



ROADWAY SAFETY  
COUNCIL

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# Agenda

- ★ Solve or Treat?
- ★ Systemic vs. Unique
- ★ \$1.5 Million for 2021 Deployment of Enhanced Signing, Pavement Markings & Cameras
- ★ Home grown notification system
- ★ Unique treatments worth sharing
- ★ In-Car notification efforts





After collection WWD Data for  
10 years with \$0 budget...

I got \$1.5 Million of HSIP  
funding for enhanced signing  
and pavement markings.





# Where to Spend?

467 Interchanges in Iowa



# Network Screening



★ By Dr. Huaguo Zhou  
Md Atiquzzaman of  
Auburn University

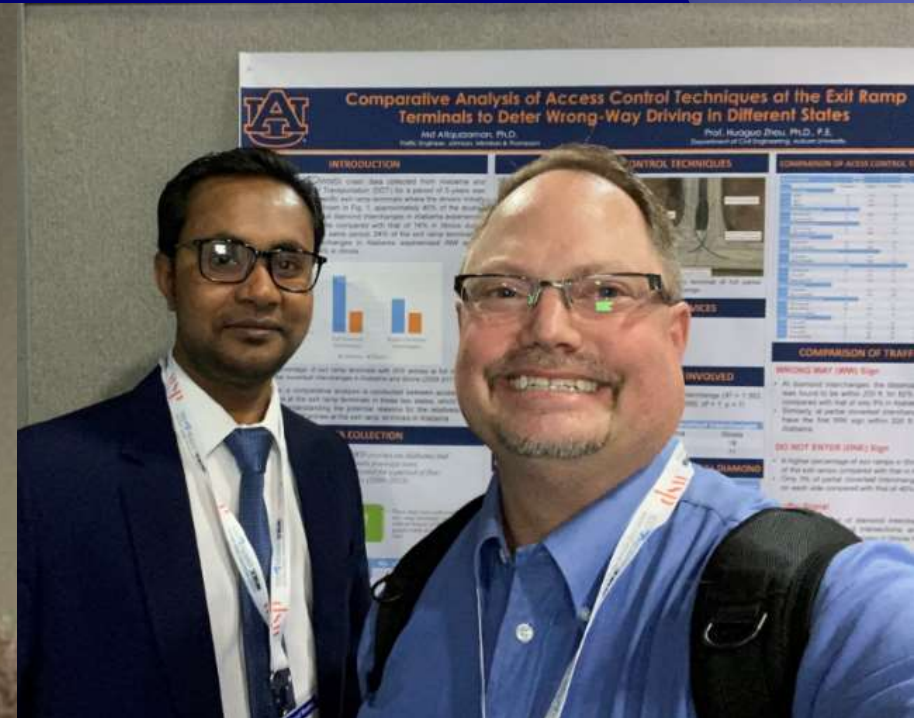
Article

## Modeling the Risk of Wrong-Way Driving Entry at the Exit Ramp Terminals of Full Diamond Interchanges

Md Atiquzzaman<sup>1</sup> and Huaguo Zhou<sup>1</sup>

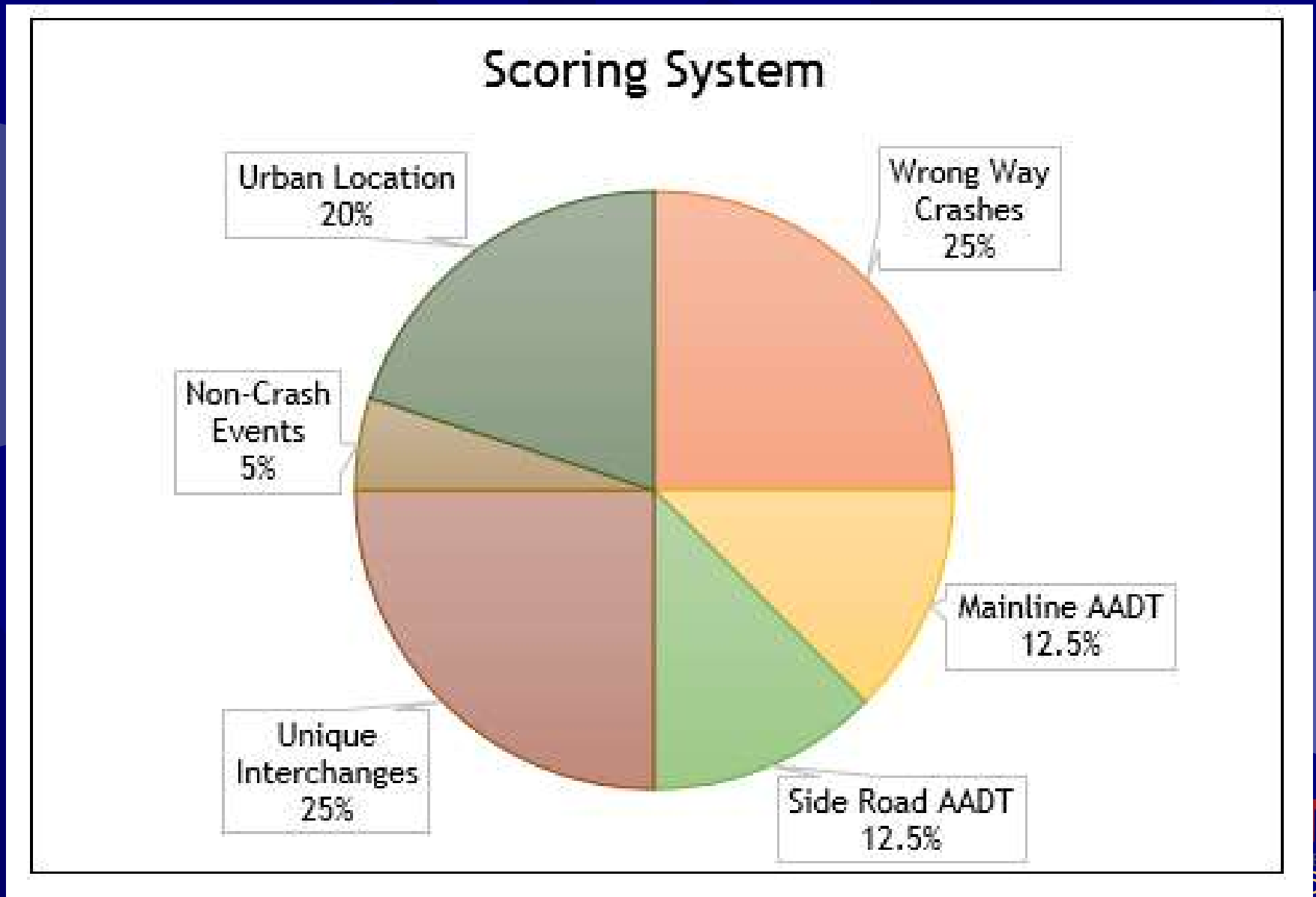
**TRR**  
JOURNAL OF THE TRANSPORTATION RESEARCH BOARD

Transportation Research Record  
2018, Vol. 2672(17) 35–47  
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Transportation Research Board 2018  
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DOI: 10.1177/0361198118783152  
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# Iowa's Modification Scoring System

