

WILLIAMS BRIDGESON, P.E.  
PROFIC & SAFETY  
TO WA DOT

INMATEL  
APPROACHES TO  
WORK ZONE MGMT.

ITS MI  
NATION  
10/27/22





# My Background

- ★ 10 years+/- in Construction/  
Utility Relocation
- ★ 10 years +/- as the State  
ITS Engineer
- ★ 10 years +/- in  
Traffic & Safety  
“Special Projects”



I also do these...  
w/ Tracey



WORK ZONES  
ORANGE YOU GLAD  
YOU SLOWED DOWN?

WORK ZONE SAFETY  
ORANGE IS  
THE NEW BLACK

SHIFT HAPPENS  
ESPECIALLY IN  
WORK ZONES





ID	WZMSL Dimension	Project	Topic	Task/Activity	Responsible Party	As Assigned	Update	Completion Date	Actual Completion Date	Comments and Status	Priority 1-High
57	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Narrou Bridge Traffic Control	Task force to address situation	Ben Hucker	9/24/2021			7/29/2022	Presentation to Charlie Purcell on cars and alternatives. Focus will be on individual bridge. Task Force established 7/29/2022	
58	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Narrou Bridge Traffic Control	Present task force Update	Ben Hucker	7/22/2022		12/31/2022		Presentation to WZ Council on 10/20/2022 Add white paper to special situations when complete 9/29/2022: In progress Example of 1-35 route around Bovington/Hartman bridge corner, Hickman Road 10/23/2022: Announced for Jan 2023 Ben to do a path forward From WZ Council meeting with Clayten Burke and Dan Sprongel on 10/20/2022 Add to the 2023 plan 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
69	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Special Situations	Develop guidance for full closures to complete work	Ben Hucker			4/30/2023			
25	Culture	Promote Work Zone Innovation	Guardian Angel	Provide additional information on the District 5 experience.	Brad Lovdeman	10/20/2022			10/13/2022		1
17	Performance Measure	WZ Production	Identify WZ Production Outcome Measure	Establish outcome measure	Clayton Burke	7/1/2022		7/1/2023		2023 system update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
18	Performance Measure	WZ Production	Identify WZ Production Outcome Measure	Provide information to the Work Zone Process Review Team	Clayton Burke	7/1/2022		7/1/2023		10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
21	Culture	Promote Work Zone Innovation	Identify issues DOT personnel that serve on industry committee and	Provide them with WZM information to share with the industry.	Clayton Burke	10/20/2022				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
22	Culture	Promote Work Zone Innovation	Reopen the RISO to involve industry in solving WZM issues (38)		Clayton Burke	10/20/2022				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
34	Collaboration	WZM External Stakeholders	RR Clarifier	Investigate and clarify with road clarifier for	Clayton Burke	9/24/2021				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
35	Collaboration	WZM Law Enforcement Stakeholders	Law Enforcement Funding	Medically review processes for WZM law enforcement.	Clayton Burke	9/24/2021				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
26	Business Process	WZM External Stakeholders	WZM External Stakeholders	Incorporate decision points into WZM needs and use WZM within the T development and implementation.	Clayton Burke	9/24/2021				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
36	Business Process	WZM External Stakeholders	WZM External Stakeholders	Plan Review Task Force	Clayton Burke	9/24/2021				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
37	Business Process	WZM External Stakeholders	WZM External Stakeholders	Plan Review Task Force	Clayton Burke	12/31/2021				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
55	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Work Zone Speed Limit	Support Continued Effort to Integrate TOP Efforts	Clayton Burke	10/20/2022				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
62	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Standards and Guidelines	Support Continued Effort to Integrate TOP Efforts	Clayton Burke	10/20/2022				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
63	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Standards and Guidelines	Support Continued Effort to Integrate TOP Efforts	Clayton Burke	10/20/2022				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
64	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Standards and Guidelines	Support Continued Effort to Integrate TOP Efforts	Clayton Burke	10/20/2022				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
53	Organization and Work Force	Support Continued Effort to Integrate TOP Efforts	Standards and Guidelines	Support Continued Effort to Integrate TOP Efforts	Clayton Burke	10/20/2022		2/18/2022		10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
52	Business Process	Improve Processes	Improve Processes	Improve Processes	Clayton Burke	10/20/2022				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
10	Systems and Technology	Connected Device	Smart Arrow Board	Complete testing and integration with Cypress for maintenance	Craig Barafredo	1/7/2021				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
11	Systems and Technology	Connected Device	Smart Arrow Board	Purchase and install maintenance kit	Craig Barafredo	7/1/2021				10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
19	Culture	Promote Work Zone Innovation	Moving double lane closure layout.	Public new TC	Dan Sprongel			9/30/2022		10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	
24	Culture	Promote Work Zone Innovation	Collect results of recent and ongoing innovative WZM efforts throughout the agency	Distribute to care WZM staff to raise awareness and encourage further innovation.	Dan Sprongel	10/20/2022			On going	10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion 10/20/2022: Update and assign further discussion	

85 Work Zone Initiatives (and I left out the completed ones!)





So, I'm only going to talk about the ones that use electricity...



