ITS – Making ADOT's Roads Smarter

Systems Technology Group (STG)

Steven Cheshko
Arash Cyrus
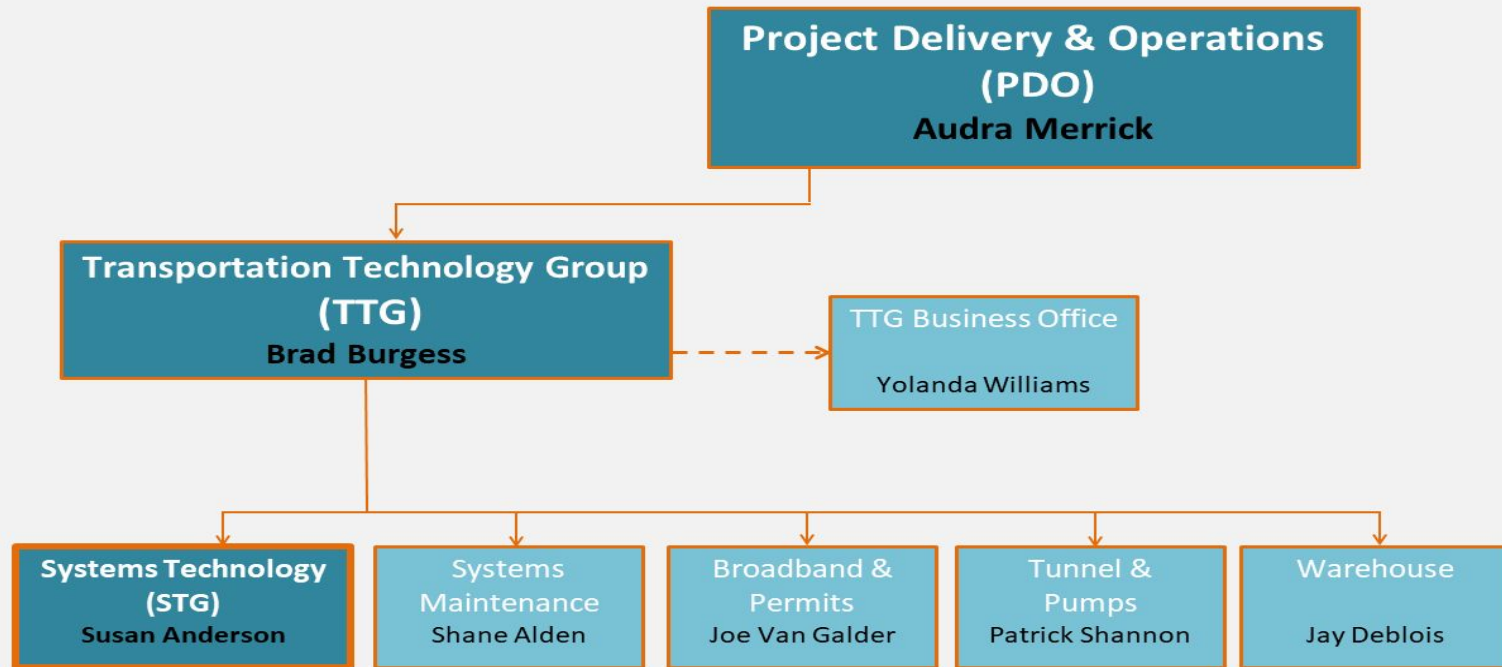
Sources: Pixabay

Agenda

- Introduce the team and Intelligent Transportation Systems (ITS)

- Identify ITS devices and systems at ADOT

- ITS Projects
  - Establishment
  - Funding
  - Coordination with stakeholders
  - Delivery

- ITS Resources

Organization Chart

STG Team Members

Susan Anderson - group manager

Project Development
- Victor Yang
- Adam McGuire
- Madison Shugrue

Technology
- Kevin Duby
- Shafique Islam
- Joseph Jones
- Arash Cyrus
- Joan Lovell
- Steven Cheshko
- Kendra Johnson

STG Overall Function

Facilitates development of Intelligent Transportation Systems (ITS) for traffic management.

- Oversees the research, planning, and implementation of new ITS technologies and applications

- Manages data and assesses performance of the existing ITS systems and assets

Background – What Is ITS?

