MAG ITS Committee

September 2, 2020

MARICOPA ASSOCIATION of GOVERNMENTS

3. Staff Report

3. Federal Updates Reported by FHWA

- **Broadband Infrastructure Deployment Notice of Proposed Rulemaking (NPRM)**
  - Comment period closes Sept 14, 2020
  - https://www.federalregister.gov/documents/2020/08/13/2020-17525/broadband-infrastructure-deployment
- **NHTSA Virtual Events: Automated Vehicle Transparency and Engagement for Safe Testing Initiative**
  - Sessions scheduled Sept 2-3, 2020
  - https://www.nhtsa.gov/events-and-public-meetings

3. FY 2020 TSOP Update

TRAFFIC SIGNAL OPTIMIZATION PROGRAM

Project ID	On-Call Assign	Lead Agency	Other Agencies	Description	Status
TS2001	KITTELSON	ADOT	Glendale Phoenix	Grand Ave from 19th Ave to Loop 101	Data collection done Kickoff pending
TS2002	AECOM	ADOT	Surprise El Mirage	Grand Ave from Loop 101 to Loop 303	Data collection done Kickoff pending
TS2003	WOOD	Avondale	MCDOT ADOT	Dysart Rd from Bethany Home Rd to Van Buren St	Data collection pending
TS2004	UCG	Gilbert	N/A	Greenfield Rd from Market St to Baseline Rd	Kickoff done
TS2005	JACOBS	Goodyear	N/A	Estrella-PebbleCreek Pkwy from MC 85 to Indian School Rd	Kickoff pending
TS2006	LEE	Phoenix	ADOT	I-10, McDowell Road, Van Buren Street, Latham Street and Roosevelt Street	Data collection pending
TS2007	B&N	Pinal County	Queen Creek	Hunt Hwy from Empire Blvd to Copper Mine Rd	Kickoff pending
TS2008	KHA	Tempe	N/A	Rural Rd, McClintock Dr from Loop 202 to US 60	Kickoff done Data collection pending
TS2009	WSP	MAG	N/A	Before-and-After Travel Time Evaluations	Scope of work pending

3. ADOT automating traffic count data for MS2 modeling project update

- Follow up of June ITS committee meeting presentation of "ADOT Statewide Traffic Data Collection Program"
- Contractor is conducting a survey on behalf of ADOT and FHWA to investigate potential integration of detailed traffic counts from intersection sensors into the statewide MS2 Traffic Count Data System in Arizona.

3. RCN update

- Previous work with member agencies
- Future projects with RCN
- On-call services contract for regional fiber maintenance support update
  - 1st Task Force meeting:
    September 15, 2020, 9:00 a.m. – 11:00 a.m.
  - Meeting information to be sent soon
    - Contact Ryan Gish for information

3. ATCMTD grant update

- Successfully submitted a proposal on August 31.
- Led by MCDOT, co-lead by MAG and ADOT, and local agency supports.

Next Generation Regional Congestion Management

through Integrated Real-time Systems and Operations Data in the Greater Phoenix Area

4. ADOT Smart Work Zone Program

ADOT

SMART WORK ZONES

MARICOPA ASSOCIATION of GOVERNMENTS

Intelligent Transportation Systems Committee

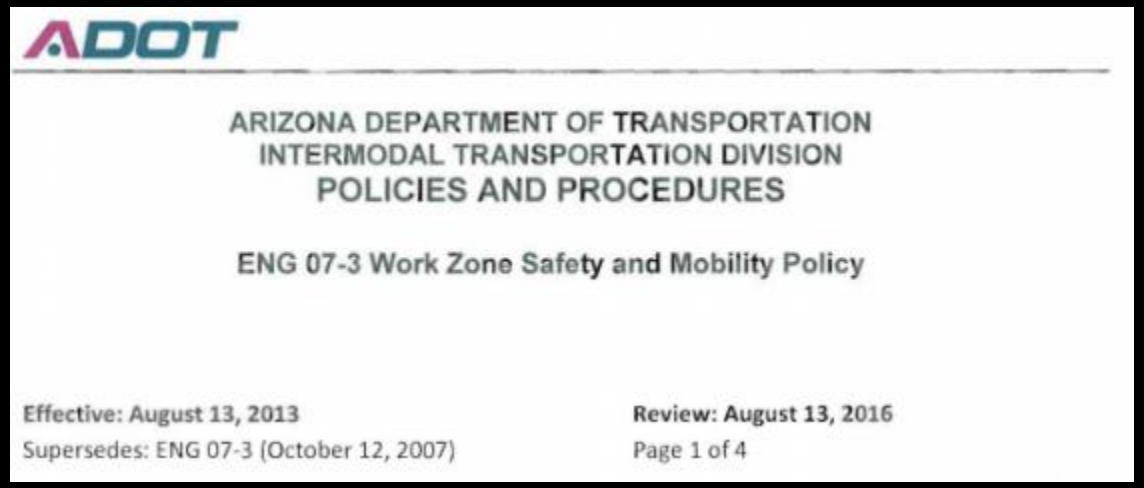
23 CFR 630 Subparts J & K

- Subpart J: aka “The Rule”
  - Work Zone Safety & Mobility

- Subpart K:
  - Temporary Traffic Control Devices

ADOT Guidance Documents

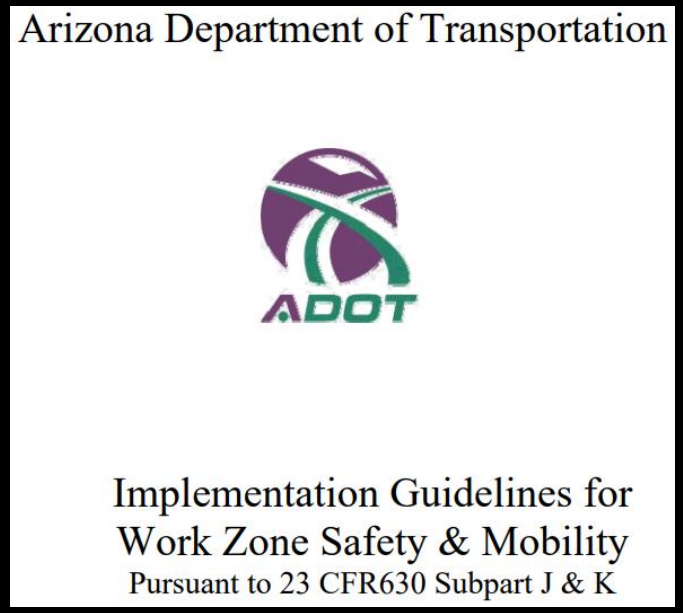
- Work Zone Safety and Mobility Policy ENG 07-3
- Work Zone Safety & Mobility Implementation Guidelines


ADOT

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
POLICIES AND PROCEDURES

ENG 07-3 Work Zone Safety and Mobility Policy

Effective: August 13, 2013
Supersedes: ENG 07-3 (October 12, 2007)
Review: August 13, 2016
Page 1 of 4


Arizona Department of Transportation

ADOT

Implementation Guidelines for
Work Zone Safety & Mobility
Pursuant to 23 CFR630 Subpart J & K

ADOT
Work Zone Safety and Mobility Policy
ENG 07-3

- Use field observations, work zone crash data, and operational information to manage work zone impacts for specific projects during implementation

- Monitor and measure work zone impacts during construction and take corrective action to manage mobility and safety based on criteria such as travel delay, queue lengths, and crash occurrences

Definition:

A "smart work zone system" is the application of computers, communications, and sensor technology to freeway transportation and would possess the following general characteristics:

- *Real-time*
- *Portable*
- *Automated*
- *Reliable*

What Smart Work Zones Look Like:

What Smart Work Zones Look Like:

Section 710 Smart Work Zone Systems

- ADOT Stored Specification
- Currently Being Applied on Select Projects

SECTION 710 SMART WORK ZONE SYSTEMS

710-1 Description:

The work under this section shall consist of furnishing and installing all components to provide a fully functional, automated, and portable Smart Work Zone (SWZ) system; operating, maintaining, and servicing the portable SWZ System; and relocating or removing various components of the system, as specified herein and in accordance with the project plans.

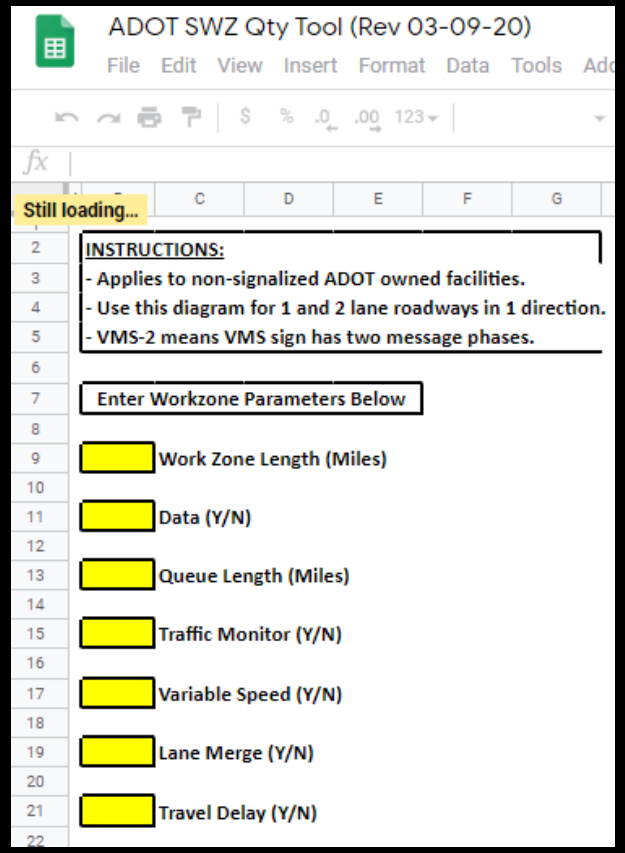
Section 710 Smart Work Zone Systems

Covers the following:

