3pm to 7pm) during Tuesdays, Wednesdays, and Thursdays and measures separately for the general purpose lanes in the inbound (morning) and outbound (evening) directions for freeways where vehicle detectors are available. The table below shows the comparison of Travel Time Indices of named freeways between the years 2012 and 2015. This measure is "normalized" by the free flow travel time and therefore allows comparison of freeway corridors of different lengths.

Pima NB and Pima SB were excluded from 2015 data due to major construction and lack of sufficient data. The results show that the 2015 travel times have increased from the previous year. The increases of travel times range from 1.5% (Black Canyon NB) to 14.9% (Papago WB).

Named Freeway	Inbound 6am-9am							Outbound 3pm-7pm						
	Dir	Lgth	2012 TTI	2013 TTI	2014 TTI	2015 TTI	% Change (from 2014)	Dir	Lgth	2012 TTI	2013 TTI	2014 TTI	2015 TTI	% Change (from 2014)
Black Canyon (I-17)	SB	11.6	1.10	1.16	1.28	1.34	4.7%	NB	10.7	1.19	1.26	1.30	1.32	1.5%
Maricopa (I-10 East)	WB	16.1	1.27	1.31	1.35	1.41	4.4%	EB	15.1	1.32	1.34	1.41	1.52	7.8%
Papago (I-10 West)	EB	14.9	1.30	1.36	1.56	1.74	11.5%	WB	13.5	1.37	1.47	1.54	1.77	14.9%
Piestewa (SR-51)	SB	12.1	1.05	1.09	1.13	1.15	1.8%	NB	13.1	1.06	1.08	1.10	1.16	5.5%
Pima (SR101L North)	EB	13.6	1.19	1.25	1.29	1.33	3.1%	WB	11.8	1.15	1.20	1.29	1.38	7.0%
Pima (SR101L)	NB	15.7	1.15	1.18	1.23	-	-	SB	14.5	1.26	1.26	1.31	-	-
Price (SR101L South)	NB	9.0	1.26	1.29	1.30	1.36	4.6%	SB	9.3	1.32	1.36	1.36	1.48	8.8%
Red Mountain (SR202L North)	WB	9.1	1.24	1.26	1.31	1.33	1.5%	EB	9.6	1.09	1.10	1.12	1.15	2.7%
Superstition (US-60 East)	WB	20.5	1.08	1.10	1.14	1.17	2.6%	EB	19.5	1.06	1.06	1.07	1.10	2.8%

2.2 FREEWAY INDICATORS

Travel Time Buffer Index

Travel Time Buffer Index (TBI) is the percentage of additional time that a traveler needs to plan for, relative to his/her own average travel time, to ensure a 95% chance of on-time arrival. TBI has been widely adopted as a measure for assessing and comparing the travel time reliability between different commute corridors. For example, a TBI value of 0.44 represents that a traveler needs to allocate 44% additional time to his/her average travel time to arrive at the destination on-time 95% of the time. A larger TBI value indicates more variations in day-to-day commute times due to recurring and non-recurring congestion. TBI is calculated as the 95th percentile travel time divided by average travel time minus 1 for each corridor and each direction. The table below shows the comparison of travel time buffer indices during peak periods per named freeway between the years 2012 and 2015.

Named Freeway	Inbound 6am-9am						Outbound 3pm-7pm					
	Dir	2012 TBI	2013 TBI	2014 TBI	2015 TBI	% Change (from 2014)	Dir	2012 TBI	2013 TBI	2014 TBI	2015 TBI	% Change (from 2014)
Black Canyon (I-17)	SB	0.60	0.69	0.73	0.81	11.0%	NB	0.56	0.59	0.64	0.65	1.5%
Maricopa (I-10 East)	WB	0.49	0.50	0.44	0.45	2.2%	EB	0.56	0.49	0.56	0.52	-7.1%
Papago (I-10 West)	EB	0.65	0.69	0.77	0.80	3.9%	WB	0.51	0.63	0.66	0.68	3.0%
Piestewa (SR-51)	SB	0.35	0.44	0.52	0.55	5.8%	NB	0.45	0.52	0.51	0.64	25.5%
Pima (SR101L North)	EB	0.33	0.40	0.41	0.41	0%	WB	0.38	0.42	0.45	0.47	4.4%
Pima (SR101L)	NB	0.30	0.34	0.48	-	-	SB	0.58	0.53	0.60	-	-
Price (SR101L South)	NB	0.52	0.58	0.52	0.58	11.5%	SB	0.53	0.52	0.56	0.45	-19.6%
Red Mountain (SR202L North)	WB	0.57	0.56	0.57	0.57	0%	EB	0.35	0.38	0.44	0.45	2.2%
Superstition (US-60 East)	WB	0.32	0.34	0.37	0.39	5.4%	EB	0.25	0.22	0.23	0.28	21.7%

During the time period from 2014 to 2015, those corridors among the highest increases in the degree of variability (i.e., became less reliable) with respect to commute time include, in order of magnitude, Piestewa NB (25.5%), Superstition EB (21.7%), Price NB (11.5%), and Black Canyon SB (11.0%).

Corridors that experienced improved reliability in commute time include Price SB (-19.6%) and Maricopa EB (-7.1%).

Media and Usage

In 2015, public information officers located at the ADOT TOC issued 421 news releases (an average of 35 per month), with an advertising equivalency value of about $1.75 million. In addition, ADOT hosted media representatives for interviews or traffic coverage more than 25 times during 2015, providing immediate traffic and roadway information to hundreds of thousands of viewers. The partnership with AZ DPS in recent years has helped to bolster the coordination during incidents and provide a consistent message for media.

Percentage of Corridor Miles Congested

Percentage of Corridor Miles (PMC) congested assesses the extent of recurring congestion by identifying the number of miles of a freeway corridor that were congested during the peak periods. A segment of a corridor (corresponding to a detector station) is considered congested when the average vehicle speed drops to 50 miles per hour or less. This measure is useful for monitoring the spatial extent of congestion along a commute corridor. The table below shows the comparison of corridor miles congested by named freeway per commute direction between the years 2012 and 2015.

Named Freeway	Inbound 6am-9am							Outbound 3pm-7pm						
	Dir	Lgth	2012 PMC	2013 PMC	2014 PMC	2015 PMC	% Change (from 2014)	Dir	Lgth	2012 PMC	2013 PMC	2014 PMC	2015 PMC	% Change (from 2014)
Black Canyon (I-17)	SB	11.6	32.82	40.75	43.7	44.85	2.6%	NB	10.7	48.63	54.59	54.84	53.66	-2.2%
Maricopa (I-10 East)	WB	16.1	37.15	38.73	40.76	41.45	1.7%	EB	15.1	35.7	37.53	41.54	44.76	7.8%
Papago (I-10 West)	EB	14.9	40.08	43.92	49.47	53.84	8.8%	WB	13.5	36.97	41.88	43.37	46.48	7.2%
Piestewa (SR-51)	SB	12.1	25.55	26.55	28.16	26.13	-7.2%	NB	13.1	20.17	20.6	19.51	23.33	19.6%
Pima (SR101L North)	EB	13.6	32.88	36.33	39.92	43.61	9.2%	WB	11.8	35.31	41.28	48.91	53.73	9.9%
Pima (SR101L)	NB	15.7	25.45	26.86	33.72	-	-	SB	14.5	39.56	39.16	47.11	-	-
Price (SR101L South)	NB	9	37.47	37.72	38.06	41.94	10.2%	SB	9.3	35.25	38.11	37.46	42.46	13.4%
Red Mountain (SR202L North)	WB	9.1	33.81	36	37.04	36.82	-0.6%	EB	9.6	21.29	21.58	26.58	29.2	9.9%
Superstition (US-60 East)	WB	20.5	16.84	19.22	22.07	21.42	-3.0%	EB	19.5	11.88	10.74	11.19	12.58	12.4%

Percentage of Time Congested

Percentage of Time Congested (PTC) represents the percentage of time a corridor is considered congested during the peak periods . Congestion is defined as when the average speed drops to 50 miles per hour or less. Along with the "percentage of corridor miles congested", it depicts the extent of congestion both in space and time. The table below shows the comparison of percentage of time congested by named freeway per commute direction between the years of 2012 and 2015.