# What Drives Iowa DOT Work Zones?

Management  
Policy  
Innovations  
Industry  
Training  
Research



Operations



Safety

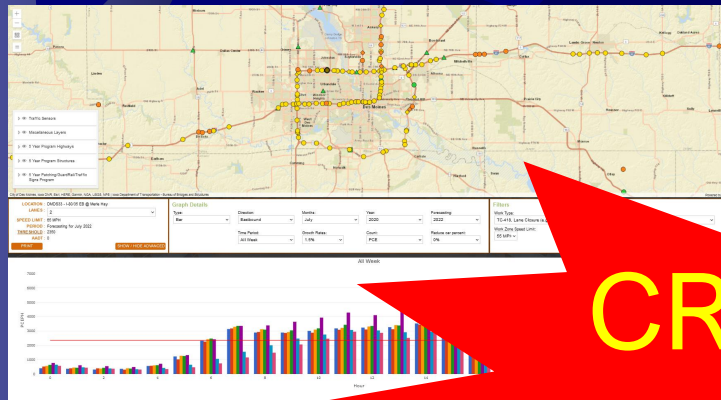




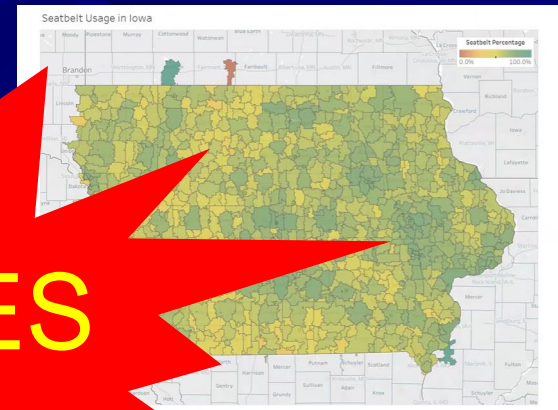


# What Drives Iowa DOT Work Zones?

Lane Closure Planning Tool



BIG Data



CRASHES

Intelligent V

SMO





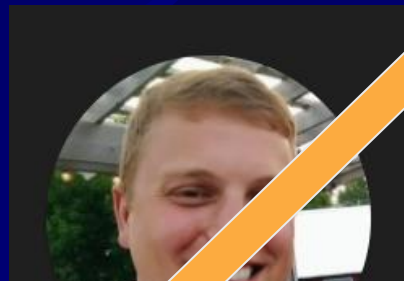
# The Work Zone Players....