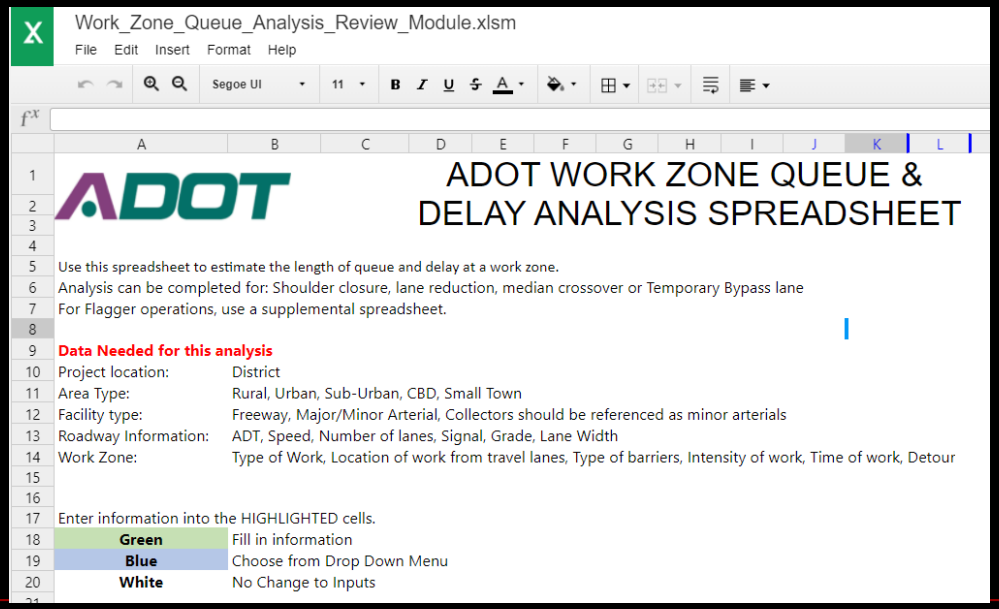
- Traffic Data Collection Subsystem (TDCS)
- Queue Warning Subsystem (QWS)
- Dynamic Lane Merge Subsystem (DLMS)
- Travel Time Subsystem (TTS)
- Traffic Monitoring Camera Subsystem (TMCS)*
- Variable Speed Limit (VSL) Subsystem*

Design Phase Tools

- SWZ Device Quantities & Locations Tool



- Work Zone Queue Analysis Tool



Technology & Innovation Deployment Program (TIDP)

23 USC 120 (c)(3)

Increased Federal Share for Project-Level Innovation

Additional 5% Federal-Aid, for ADOT = 99.34%

Typical SWZ Will Only Cost 1% of Budget

What Qualifies?

Innovative Project Delivery Methods, Technologies, Engineering or Design Approaches, Financing, or Contracting That:

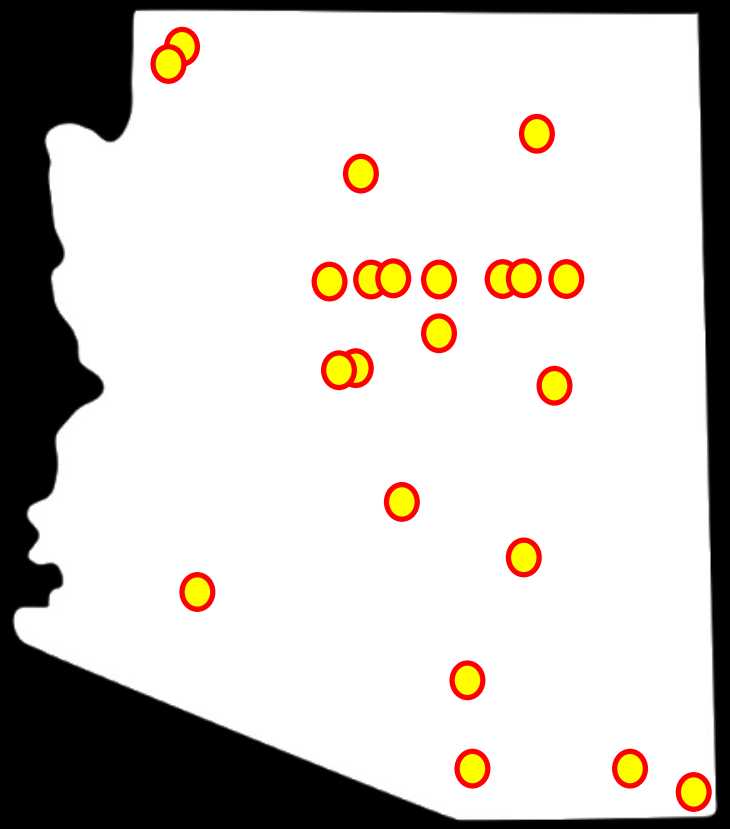
- Improve Work Zone Safety
- Reduce Congestion Related to the Construction
- Improve quality of highways and bridges
- Extend service life of highways and bridges
- Reduce long-term maintenance costs of highways and bridges

Must be innovative for the applicant

IFS - WIDE USE IN ARIZONA

22 Projects Since 2014

- 6 Smart Work Zone Projects
- 4 Accelerated Bridge Construction
- 3 Intelligent Compaction
- 3 Increased Asphalt Density
- 2 Electronic Plans
- 1 ID/IQ
- 1 EDC Cape Seal
- 1 3D Paving
- 1 2D Hydraulic Modeling & A-GaMe



SWZs have saved over $10 million in state matching funds

New Specification: 109.14

- Description of IFS component
- IFS cannot be removed without State and FHWA consent
- Requires lessons learned report and closeout meeting

109 INFS, 01/16/20

USE ON PROJECTS WITH INCREASED FEDERAL SHARE
DESCRIBE THE INNOVATIVE TECHNOLOGY IN THE SECOND PARAGRAPH

(109INFS, 01/16/20)

SECTION 109 **MEASUREMENT AND PAYMENT:** of the Standard Specifications is modified to add:

109.14 **Increased Federal Share:**

(A) **General:**

Increased federal share has been approved by FHWA for an innovative technology and practice. The increased federal share on this project is 5 percent.

The innovation includes ***(Describe specific innovation – information can be found on the Increased Federal Share Application.)***

Due to the increased federal share, the project components related to the innovation described above must be constructed with the materials, quantities, methods, and innovations as shown on the project plans and specifications. If the contractor requests materials, quantities, methods, or innovations other than those included in the plans and specifications, the request must be reviewed and approved by the Department and FHWA. Approved changes shall be at no additional cost to the Department, and shall not increase contract time.

(B) **Post-Activity Report and Meeting:**

The contractor shall prepare a report that includes a general summary of the daily operations and discussion of the overall effectiveness of the innovative technology, in a format provided by the Department. A description of additional means of quality control and any benefits realized or detriments suffered relating to implementation and utilization of the innovative technology shall be included. Comments provided by equipment operators, laborers, field personnel, or other personnel who adapted to the use of the technology, positive or negative shall be included.

The contractor shall schedule a closeout meeting with the Engineer within 30 days of the innovative technology completion to review and discuss the findings contained in the report.

F0115: I-17 @ Central

9240126	L.SUM	MISCELLANEOUS WORK (TRAVEL TIME SYSTEM)(INSTALLATION AND REMOVAL)		TOTAL:	% of *their* total bid:
Bid Rank		1.000			
1	PULICE CONSTRUCTION, INC.		$270,000.000	$286,890	2.1%
2	FNF CONSTRUCTION, INC.		$279,000.000	$340,930	2.3%
3	SUNDT CONSTRUCTION, INC.		$210,000.000	$221,260	1.4%
4	HAYDON BUILDING CORP		$106,000.000	$646,480	4.1%
5	FISHER SAND & GRAVEL CO. DBA SOUTHWEST ASPHALT PAVII		$175,000.000	$189,075	1.1%

9240132	EACH-DAY	MISCELLANEOUS WORK (TRAVEL TIME SYSTEM)(IN-USE)			PER DAY:
Bid Rank		563.000			
1	PULICE CONSTRUCTION, INC.		$30.000	$16,890.00	$509.57
2	FNF CONSTRUCTION, INC.		$110.000	$61,930.00	$605.56
3	SUNDT CONSTRUCTION, INC.		$20.000	$11,260.00	$393.00
4	HAYDON BUILDING CORP		$960.000	$540,480.00	$1,148.30
5	FISHER SAND & GRAVEL CO. DBA SOUTHWEST ASPHALT PAVII		$25.000	$14,075.00	$335.83

+ =

5% = $676,551.64

F0152; I-40 Two Guns

9240126	L.SUM	MISCELLANEOUS WORK (SMART WORK ZONE SYSTEM)(INSTALLATION AND REMOVAL)			
Bid Rank		1.000		**TOTAL:**	% of *their* total bid:
1	PULICE CONSTRUCTION, INC.		$70,000.000	**$99,080**	**2.3%**
2	FISHER SAND & GRAVEL CO. DBA SOUTHWEST ASPHALT PAVI		$4,000.000	**$86,800**	**2.0%**
3	VASTCO, INC.		$92,935.000	**$126,000**	**2.6%**

+ =

9240132	EACH-DAY	MISCELLANEOUS WORK (SMART WORK ZONE SYSTEM)(IN USE)			
Bid Rank		276.000			**PER DAY:**
1	PULICE CONSTRUCTION, INC.		$80.000	$22,080.00	**$359.00**
2	FISHER SAND & GRAVEL CO. DBA SOUTHWEST ASPHALT PAVI		$300.000	$82,800.00	**$314.49**
3	VASTCO, INC.		$120.000	$33,120.00	**$456.52**