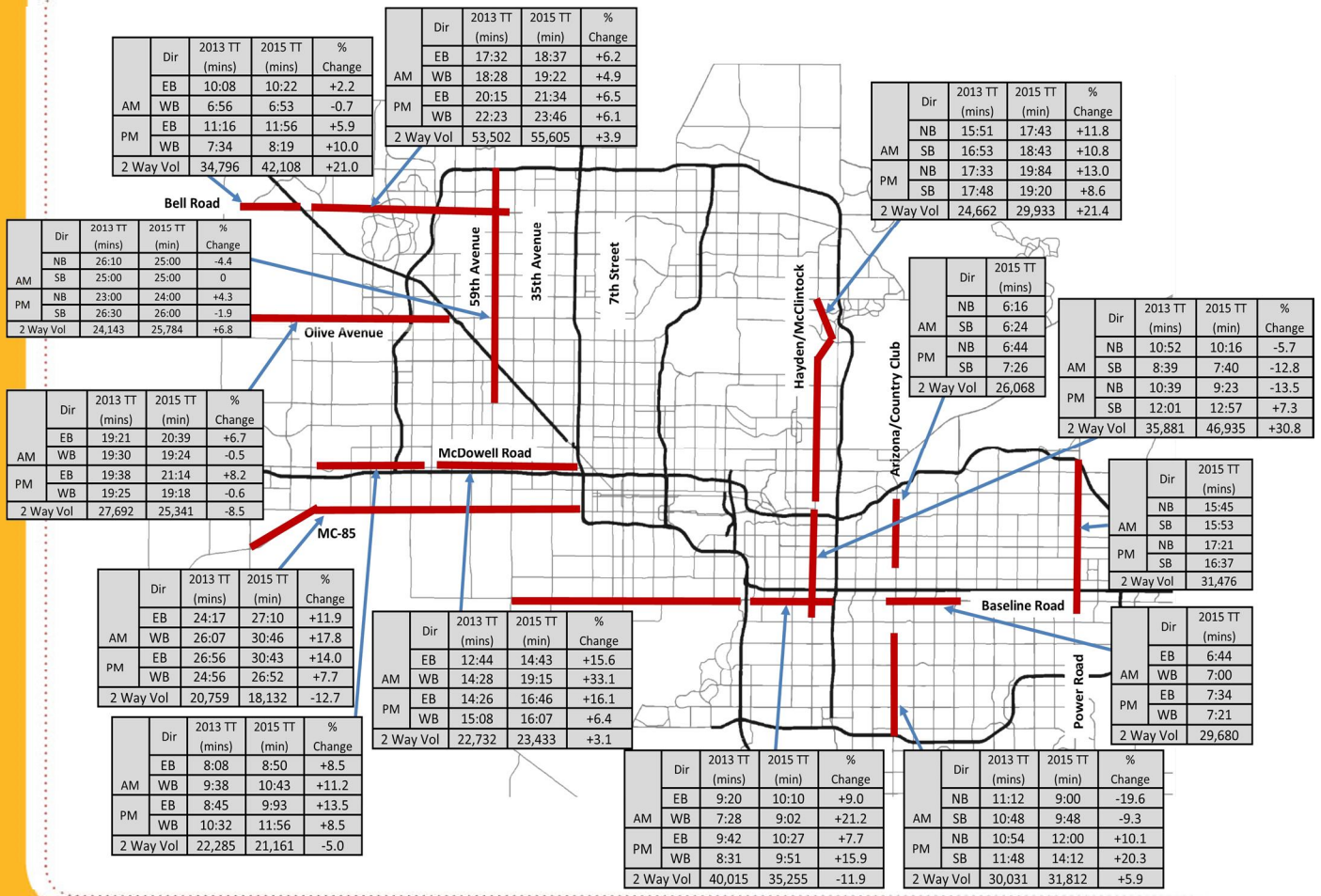
Named Freeway	Inbound 6am-9am							Outbound 3pm-7pm						
	Dir	Length	2012 PTC	2013 PTC	2014 PTC	2015 PTC	% Change (from 2014)	Dir	Length	2012 PTC	2013 PTC	2014 PTC	2015 PTC	% Change (from 2014)
Black Canyon (I-17)	SB	11.6	24.5	33.1	37.1	38.9	4.9%	NB	10.7	36.5	42.8	42.6	43.1	1.2%
Maricopa (I-10 East)	WB	16.1	30.5	32.2	34.3	37.1	8.2%	EB	15.1	32.5	35	39.3	44.4	13.0%
Papago (I-10 West)	EB	14.9	32.2	36.7	41.9	47.6	13.6%	WB	13.5	29.7	35.2	38.6	43.8	13.5%
Piestewa (SR-51)	SB	12.1	16.8	18.8	21.1	20.3	-3.8%	NB	13.1	10.3	13	15.5	20.0	29.0%
Pima (SR101L North)	EB	13.6	25.5	31.6	36.0	41.9	16.4%	WB	11.8	20.1	27.7	37.8	47.2	24.9%
Pima (SR101L)	NB	15.7	18.6	20.8	28.4	-	-	SB	14.5	29.7	31.3	40.6	-	-
Price (SR101L South)	NB	9	30.9	32.2	30.5	35.5	16.4%	SB	9.3	36.1	40	39.4	48.0	21.8%
Red Mountain (SR202L North)	WB	9.1	25.2	26.8	28.2	28.0	-0.7%	EB	9.6	8.1	9.9	12.7	15.7	23.6%
Superstition (US-60 East)	WB	20.5	11.4	13.8	16.1	17.2	6.8%	EB	19.5	4.7	4.9	4.7	9.7	106.4%

Arterial ITS Infrastructure

The Phoenix Metropolitan Area has been one of the fastest growing regions in the nation over the past two decades. There are 13 traffic management centers in the region. The arterial traffic management infrastructure in the region includes approximately 3,300 signals operated by 13 different agencies, 86% of which are connected to a centralized signal system. 83 DMS and 1,089 CCTV cameras support arterial real-time traffic management. See Page 3 for more detail of arterial infrastructure by agency.

Corridor Travel Times

Arterial data collection corridors have been identified to facilitate consistency in measuring and reporting the operational performance each year in collaboration with AZTech partner agencies. Travel time data for AM and PM peak hours is collected and percentage change in travel time is reported, as shown in the graphic below. The percent change in travel time from 2013 to 2015 was calculated where information was available. Positive percent changes indicate an increase in travel time and negative percent changes indicate a reduction in travel time. Overall, there has been an increase in travel time on arterial data collection corridors since 2012. There has also been an average increase in arterial volumes of 3.2% over the region.



	Dir	2013 TT (mins)	2015 TT (mins)	% Change
AM	EB	10:08	10:22	+2.2
	WB	6:56	6:53	-0.7
PM	EB	11:16	11:56	+5.9
	WB	7:34	8:19	+10.0
2 Way Vol		34,796	42,108	+21.0

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	EB	17:32	18:37	+6.2
	WB	18:28	19:22	+4.9
PM	EB	20:15	21:34	+6.5
	WB	22:23	23:46	+6.1
2 Way Vol		53,502	55,605	+3.9

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	NB	15:51	17:43	+11.8
	SB	16:53	18:43	+10.8
PM	NB	17:33	19:84	+13.0
	SB	17:48	19:20	+8.6
2 Way Vol		24,662	29,933	+21.4

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	NB	26:10	25:00	-4.4
	SB	25:00	25:00	0
PM	NB	23:00	24:00	+4.3
	SB	26:30	26:00	-1.9
2 Way Vol		24,143	25,784	+6.8

	Dir	2015 TT (mins)
AM	NB	6:16
	SB	6:24
PM	NB	6:44
	SB	7:26
2 Way Vol		26,068

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	NB	10:52	10:16	-5.7
	SB	8:39	7:40	-12.8
PM	NB	10:39	9:23	-13.5
	SB	12:01	12:57	+7.3
2 Way Vol		35,881	46,935	+30.8

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	EB	19:21	20:39	+6.7
	WB	19:30	19:24	-0.5
PM	EB	19:38	21:14	+8.2
	WB	19:25	19:18	-0.6
2 Way Vol		27,692	25,341	-8.5

	Dir	2015 TT (mins)
AM	NB	15:45
	SB	15:53
PM	NB	17:21
	SB	16:37
2 Way Vol		31,476

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	EB	24:17	27:10	+11.9
	WB	26:07	30:46	+17.8
PM	EB	26:56	30:43	+14.0
	WB	24:56	26:52	+7.7
2 Way Vol		20,759	18,132	-12.7

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	EB	12:44	14:43	+15.6
	WB	14:28	19:15	+33.1
PM	EB	14:26	16:46	+16.1
	WB	15:08	16:07	+6.4
2 Way Vol		22,732	23,433	+3.1

	Dir	2015 TT (mins)
AM	EB	6:44
	WB	7:00
PM	EB	7:34
	WB	7:21
2 Way Vol		29,680

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	EB	8:08	8:50	+8.5
	WB	9:38	10:43	+11.2
PM	EB	8:45	9:93	+13.5
	WB	10:32	11:56	+8.5
2 Way Vol		22,285	21,161	-5.0

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	EB	9:20	10:10	+9.0
	WB	7:28	9:02	+21.2
PM	EB	9:42	10:27	+7.7
	WB	8:31	9:51	+15.9
2 Way Vol		40,015	35,255	-11.9

	Dir	2013 TT (mins)	2015 TT (min)	% Change
AM	NB	11:12	9:00	-19.6
	SB	10:48	9:48	-9.3
PM	NB	10:54	12:00	+10.1
	SB	11:48	14:12	+20.3
2 Way Vol		30,031	31,812	+5.9

Peoria is Getting Great Use from Latest Technologies Available

The City of Peoria has been active in deploying new technologies and systems to gain a better understanding of conditions on their transportation network.

Although other agencies have completed tests on the technology, Peoria is the first to implement WiFi detectors (versus Bluetooth) in the metro area for the purpose of collecting travel times. WiFi detectors have been put in place along Thunderbird Road and work by collecting an anonymous ID from a passing vehicle to detect the presence of that vehicle at that time. This application provides the travel time it takes the vehicle to get from one WiFi detector location to another. Based on preliminary results from the use of this technology on Thunderbird Road, there are plans to expand the use of this technology to other high profile corridors in the City.

As part of efforts to continuously enhance the traveler experience along Bell Road, the most congested and heavily traveled arterial corridor in the state, Peoria is now posting travel times on their two DMS along Bell Road. Travel times are calculated by third party data and posted during peak periods, with plans to expand the display times. The eastbound sign provides travel times to SR101L/I-17 and SR101L/I-10 destinations and the westbound sign provides travel times to Bell Road/99th Avenue and Bell Road/Grand Avenue.

Peoria is also expanding their use of the Aldis Gridsmart video detection system, which is a 360 degree high-resolution camera, to replace loop detectors and older video detection systems that are costly to repair and not reliable anymore. The Gridsmart system also provides 24/7 turning movement counts. Turning movement counts are typically collected through a separate effort and evaluate how an intersection's signal timing plans are performing relative to the activity at the intersection. The fact that the Gridsmart camera can collect this information reduces the cost and resources necessary to complete that activity separately.

Surprise Completed Traffic Signal and ITS Projects

The City of Surprise completed a TSOP project along Bell Road between SR303 and Grand Avenue in 2015. This TSOP project provided time-of-day signal timing plans for the weekday AM, midday and PM traffic peak traffic conditions. TSOP projects are implemented around the Valley every year and help agencies to keep their major arterial corridor signal timing plans reflective of the traffic, bicycle, and pedestrian activity that uses the corridor. A fiber project was completed along SR303 in 2014 that connected the five interchanges back to the Surprise Traffic Operations Center. CCTV cameras were also installed at each of the five interchanges providing observation capabilities along those key access points to the City.