Design Side



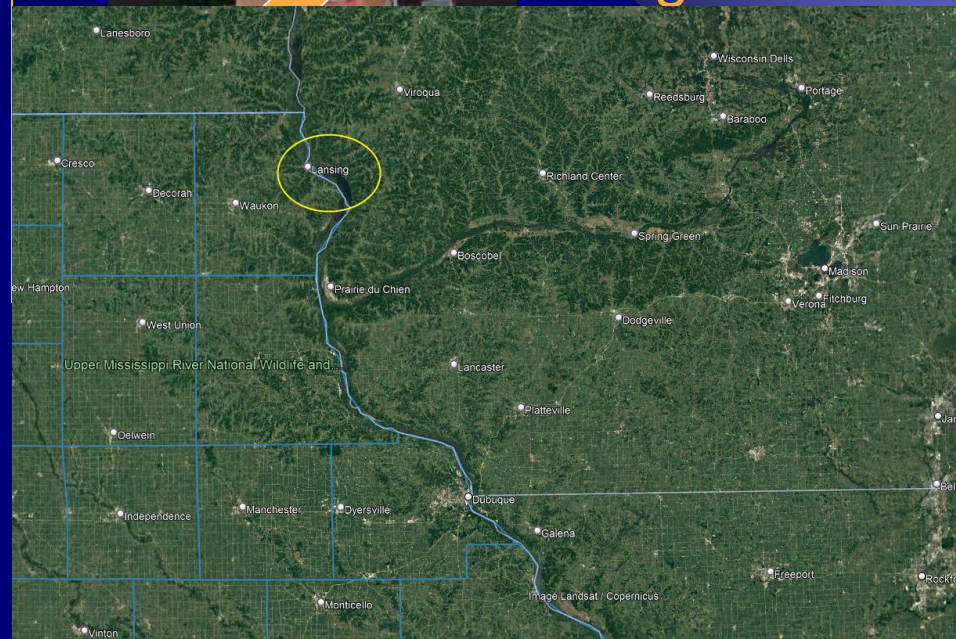
Sprengeler, Dan

Construction Side

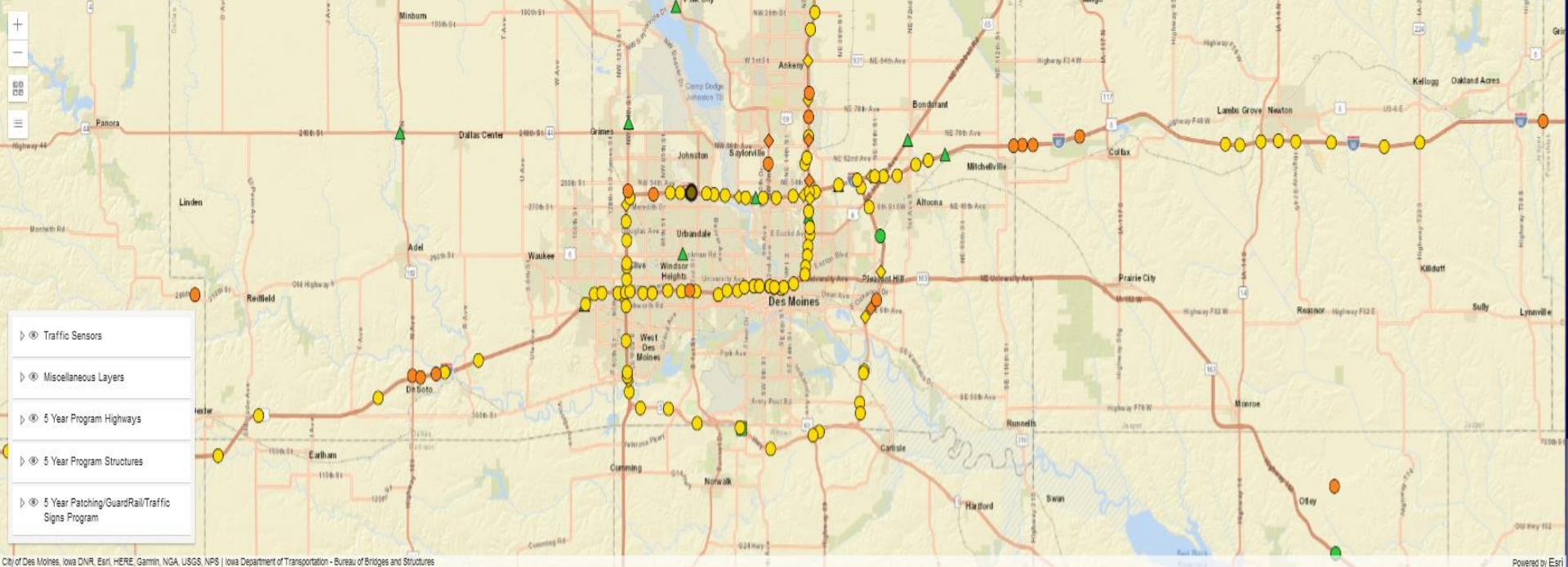


Promotion to

Lansing  
Bridge  
Engineer







LOCATION : DMS633 - I-80/35 EB @ Merle Hay

LANES : 2

SPEED LIMIT : 65 MPH

PERIOD : Forecasting for July 2022

THRESHOLD : 2350

AADT : 0

PRINT

SHOW / HIDE ADVANCED

Graph Details

Type: Bar

Direction: Eastbound

Months: July

Year: 2020

Forecasting: 2022

Time Period: All Week

Growth Rates: 1.5%

Count: PCE

Reduce car percent: 0%

Filters

Work Type: TC-418, Lane Closure (e.g. overlay, patching, centerline joint, etc.)

Work Zone Speed Limit: 65 MPH



# LCPT



★ Quickly & Easily Determine if a work zone will cause queueing. It spurred the following:

- ★ Traffic Critical Projects
- ★ Non-Construction related lane closures
- ★ Lane Closure System (permitting system)

