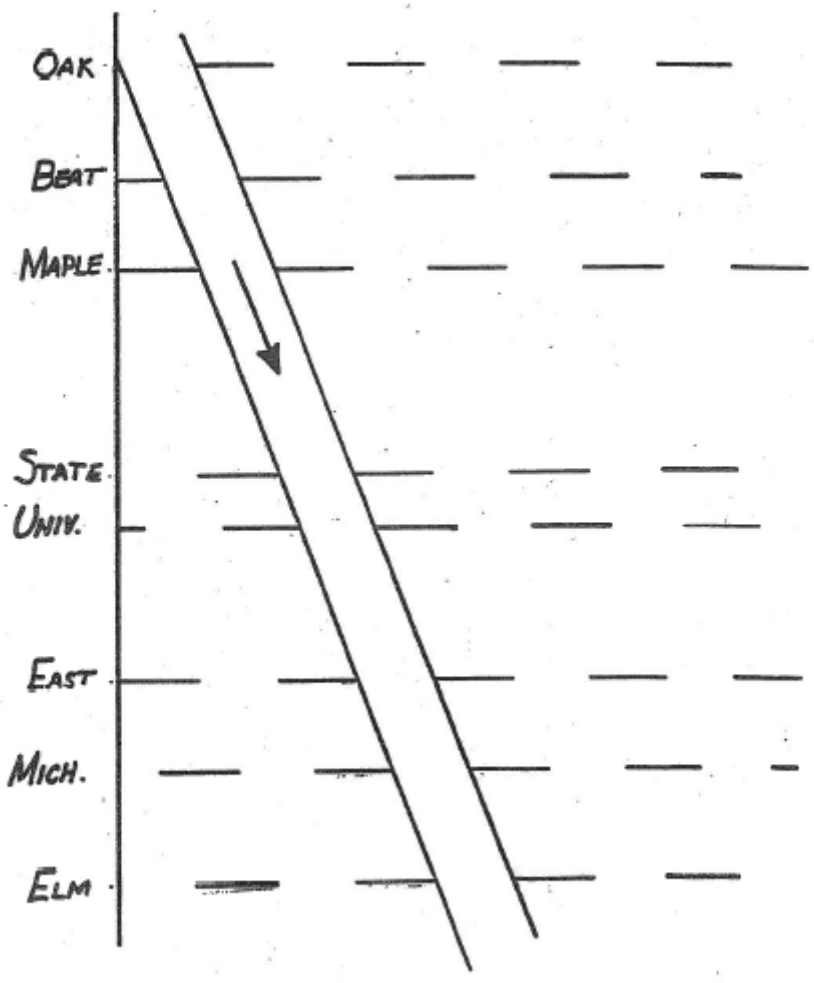
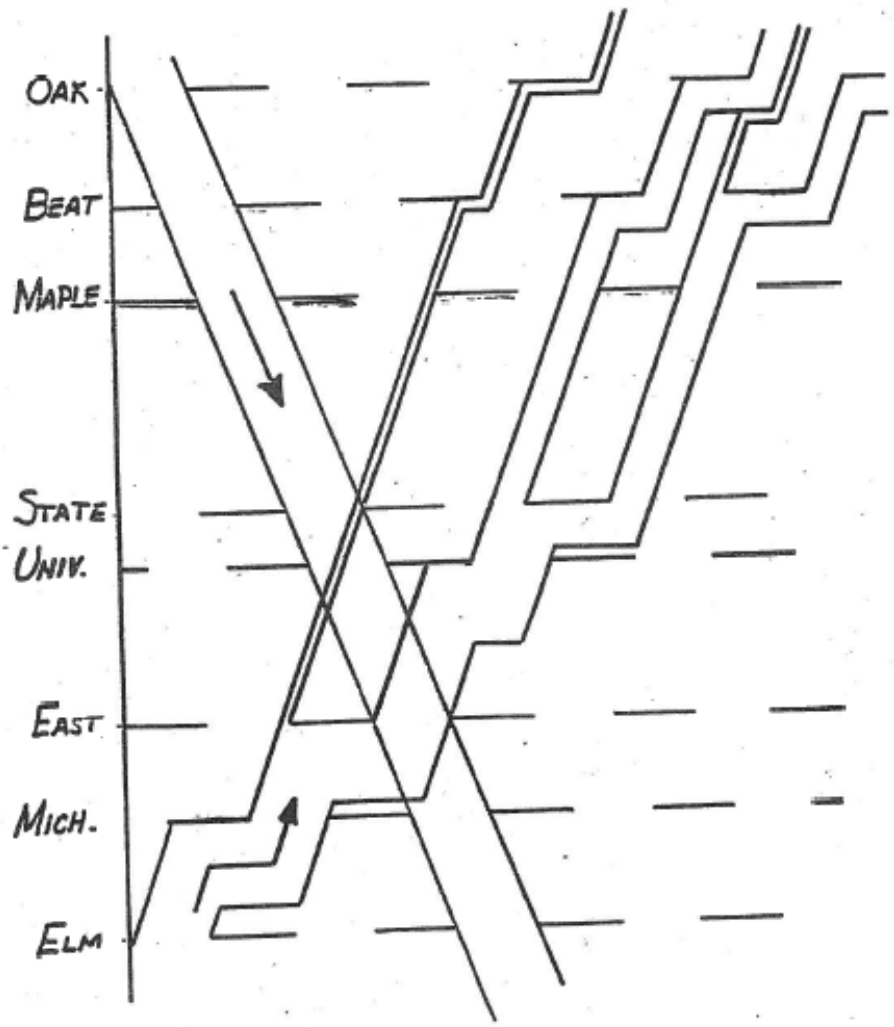
# Safety and Operational Impact of Median Left Turns