Tempe Expands Special Event Management

The City of Tempe Transportation Systems Management group began working with the Tempe and ASU Police Departments in the fall of 2014 to provide special event traffic signal management, staffing the TMC during ASU football games to manage special event traffic flows. This effort began with managing signal timing at five intersections along McClintock Drive, and based on the success of this partnership, coverage was expanded to 25 signals for the 2015 football season, as critical intersections along Rural Road and University Blvd were added. This special event management partnership has demonstrated significant improvements in clearing egress traffic more efficiently while also freeing up uniformed officers to focus more on pedestrian traffic and overall public safety.

3.1 ARTERIAL PARTNER AGENCY HIGHLIGHTS

Gilbert Completes Major Upgrades to Infrastructure and Central System

In 2015, Gilbert upgraded controllers at all signalized intersections to ASC/3, which support additional functionality and performance measurement via the Centracs central monitoring system that was implemented in 2014.

Two projects are under design to install pedestrian hybrid beacons (HAWK's) at five trail or school crossings of arterial streets. The projects are federally-funded and led by the Arizona Department of Transportation. Construction is planned for summer of 2016.

Gilbert replaced an in-pavement warning system with median refuge and rectangular rapid flashing beacons (RRFB's) at a popular trail crossing on Recker Road. The beacons are pedestrian safety warning devices to alert drivers of pedestrians intending to cross Recker Road. The new beacons were also installed at Cullumber Avenue and Bruce Avenue for crossing Gilbert Road and are part of a Town project to improve pedestrian infrastructure in downtown Gilbert. Studies have found that RRFB's have been able to improve the rate at which drivers yield to pedestrians in the crosswalk from 10-20% to 70-85%.

The City's Transportation Master Plan, adopted in late 2014, included a Prioritization Matrix that was applied for the first time within the Capital Improvement Plan development process.

Avondale is Expanding Fiber Communications Around the City

The City of Avondale was busy in 2014 completing numerous fiber installation projects to for better operations and management of Avondale's roads. The first project in 2014 was a City-funded fiber installation project that connected Avondale City Hall to the Avondale Sports Complex. This included connections to the traffic signals at Coldwater Springs Boulevard, Van Buren Street, City Center, Roosevelt Street, I-10 and McDowell Rd intersections along Avondale Boulevard. The second project was Avondale's first Federally funded ITS project along McDowell Road. The project started at 99th Avenue and connected signals west to Avondale Boulevard. In early 2016, Avondale will be pursuing another fiber installation along Dysart Road from I-10 to Indian School, which will connect to seven more signals. The two projects in 2014 connected 11 traffic signals, and with the additional signals being connected in 2016, these Avondale is well positioned to begin having full operational capability to manage traffic in the City.

Tempe Upgrades TMC Video Management System

In February of 2015, the City of Tempe installed the Replicam video management system in its TMC to manage its growing inventory of CCTV cameras. Replicam offers a host of improvements and efficiencies over the City's previous analog system and greatly increases the number of video sources that can be managed and displayed on the TMC's video wall. In addition to a modern interface and enhanced source management, users are able to access the system from local and remote workstations, providing support for multiple groups within the Transportation Division, including traffic engineering, transit and barricading, to more effectively manage the City's infrastructure.

Flashing Yellow Left Turn Arrows

These types of arrows are a recommended tool for public agencies to improve the safety of left-turn movements and reduce delay at signalized intersections. Agencies in the Valley are introducing these new types of arrows to travelers through initial deployments and online education. Current installations are listed to the right. Additional installations are anticipated to occur in the coming years as safety and delay benefits are realized.

Jurisdiction	2013	2015
Gilbert	2	6
Glendale	0	2
Mesa	14	28
Peoria	8	13
Chandler	9	12
Scottsdale	10	7

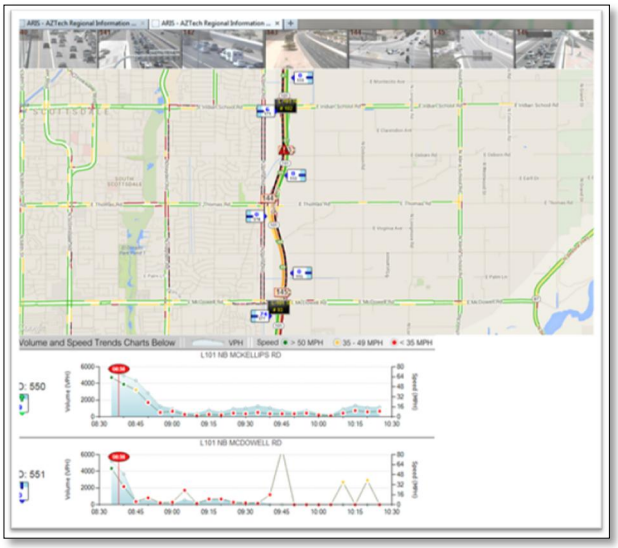
East Valley Agencies Moving Forward With Travel Time Technology

The City of Mesa installed 82 Bluetooth devices focused in the west Mesa area. Bluetooth devices will be installed in approximately one-mile increments in existing traffic signal control cabinets. They will allow Mesa to gather travel times and ultimately disseminate them to the public via website or other service. Data is being gathered anonymously and being used in aggregate.

Arterial travel times will expand to additional corridors throughout the region. An extension to the Mesa Bluetooth project will be a partnership between the City of Mesa, the Town of Gilbert, and the City of Tempe to deploy additional sensors for broad East Valley coverage. The travel time data will be reported to a regional website that broadcast traveler information. Arterial travel times are also being planned for the Southwest Valley along McDowell Road and MC-85.

AZTech Regional Information System

The AZTech Regional Information System (ARIS) is a regional ITS tool that provides real-time incident notification and intelligently assimilates incident-centric traffic information to support traffic management during an incident. The ARIS system has been designed based on the needs of local jurisdictions who demand timely notification of incidents as they occur in their respective jurisdiction. In addition, upon notification, ARIS automatically assimilates a range of useful information related to the particular incident and presents the information in a web-based "tactical screen" including:



- A map identifying the incident location, speed (and trend) of the nearby freeway traffic detector stations, DMS, and CCTV cameras;
- Snap shot images of CCTV cameras around the incident location;
- Messages currently displayed on the DMS; and
- Charts (histogram) of nearby freeway detector stations showing both the speed and volume distributions since the time of incident.

The ARIS incident monitoring web portal provides a summary of on-going incidents in a selected jurisdiction/zone and generates a tactical view of each incident. The tactical view contains integrated information including: a live traffic map, CCTV images, dynamic detector station speed-volume graphs, and Dynamic Message Sign content. To ensure timely notification of incidents, the ARIS incident notification feature allows a registered user to receive incident notification via e-mail and mobile phone text message service.

Since its debut in April 2014, ARIS has proven to be an effective tool for incident management involving multiple regional agencies. A total of 35 clients, representing more than ten agencies and organizations, are currently registered to receive real-time notifications. Since its deployment, ARIS has generated over 900 notifications per day to its 35 registered users. These represent an average of 18 closures, 200 lane restrictions, and 60 maintenance events on a typical day. A recent upgrade improved the usefulness of notification emails to display pertinent incident information without needing to click into the system as well as improvements to the web interface. ARIS was recognized by the Institute of Transportation Engineers (ITE) Transportation System Management and Operations Council with an Achievement Award.

3.1 ARTERIAL PARTNER AGENCY HIGHLIGHTS

Mesa Quarterly Performance Measures

The City of Mesa tracks the performance measures on a quarterly basis to observe trends. The following performance measures were reported on in 2015.

Goal	FY2014-15 Q3 Jan to Mar 2015	FY2014-15 Q4 Apr to Jun 2015	FY2014-15 Q1 Jul to Sep 2015	FY2014-15 Q2 Oct to Dec 2015
Percentage of Signalized Intersections Receiving Preventative Maintenance Annually (Goal: 100% at end of fiscal year)	79%	100%	21%	57%
Number of signalized intersections audited for timing quarterly. (Goal: 50 per quarter)	52	50	50	50
Percentage of high priority traffic signal trouble calls responded to within an hour. (Goal: 90% within an hour)	100%	98.5%	95.5%	100%

Scottsdale Completes Travel Time Study Using Bluetooth Technology

Vantage Velocity Bluetooth technology has been used at four intersections along Shea Boulevard from 90th Street to Via Linda to measure travel times. Sensors pick up Bluetooth signals and automatically calculate travel times along the corridor from one sensor to the next. Outcomes of the travel time study included the following:

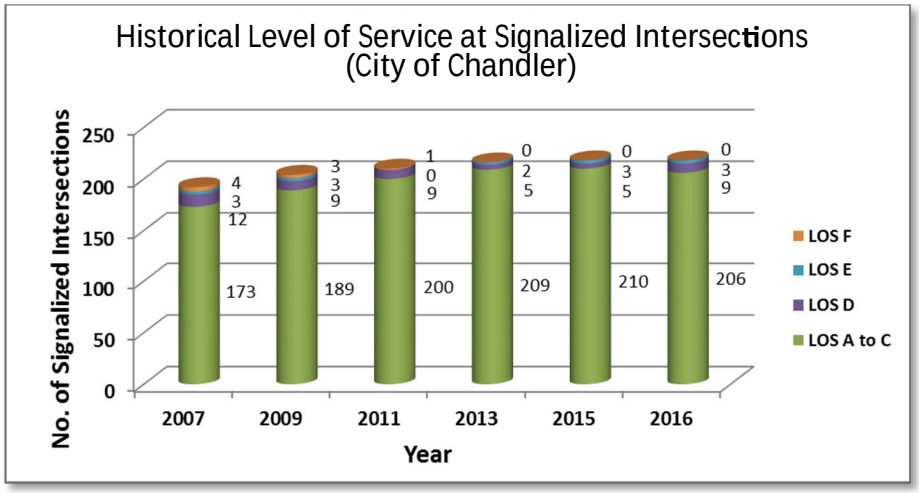
- 92nd Street to 90th Street westbound towards SR101L is heavily congested and the travel speed is an average of 8-11 mile per hour specially during lunch hours 11am to 1 pm.
- The eastbound is a bit faster but not much averaging about 16 miles per hour.