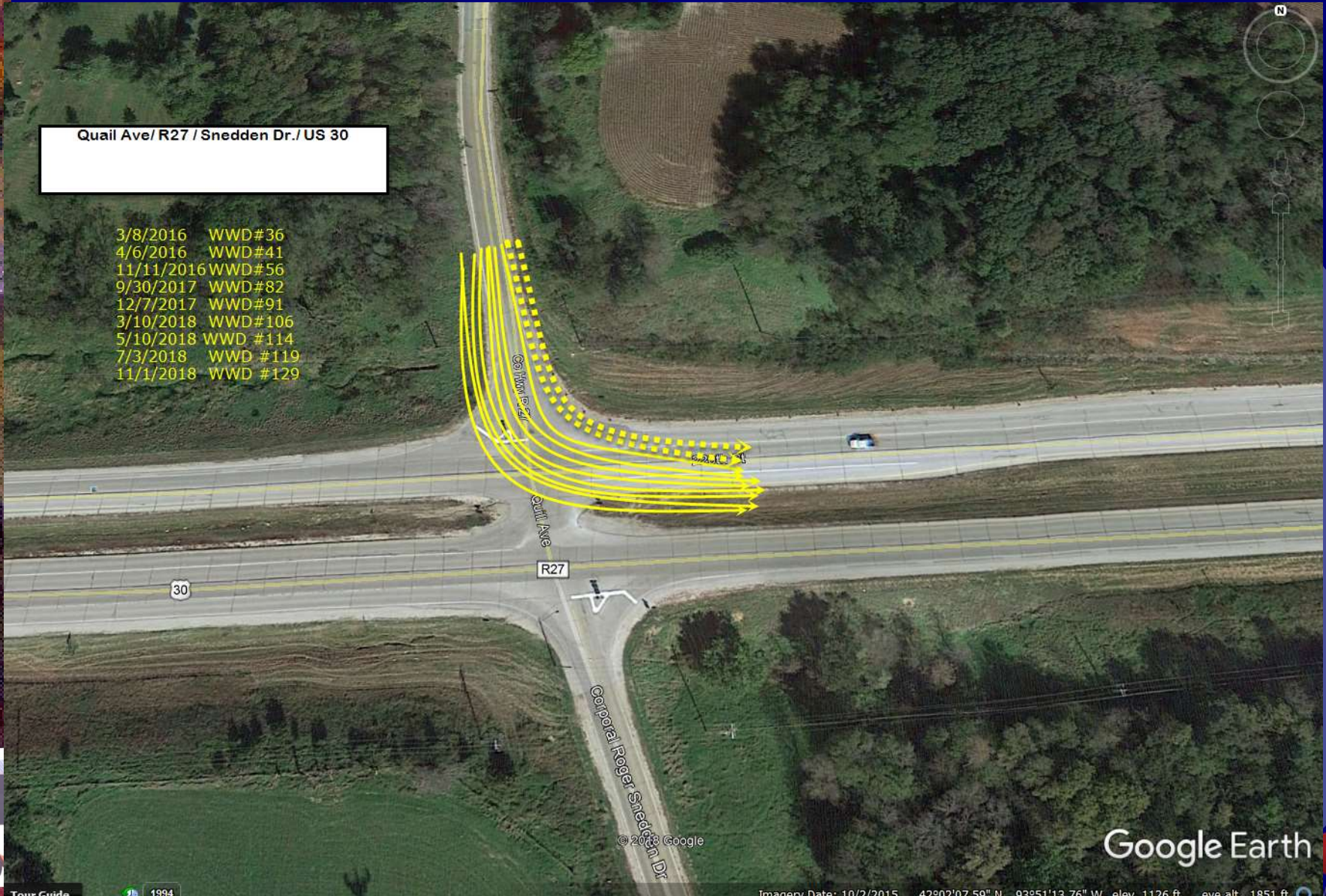




# Don't forget about At-Grades

Quail Ave/ R27 / Snedden Dr./ US 30

- 3/8/2016 WWD#36
- 4/6/2016 WWD#41
- 11/11/2016 WWD#56
- 9/30/2017 WWD#82
- 12/7/2017 WWD#91
- 3/10/2018 WWD#106
- 5/10/2018 WWD #114
- 7/3/2018 WWD #119
- 11/1/2018 WWD #129



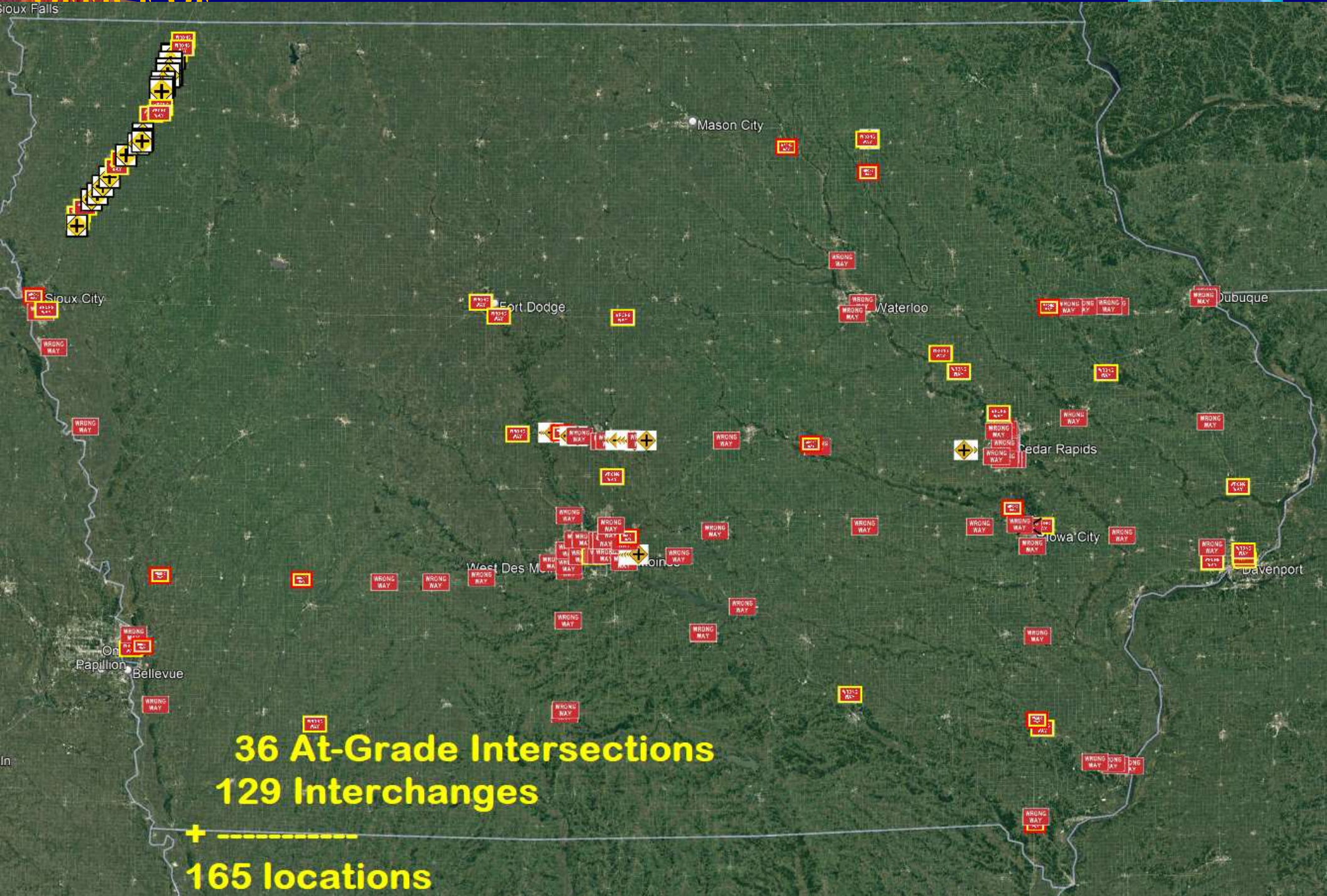
© 2018 Google

Google Earth

OT

Imagery Date: 10/2/2015 42°02'07.59" N 93°51'13.76" W elev. 1126 ft eye alt. 1851 ft