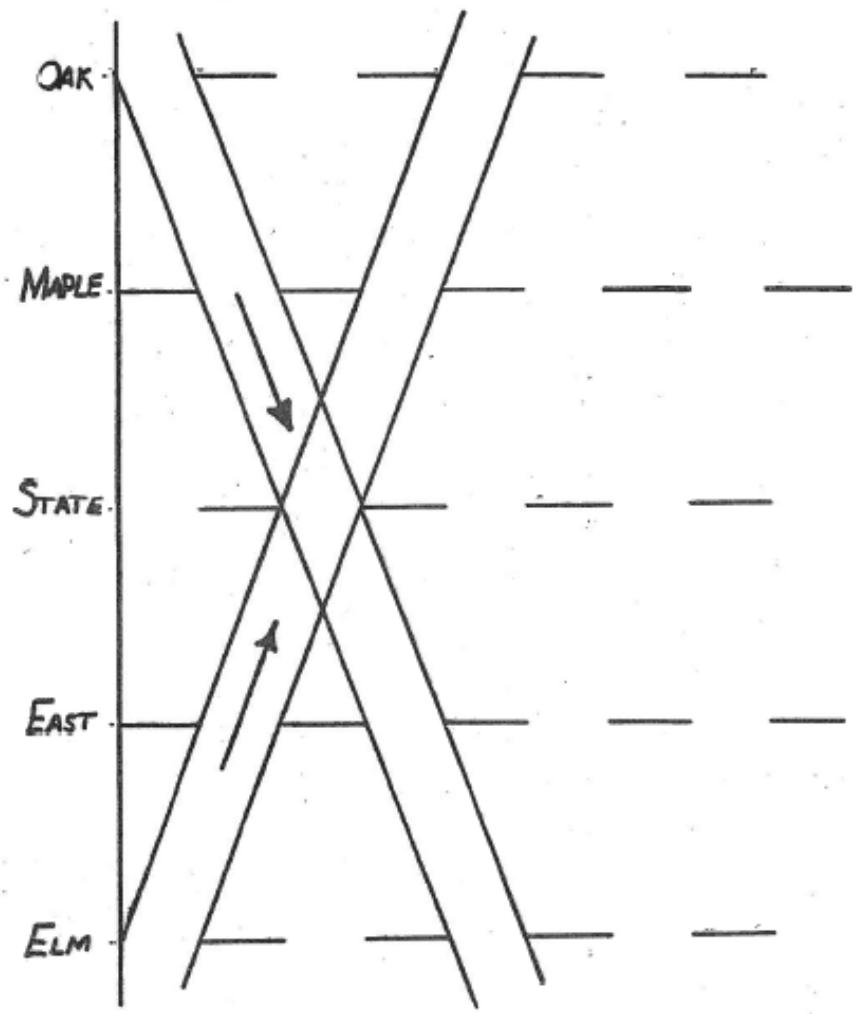
Keystone, CO
June 2018
Dr. Robert E. Maki, PE




Example 1




Example 2




Example 3

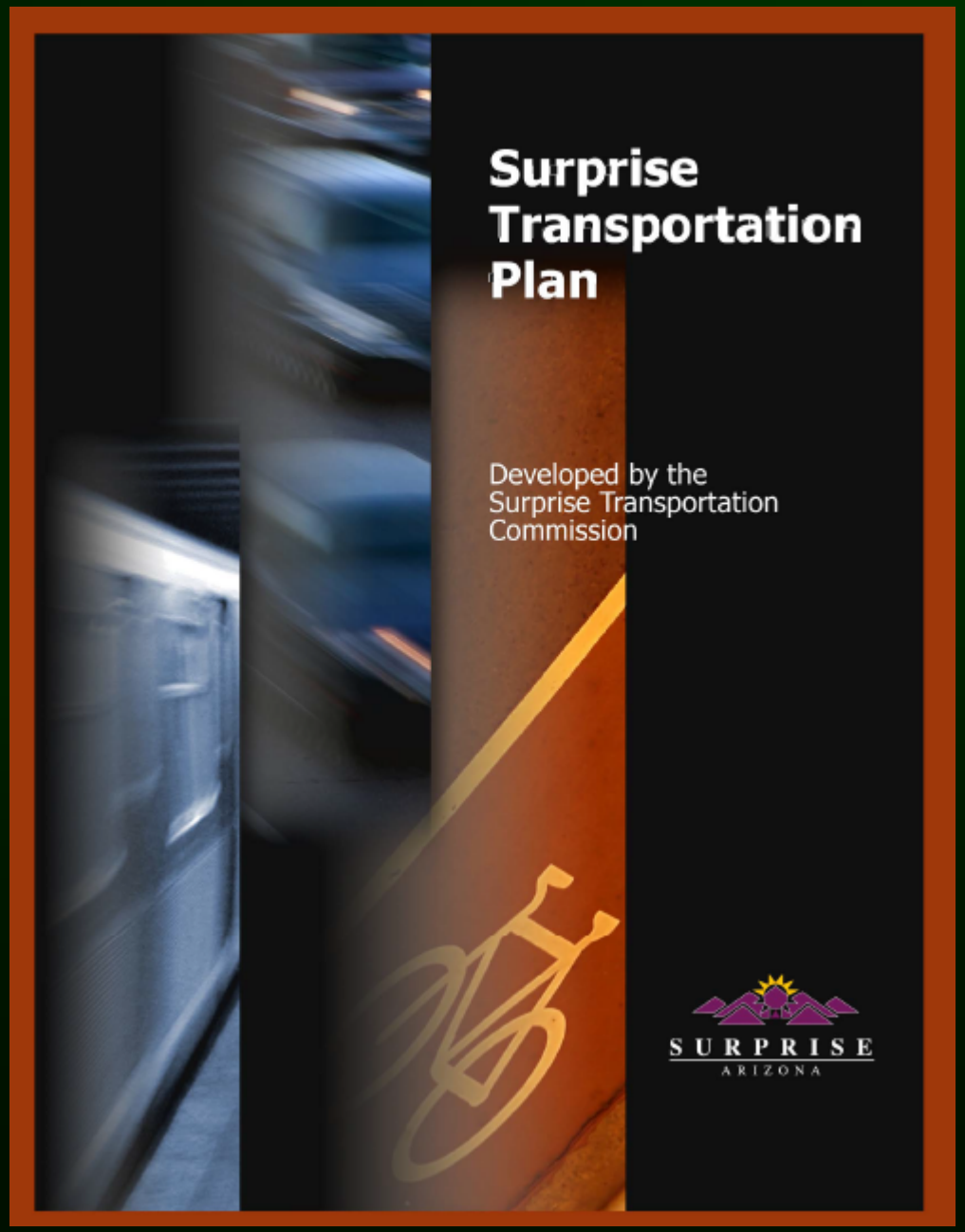
First  Arizona Application of the Indirect Left Concept