From the findings, Scottsdale TMC personnel have implemented a longer cycle during the lunch time (mid-day traffic signal timing plans) that is helping to clear up congestion and improve travel speed, which in turn improves travel times along the corridor. The system will continue to be used along the corridor to monitor conditions and make adjustments necessary to signal timing to improve conditions.

Chandler Completes Major Upgrades Throughout City

Over the past several years, City of Chandler has upgraded their ITS network by adding 9.5 miles of fiber, replacing central system software and controller firmware, and upgrading field switches. With the upgraded infrastructure, the city is able to reconfigure their traffic network to improve reliability, security and connections. Now the city traffic network covers 96% of signalized intersections with a total of 90 miles of fiber. TMC staff is able to view live video from 146 signalized intersections and 29 PTZ cameras.

In 2015, the Chandler TMC retimed 82 signalized intersections with four timing plans per intersection and conducted 40 temporary timing changes at 40 intersections in response to construction or special events. The number of signalized intersections with Level of Service E or worse has been consistently low.



Scottsdale Traffic Management Center More Efficient After Move

The City of Scottsdale Traffic Management Center (TMC) moved to a new space in early 2014. The TMC is now in a larger space with more offices and a larger video wall to be able to manage their transportation network. Media covered a story about the TMC in April 2014. The City has 96 traffic signal timing patterns to control traffic signals—only four are used on a daily basis, the other 92 are for use during incident and special events that require different legs of an intersection to flow more freely than others. The TMC moved from downtown in late February and runs far more efficiently.

Arizona Connected Vehicles and the MCDOT SMART*Drive* Program℠

Through a federal initiative called "Connected Vehicles", the U.S. Department of Transportation (USDOT) is working to leverage ITS technology to improve public safety and surface transportation mobility. The Arizona Connected Vehicles Initiative involves a partnership between MCDOT and ADOT, the FHWA and the University of Arizona. These partners are continuing to move this initiative forward to develop and demonstrate advanced ITS applications that integrate vehicles with Systematically Managed ARTerial (SMART) roadway systems in Maricopa County. MCDOT continues to field test applications on Daisy Mountain Drive in Anthem, Arizona to demonstrate capabilities, evaluate benefits, and provide a test bed for future SMART*Drive* applications.

ARIZONA CONNECTED VEHICLES
Maricopa County Deployment

By 2015, the Program has expanded to include:

MCDOT SMARTDrive Program℠

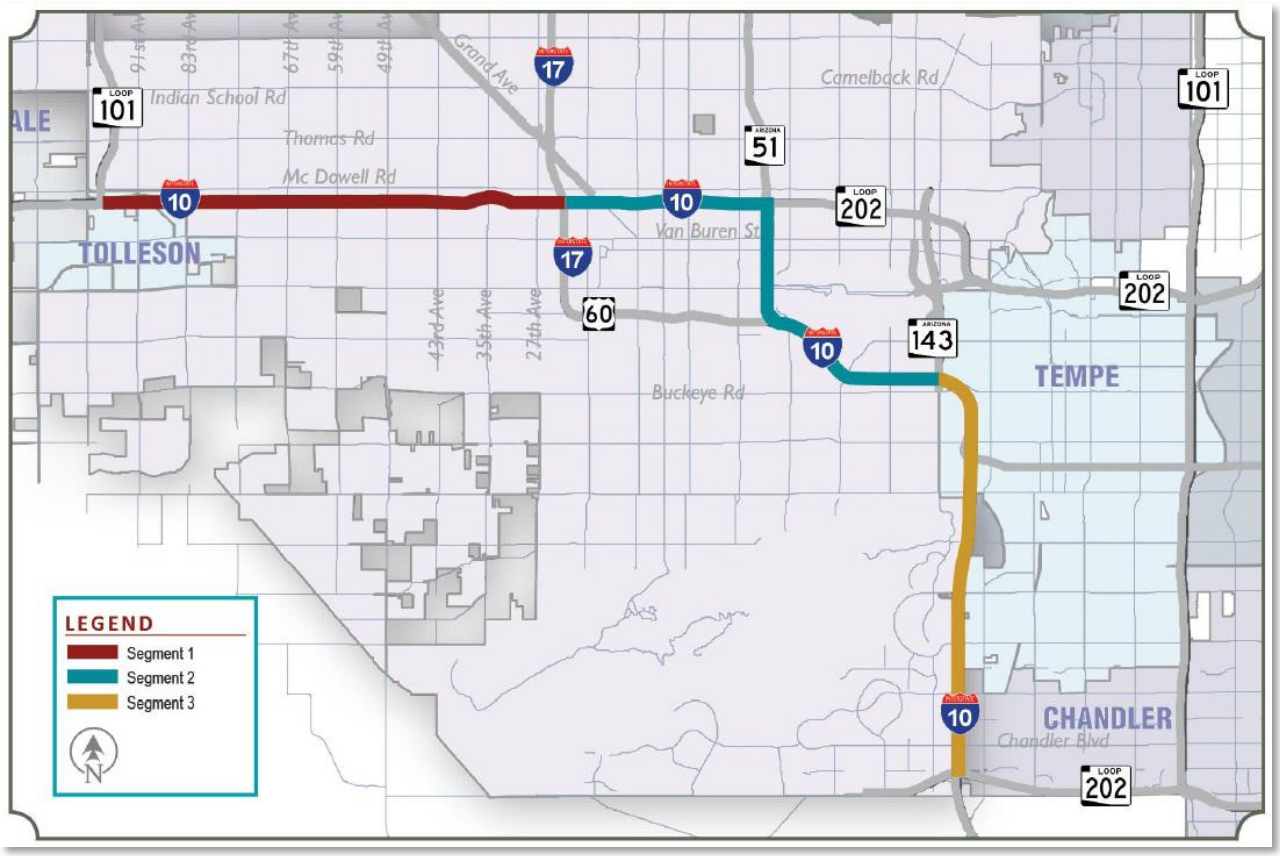
- Five more signalized intersections equipped with Dedicated Short-Range Communications (DSRC) Radios, WiFi and Bluetooth readers—bringing total to eleven signalized intersections connected
- I-17 freeway interchange traffic signals at two locations including freeway fiber communications backhaul to the MCDOT TMC via RCN connectivity

The test bed in Anthem will continue to be expanded in the upcoming years and will be demonstrated to key members of national committees and programs. The MCDOT SMART*Drive* Test bed will continue to focus on traffic signal operations safety and mobility applications.

MAG Integrated Corridor Management Planning

MAG applied for and received a Integrated Corridor Management (ICM) Deployment Planning Grant from the FHWA to develop an ICM Concept of Operations (ConOps) for the I-10 corridor between the SR101L in the west valley to the SR202L in the east. The project will accelerate key steps towards broader implementation of ICM strategies on the I-10 corridor with a focus on coordinating operations and traffic incident management. MAG is the lead agency on the project, but the project involves significant participation from operations and incident management agencies within the corridor, including City of Phoenix, City of Tempe, City of Chandler, MCDOT, DPS, and Valley Metro.

The first phase of the project was completed in 2015 and involved the development of a Project Management Plan (PMP) and Systems Engineering Management Plan (SEMP). These two documents are foundational for system and project management and will guide the later project activities, which include the development of a formal ICM ConOps, System Requirements (SyRS), and an Analysis, Modeling and Simulation (AMS) Plan for an ICM solution in the I-10 study area. It is intended that, based on the results and outputs of this grant, there will be a subsequent effort to identify funding and move forward with design and implementation of the proposed ICM project for the I-10 study area.



SR101L ICM Program Fully Operational

The ADOT Traffic Operations Center (TOC), Department of Public Safety (DPS), MCDOT TMC, Scottsdale Traffic Management Center, Arizona Local Emergency Response Team (ALERT), REACT, Salt River Pima Maricopa Indian Community and MAG jointly developed an ICM Program for the SR101L corridor in Scottsdale. The plan is in full operation and has assisted agencies in managing non-recurring congestion events as well as construction detours of the SR101L widening/HOV lane project. The ICM plan includes traffic management protocols between operating and responding agencies involved in freeway detour of traffic and specific alternate routing options through the arterial network of the City of Scottsdale. This plan uses a strategic combination of Scottsdale arterial signal and infrastructure control, ADOT freeway DMS messaging, ALERT freeway traffic control support, REACT arterial traffic control support and other responding services. New plans are being developed in 2016 for SR101L through Phoenix and through the West Valley cities.