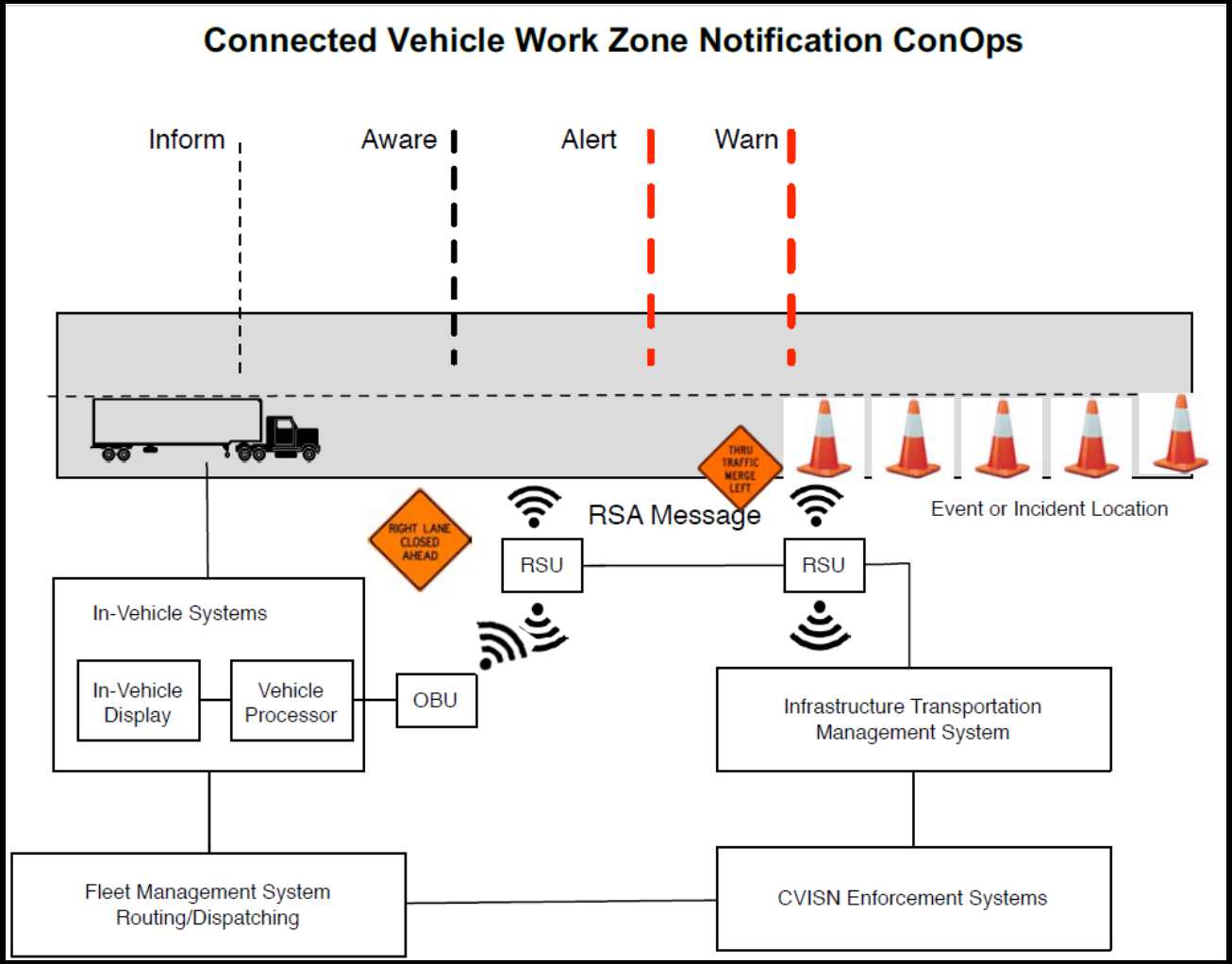
5% = $213,618

F0089; SR64 Williams - Grand Canyon

7100002	L.SUM	SWZ SYSTEM ((ITS				
Bid Rank			1.000		**TOTAL:**	% of *their* total bid:
1	FANN CONTRACTING, INC			$58,000.000	**$124,960**	**2.1%**
2	FNF CONSTRUCTION, INC.			$75,000.000	**$170,040**	**2.6%**
7100101	EACH-DAY	SWZ TDC LOCATION (IN USE) (ITS)				
Bid Rank			1,800.000			
1	FANN CONTRACTING, INC			$17.000	$30,600.00	
2	FNF CONSTRUCTION, INC.			$25.000	$45,000.00	
7100201	EACH-DAY	SWZ CMB ASSEMBLY (IN USE) (ITS)				
Bid Rank			720.000			
1	FANN CONTRACTING, INC			$36.000	$25,920.00	
2	FNF CONSTRUCTION, INC.			$50.000	$36,000.00	
7100300	EACH-DAY	SWZ TRAFFIC MONITORING CAMERA ASSEMBLY (IN USE)				
Bid Rank			360.000			
1	FANN CONTRACTING, INC			$29.000	$10,440.00	
2	FNF CONSTRUCTION, INC.			$40.000	$14,400.00	

5% = $292,651.83

Smart Work Zones and Connected Vehicles

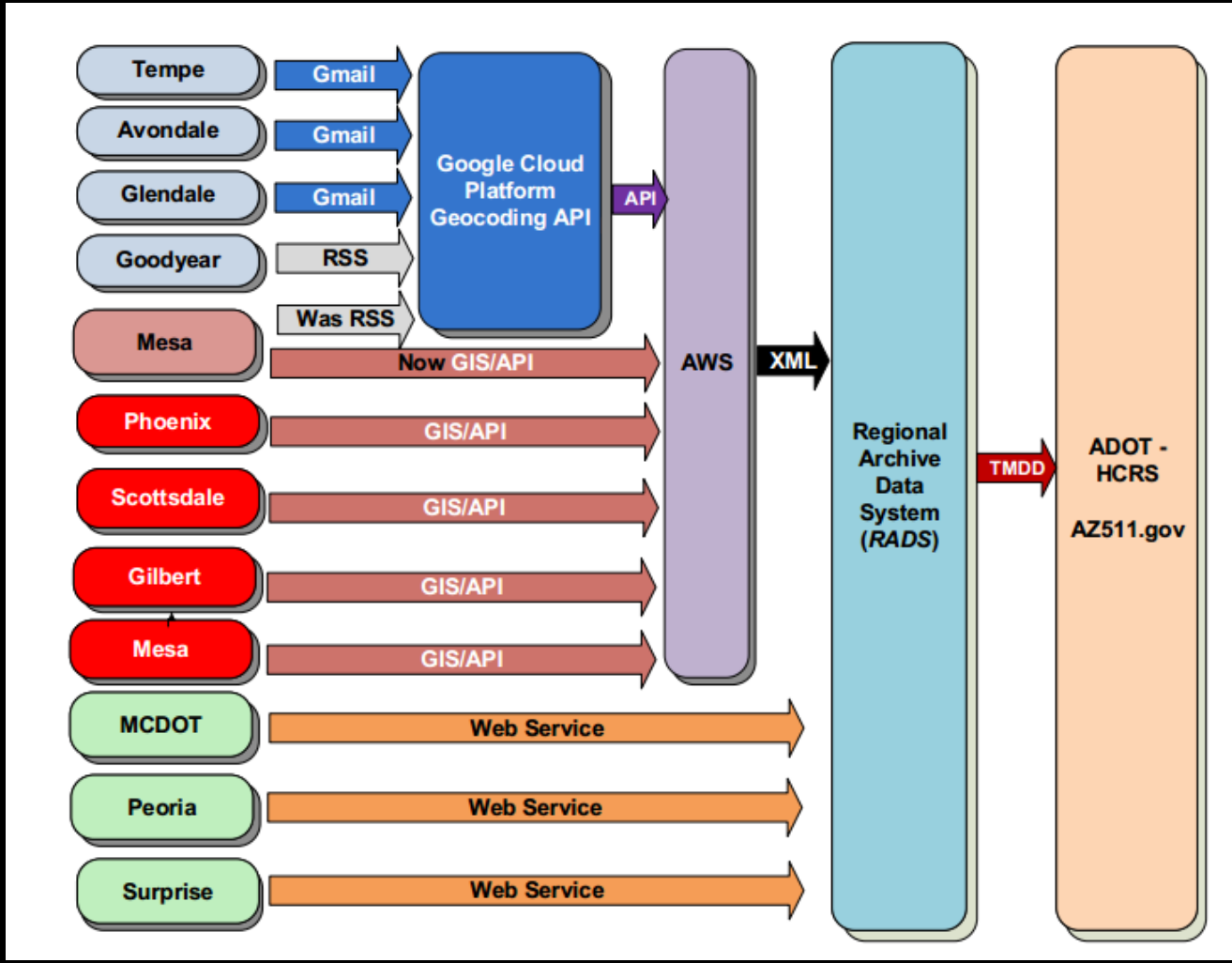


FHWA Work Zone Data Initiative (WZDI)

- Development of a Standardized Approach for Collecting, Organizing, and Sharing Work Zone Event Data (WZED)

- Work Zone Data Exchange (WZDx) Specification
  - ADOT & MCDOT through AZTech partnered on recent grant opportunity

Work Zone Data Exchange (WZDx)