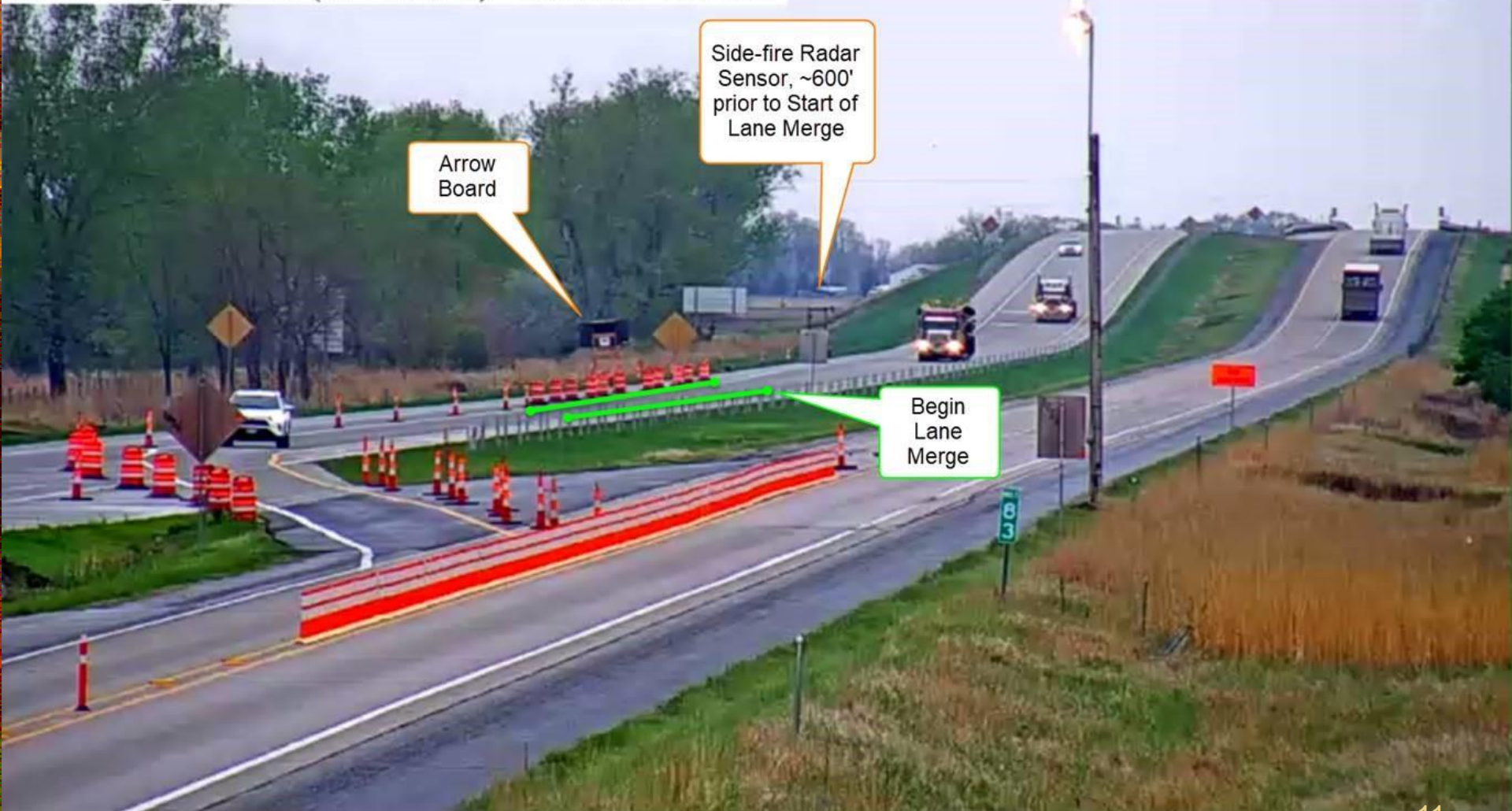






# Intelligent Work Zones

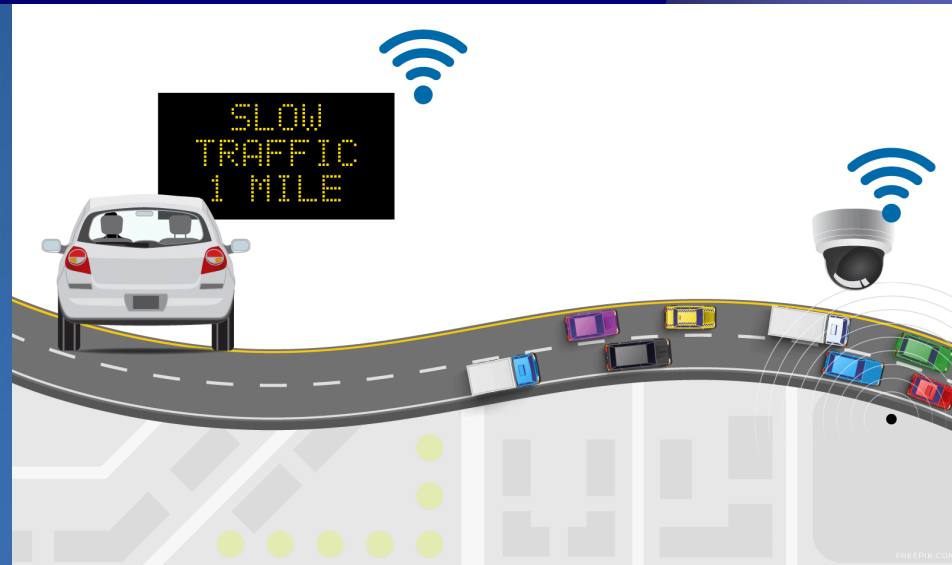
North I-29@ MM 82.8 (IwZ 3159 W) 05/04/20 15:55:53





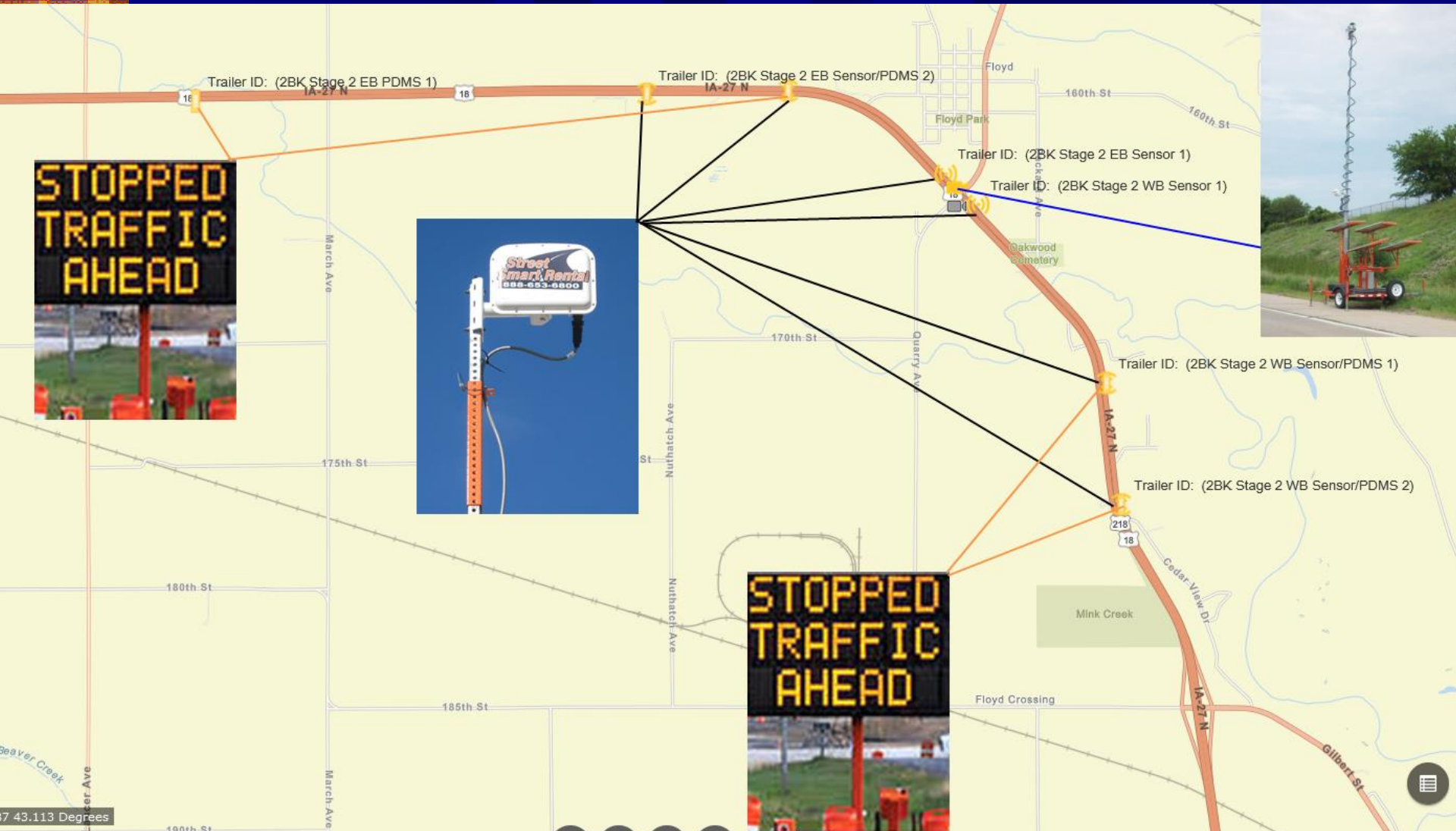
# Intelligent Work Zones

- ☀ To plan for the “above average” traffic, or incidents
- ☀ And/or Situational Awareness
- ☀ We add cameras, Portable DMS and Sensors





# “Typical” Intelligent Work Zone





# Portable DMS Before Work Zone

- ★ Primary Use
  - Slow/Stopped Traffic
- ★ Secondary Use
  - Incident Management



When variable speed limit signs such as this one are used to alert motorists to slowed or stopped traffic, the incidence of rear-end collisions occurring in work zones is reduced.