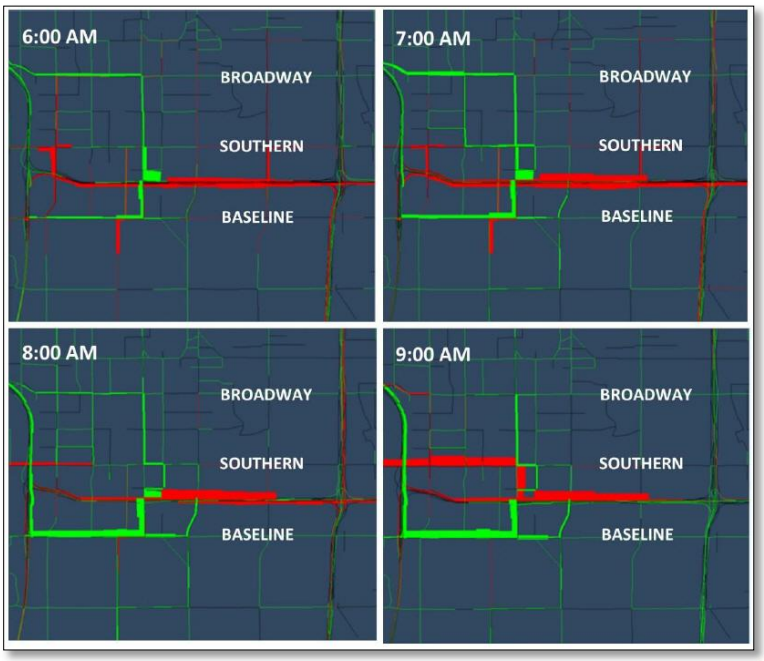
Arterial Signal Timing Plans Developed for Major Freeway Closures

I-10 in Phoenix

After five years of working with MAG and partner agencies, including ADOT and MCDOT, the City of Phoenix will complete the design for the I-10 closure diversion routing in early 2016 and will be prepared to implement the signal plans for the 12 scenarios developed. Formal agreements between MCDOT and ADOT and between ADOT and the City of Phoenix are complete. An agreement between MCDOT and the City of Phoenix is in development to allow MCDOT to provide after-hours support during events when vehicles are detoured onto Phoenix arterials. This will allow MCDOT and REACT to implement pre-approved timing plans from the MCDOT TMC to the Phoenix signal system.

US-60 in Tempe

The US-60 Superstition Freeway is a vital east-west corridor that provides access to the City of Tempe and the East Valley. Traffic incidents, especially those resulting in a complete directional closure of the US-60 can disrupt traffic flow on the freeway as well as on adjacent surface streets that receive detour traffic. There are two parallel arterials that are impacted by such events on US-60 – Baseline Road, south of US-60, and Southern Avenue, north of US-60. Either arterial may be used as a "bypass corridor" when there is heavy traffic congestion on US-60.



The project assisted the City in developing an incident diversion strategy and signal timing plans for Baseline Road and Southern Avenue. Two freeway closure locations, one in each peak period direction, were chosen for the analysis. The MAG DynusT model was used to identify the appropriate detour paths and relative magnitude of diversion in the two diversion scenarios. This helped guide the development of reassigned traffic volumes for Synchro timing plans along the detour routes.

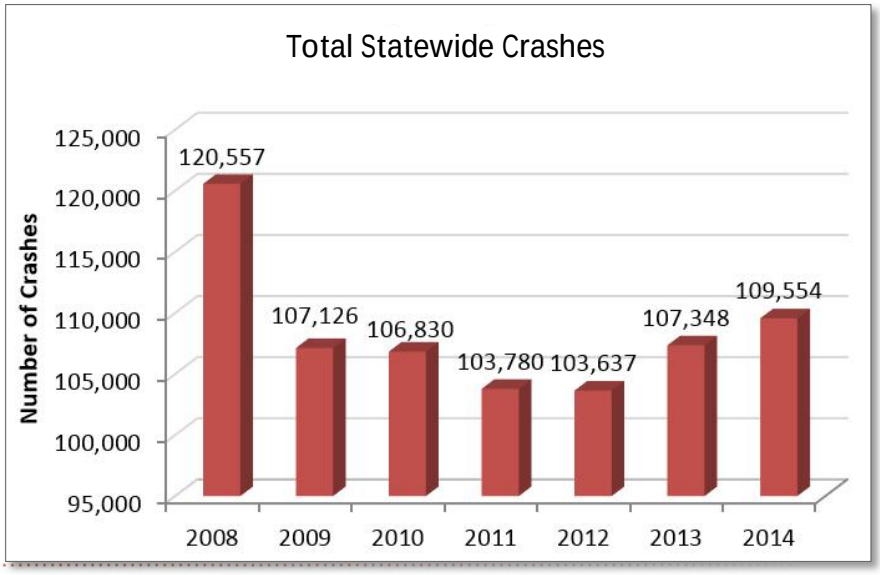
Arizona Holds Regional Traffic Incident Management Summit

Multidisciplinary leaders engaged in Traffic Incident Management (TIM) talked about ways to strengthen collaboration in the Southwest at a summit on December 9—10, 2015 in Phoenix, Arizona. Discussions included linking traffic incident management with safety, training, policies, procedures, performance measures, local challenges and the future of traffic incident management. ADOT, AZ DPS and MCDOT hosted the summit in partnership with the Arizona Council for Transportation Innovation, National Operations Center of Excellence and FHWA.

Led by the DPS, the AZTech TIM Coalition was established in 2010 as a multi-disciplinary traffic incident management partnership including state and local police, fire agencies, state and local transportation agencies, metropolitan planning offices and towing companies in the Phoenix metropolitan region. The purpose of the TIM Coalition is to share ideas, lessons learned, best practices and knowledge to foster regional incident management.

www.aztech.org/TIM

In October 2010, DPS began collecting key data elements to measure TIM performance. DPS found positive results related to the time for clearing blockages and removing incidents from the roadway. The TIM Coalition has partnered with DPS in providing incident management training courses to all first responders throughout the State.



Total Crashes

The ADOT Motor Vehicle Division (MVD) tracks crash rates on a yearly basis and publishes this information within the annual Arizona Crash Facts report. Since 2012 the annual crash rates have increased statewide by almost 6%.

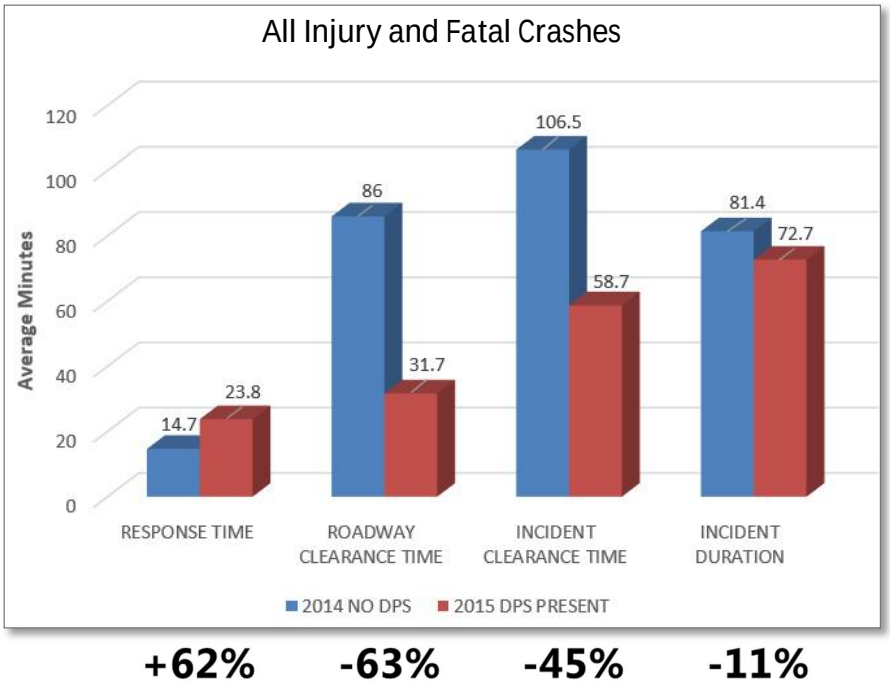
First Year Evaluation Results from the Co-location of DPS Officers at the ADOT TOC

The average time taken to clear crash sites on Maricopa County freeways has been reduced by nearly an hour over the past year, even as the region experiences more crashes. The dramatic reduction in clearance times is attributed to a decision to locate DPS troopers at the ADOT TOC.

Placing DPS troopers at the TOC began in October 2014 as a result of a collaborative effort among ADOT, DPS, FHWA, and MAG. MAG and ADOT are jointly funding a three-year pilot project to locate troopers at the TOC. The TOC uses information from a variety of sources to monitor traffic flow, including more than 200 traffic cameras along the freeway system.

The three year pilot project began with three months of staff training, which became fully operational in January 2015. All crash clearance data is gathered using the DPS electronic reporting system, TraCS. Evaluation of the program's first year compared performance data from January through September of 2014 with data from 2015. The results provided in the graph show that roadway clearance time was reduced by 54 minutes and incident duration as a whole was reduced by 9 minutes. Despite a 23% increase in the number of freeway crashes, the time to clear crashes was reduced by an average of 63%. Each valuable minute saved results in quantifiable savings as reported using the MAG modeling program DynusT (the Regional Traffic Simulation Model) as follows:

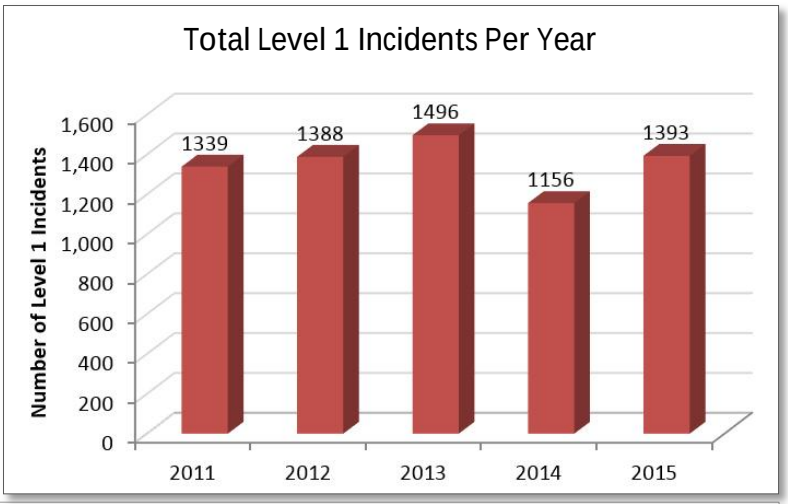
- Traffic delay experienced by travelers in 2015 was reduced by nearly 8.4 million vehicle-hours (during incidents)
- Equivalent to $165 million in savings
- Does not include potential savings from secondary crashes reduced
- Benefit : Cost for DPS at the TOC Pilot Program in Year 1 = 368 : 1