ITS systems are used by MPD, ECD, PDO and comprised of:

- Hardware
- Software
- Networks and data

Parts of the infrastructure which:

- Make our roadways smarter
- Made us smarter about our roadways
- Maximize mobility and improve safety

Monitor & Operate

ITS Systems

- Ramp metering

- Speed/volume detectors

- Travel time dissemination system

- Wrong-way detection system

- Road Weather information system

- Dust detection system
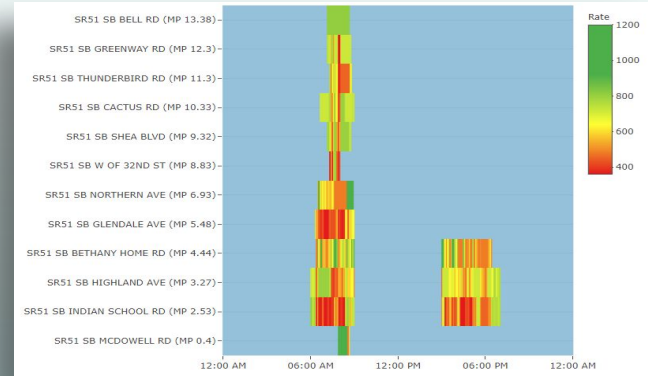
- Performance measure dashboards
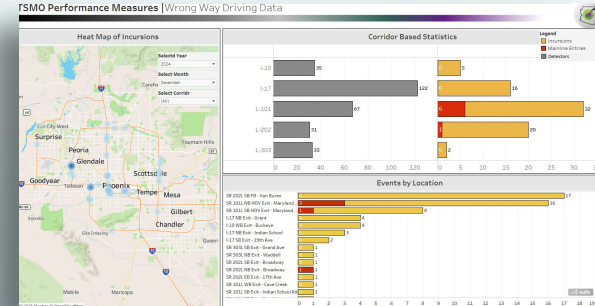
Monitor & Operate

Ramp Metering

Different levels of system intelligence:

- Basic: fixed rate

- Intermediate: responsive

- Advanced: adaptive (current status)

Monitor & Operate

Speed/Volume Detectors

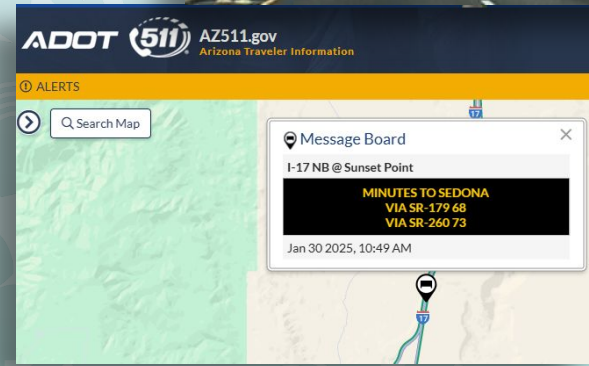Detectors collect mobility data including:

- Speed
- Volume
- Occupancy

Monitor & Operate

Travel Time Dissemination System

- Data Collection
  - ADOT owned data
  - ADOT acquired probe data

- Data Processing
  - Application developed by ITG

- Display
  - Dynamic Message Signs (DMS)
  - AZ511 application

Monitor & Operate

Wrong-Way Detection System

Components:

- Infrared (thermal) cameras
- Internally illuminated WW signs
- Decision Support Software
- CCTV cameras
- DMS
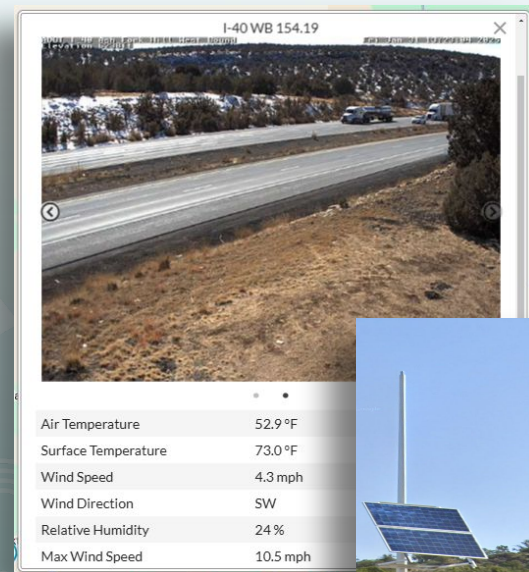

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Monitor & Operate

Road Weather Information System

Sensors monitoring:

- Wind
- Precipitation
- Visibility
- Snow depth
- Radiation
- Temperature and humidity

Traveler Information:

- DMS
- AZ511

I-40 WB 154.19

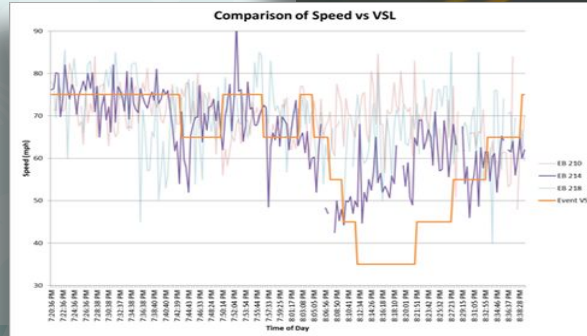|	
Air Temperature	52.9 °F
Surface Temperature	73.0 °F
Wind Speed	4.3 mph
Wind Direction	SW
Relative Humidity	24 %
Max Wind Speed	10.5 mph

Monitor & Operate

Dust Detection System

Sensors:

- Visibility
- RWIS
- CCTV
- Loop detectors
- X-Band Doppler Radar

Traveler Information:
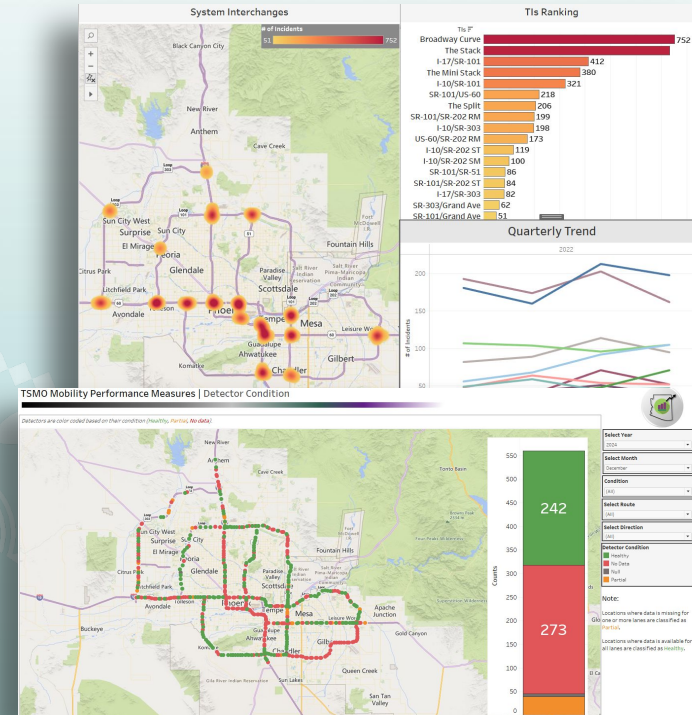
- DMS
- Variable Speed Limits
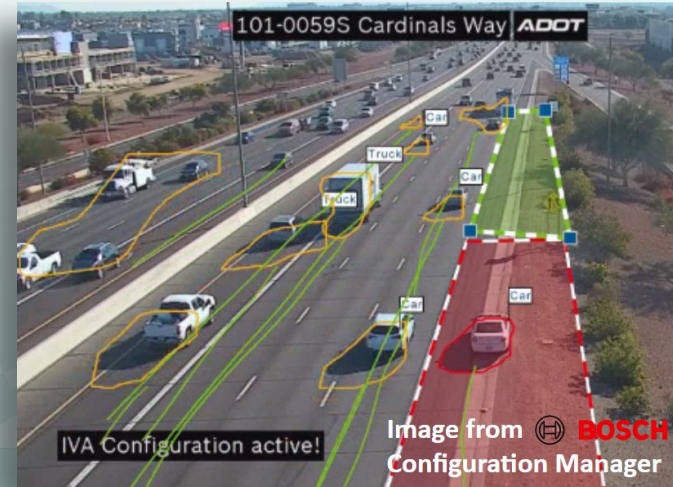

Comparison of Speed vs VSL

Monitor & Operate

Performance Measures Dashboards

- Measure performance of the system itself

- Measure performance of the traffic flow and incident management

https://adotnet.az.gov/content/performance-measurements-systems-technology

Emerging Technologies & Innovation

- CV pilot applications

- AZ511 alerts
  - Back of queue, work zone, etc.

- Automated DMS message
  - Back of queue and weather

- Incident detection using AI

101-0059S Cardinals Way ADOT

IVA Configuration active!

Image from BOSCH
Configuration Manager

MINUTES TO

17
17 101

10
16

Questions?