USDOT

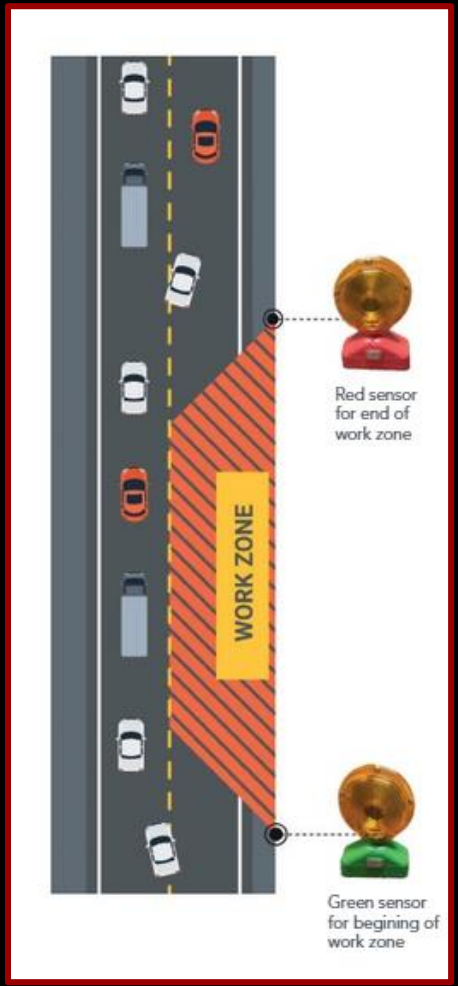
DATA FOR AUTOMATED VEHICLE INTEGRATION
GET DATA ON WORK ZONES INTO VEHICLES!
LEARN MORE ▶

Getting the information into vehicles

Next Steps

Add to Standard Specification

1. Portable Speed Feedback Sign
2. Smart Arrow Boards
3. Location Sensors
4. Truck Entry (&Exit) System



Next Steps

1. Train on Design Phase Tools
    - Work Zone Queue and Delay Analysis Tool
    - SWZ Device Quantities & Locations Tool

2. Education
    - Designers, Districts, Stakeholders...

3. Expand Section 710

Thank you!

Adam Carreon P.E.

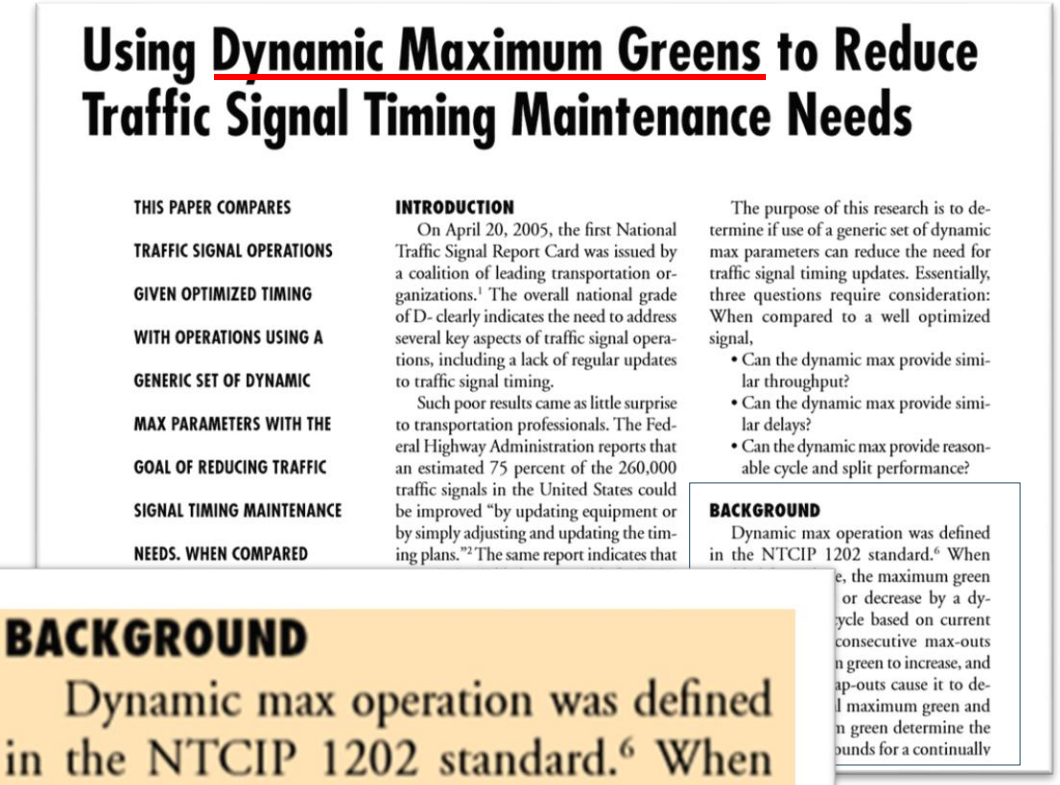
ADOT Work Zone Operations Engineer
Operational Traffic & Safety Group
TSMO Division
ADOT

602-712-2212
ACarreon@azdot.gov

5. Traffic Signal Operations Utilizing Dynamic Maximum Green

Purpose

- Follow-up of the suggestion in August ITS committee meeting to include Dynamic Max Green in future TSMO projects
- Experience sharing by City of Peoria – Dynamic Max Free



Using Dynamic Maximum Greens to Reduce Traffic Signal Timing Maintenance Needs

THIS PAPER COMPARES TRAFFIC SIGNAL OPERATIONS GIVEN OPTIMIZED TIMING WITH OPERATIONS USING A GENERIC SET OF DYNAMIC MAX PARAMETERS WITH THE GOAL OF REDUCING TRAFFIC SIGNAL TIMING MAINTENANCE NEEDS. WHEN COMPARED

INTRODUCTION

On April 20, 2005, the first National Traffic Signal Report Card was issued by a coalition of leading transportation organizations.[1] The overall national grade of D- clearly indicates the need to address several key aspects of traffic signal operations, including a lack of regular updates to traffic signal timing.

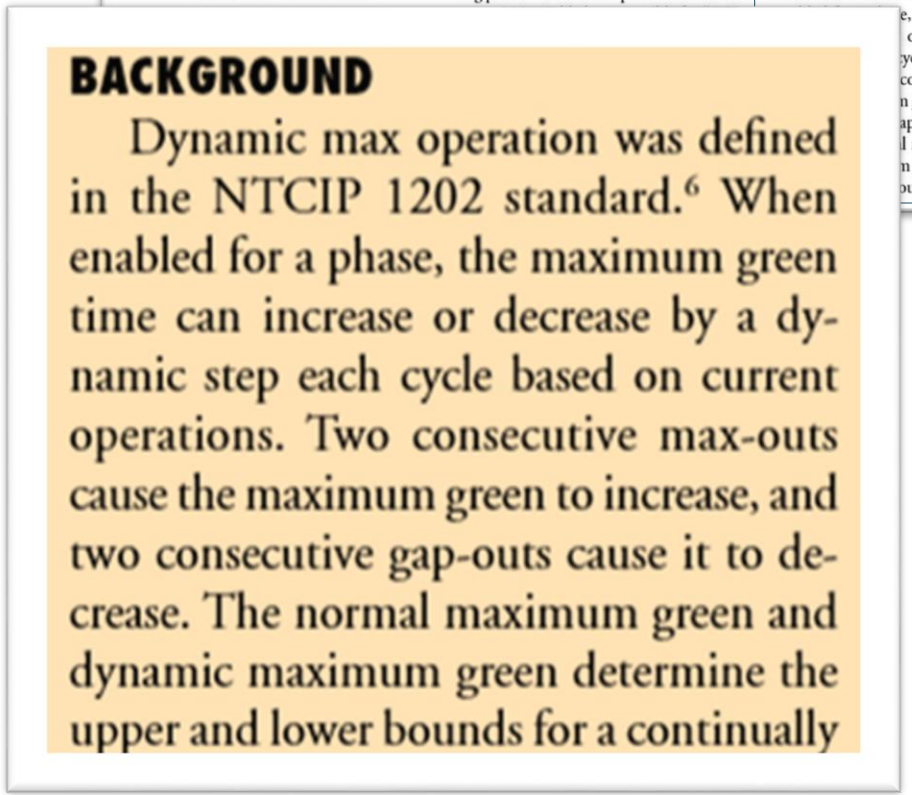
Such poor results came as little surprise to transportation professionals. The Federal Highway Administration reports that an estimated 75 percent of the 260,000 traffic signals in the United States could be improved "by updating equipment or by simply adjusting and updating the timing plans."[2] The same report indicates that

The purpose of this research is to determine if use of a generic set of dynamic max parameters can reduce the need for traffic signal timing updates. Essentially, three questions require consideration: When compared to a well optimized signal,

- Can the dynamic max provide similar throughput?
- Can the dynamic max provide similar delays?
- Can the dynamic max provide reasonable cycle and split performance?

BACKGROUND

Dynamic max operation was defined in the NTCIP 1202 standard.[6] When



BACKGROUND

Dynamic max operation was defined in the NTCIP 1202 standard.[6] When enabled for a phase, the maximum green time can increase or decrease by a dynamic step each cycle based on current operations. Two consecutive max-outs cause the maximum green to increase, and two consecutive gap-outs cause it to decrease. The normal maximum green and dynamic maximum green determine the upper and lower bounds for a continually

PEORIA

ARIZONA

Dynamic Max Free

Steve McKenzie, PE, PTOE
ITS Engineer
steve.mckenzie@peoriaaz.gov
623-773-7994

What does it mean to operate a traffic signal in Dynamic Max Free?