5.2 INCIDENT MANAGEMENT INDICATORS

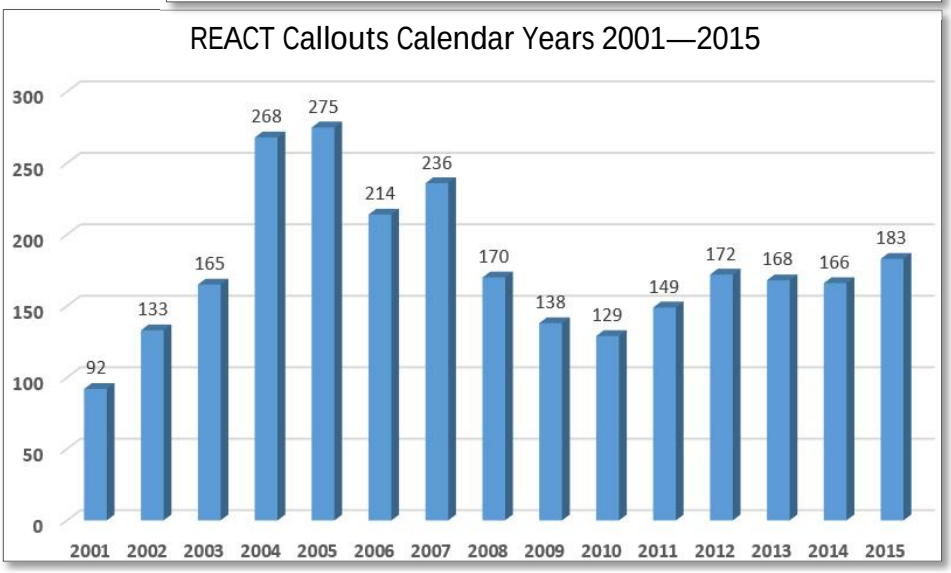
ADOT Level 1 Incidents

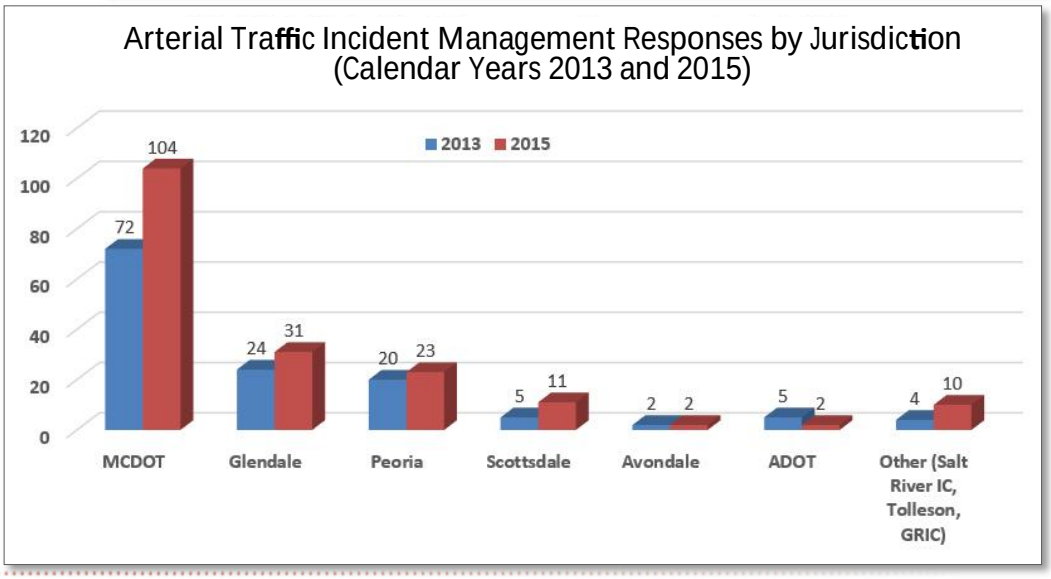
Level 1 incidents are termed "unplanned events" and include events such as a full closure that occurs in one or more directions of travel, a fatality, an event involving Hazardous Materials (HAZMAT), a school bus crash resulting in one or more injured children, or an incident involving an ADOT employee resulting in an injury or fatality.



REACT

The MCDOT Regional Emergency Action Coordinating Team (REACT) is the region's arterial incident response team. Besides responding to incidents on MCDOT roads, the team also responds to arterial incidents in six other jurisdictions through established Inter-Governmental Agreements (IGA). REACT continues to play a larger role in arterial traffic incident management in the region as seen by the number of responses by jurisdiction and callouts by year. In 2014 and 2015, REACT continued to exceed their goal of responding to 99% of incident calls within 30 minutes for a distance 20 miles or less.





SECTION 6 TRAVELER INFORMATION

2015 Media and Transportation Forum

AZTech hosted the 2015 Media and Transportation Forum on September 10th, 2015. This forum drew an outstanding cross-section of attendees from local media outlets, state and local agencies, and law enforcement. There was strong support from the Executive levels at FHWA, ADOT, Arizona DPS, and MCDOT. Several agencies had public information officers in attendance, and local media representatives included traffic reporters and station producers. In all, there were more than 100 attendees. The 2015 forum saw a focus on distracted driving, the need to reduce distractions for drivers and the importance of social media for traffic alerts. Media partners appreciate how agencies have embraced tools like Twitter for issuing notices about incidents and crashes; transportation agencies recognize the value and reach of media in helping to re-Tweet important agency alerts. Media partners also noted the value of the visual image and would like to receive more information, including CCTV screen shots, on arterial road conditions. It was agreed that a collaborative effort is needed in the future to educate the public on new initiatives such as ATM and ICM and how agencies are using these new tools to improve safety and mobility on the region's transportation network.

511 Phone System Upgraded

In 2014, ADOT upgraded its 511 information phone line to allow more callers to receive emergency information simultaneously. Before the upgrade, ADOT had a maximum of 96 available phone lines for callers to get information about emergency road conditions. Through an arrangement with CenturyLink, ADOT now has access to a cache of phone lines whenever they are needed, ensuring that all callers get the recorded information they need when demand is heavy. That was proven successful in September 2014 when a huge storm dumped inches of rain on the Phoenix metropolitan area, resulting in flooding. During that crisis, no callers were dropped and everyone who called 511 found the roadway information they needed.

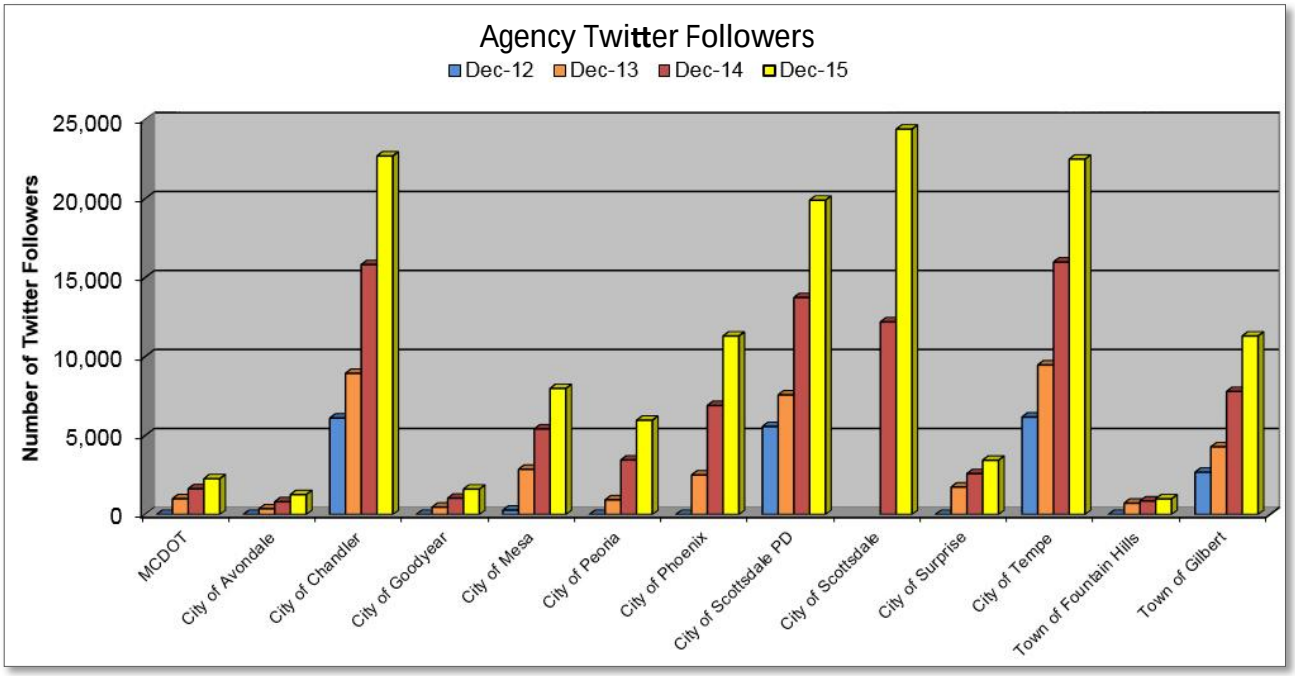
6.1 NOTIFICATION OF TRAVELER INFORMATION

Social Media Notifications

Transportation Departments and Public Safety Departments are using more email alerts and various social media outlets to get traveler information out to the public. Looking specifically at Twitter usage, both the number of Twitter postings rising on a week-to-week basis and the number of Twitter followers are concurrently rising. Just since January of 2012, the number of Twitter followers on the accounts listed in the table below have risen almost 40%. Twitter follows in the region have increased 120% per year since 2013.