ITS Systems

- Ramp metering
- Speed/volume detectors
- Travel time dissemination system
- Wrong-way detection system
- Road Weather information system
- Dust detection system
- Performance measures dashboards

Emerging Technologies & Innovation

ADOT Broadband for Commercial Use


ConnectAllAZ

- 320k or 12% of households unserved or underserved

- Governor has prioritized *Narrowing the Digital Divide*

- ADOT Broadband Plan/Approach

  - ❏ Contracted with a vendor to Operate, Maintain and Commercialize
  - ❏ Smart Highway Corridor Trust Fund
  - ❏ ADOT is developing Fiber Installation Specs

ITS Scoping

How to Plan and Implement

- ITS Master Plan
  - [ADOT](https://adotnet.az.gov/its-master-plan) - https://adotnet.az.gov/its-master-plan
  - [Public](https://azdot.gov/business/its-master-plan) - https://azdot.gov/business/its-master-plan

- ITS Design Guides

- Stand-alone vs add-ons
  - May be hidden, so please ask
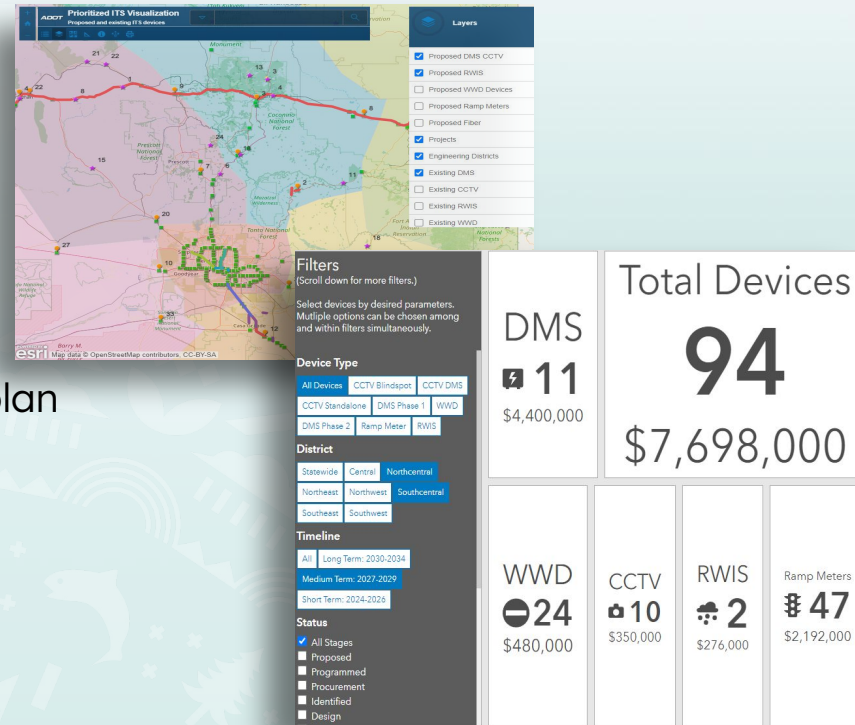
ITS Funding

- **5-year program**
  - Smart Highway Subprogram
  - 705 Modernization Subprogram
  - Others (CRP, CMAQ, etc)
- **Grants**
- **MAG**

eSTIP Projects | Amendments | Advanced Search | Projects by County | Interactive Map | Information

State Transportation Improvement Progra...

ADOT ID [_____] County [All ▼] Lead Agency [All ▼] Project Type [Intelligent Transportation ▼]

19 transportation project(s)

ADOT ID	Region	County	Lead Agency	Title
103842	NACOG	Yavapai	ADOT	I-40 and SR 89 and I-40 & US 93
78926	Statewide	Statewide	ADOT	2026 Statewide 3rd Party Data Collection
105022	CAG	Pinal	ADOT	SR 77 Dynamic Messaging System
103298	FMPO	Coconino	ADOT	I-17 - Country Club Dr
104478	MAG	Maricopa	ADOT	Fiber Pull Box and Fiber Inventory
105024	MAG	Maricopa	ADOT	US 60/Grand Ave ITS
78826	Statewide	Statewide	ADOT	2026 Statewide ITS Operations, Traffic and Support