Major Contributions from:

Randall Overmyer, Former Transportation Planner, now with CivTech, Inc.

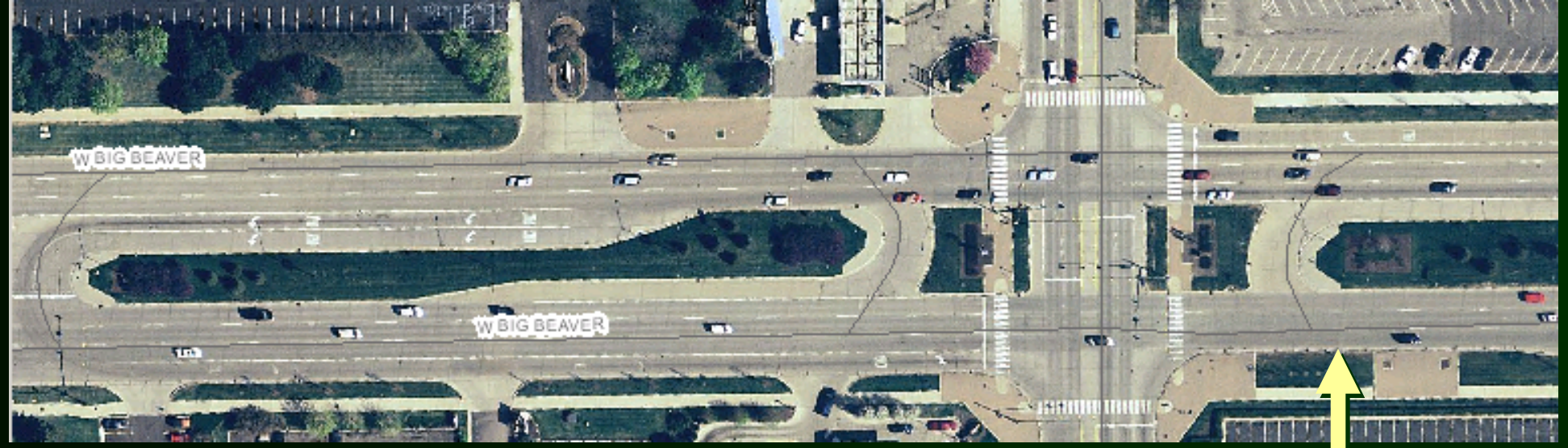
And

Dr. Robert E. Maki, PE,
Former Transportation Director



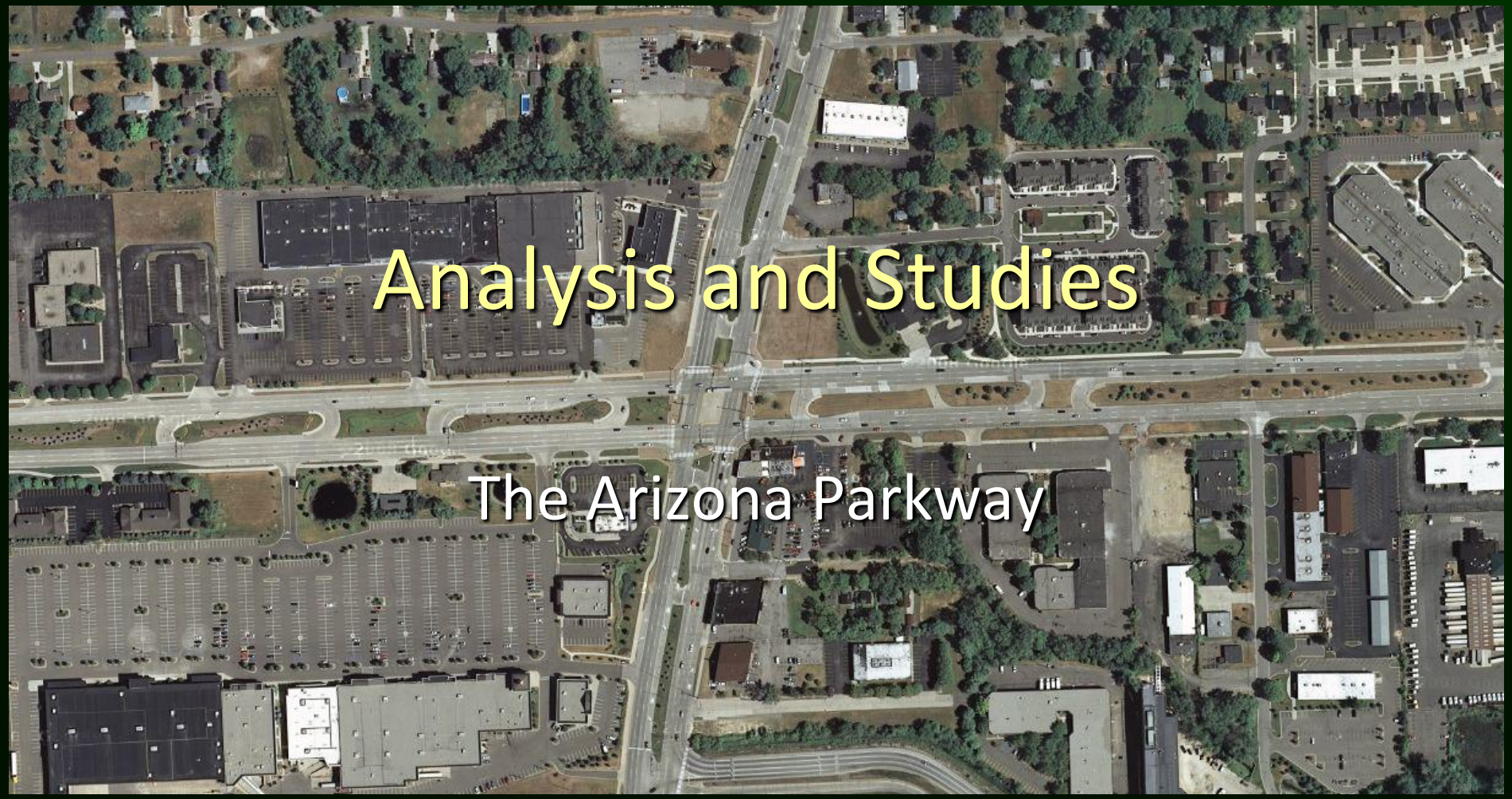
# “The Arizona Parkway”

- 40 years practice in seven states
- Marginal cost increase over conventional arterials
- Near-freeway volumes
- Context-sensitive