- How To Implement Dynamic Max Free (DMF)
- Peoria's History With DMF
- Supporting Critical Information
- To DMF or Not To DMF

How To Implement Dynamic Max Free (DMF)

MaxView 1.9 Client View

Timing Plans

1 2 3 4

Phase	1	2	3	4	5	6	7	8
Min Green	5	10	5	10	5	10	5	10
Bike Min Green	0	0	0	0	0	0	0	0
Cond Service Min Green	0	0	0	0	0	0	0	0
Delay Green	0	0	0	0	0	0	0	0
Walk	0	7	0	7	0	7	0	7
Walk2	0	0	0	0	0	0	0	0
Walk Max	0	0	0	0	0	0	0	0
Ped Clear	0	31	0	36	0	31	0	36
Ped Clear 2	0	0	0	0	0	0	0	0
Ped Clear Max	0	0	0	0	0	0	0	0
Ped Carry Over	0	0	0	0	0	0	0	0
Veh Ext	2.0	3.0	2.0	3.0	3.0	3.0	2.0	3.0
Veh Ext2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max1	15	40	15	25	15	40	15	25
Max2	0	0	0	0	0	0	0	0
Max3	0	0	0	0	0	0	0	0
Dynamic Max	30	55	30	45	30	55	30	45
Dynamic Max Step	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

ASC/3 Panel View

```
TIMING PLAN [  1] PHASE DATA                >^v
  PHASE      1    2    3    4    5    6    7    8
MAX1        15   40   15   25   15   40   15   25
MAX2         0    0    0    0    0    0    0    0
MAX3         0    0    0    0    0    0    0    0
DYM MAX     30   55   30   45   30   55   30   45
DYM STP    5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
```

75th Ave/Tbird – FYA by time of day

Peoria's History with DMF Operation

- Started running DMF at Lake Pleasant Parkway and Happy Valley Parkway in 2006 (talk to Sean)

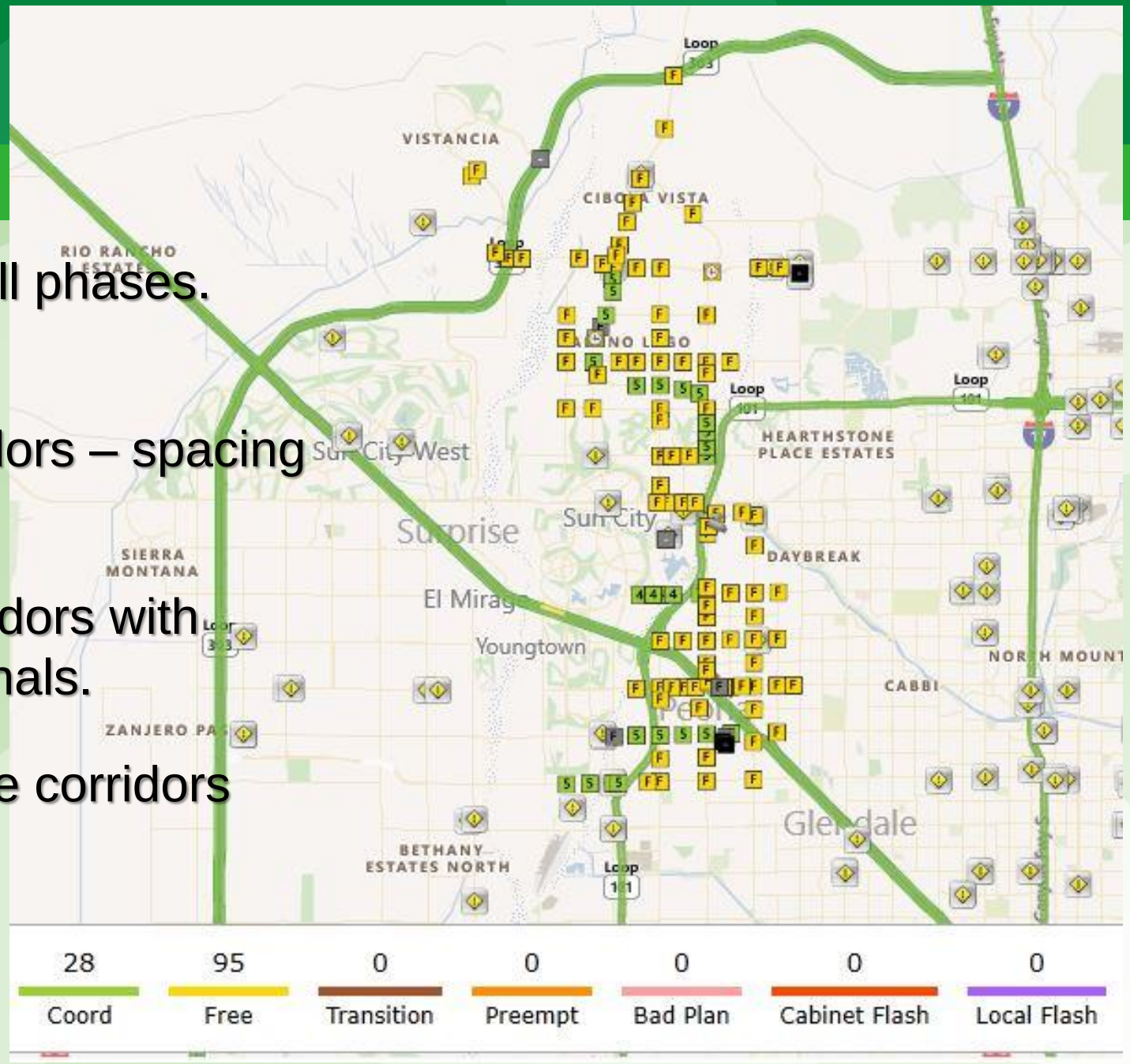
- TOD plans were not working well on Happy Valley Parkway due to platoons spreading out too much. Staff decided to change to DMF and saw immediate improvements, by observation and feedback from peer who used the roadway daily.

Supporting Critical Information

- Start with highest Max 1 time from TOD plans as your base Dynamic time, adjust as needed with observation.
- Increments of 5 seconds were found to work well for transition times (up and down)
- Unless a signal is being installed in close proximity to another signal or in the middle of a corridor running TOD, DMF will be the initial go-to for operations.

To DMF or Not To DMF

- Need to have good detection on all phases. Don’t bother otherwise.
- Works well on lower volume corridors – spacing doesn’t seem to be a factor.
- Works well on higher volume corridors with portions greater than half mile signals.
- Does not work well on high volume corridors with closely spaced signals.
- Works great during construction



Questions?

6. Performance Evaluation of Traffic Signal Timing Plans

6. Performance Evaluation for TSOP Projects

- Procurement of TranSync software for TSOP evaluation
- Development of new evaluation methodology based on TranSync supplemented by third-party travel time data
- Expected first pilot in FY2020 TSOP evaluation
- Experience sharing by City of Phoenix

“Bandwidth Optimization” TranSync Software

Arterial Systems Management Section
Traffic Services Division

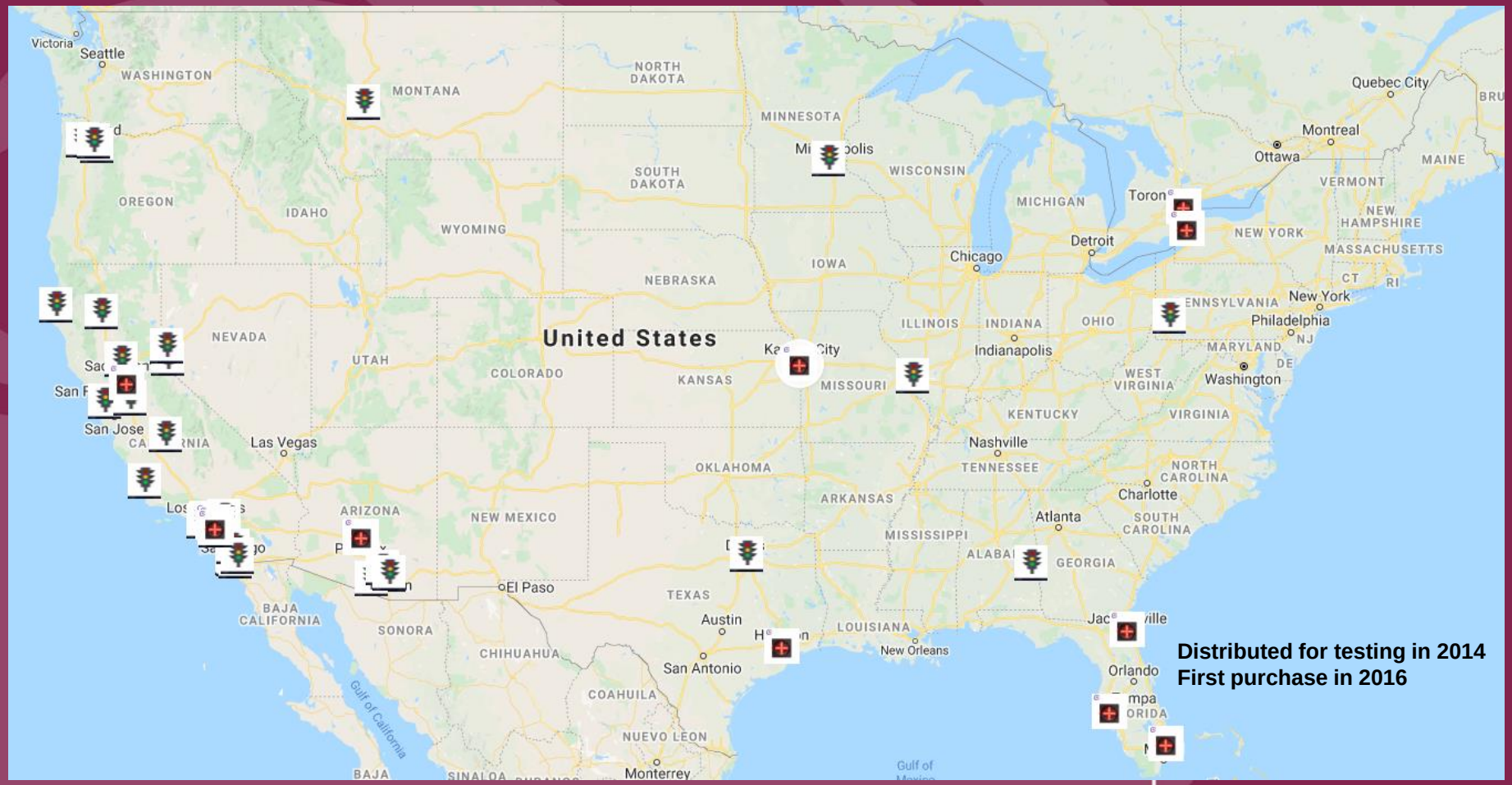
Street Transportation Department

TranSync-D™
Signal Timing Management, Optimization, Diagnosis & Evaluation Tool

Simon T Ramos, PE
Traffic Management & Operations Engineer
August 2020

City of Phoenix

Where has TranSync been used?