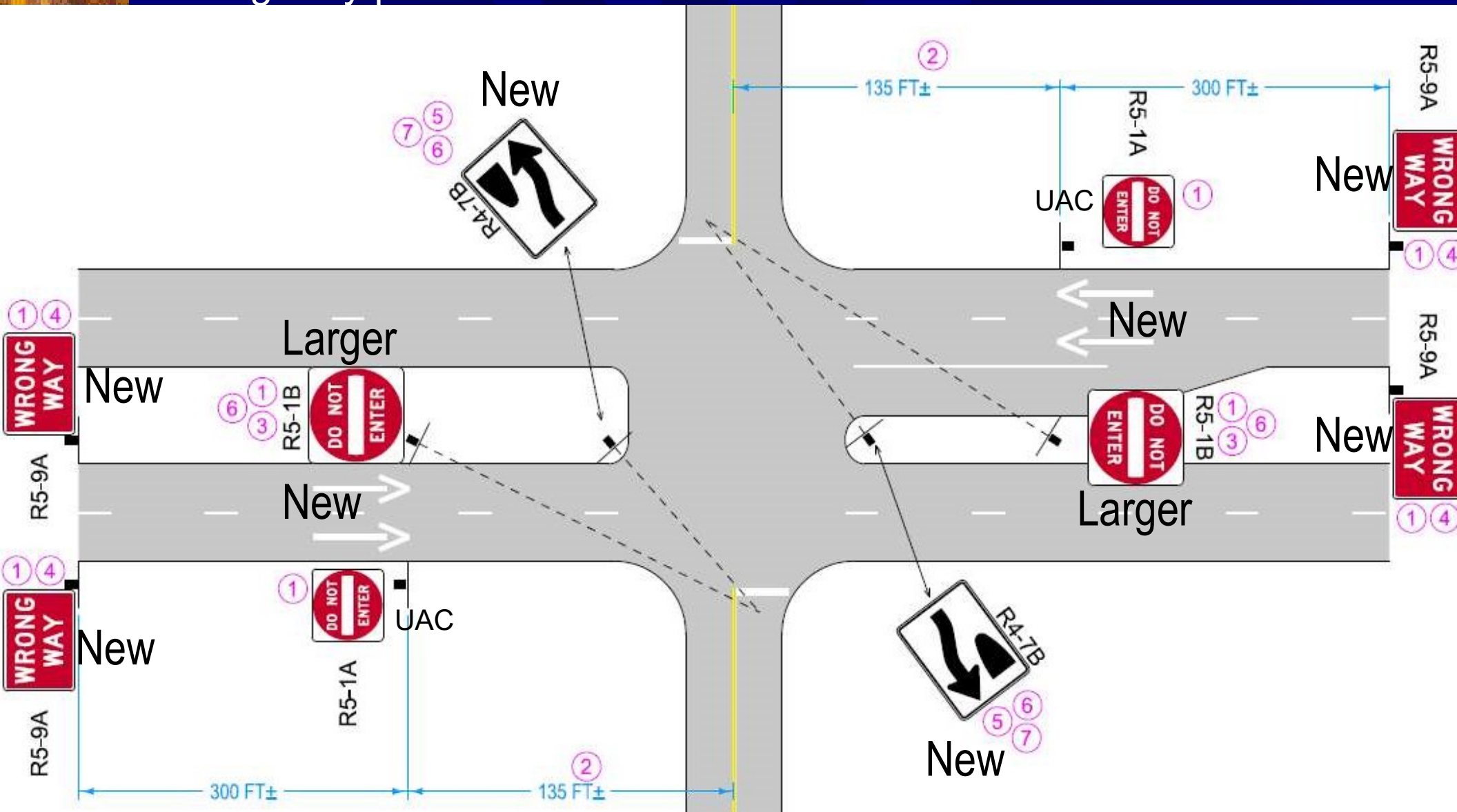
USER DRIVEN

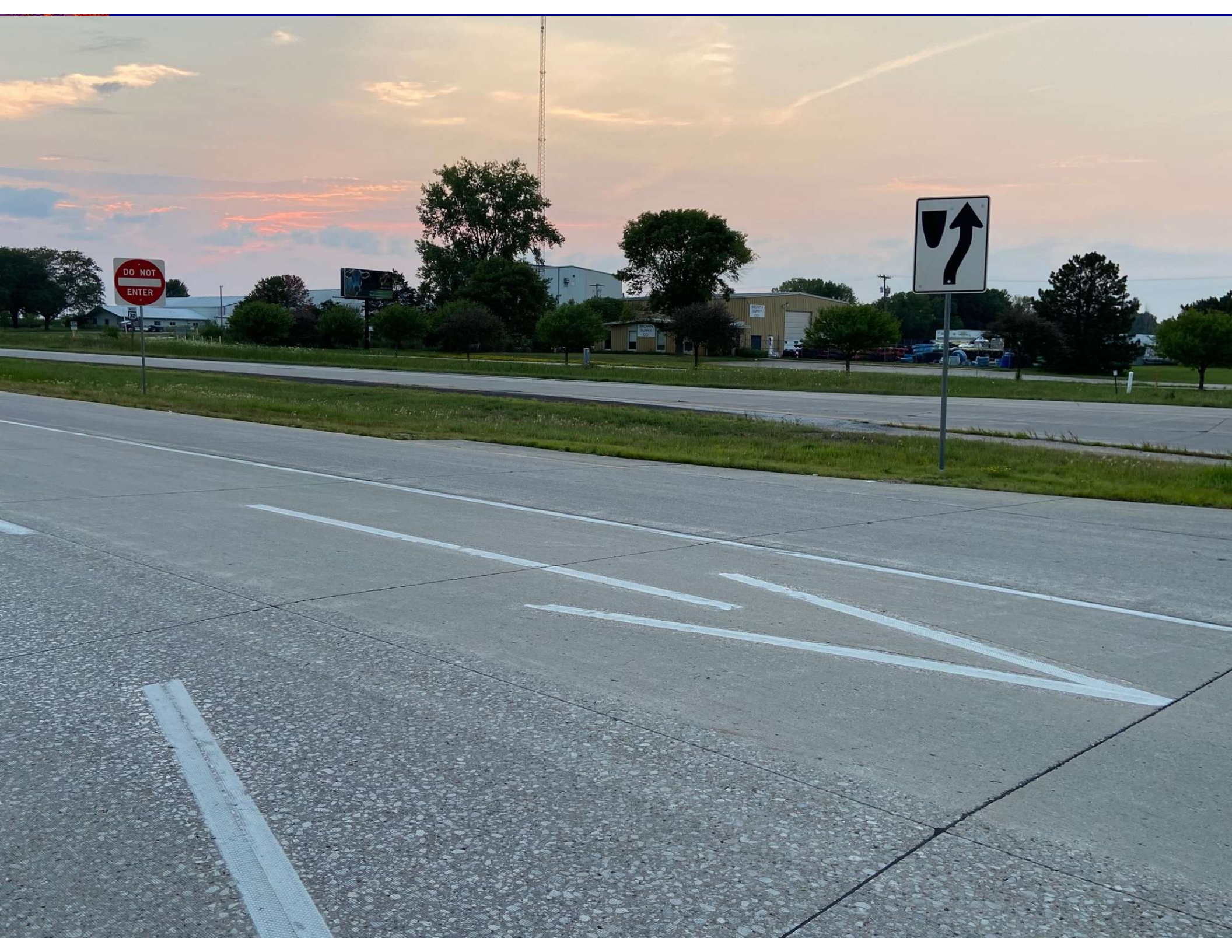






- ★ New Signs/Pavement Markings
- ★ Larger Signs
- ★ Strategically placed & aimed