Boulevard, 60-ft Median, 200-ft Right-of-Way, up to 8-lanes

Arterial, 12-ft Median, 130-ft Right of Way, up to 6-lanes



# Analysis and Studies

## The Arizona Parkway


8 Mile Rd (M-102), west of Woodward Ave
**124,600 vpd**

Telegraph Rd (US-24), north of I-696
**104,200 vpd**

Hall Rd (M-59), east of M-53
**102,300 vpd**

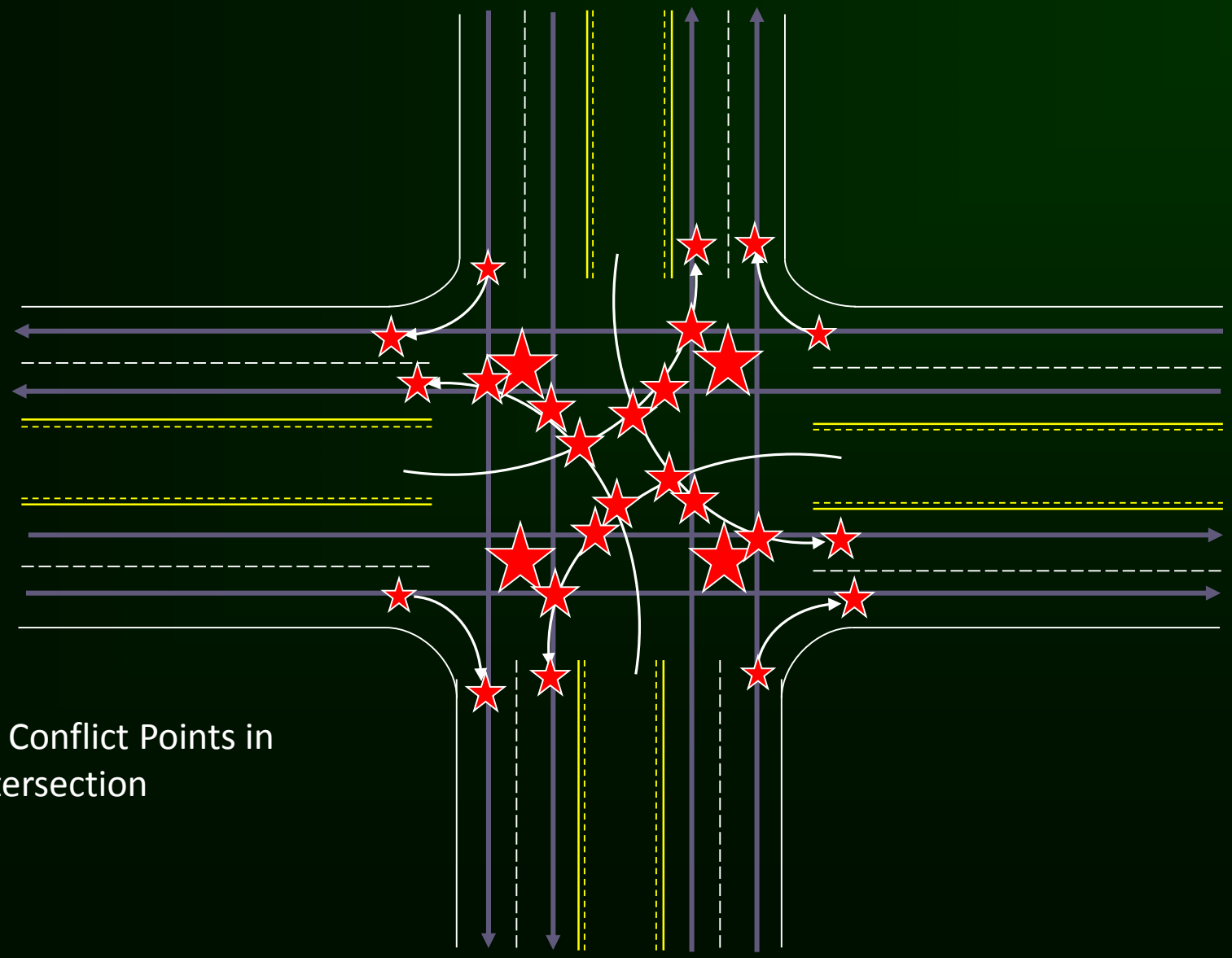
Some intersections carry more than 130,000 entering vehicles per day