ITS Design

- Design team
  - PMG
  - Subject Matter Experts - Systems Technology
  - Designers - Traffic Group or Consultant
- Standard drawings and specifications
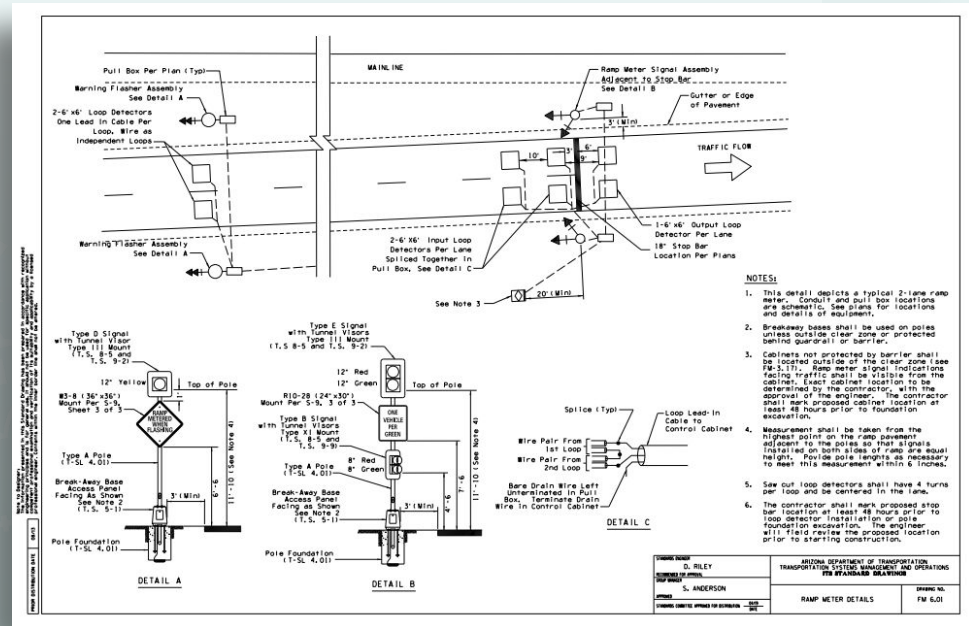
ITS Design

- Special considerations
  - Power
  - Communications
    - Urban - Fiber
    - Rural - Cellular
  - Clearances
  - Systems Engineering Checklist and Vee Diagram

ITS and Other Groups

- **ITG and data governance process**
  - Business request - new technologies, interactions, or capabilities
  - Project Investment Justification (PIJ) - new or expanded, projects over $25,000
- **Procurement**
  - Proprietary items ([SUP 01-1](https://adotnet.az.gov/system/files/documents/2023/11/SUP_01-1_Proprietary_Items_effective.pdf))
  - https://adotnet.az.gov/system/files/documents/2023/11/SUP_01-1_Proprietary_Items_effective.pdf
    - Public Interest Findings (PIFs) and Certifications
  - Contracts
    - Project-specific
    - Non-project-specific

ITS Post-Design

- Submittals

- System integration

- Inspections

- Testing

- Operations and maintenance

Regional ITS Operations Planning

Project Identification and Scoping

Project Planning

Concept of Operations

Requirements

Design and Specifications

Software / Hardware Implementation

Decomposition and Definition

Validation Plan

Acceptance Criteria

Verification Plan(s)

Operations and Maintenance

Validation

Deployment and Acceptance

Integration and Verification

Integration and Recomposition

Decision Gate

Retirement/ Replacement

Post-Design Phase

ITS Related Resources

ITS References

https://azdot.gov/business/engineering-and
-construction/its-references

- ○ Guides and plans
- ○ Systems Engineering Checklist
- ○ Standards
- ○ Test forms

ITS References

Title	Size	Description
Ramp Metering Design Guide Errata	117 KB	Two pages of errata for the 2013 Ramp Meter Design Guide. Revised July 2019.
Ramp Metering Design Guide(link is external)	23 MB	Guide for ramp metering warrant checking, designing and installation for ADOT FMS 2013
ITS Design Guide	2.7 MB	Intelligent Transportation System Design Guide – March 2019
Systems Engineering Checklist	857 KB	For use with all projects containing ITS elements. Revised March 2025.
ITS Test Forms	72 KB	Test forms for construction of ITS elements 2018.
Arizona Statewide ITS Architecture (2018)		
ITS Standard Drawings	5.7 MB	ITS Standards - October 2021 Sheet 1E Index: PDF | DGN
DMS Masterplan	18.5 MB	Guidelines for location and placement of permanent DMS 2011
FMS Communications Master Plan	4.8 MB	Freeway Management System, Communications Master Plan 2010

Questions?

- ADOT & Broadband
- ITS Scoping
- ITS Funding
- ITS Design
- ITS Related Resources

Thank you for attending!

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