DO NOT  
ENTER



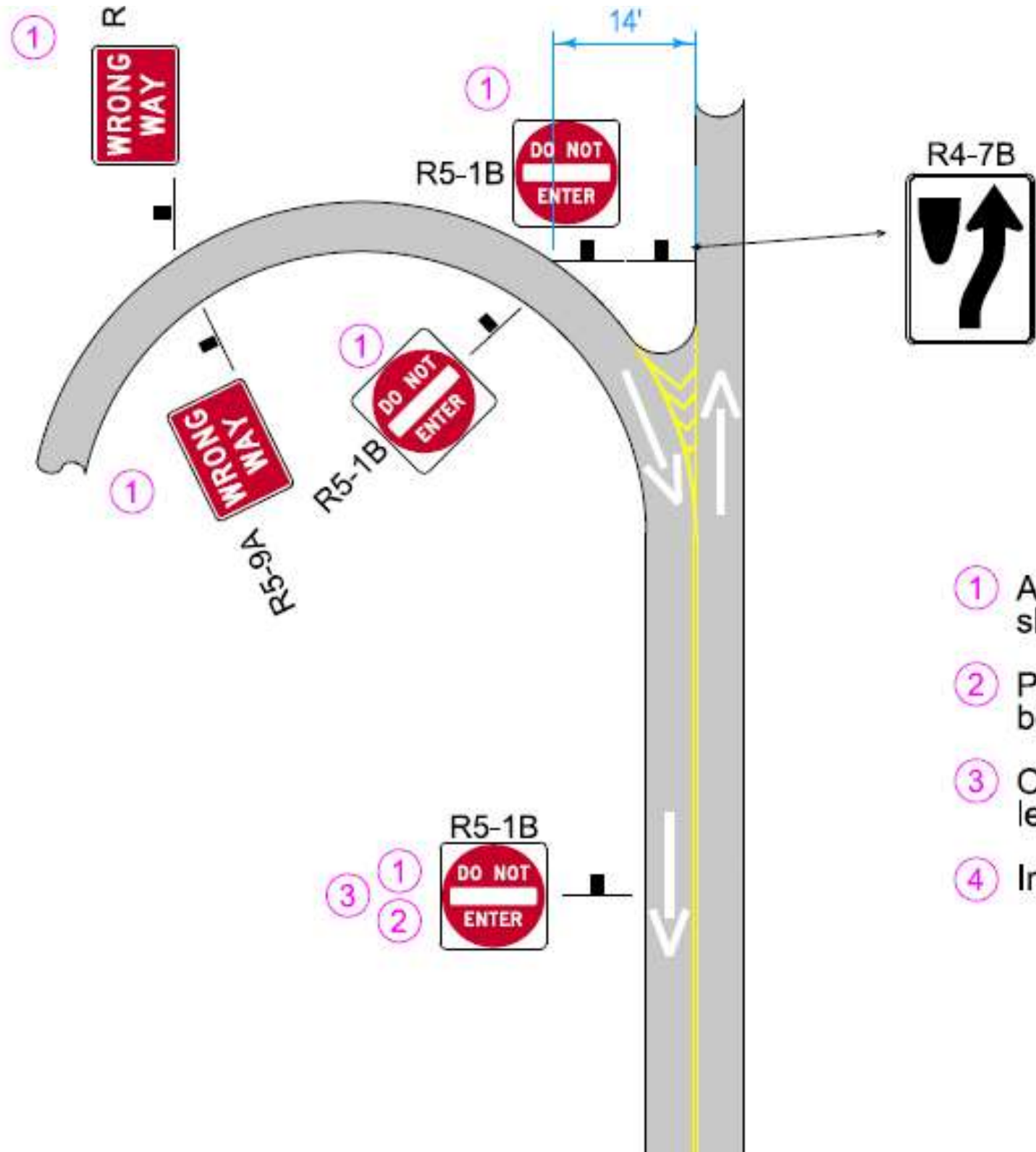
Before



After



# Folded Diamond Interchange





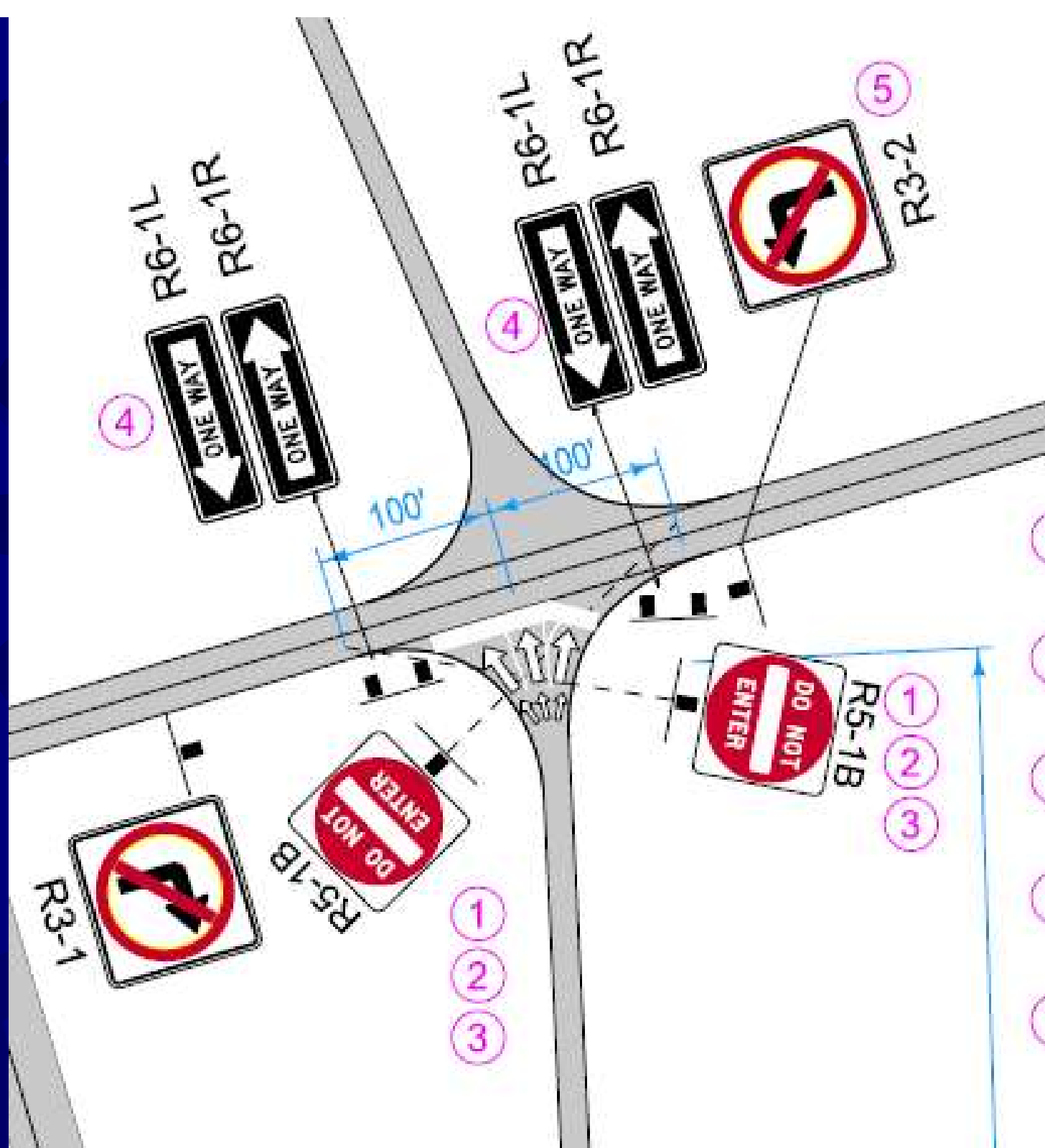


# Interesting Countermeasure #1



“Gateway” for Folded Diamonds

# Standard Diamond Interchange





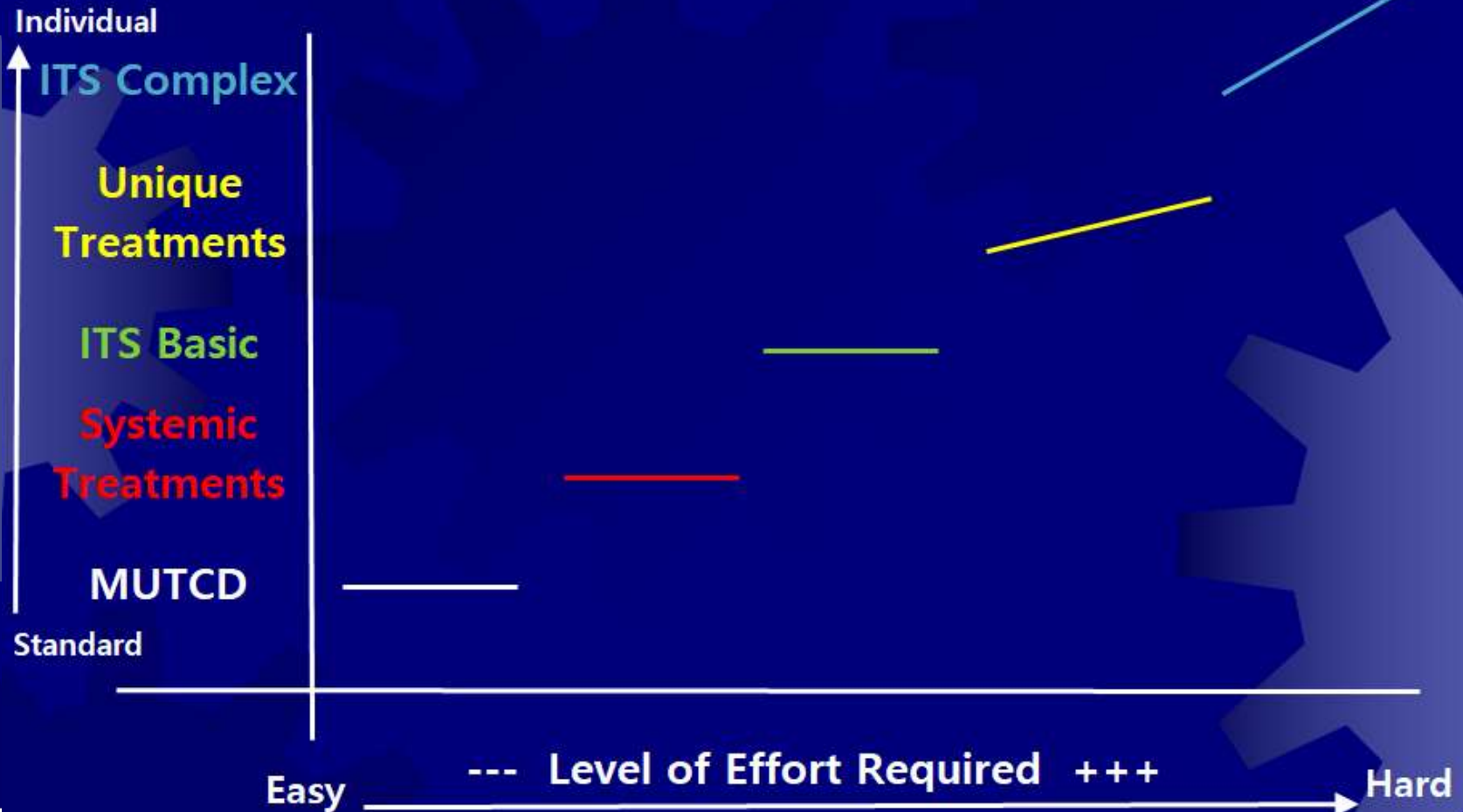


# Zac's Sign





# Level of Effort for WWD



# The goal....



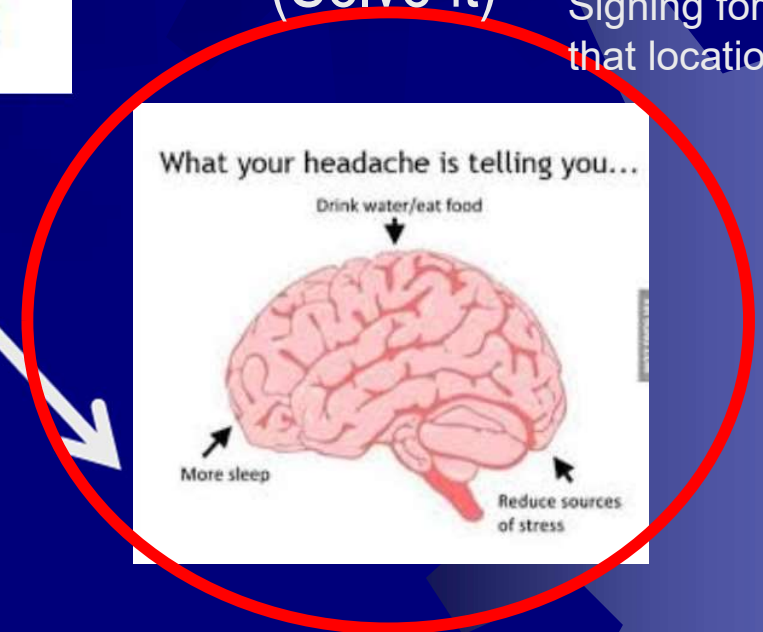
## Determine Points of Entry (fix the problem/eliminate the headache)

Option A  
(Treatment)



Option B  
(Solve it)

Specific /  
Targeted  
Signaling for  
that location



Enhanced  
Signaling  
Everywhere



★ Solve with signing, painting & lighting

# Special “Wrong Way Driving Detection” Cameras w/ Video Analytics & alerting.



**WWD Camera Locations  
(35) w/ existing camera.**



**WWD Camera Locations  
(14) needing electrical**



# 60 Cameras + Installation for \$300,000

- ★ 42 cameras at 35 sites with existing camera
- ★ 18 cameras at 14 completely new sites



# ☀ WWD Camera Detection Project:

- ☀ 60 have been installed
- ☀ Roughly 85% self correct, but 15% did not.
- ☀ Thousands of other events...



# Why Video Analytics?



- ☀ Confirmation
- ☀ Multiple areas