*Bell Rd, over Agua Fria River*
***62,000 vpd***

# Results and Conclusions
# AZ Pkwy versus Conventional Design

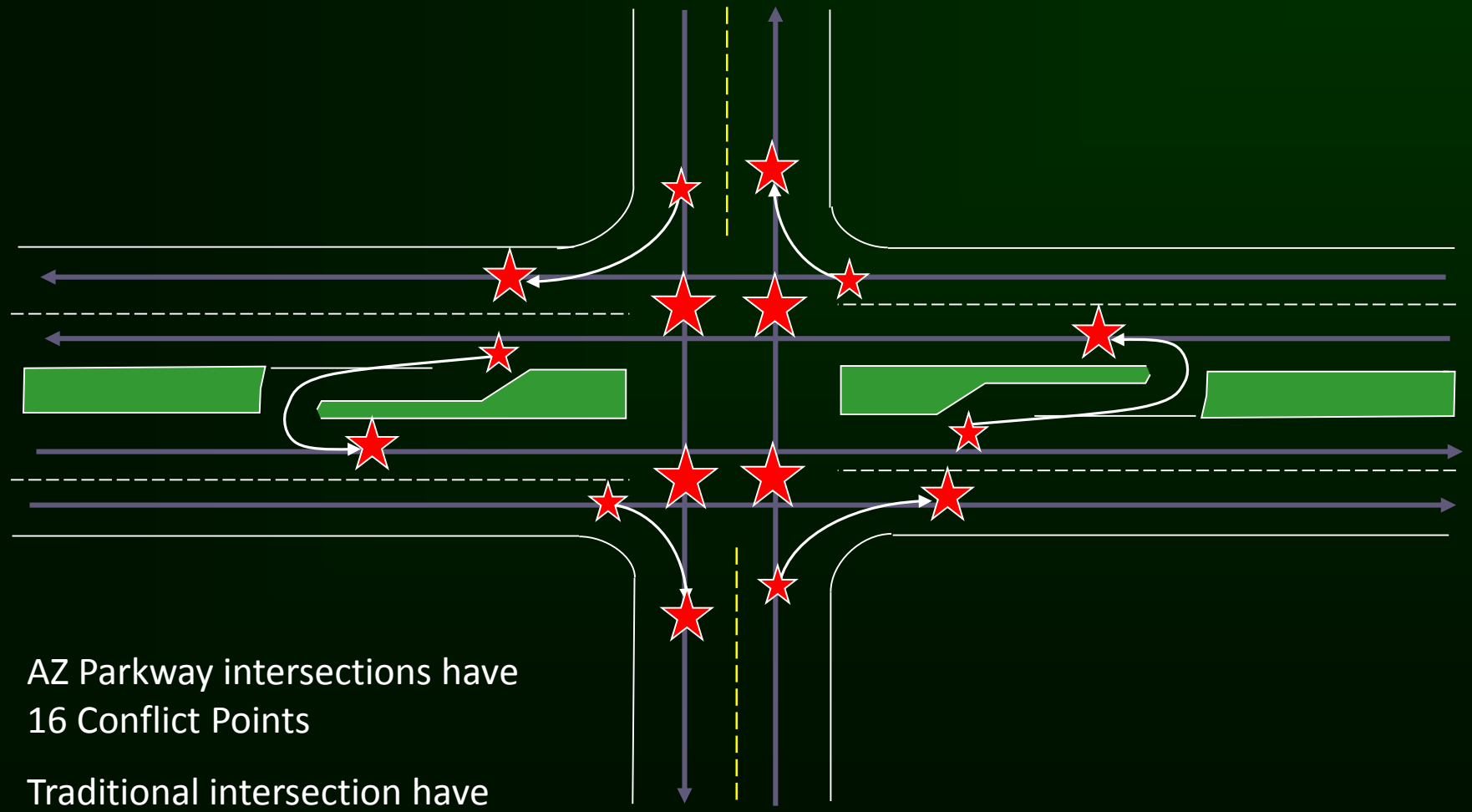
- 6-Lane MLT > 8-Lane Conventional parkway
- 4-Lane MLT = 6-Lane Conventional parkway