# TMC Integration



# Past \$\$



# Smart Arrow Boards Spec Change



Interstate – October 2020 (Done)

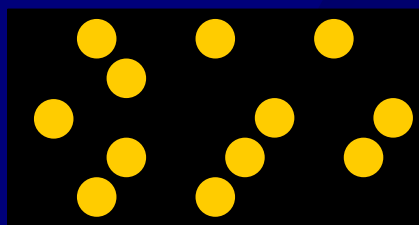
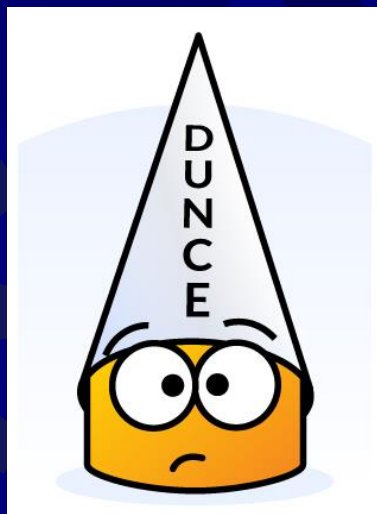
All other primary Roads – Add in October 2021



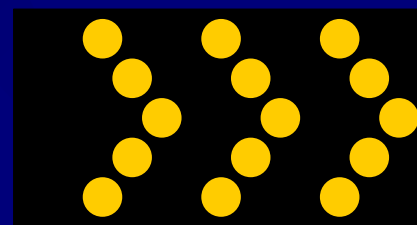
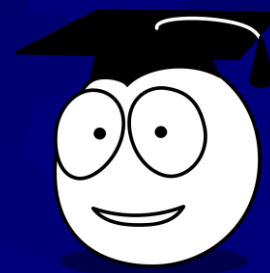




# What makes an Arrow Board “Smart”?



VS.