Distributed for testing in 2014
First purchase in 2016

= Testing
= Purchased

City of Phoenix

Background – What is TranSync?

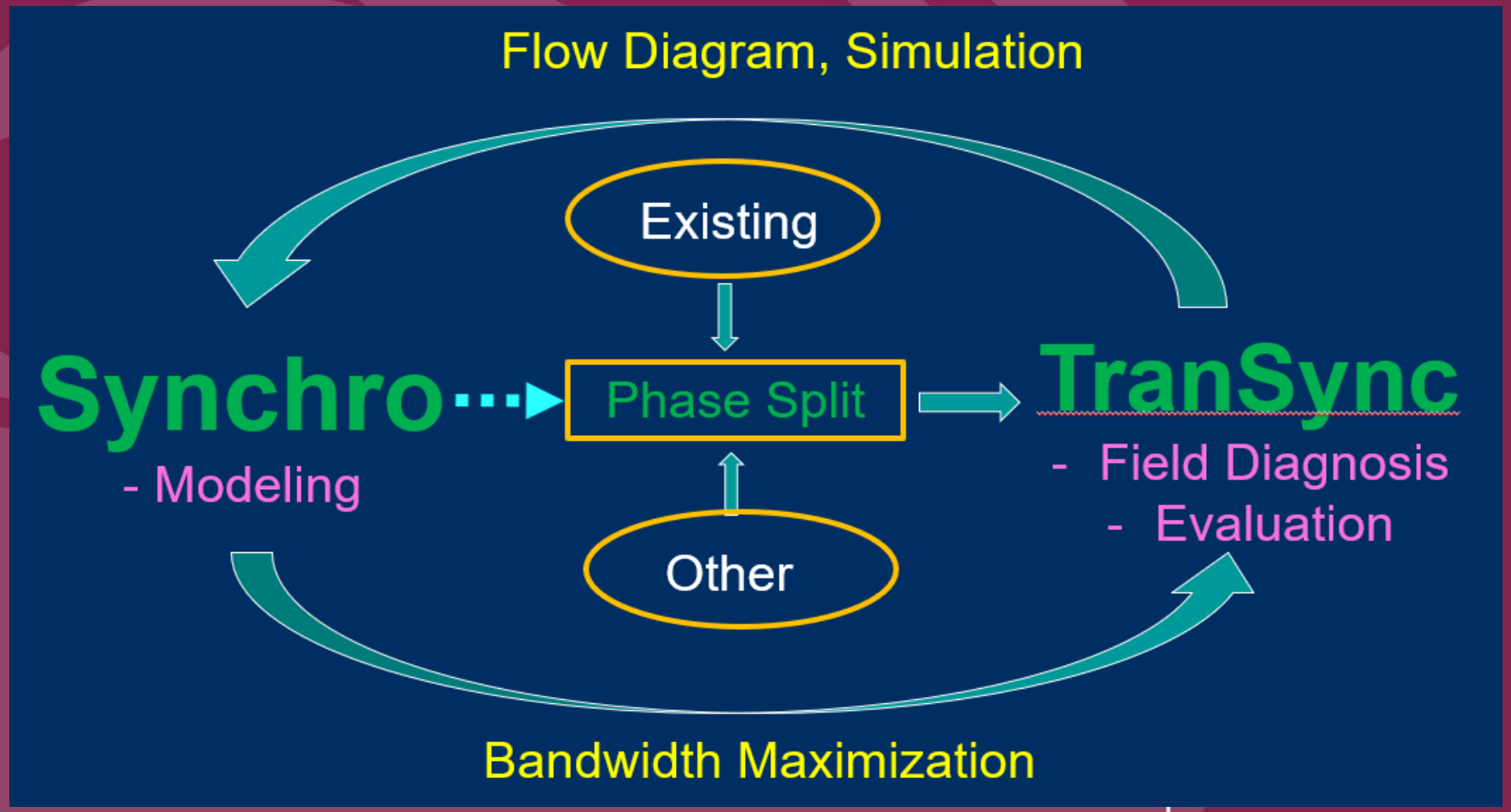
- Supports database **MANAGEMENT** to easily store, access, and view signal timing plans
- Provides maximum bandwidth **OPTIMIZATION** when developing signal timing plans
- Allows users to **DIAGNOSE**, implement and fine-tune timing plans in the field
- Provides the ability to **EVALUATE** the performance and quality of signal timing plans with the use of its performance indexes

Comparison with Synchro Software

Features	Synchro	TranSync
Inputs	Turning volume, lane configuration	Cycle and splits (*no volume)
Timing Data Management	One file for each timing plan	Multiple agency, timing plans in a single database
Optimization	Delay based	Maximum bandwidth
Diagnosis	No field diagnosis	GPS and real-time time-space diagram on iOS device
Evaluation/Performance	Delays, stops produced by Synchro	Performance index for Quality of Signal Timing based on field GPS runs

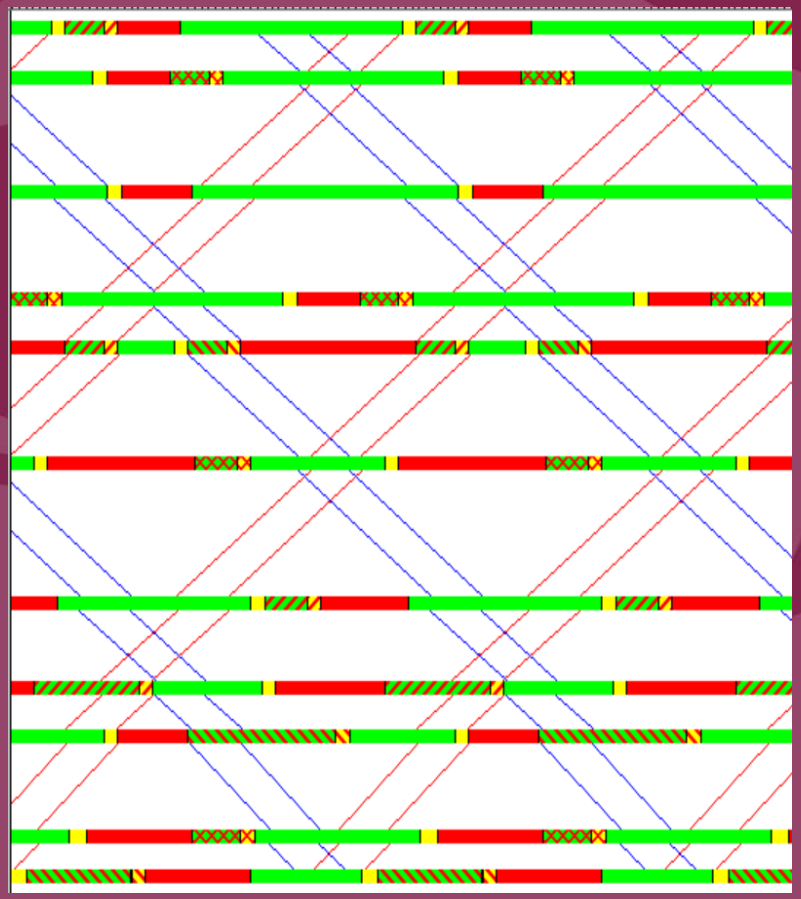
Zong Z. Tian, Ph.D., P.E.
Professor and Director
Center for Advanced Transportation Education and Research (CATER)
Department of Civil & Environmental Engineering
University of Nevada, Reno (UNR)