- ☀ Did they self-correct?
- ☀ Multiple install locations/ Viewing Angles
- ☀ What were they doing before WWD
- ☀ Type of Vehicle
- ☀ How far did they go?

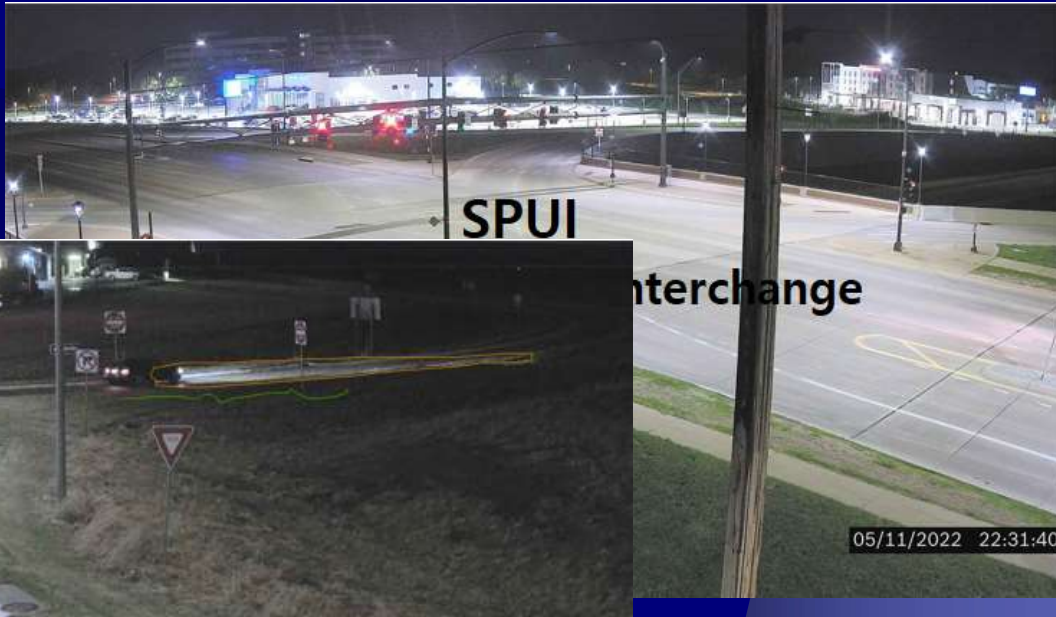




# Flexibility for Install Locations



WWD30-DMTV22



SPUI

Interchange

05/11/2022 22:31:40



Roundabout

WWD44W-D200

04/13/2022 03:31:38



Folded Diamond



At-Grade  
Intersection

WWD42-D3TV00-Hospers

02/11/2022 07



# Each WWD “trips” an e-mail alarm

📎 WWD Detected at US 30 EB Exit & University (IV)	464 KB	BoschWWD01_IV@iowadot.us	Sun 2/13/2022 1:41 PM
📎 WWD Detected at US 30 EB Exit & University (III)	466 KB	BoschWWD01_III@iowadot.us	Sun 2/13/2022 1:41 PM
📎 WWD Detected at US 30 EB Exit & University (II)	467 KB	BoschWWD01_II@iowadot.us	Sun 2/13/2022 1:41 PM
📎 WWD Detected at US 30 EB Exit & University (I)	469 KB	BoschWWD01_I@iowadot.us	Sun 2/13/2022 1:41 PM

WWD Detected at US 30 EB Exit & University (I)



BoschWWD01\_I@iowadot.us

To Sorenson, Willy



2/13/2022



20220213\_134016\_Image I.jpg  
429 KB

Alarm Mail from [BoschWWD01\\_I@iowadot.us](mailto:BoschWWD01_I@iowadot.us)

Unit name: WWD01-AMTV16

Local Unit time: 02/13/2022 13:40:16

Condition of the alarm inputs (logical states):