## Communication!



# What is it?



**Blackbox  
Controller**



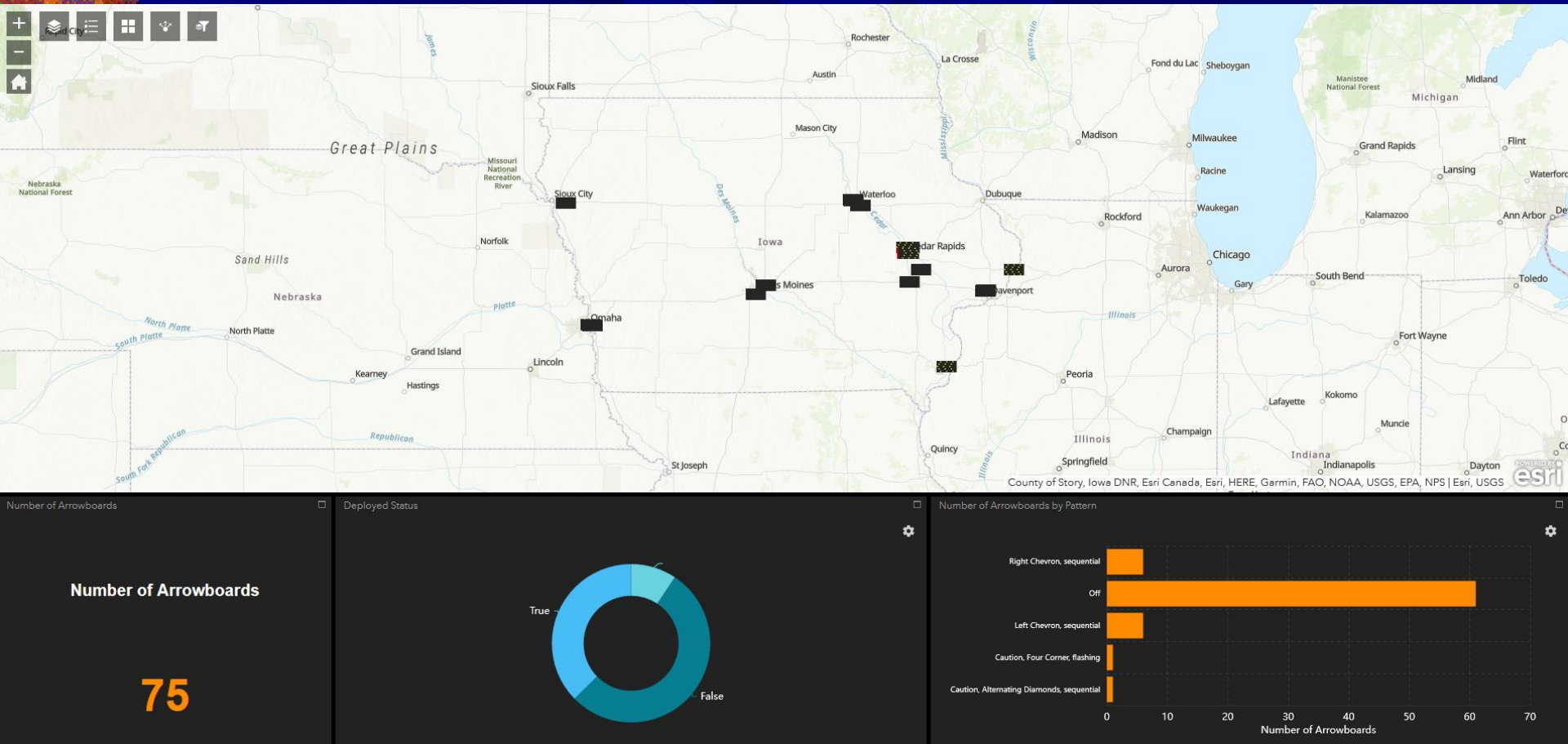
**Regular  
Arrow  
Board**



**Cellular  
Modem  
w/ GPS  
Antenna**



# Smart Arrow Boards

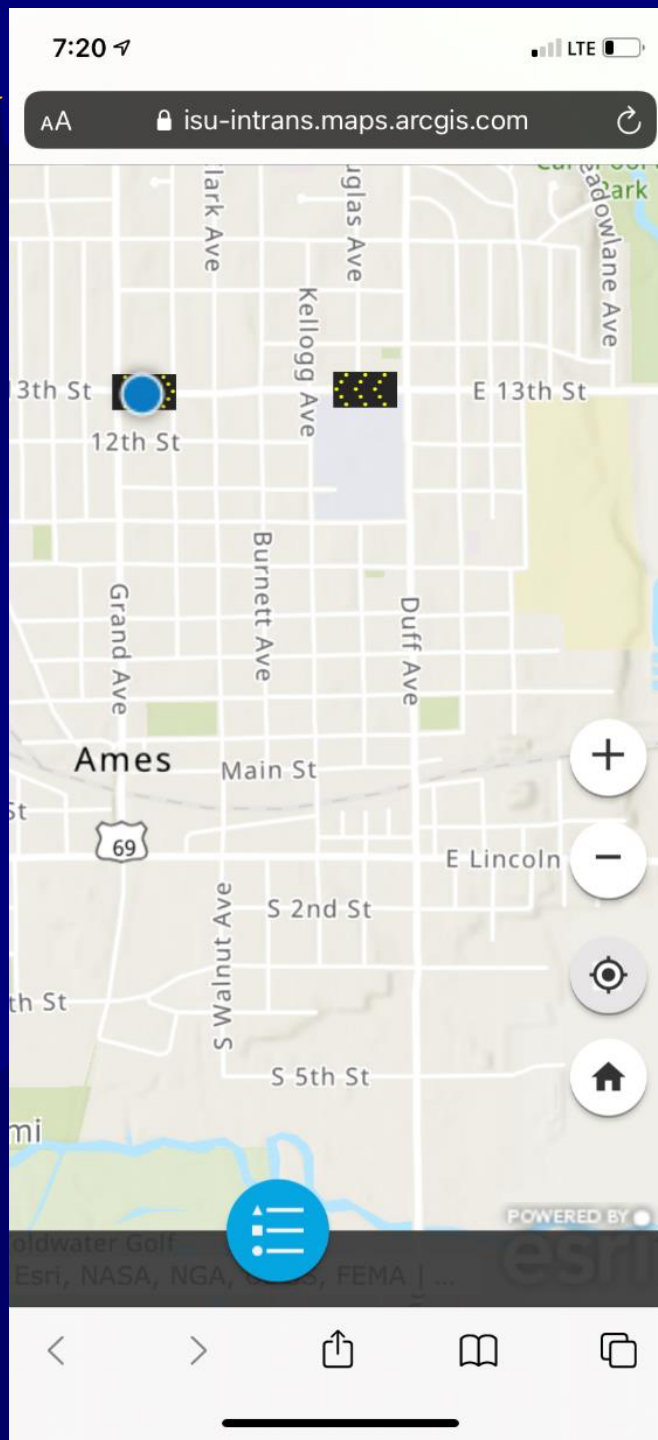


Live view yesterday



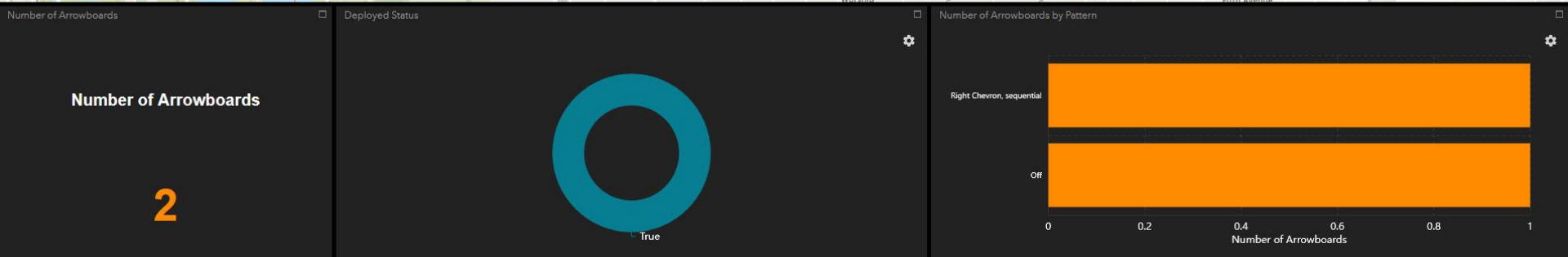
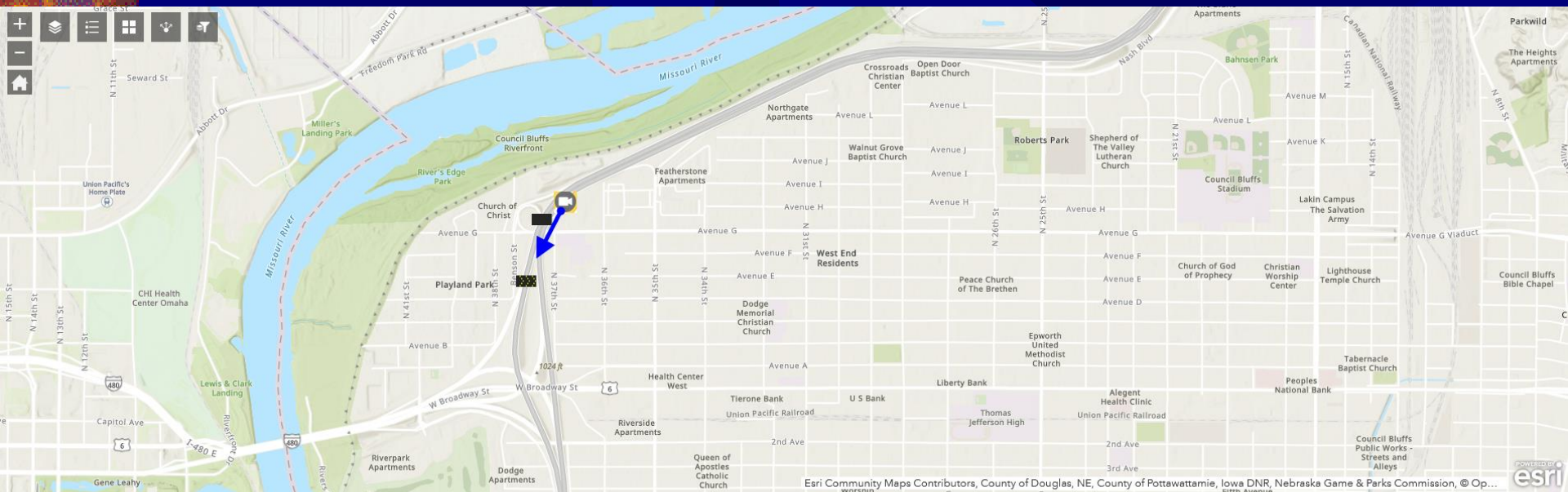
# Is that one Smart ?