# Conflict Points



32 Conflict Points in intersection

# Conflict Points

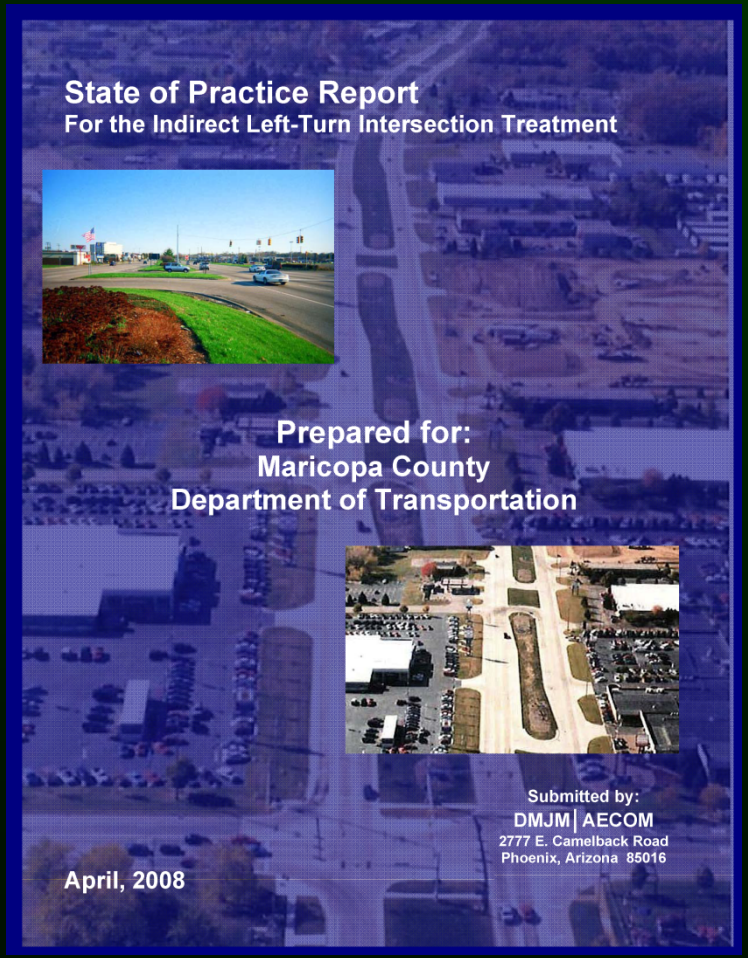


AZ Parkway intersections have
16 Conflict Points

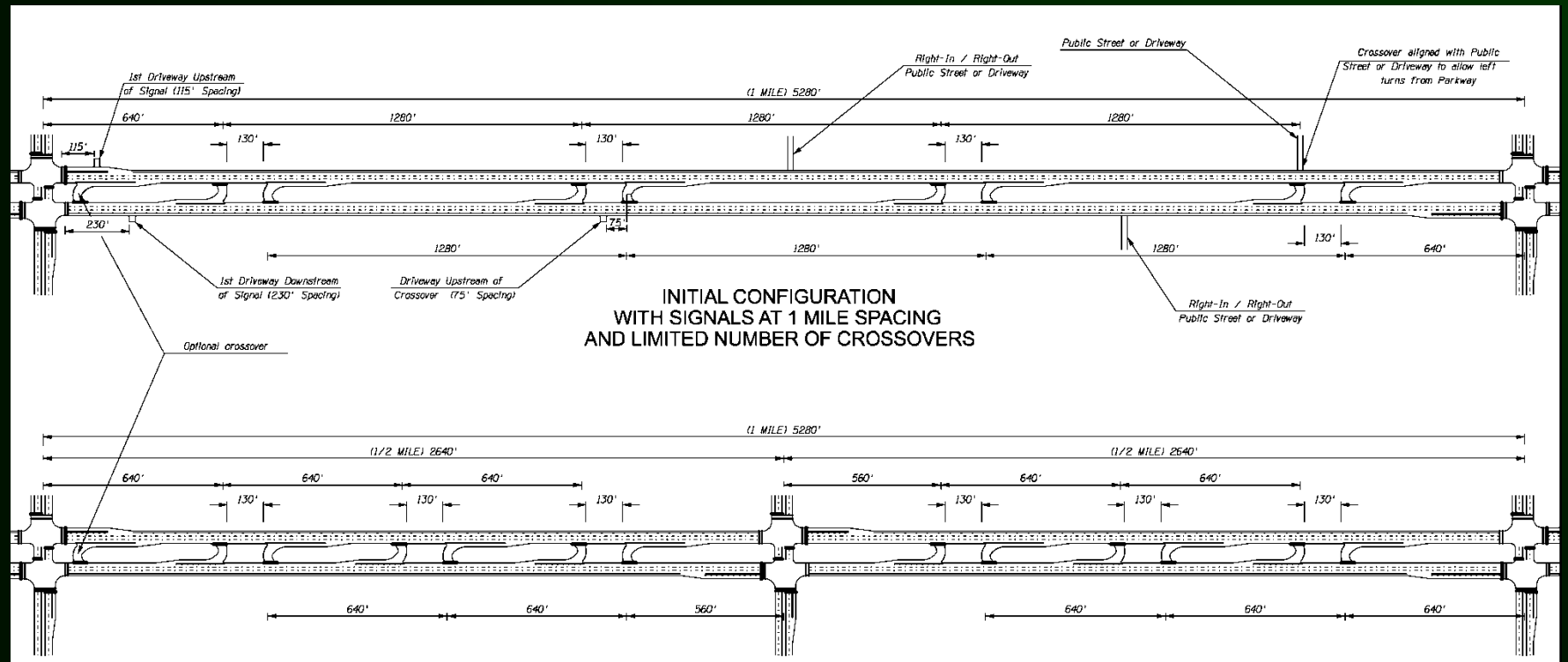
Traditional intersection have
32 Conflict Points