Local Input 01 'Input 1 ': idle

Local Input 02 'Input 2 ': idle

VCA alarm cam 1: : idle

Virtual alarm input 1: : idle

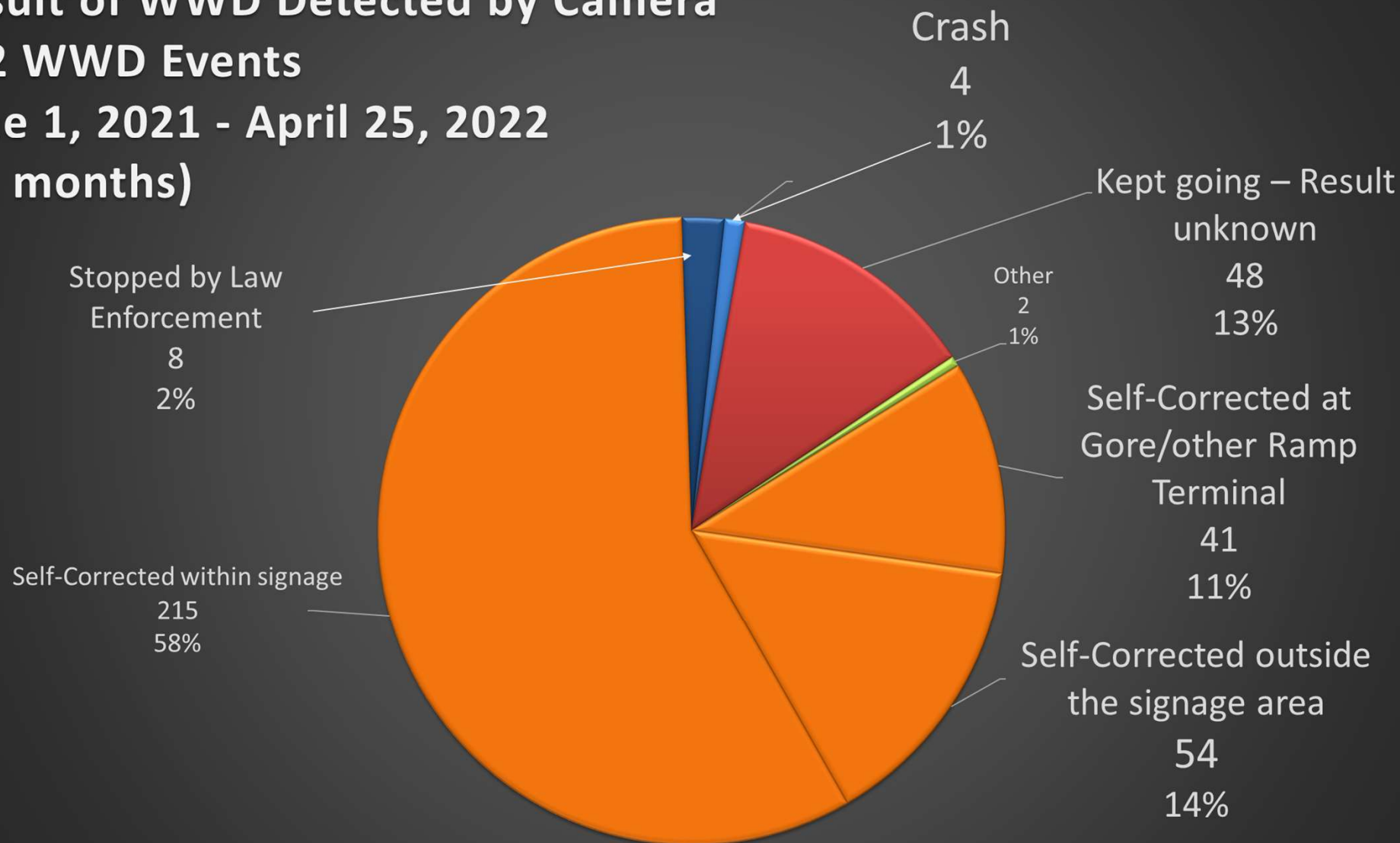
Virtual alarm input 2: : idle

Virtual alarm input 3: : idle



# If you are only counting crashes, you might be missing some useful data.

**Result of WWD Detected by Camera**  
**372 WWD Events**  
**June 1, 2021 - April 25, 2022**  
**(11 months)**

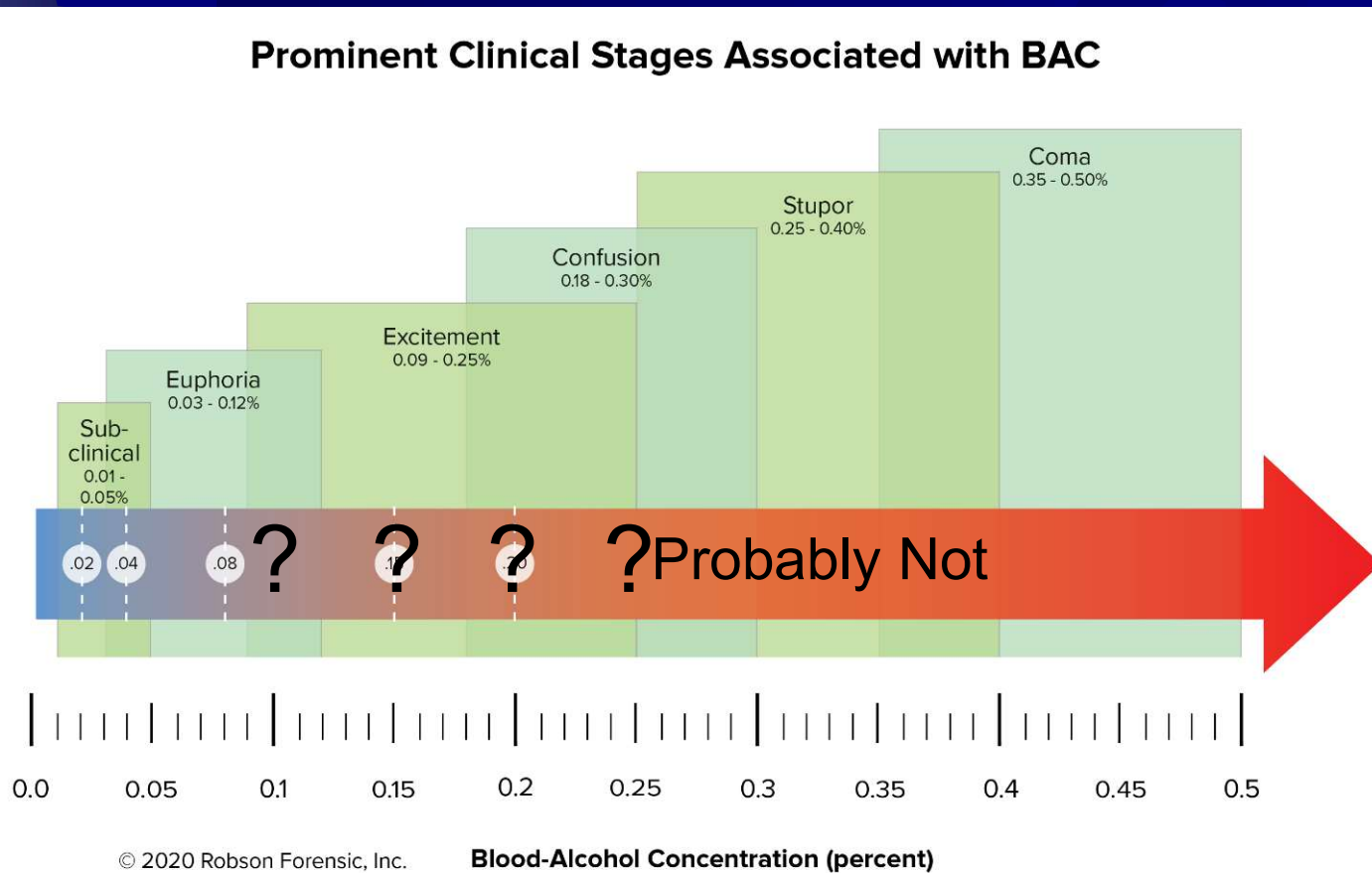




# Hypothesis....

If you can solve the WWD problem for Daytime, non-drunks.... (85% that self correct).... Will it reduce the nighttime intoxicated WWD problem, (the other 15%)?

Prominent Clinical Stages Associated with BAC





ALARM:



Dyersville WWD

11/18/2020 11:03:19

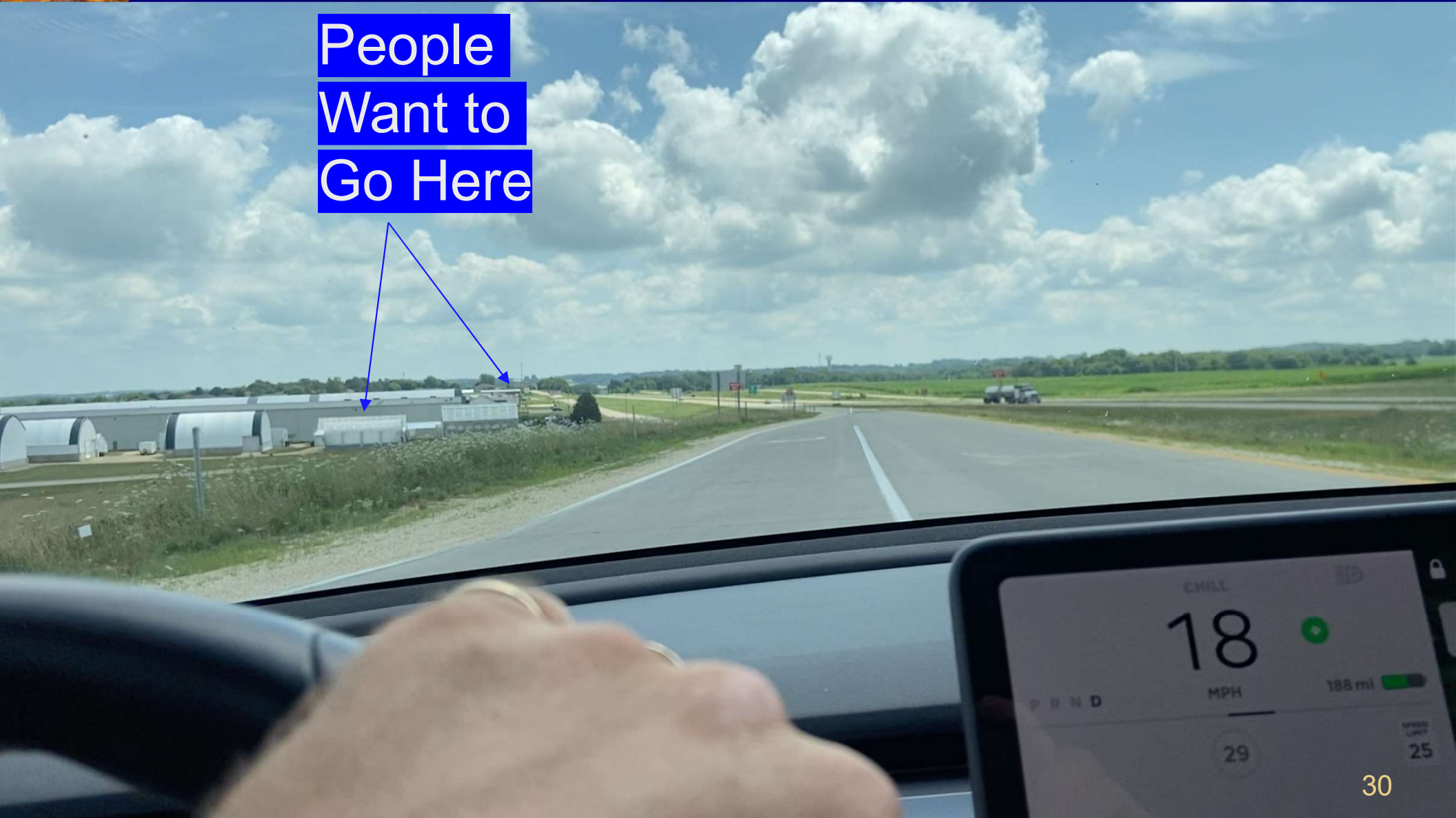
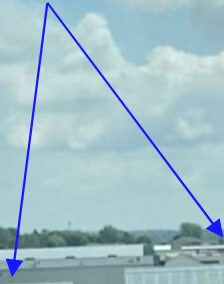