<https://isu-intrans.maps.arcgis.com/apps/webappviewer/index.html?id=4ca460dcc5054d1db7321a1a1d2ac20b&extent=-11393518.5523%2C4643895.4522%2C-9384141.9528%2C5687108.0142%2C102100>





# Example in Council Bluffs







# Can you see the 2 Arrow Boards?

South I-29 @ Ave G (IWZ3138) 03/01/2022 11:00:43

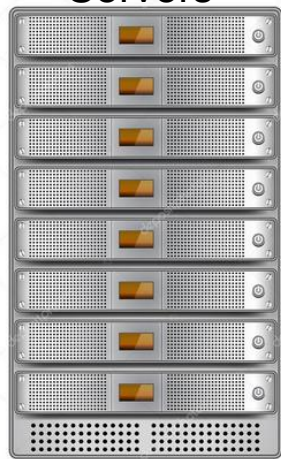




OFFICE OF  
TRAFFIC & SAFETY

# How's it Work?

## Manufacturer's Servers



## Iowa DOT's Servers



InTrans  
Proof of Concept  
page

Coming  
Late  
2022

511ia.org



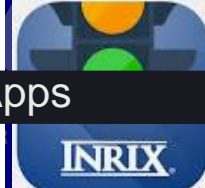
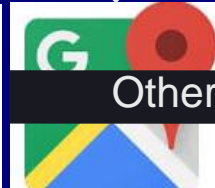
Planned  
ATMS Work  
Zone Data

Actual  
Field Data

Iowa DOT  
ATMS  
(TMC Software)

Wk Zn Data Exchange

Over 100 "3rd  
party" users.  
XML Feed or  
REST Service



Other 3rd Party Apps





Add a few slides showing  
integration into 511 (if  
possible)





# Next Item we are working on

## Connected Temporary Traffic Signal Deployment Plan







# Same General Concept

- ★ Add GPS Antenna
- ★ Add Cellular Modem
- ★ Develop Communication Protocol
  - ★ Wait for a National Communication Protocol
  - ★ July 2022 voting
- ★ Will not be a DOT requirement until Late'23/Early'24