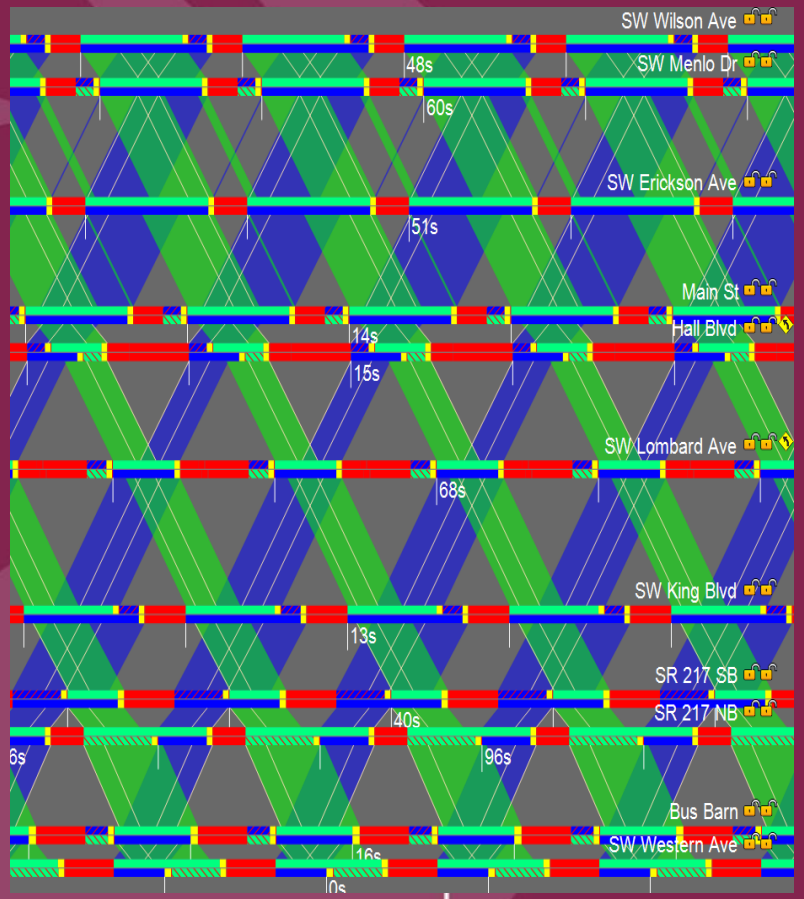
TranSync's Role in Signal Timing



Zong Z. Tian, Ph.D., P.E.
Professor and Director
Center for Advanced Transportation Education and Research (CATER)
Department of Civil & Environmental Engineering
University of Nevada, Reno (UNR)

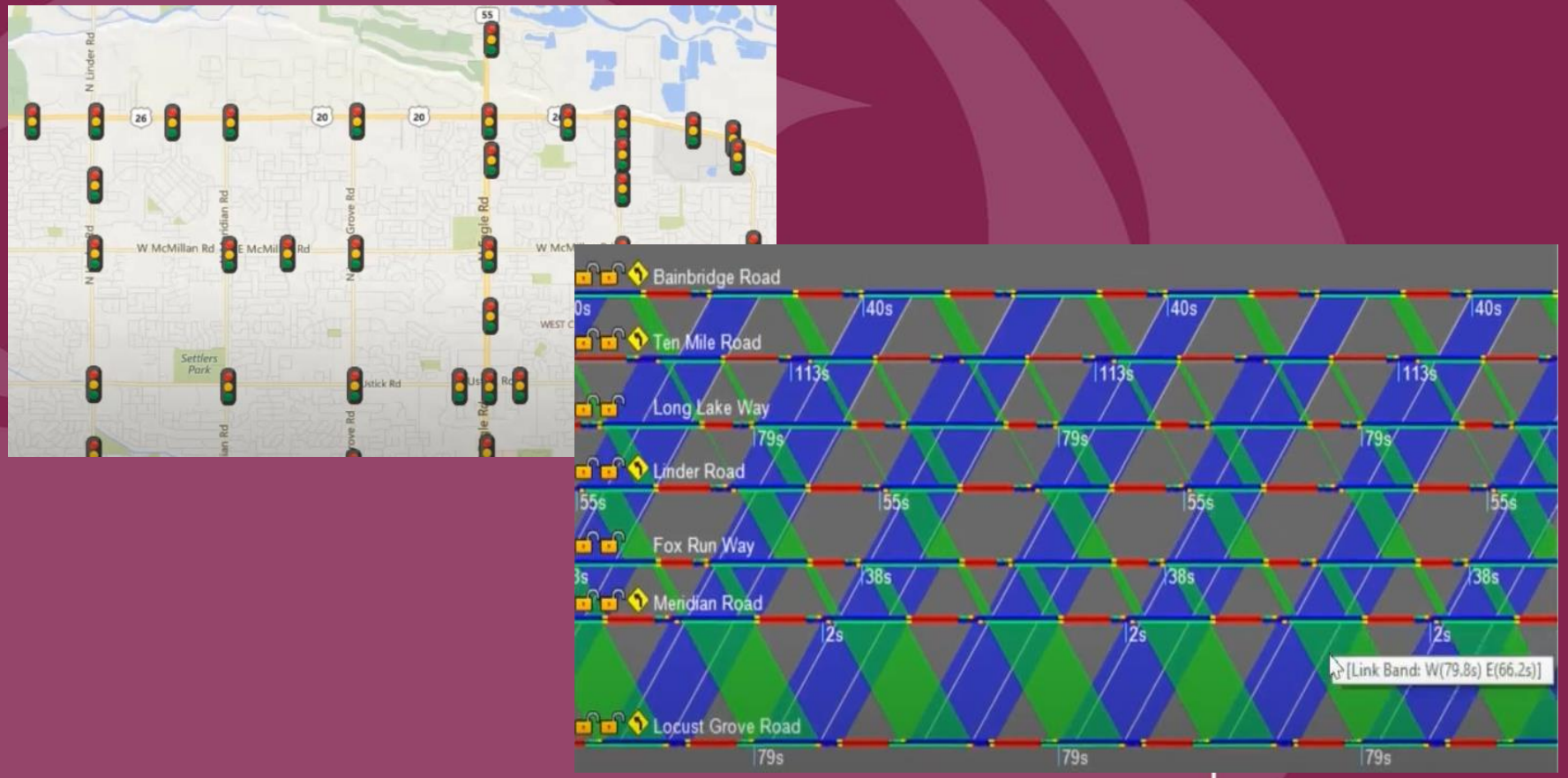
Synchro vs TranSync





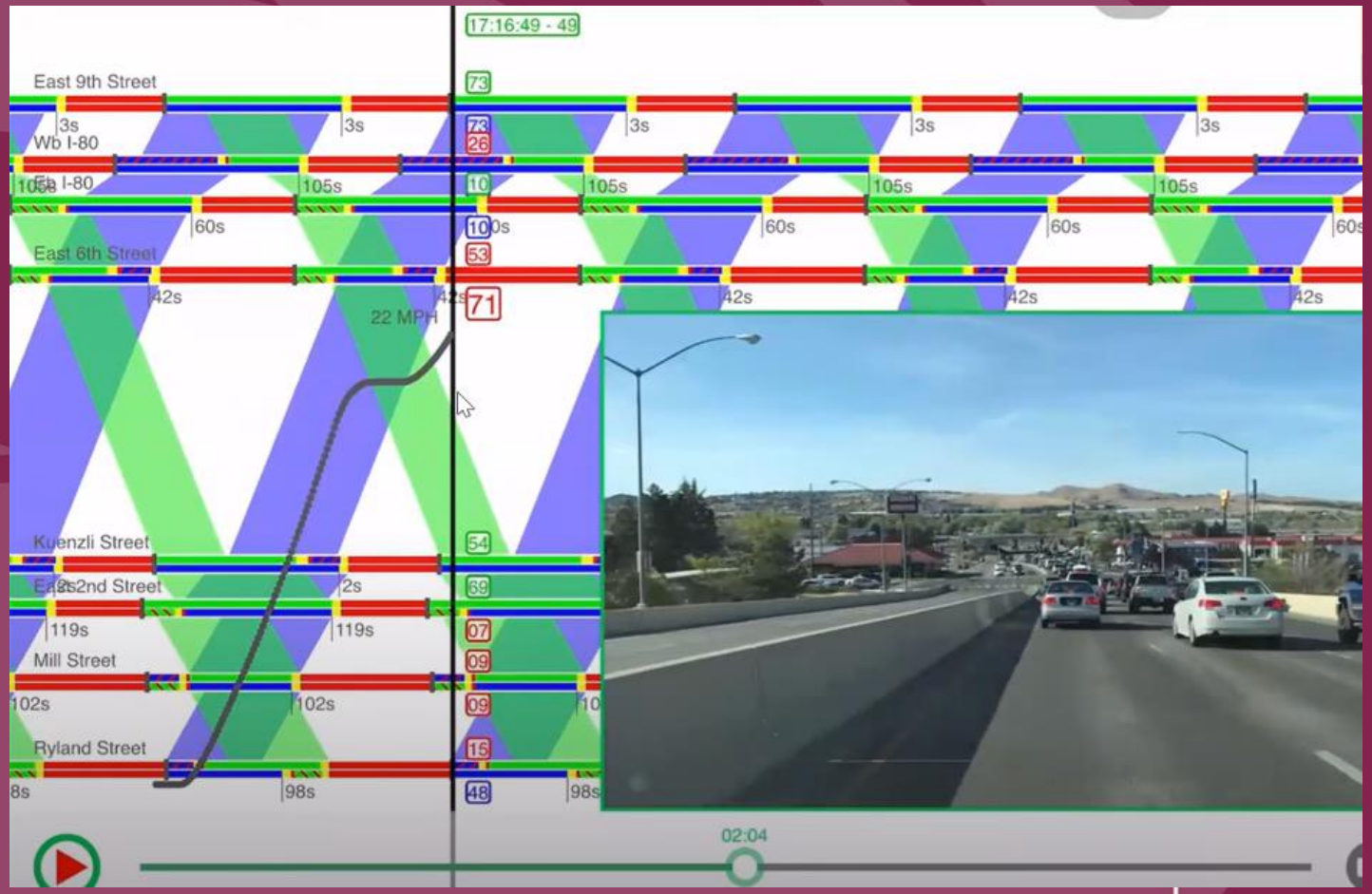
Zong Z. Tian, Ph.D., P.E.
Professor and Director
Center for Advanced Transportation Education and Research (CATER)
Department of Civil & Environmental Engineering
University of Nevada, Reno (UNR)

TranSync – D



Zong Z. Tian, Ph.D., P.E.
Professor and Director
Center for Advanced Transportation Education and Research (CATER)
Department of Civil & Environmental Engineering
University of Nevada, Reno (UNR)

TranSync – M



Zong Z. Tian, Ph.D., P.E.
Professor and Director
Center for Advanced Transportation Education and Research (CATER)
Department of Civil & Environmental Engineering
University of Nevada, Reno (UNR)

City of Phoenix

Why does the City of Phoenix use TranSync?