# Wrong Way Driving Dyersville, Iowa



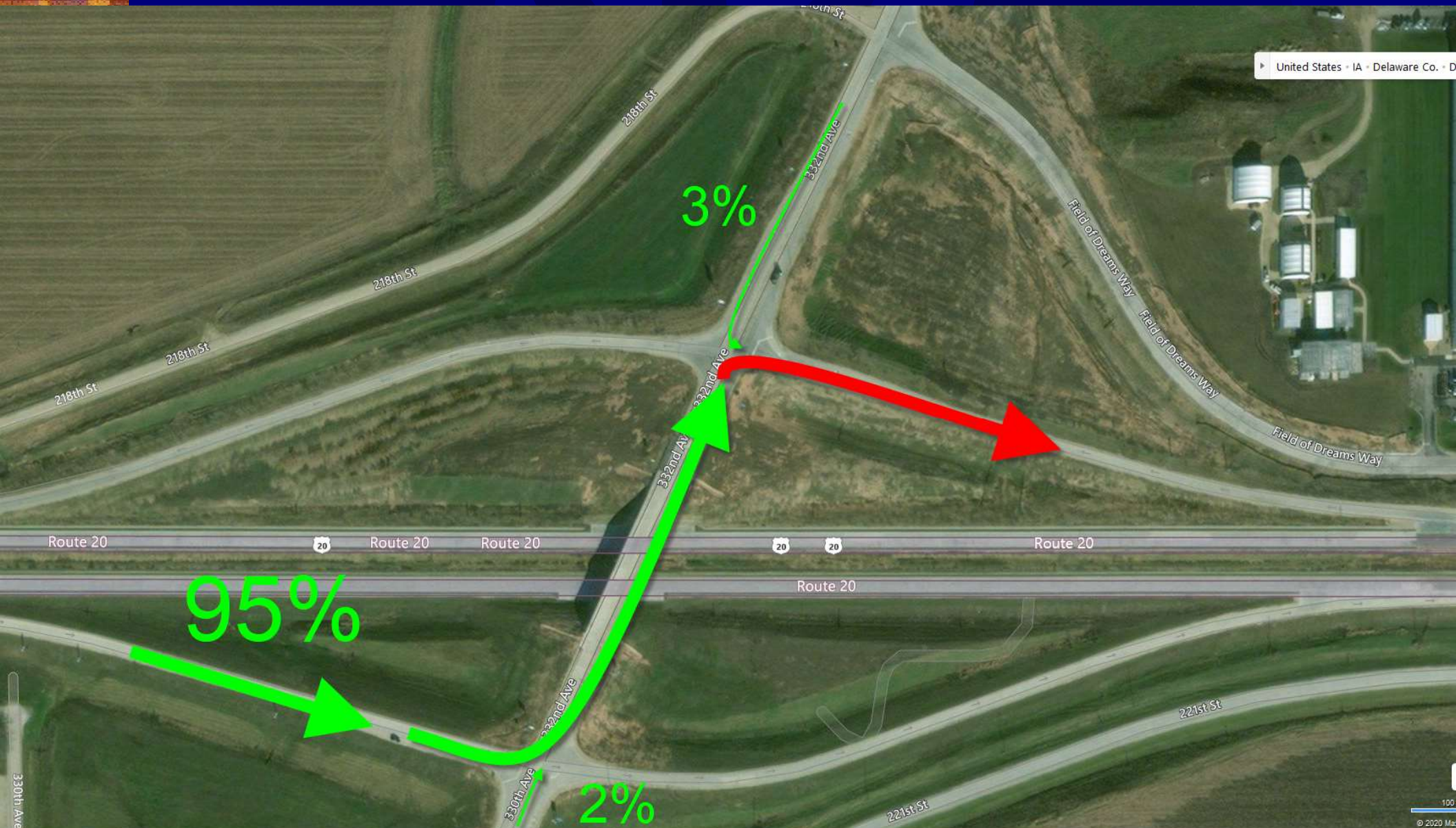
# The Main Problem

People  
Want to  
Go Here





# Where are they coming from?





# But, How About a Barrel?

☀️ 7<sup>th</sup> Treatment was the Charm!... Sort of!







# That afternoon.....



Dyersville WWD

12/17/2020 15:38:11

6 days w/o a WWD.... Then wind blew.



Within 90 min of barrel blowing over.....



Dyersville WWD

12/23/2020 14:21:06



# Over Christmas & New Year



12/31/2020 18:53:33



01/06/2021 06:54:50



12/24/2020 14:37:02



# Barrel Uprighted



01/06/2021 08:00:00



01/07/2021 08:00:00



# What do you do when 1 barrel is not enough???

**WHAT DO WE  
NEED?**



**MORE POWER!**

memegenerator.net



01/13/2021 08:00:00



Around 3pm+/- 2/26/2021

02/22/2021 16:44:44

02/16/2021 09:51:23

02/09/2021 10:58:48

01/28/2021 09:18:07

01/22/2021 16:06:31

**7 More Occurred  
Until the Paint  
Truck Arrived!!!**



# Skip Dash Edge Line

- ☀ Treatment #8
- ☀ That'll fix it!! ;0)





# Well, maybe not.....



07/06/2021 13:58:28





# We have tried Everything.. ...Except the Kitchen Sink....





# What is our missing “Kitchen Sink”???





# Convert to an Island?





This is where it gets deep!







Dyersville WWD

02/16/2021 09:51:10



# Psychological Reactance

- ✦ The urge to do something that is against authority.
- ✦ Why we don't have 100% seat belt usage.





# Spring break trip to San Antonio

- ☀️ 2,000 mile round trip in the Tesla
- ☀️ With Amy & our 2 dogs







# Texas Frontage Roads



# Treatment #9

- ★ We found the “Kitchen Sink”
- ★ Installed 7/19/21
- ★ Still had some WWD, but HUGE difference.
- ★ 8/13/21
- ★ 8/18/21
- ★ 9/20/21
- ★ 3 in last 4 months



# Did it work?





**Common Problem**  
**Turning WWD at a ramp when the driver really just wanted to get to "X"**







# Psychological Scotoma

## Scotoma = Mental Blind Spot

Scotoma is a sensory locking out of the environment caused by conditioning or prior expectation. *(The Pacific Institute)*



It's the "truth as *I* perceive it"  
based on:

- my upbringing
- my conditioning
- my prior expectation



Window

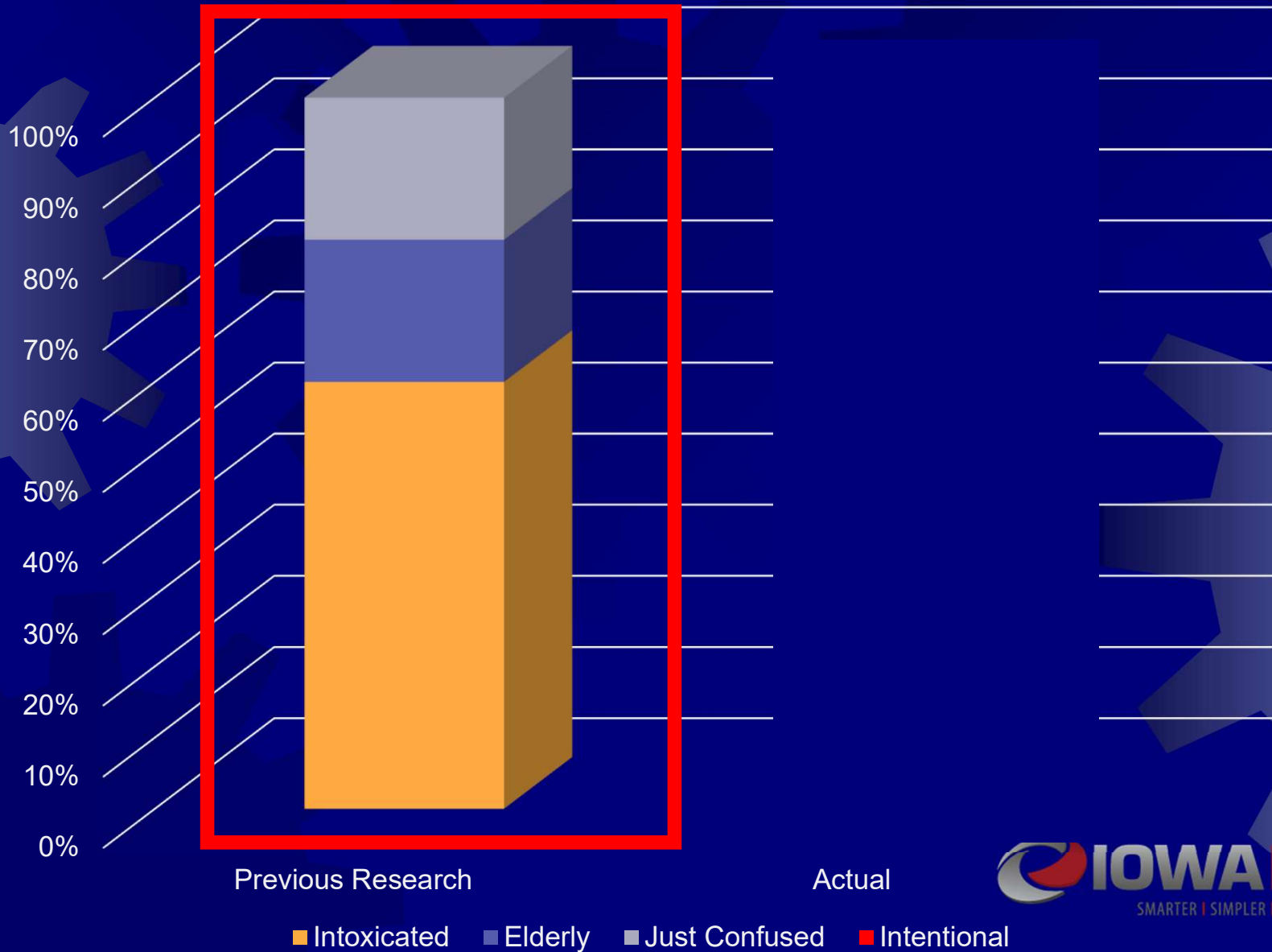


Scotoma



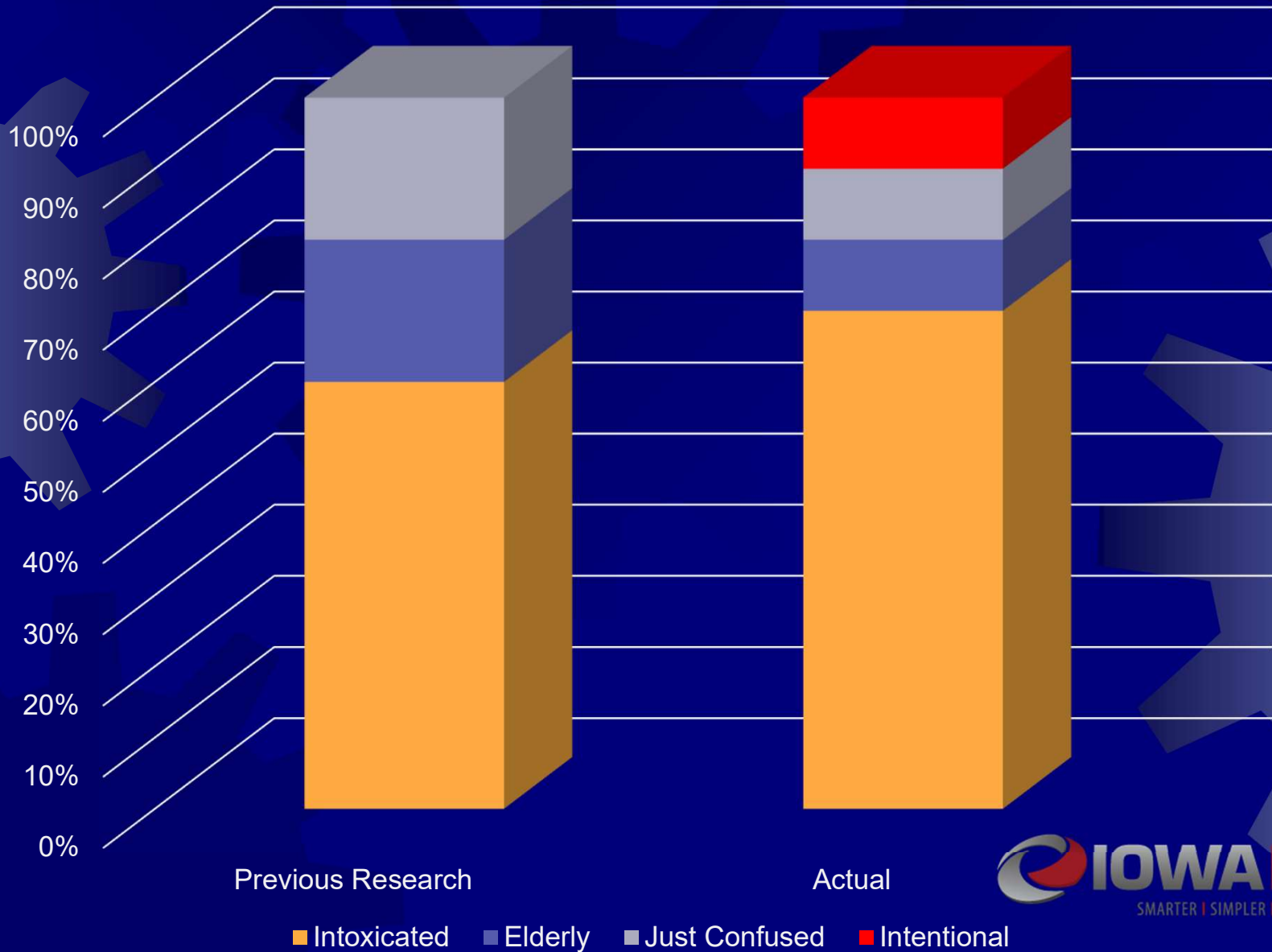


# Who are the Wrong Way Drivers?





# Who are the Wrong Way Drivers?





# Lessons Learned



- ★ Thermo cameras (that track vehicles) would eliminate a lot of false alarms (clouds, exhaust plums, shadows, wet pavement reflections) and would catch some that were missed at night due to headlight blooming and low light.
- ★ Get best (highest) zoom possible
  - ★ Ours were 3 to 10mm (not that great)
  - ★ Next time I would get the 12 to 40mm
- ★ You will get hundreds of false calls until you have “fine tuned it”.
  - ★ Then you are probably missing some!



# Cedar Rapids & Iowa City



## Overhead DMS use

About 20 activations in the 1<sup>st</sup> 6 months of implementing





# InTrans WWD Detection Software

## Current Research Project

- Will use in locations where existing PTZ camera is already looking where a WWD may be entering the Highway
- Server based and Edge based (focus on cameras already on fiber)





# Using e-mail Alarms to Notify DOT TMC or Local 911 of a WWD



# OFFICE OF TRAFFIC & SAFETY



BoschWWD46\_II@iowadot.us

BoschWWD46\_IV@iowadot.us

BoschWWD47\_V@iowadot.us



e-mail

e-mail

e-mail

Python Code

48 seconds

e-mail #1

e-mail #2



Phone Call



Read





## Considerations:

“False positives” - alerts to drivers who are not driving the wrong direction

- Provide drivers with ability to override the warning?

What would the system or app communicate with this alert?

- E.g. “Turn around immediately”?

## Construction Zones

Once “override” Shuts off for 15 min.

If “connected” it updates the map for everyone





- Similar to the Work Zone Data Exchange Initiative by Federal Highway Administration – Whereas work zone information from State DOT's can be "broadcast" using XML to tell 3<sup>rd</sup> party apps, and/or a (connected) car directly information about a work zone they are approaching.
- After a 911 center receives a call about a Wrong Way Driver is reported, why can't we start the process to enable the "broadcast" that information to 3<sup>rd</sup> party apps and/or a (connected) cars in the vicinity of the Wrong Way Driver?





To wrap things up, there is 1 more thing that I'd like you to know and share with your family, friends and co-workers.

LET'S GET TOGETHER  
AND SAVE LIVES







# Best False Call Ever!!!!



WWD61-NVTV05

10/08/2021 08:06:26



Questions?