Since 2012, ADOT public information officers located at the TOC have communicated daily with the media and the public via Twitter (@ArizonaDOT). The Twitter account, active 20 hours per day, every day, allows ADOT to have immediate communications to the media and the public about such issues as road closures, crashes and recommended alternate routes. During 2015:

- » ADOT increased the number of followers by about 80 percent, from about 50,000 at the beginning of the year to more than 90,000; this is equivalent to more than 111 new followers per day. As of Feb. 24, 2016, @ArizonaDOT had 99,343 followers, which is an increase of 85,000 (542 percent) since September 2012. ADOT has more than four times the number of followers (not shown in the graph below) than any other agency in the region. ADOT has the second-largest number of followers among state DOTs with single Twitter accounts, behind Washington state.
- » ADOT tweets were viewed more than 109.2 million times either directly by ADOT followers or by those who received retweets of ADOT messages. That averages 9.1 million impressions per month or 1,100 views per follower, which is 17 times larger than the population of Arizona.
- » Twitter users made 914,000 visits to the @ArizonaDOT home page, an average of 76,225 per month.
- » ADOT was mentioned in others' tweets 24,605 times, about 2,050 per month.
- » ADOT distributed 25,512 tweets in 2015, about 2,126 per month.



SECTION 7 SPECIAL EVENT MANAGEMENT

2015 Super Bowl Was a Success

The planning and execution of traffic operations for the Super Bowl was a major success with respect to regional operations and collaboration between agencies. With multiple agencies involved in events during the week prior to the game, planning and real-time execution of Super Bowl traffic management required coordination and cooperation led by the City of Glendale in partnership with ADOT, MCDOT, and the City of Phoenix. The event spurred the need to develop improved coordination processes to provide safe and efficient travel for visitors and residents during the event. Agencies also collaborated on video sharing capabilities through the MAG Regional Community Network (RCN) system to provide national security and NFL stakeholders with the ability to monitor key areas in real-time.

ADOT TOC personnel were at the Glendale TMC to help manage the Loop 101 and I-10 freeways with their freeway DMS messages and as well as with directing and re-directing traffic to appropriate exits on the Loop 101. ADOT helped identify appropriate and best routes for the teams to get to the stadium. ADOT ALERT and DPS were also on site to help with any traffic diversion needed and to clear incidents on the freeway. MCDOT REACT was on-site to help with any necessary re-directing of traffic on the surface streets and implement closures as needed. The City of Glendale worked with ADOT, MCDOT and the City of Phoenix to develop signal timing plans for special events that could be used for future events as well.

While the Super Bowl was a single event, the collaboration efforts opened the way for improved communications between agencies and an ability to work together that goes far beyond the timeframe of the Super Bowl; it has set the stage for more positive, regional operations in the future.

2016 College Football Playoff National Championship

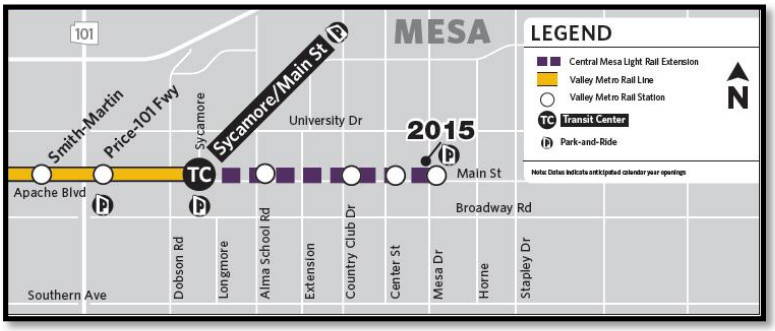
The Valley hosted college football's second national championship game to culminate the 2015-2016 season on January 11th, 2016 at the University of Phoenix Stadium in Glendale. The ADOT TOC personnel were again at the Glendale TMC and MCDOT REACT teams monitored traffic ingress and egress for the game.

Preparations for events in downtown Phoenix related to the Super Bowl brought numerous Phoenix City Divisions together to plan and implement protocols and procedures collaboratively to provide a safe, festive, and inviting environment for the multitude of fans attending the events held downtown. Events included concerts, the NFL experience held at the Convention Center, and sponsor activities held in multiple locations downtown. Because of the elevated security concerns related to a premier event and the involvement of Federal Agencies, many firsts occurred with the high spirit of cooperation exhibited by all agencies involved. All involved City Divisions including the Police, Fire, Emergency Medical Service, Solid Waste, Public Works, Street Transportation Department, Valley Metro and Public Transit manned the Phoenix Incident Management Team (IMT) housed at the Emergency Operations Center (EOC). As the EOC had connections to regional partners, the EOC also served as the Multi-Agency Coordination Center (MACC) for all events held throughout the Valley and was given direct access to the CCTV's used by the Street Transportation Department to monitor traffic conditions. The regional interconnect through the RCN provided all agencies both in the MACC and the IMT camera images throughout the valley including Scottsdale cameras used for the PGA Tour, Glendale's for use at the Stadium, and Phoenix's used to cover downtown activities. Post event reviews by both NFL officials, and the participating agencies indicated that the events were well managed, issues were dealt with quickly and efficiently, and clearly raised the bar for the next sites of such events.

Major Light Rail Projects Completed in Mesa and Phoenix

Mesa Extension to Mesa Drive

In August 2015, 3.1 miles of light rail was extended through downtown Mesa to Mesa Drive. It consists of four stations and a park-and-ride, which added approximately 5,000 new riders and attracted additional development to downtown Mesa. The project began construction in summer of 2012 and ultimately came in on budget and ahead of schedule.



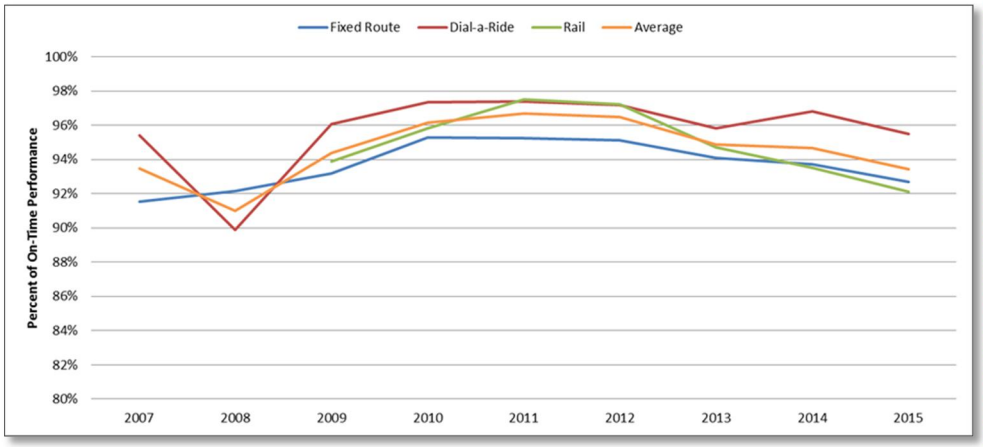
Northwest Phase I Light Rail Phoenix Extension

Construction of the 3.2-mile extension began in January 2013 and was recently opened on March 19, 2016. This extends the light rail north on 19th Avenue to Dunlap Avenue and plans to serve 5,000 riders per day. In 2012, the project received approval to move ahead utilizing capital funds from the countywide Proposition 400 transit sales tax, as well as funds from Phoenix's Transit 2000. Phoenix is responsible for the operations costs of light rail service that travels through the City. The project included an updated streetscape with wider sidewalks and new landscaping between Montebello and Dunlap Avenues. Construction of the extension also included the replacement of underground City infrastructure. This extension will continue with Northwest Phase II to Metrocenter Mall area, which will soon be moved forward with the passage of Phoenix's Transportation 2050.

As part of the Northwest Extension of Light Rail Transit, the Phoenix Street Transportation Department took a much more active role in managing the day-to-day flow of traffic through the work zone along 19th Avenue from just south of Bethany Home Road to just north of Dunlap Road. CCTV cameras were installed at the five major intersections so that the Phoenix TMC could monitor traffic conditions. Temporary video detection cameras were installed at all signalized intersections in the work zone so that the signal timings could be adjusted on demand. All the video detection camera images and controls were brought back to the Phoenix TMC so that the detection zones could be adjusted by TMC staff every time the lanes were re-assigned with temporary traffic control devices. Similarly, signal heads at existing intersections were moved to span wires and temporary portable pole bases with poles were constructed to allow crews to shift signal heads by simply sliding the signal heads on the span or moving the temporary pole and base to a new location. This allowed the contractor to maintain an fast pace and open the project on budget and ahead of schedule.

Bus Schedule Adherence

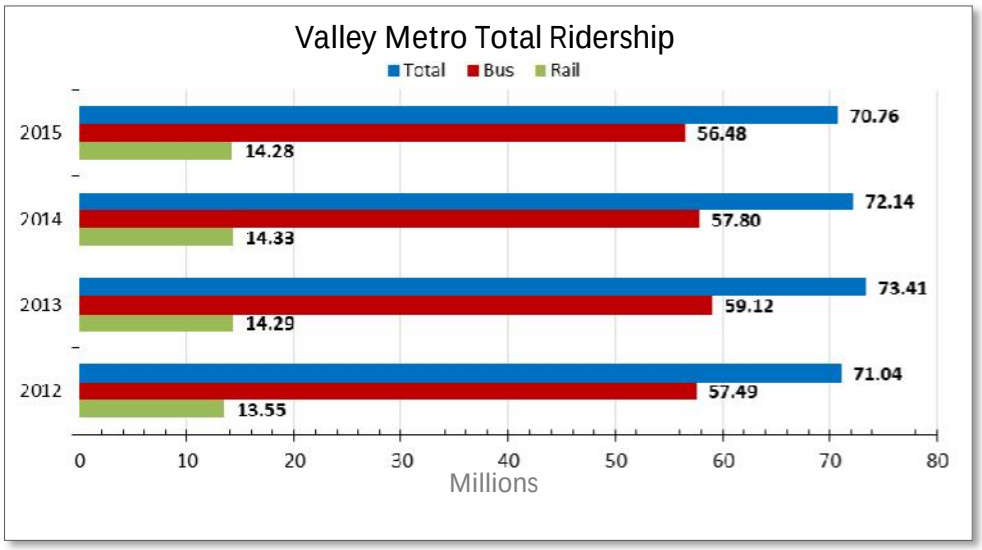
Valley Metro tracks schedule adherence as a performance measure to provide quality on-time service to the traveling public. As shown in the graph, bus schedule adherence has maintained an average above 90% since 2007. Light rail schedule adherence has sustained an average above 92% since 2009.