# MCDOT Design Guidelines

- Initiated in January 2008
- Included Field Visit in March 2008
- Reports
  - State of the Practice (April 2008)
  - Draft Design Guidelines (June 2008)
  - Final Report (July 2008)



# Access Conceptual Schematic




INITIAL CONFIGURATION
WITH SIGNALS AT 1 MILE SPACING
AND LIMITED NUMBER OF CROSSOVERS

FUTURE CONFIGURATION
WITH SIGNALS AT 1/2 MILE SPACING
AND MAXIMUM NUMBER OF CROSSOVERS

NOTES:

1. Not to scale.
2. Crossover spacing from signal and between crossovers should be 660'(±100')
3. Spacing between back to back crossovers is 100' minimum.
4. 330' spacing for high-volume driveways and 165' spacing for low-volume driveways.

DRAFT

# Resources

- Enhanced Parkway Reports
  1. General Analysis
  2. Continuous Flow Intersections
  3. MLT Intersection Analysis
- MCDOT Design Guidelines
  1. State of the Practice
  2. Guideline Recommendations

# Thank You !

Graphics Courtesy of:

Maricopa Association of Governments

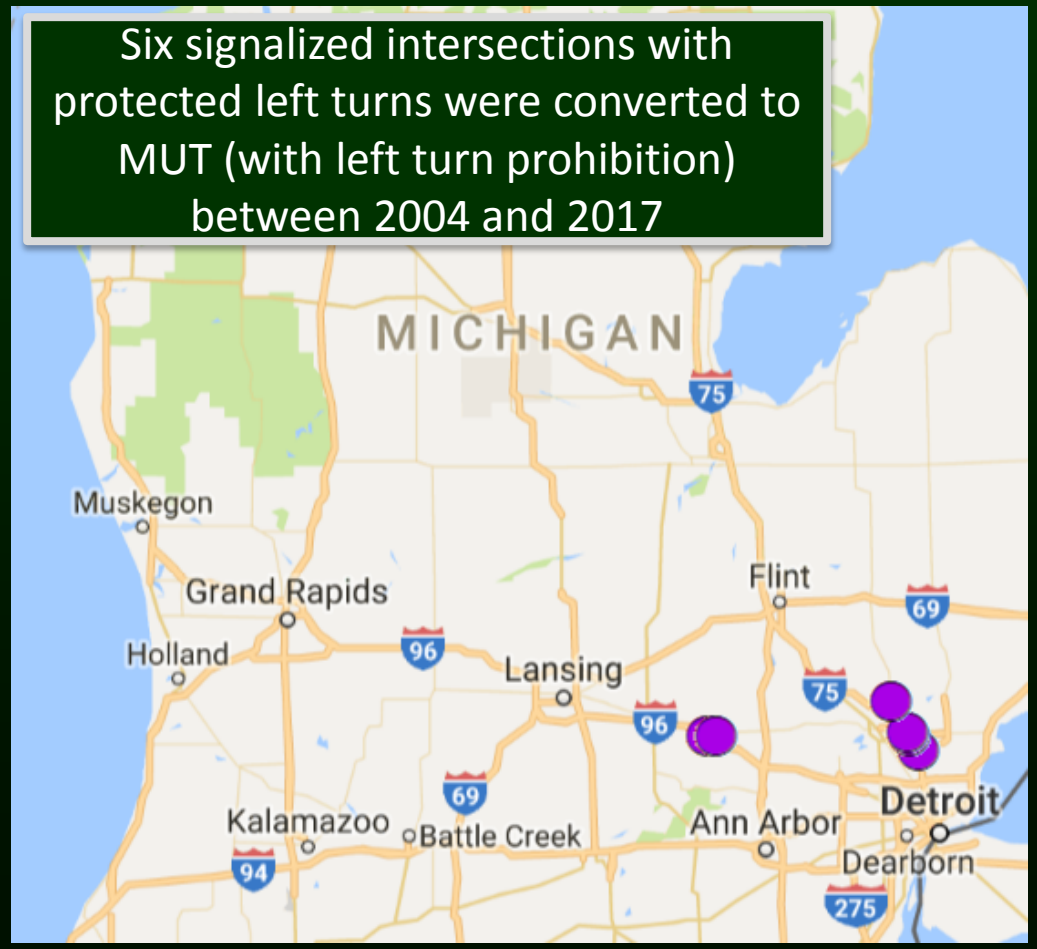
Maricopa County (MCDOT)