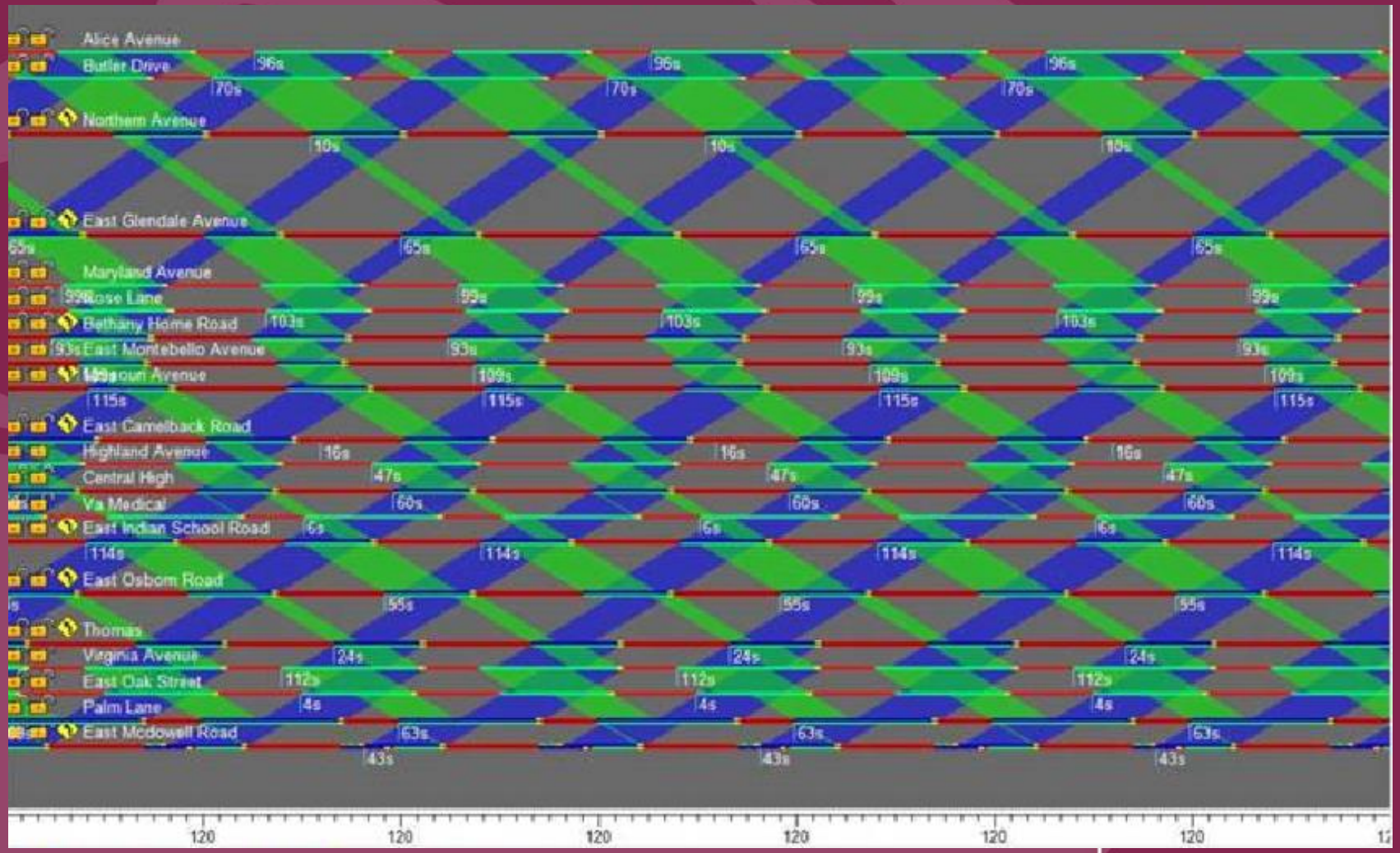
- Turning Movement Counts unavailable
- Intuitive to use
- Staff is able to validate and verify Synchro models
- Synchro data, such as timing, phasing and locations can be imported in TranSync
- Saves time
- TranSync – M provides clearer insight when making field adjustments in real-time

☺ Engineering and Signal Shop Staff has better overall understanding how coordination works by correlating signal timing plans and field operations

List of City of Phoenix Signal Retiming Projects

- Camelback Road – 103rd Avenue to El Mirage Road
- Indian School Road - SR 101 to 27th Avenue
- Greenway Road – 51st Avenue to 64th Street
- Tatum Boulevard - Cave Creek Road to Doubletree Ranch Road
- Bell Road – 7th Avenue to 56th Street (MAG TSOP)
- Thunderbird Road - 19th Avenue to 7th Street (MAG TSOP)
- Cactus Road - Cave Creek Road to 56th Street (MAG TSOP)
- Cactus Road – 51st Avenue to 31st Avenue
- 43 Avenue - Bell Road to Camelback Road
- 7th Street – Dunlap Avenue to McDowell Road (in progress)
- 7th Avenue – Dunlap Avenue to McDowell Road (in progress)
- Baseline Road – Central Avenue to 59th Avenue
- Thomas Road – 27th Avenue to SR 101

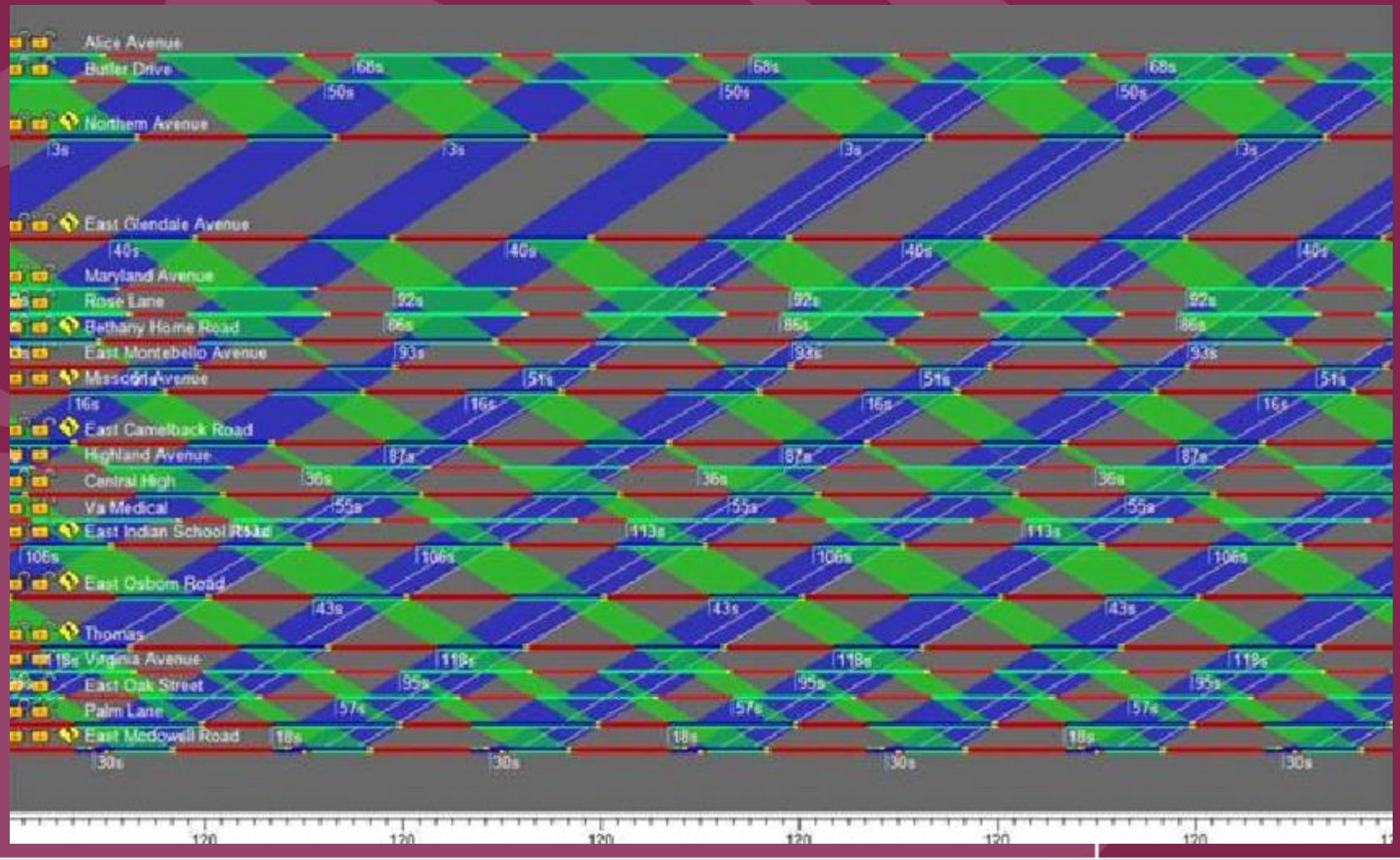
Before – 7th Street from McDowell Road to Dunlap Avenue PM Plan



Eric Hernandez
Signal System Specialist II
Traffic Management Center
City of Phoenix

City of Phoenix

After – 7th Street from McDowell Road to Dunlap Avenue PM Plan



Eric Hernandez
Signal System Specialist II
Traffic Management Center
City of Phoenix

City of Phoenix

Questions

7. Requests for Future Agenda Items

8. Comments from the ITS Committee Members

Next Meeting

Wednesday, October 7, 2020 at 10:00 a.m.
Virtual Meeting

9. Adjourn