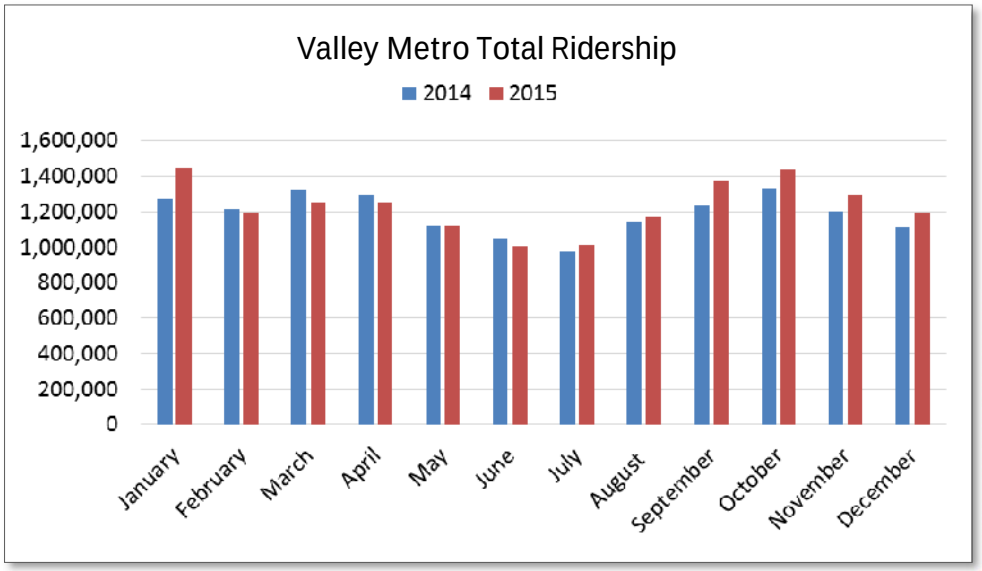


Valley Metro Ridership

Valley Metro's ridership is tracked on a yearly basis for both bus routes and light rail and are published on Valley Metro's website. As shown in the graph to the right, rail ridership has maintained an average of 14 million riders annually over the past four years.

As shown in the second graph to the right, ridership trends on light rail have slightly increased since August 2015.

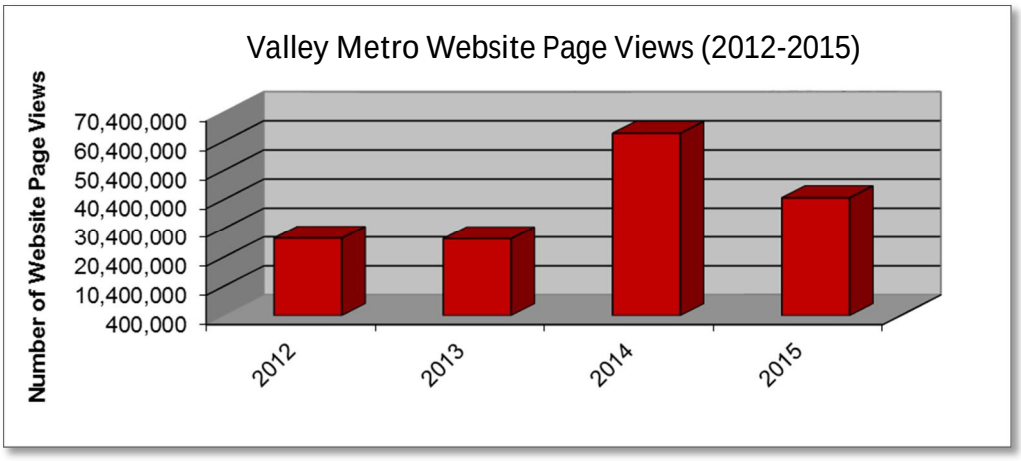




8.1 TRANSIT INDICATORS

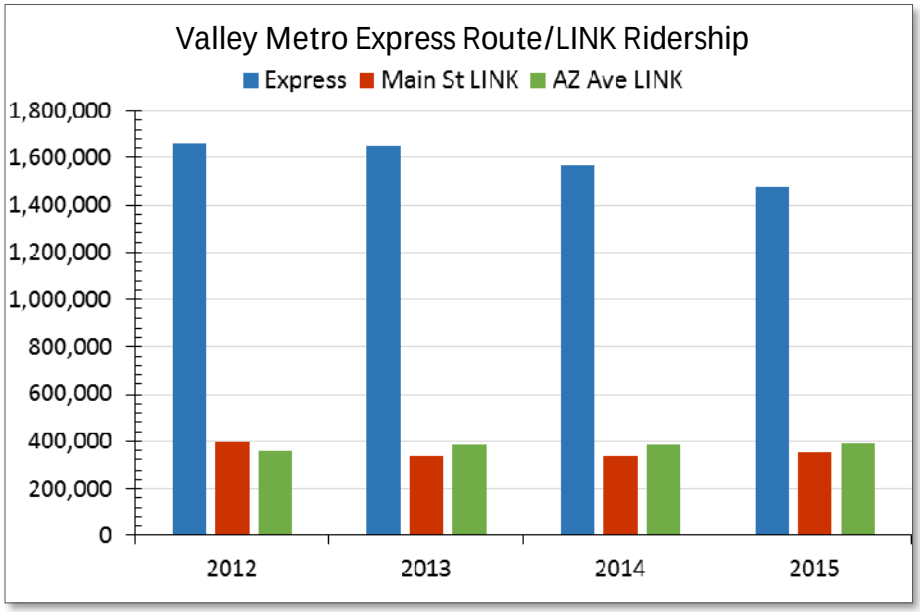
Valley Metro Web Page Usage

Valley Metro tracks the number of page views on a monthly basis and has seen an increase in web page views by 34% from 2012 to 2015.



Express Route Usage

The Express bus routes saw a peak usage in 2012 and has since slightly decreased over the years. The two LINK services in the east valley have remained fairly steady since 2012.



BikeShare Programs

Phoenix plans on expanding their BikeShare Program that uses GRID “smart bikes”. These are rentable green bikes at strategic renting locations along the Central Phoenix corridor and around downtown.

The bike sharing program that the City of Phoenix endorses will soon be expanding to other Arizona cities. Grid Bike Share has plans to double its fleet of bikes around Phoenix and stretch its reach to surrounding communities. The bike sharing program is meant to operate as an extension of the light rail system with rental hubs stationed at or near most stations.

SECTION 9 WHAT'S NEXT?

This Region and the AZTech Partnership have made some significant traffic operations investments and some impressive strides in advancing traffic management and operational strategies. Emerging issues and expectations for the AZTech partnership in the coming years include the following:

Bell Road and Grand Avenue Interchange Work

To improve congestion at the busy Bell Road intersection, ADOT will construct a new Bell Road bridge over US 60 (Grand Avenue) and the adjacent railroad tracks. The bridge will replace the current ground-level intersection. With this new interchange, through traffic on Grand Avenue will no longer stop at Bell Road. Instead, the two roadways will be connected via new on- and off-ramps constructed within the Grand Avenue median. A full closure of Bell Road will be in place for a duration of 6 and 8 months. The City of Surprise, City of Peoria, MCDOT, and MAG have been working together to provide redundant communications for sharing traffic signal timing plans and CCTV camera images during the interchange work.

Travel Times on the 7's in Phoenix

In early 2016, the City of Phoenix will advertise a construction project that will place into service a first of its kind travel time project using HYBRID DMS to post travel times for the motoring public on the two most heavily traveled north south arterials, 7th Avenue and 7th Street. Travel times will be posted in well-known color schemes, (green, yellow, red, and burgundy) so that the time posted reflects the expected condition encountered. A unique feature of the project will be the posting travel times for alternate routes, including parallel arterials or parallel freeways to the same destinations. This will be accomplished by fusing data within RADS from various sources, including Wi-Fi ARID devices.

ICM Expansion in the Region

Two MAG TSOP projects are in the works for early 2016 to coordinate freeway and arterial signal interfaces. One project is on the US-60 in Gilbert/Mesa and the other is on I-17 along Indian School Road and Camelback Road .

2017 NCAA Final Four Men's Basketball Tournament Coming to Town

The University of Phoenix Stadium is in the middle of hosting three national sporting events over a three-year span. This tournament is anticipated to require multi-agency coordination leveraging lessons learned from past events.

AZTECH PARTNER AGENCIES

Arizona Department of Public Safety

Arizona Department of Transportation

Arizona Division of Emergency Management

Arizona State University

University of Arizona

City of Avondale

City of Chandler

City of Glendale

City of Goodyear

City of Mesa

City of Peoria

City of Phoenix

City of Scottsdale

City of Surprise

City of Tempe

Town of Fountain Hills

Town of Gilbert

Town of Paradise Valley

Town of Queen Creek

Federal Highway Administration

Maricopa Association of Governments

Maricopa County Department of Emergency Management

Maricopa County Department of Transportation

Maricopa County Sheriff's Office

Phoenix Sky Harbor International Airport

Valley Metro

Phoenix Fire Department

Private Partners