# Safety Evaluation of Median U-Turn (Michigan Left) Intersection Conversions in Michigan

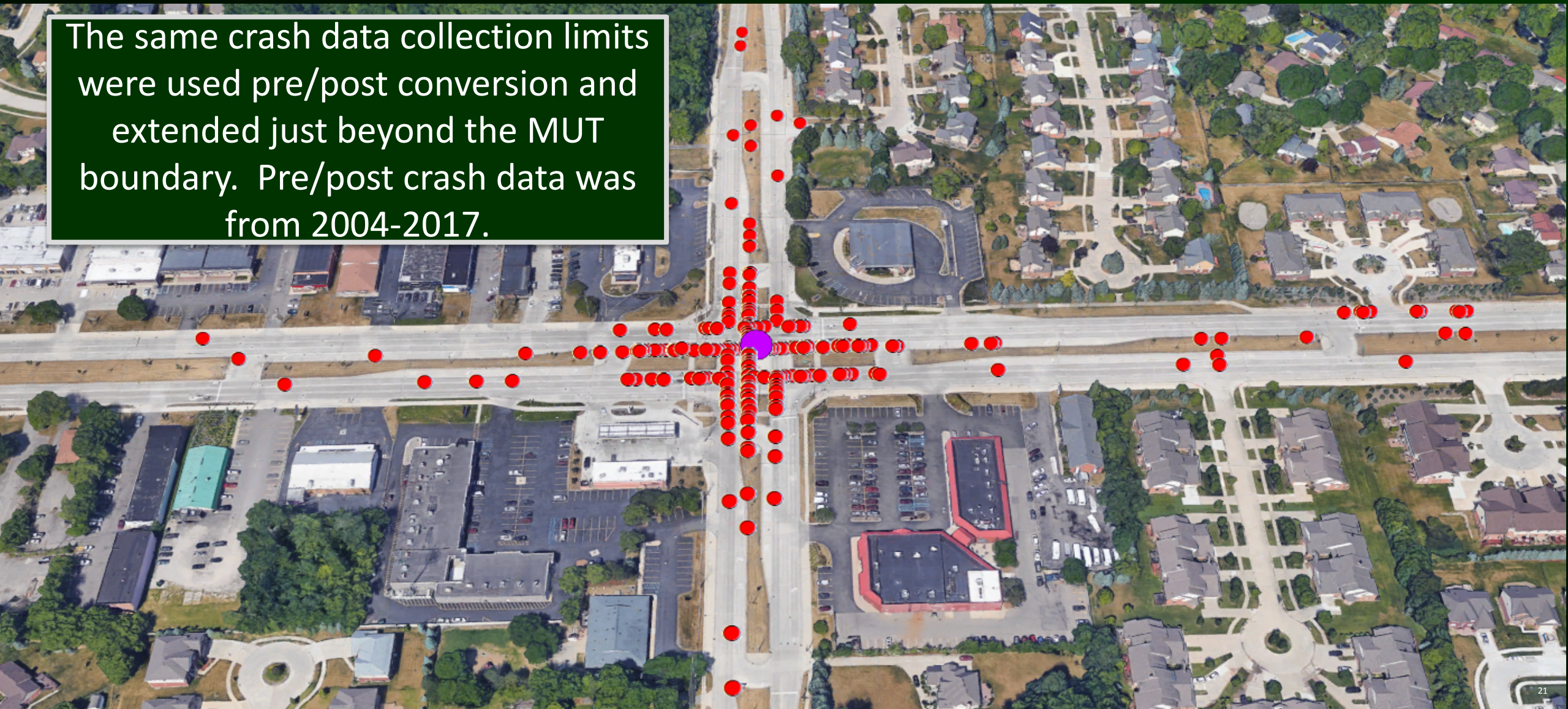
**June 2018**

# Michigan Signalized MUT Conversions

| Name | County | Pre-Conversion Years | Post-Conversion Years |
|---|---|---|---|
| Rochester and Wattles | Oakland | 6 | 6 |
| Crooks and South Boulevard | Oakland | 1 | 10 |
| Crooks and Auburn | Oakland | 3 | 8 |
| M-24 and Silverbell | Oakland | 12 | 1 |
| Highland and Grand River | Livingston | 2 | 9 |
| Highland and Byron | Livingston | 2 | 9 |



# Traffic Crash Data Collection



The same crash data collection limits were used pre/post conversion and extended just beyond the MUT boundary. Pre/post crash data was from 2004-2017.

# Pre/Post Crash Rate Results - Injury Severity

| Worst Injury Outcome | Pre-Conversion Annual Crash Frequency | Post-Conversion Annual Crash Frequency | Percent Change |
|---|---|---|---|
| Fatal (K) Crash Rate | 0.0000 | 0.0000 | 0.0% |
| Fatal (K) and Serious Injury (A) Crash Rate | 0.0144 | 0.0119 | -16.8% |
| Fatal and Injury (K+A+B+C) Crash Rate | 0.2399 | 0.2355 | -1.8% |
| Property Damage Only Crash Rate | 1.2488 | 0.9129 | -26.9% |
| **Total Crash Rate** | **1.4887** | **1.1484** | **-22.9%** |

Notes: Crash rates presented in intersection crashes per one million entering vehicles.
Major/minor volume data obtained from various sources, including MDOT, MPOs, and local agencies

# Pre/Post Crash Rate Results - Crash Type as a Proportion of Total

| Crash Type | Pre-Conversion Crash Frequency | Pre-Conversion Percent of Total | Post-Conversion Crash Frequency | Post-Conversion Percent of Total |
|---|---|---|---|---|
| Single Vehicle | 20 | 2.8% | 39 | 5.8% |
| Head On | 6 | 0.8% | 2 | 0.3% |
| Head On Left-Turn | 20 | 2.8% | 10 | 1.5% |
| Angle | 125 | 17.2% | 133 | 19.8% |
| Rear End | 450 | 62.0% | 399 | 59.3% |
| Sideswipe Same | 67 | 9.2% | 66 | 9.8% |
| Sideswipe Opposite | 12 | 1.7% | 2 | 0.3% |
| Other | 26 | 3.6% | 22 | 3.3% |
| **Total** | **726** | **100.0%** | **673** | **100.0%** |

# Summary of Michigan MUT Conversion Findings

- Six Michigan signalized intersections were evaluated pre/post MUT conversion:
  - 23% reduction in total crash rate post MUT
  - 17% reduction in fatal and serious injury crash rate post MUT
  - Reduced proportion of head-on left-turn crashes after conversion
- Results are based upon simple B&A rate comparisons methods and should be interpreted with caution
  - No comparison sites or EB analysis
  - Further work in this area will develop CMFs consistent with HSM methods