# CTTS Timeline



# Intermission...

## More from Tracey & me

BOB WORKS ON ROADS  
DON'T HIT BOB  
WE NEED BOB

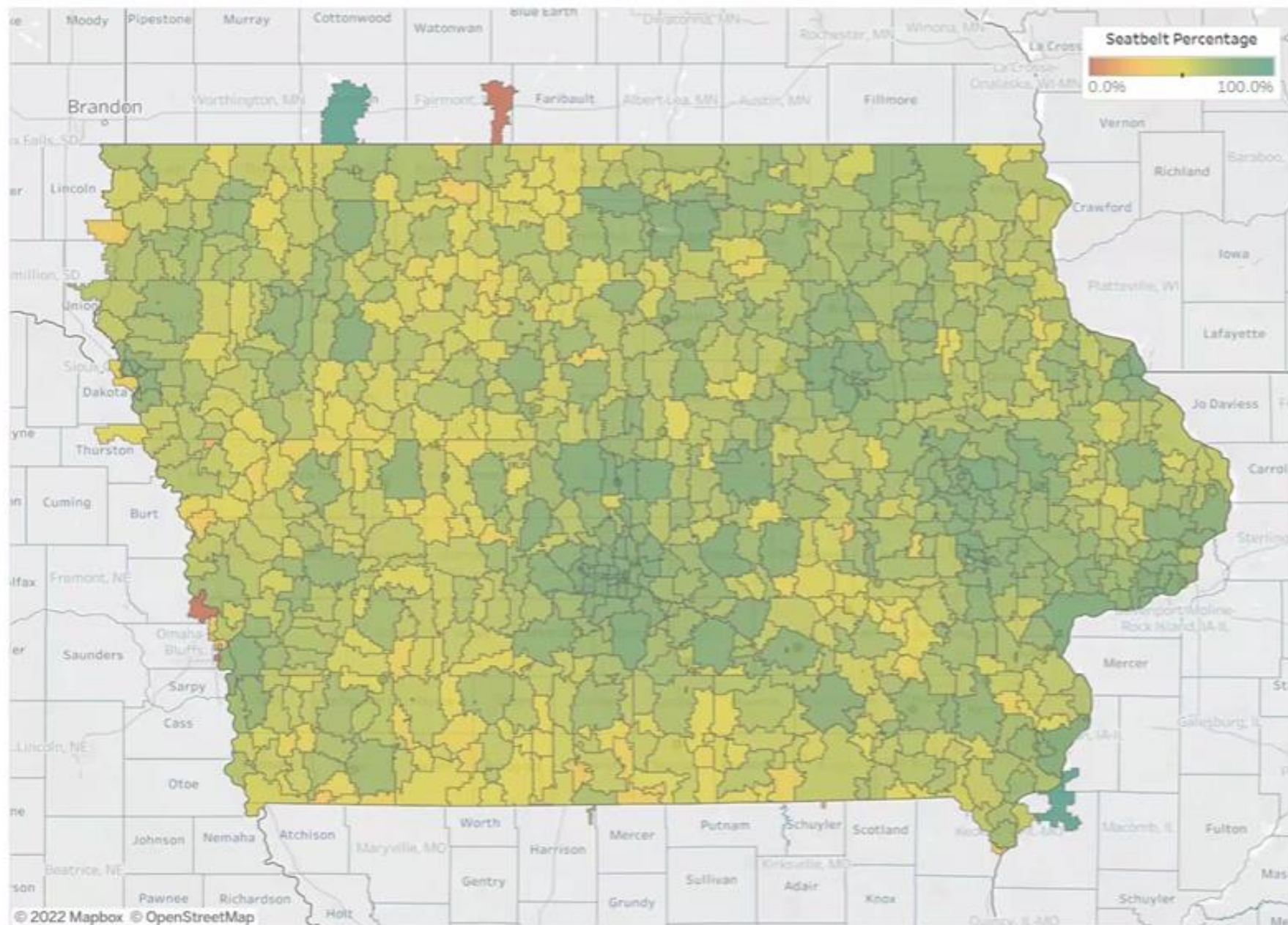


WORK ZONE ORANGE  
IS ALWAYS IN SEASON

WAIT, YOU WORK HERE?  
SLOW DOWN  
IN WORK ZONES



## Seatbelt Usage in Iowa



# Work Zone Data Exchange (WZDx)



## ☀ Overly Simplified Example

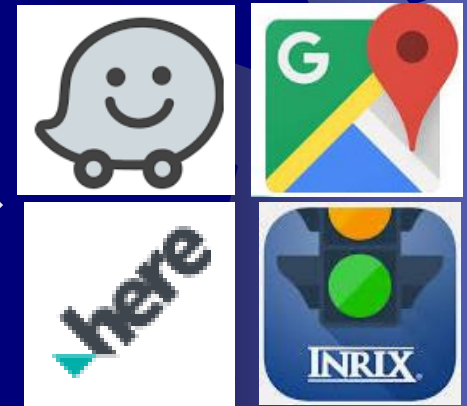
All 50  
States



One Database  
(format)



3<sup>rd</sup> party Traffic  
Data Apps



Sending  
Work Zone  
Information











## WORK ZONE DATA EXCHANGE



# JANUARY 2022

Work Zone Data Working Group Newsletter

## New WZDx Feed from North Carolina

The WZDWG has some exciting news to share! The North Carolina DOT has recently begun providing a state-wide WZDx feed through its work with traffic management platform [one.network](#).

The North Carolina feed joins existing feeds from Arizona, Iowa, Massachusetts, and Texas on US DOT's [WZDx feed registry website](#). Keep an eye out in the coming months for more new feeds from the WZDx Demonstration Grant Awardees.





# Iowa DOT & WZDx

- ★ We the same information that is on 511ia.org to WZDx every 15 minutes.
- ★ (Regardless if it is accurate)
- ★ Smart Arrow Boards (and other “smart” or “Connected” devices) will improve the accuracy.
- ★ Other States are starting to do this.





# TSMO





# TSMO



TSMO Efforts <i>involving Work Zones</i>	
Integrating TSMO into Project Delivery (7 tasks)	
Add Operational Considerations to Planning Studies	(OLE)
Narrow Bridge Traffic Control Task Force	Ben Hucker, Dave Evans, Jeremey V
Add TSMO Engineers to PMTs	Jeremey V
Paved Shoulder Standards	(Kevin P?)
Improved Project Coordination	(ADEs)
End-of-Season Work Zone Traffic Operations Workshops	TSMO Engineers
<ul style="list-style-type: none"> <li>Pre-analysis by InTrans, Skylar</li> <li>Participation of WZMTO members?</li> <li>Tie in to FHWA Process Review efforts?</li> </ul>	Dan S
Median Crossover Coordination	





# TSMO Award

- ★ <https://www.srfconsulting.com/iowa-department-of-transportation-wins-2021-national-operations-center-of-excellence-award/>





# MOVITE Award

✦ <https://iadot.sharepoint.com/sites/WorkZoneManagement/Shared%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FWorkZoneManagement%2FShared%20Documents%2FWork%20Zone>





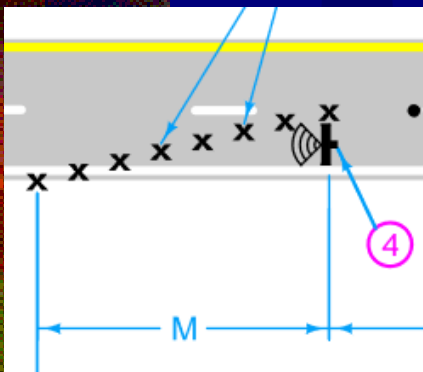
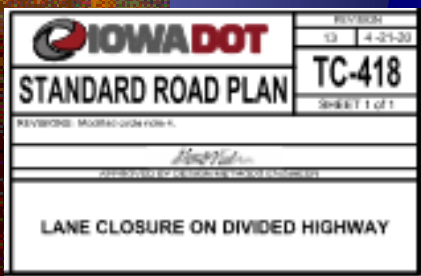
# CRASHES



# Speed Feed Sign on Lane Closures



Started in  
April 2020





# Adding Automation for Audible Attenuator



<https://www.youtube.com/watch?v=jOwom1p-5d8>



**IOWA DOT**  
SMARTER | SIMPLER | CUSTOMER DRIVEN



# Audible Attenuator (Manually Activated)







## Testing Automation Below



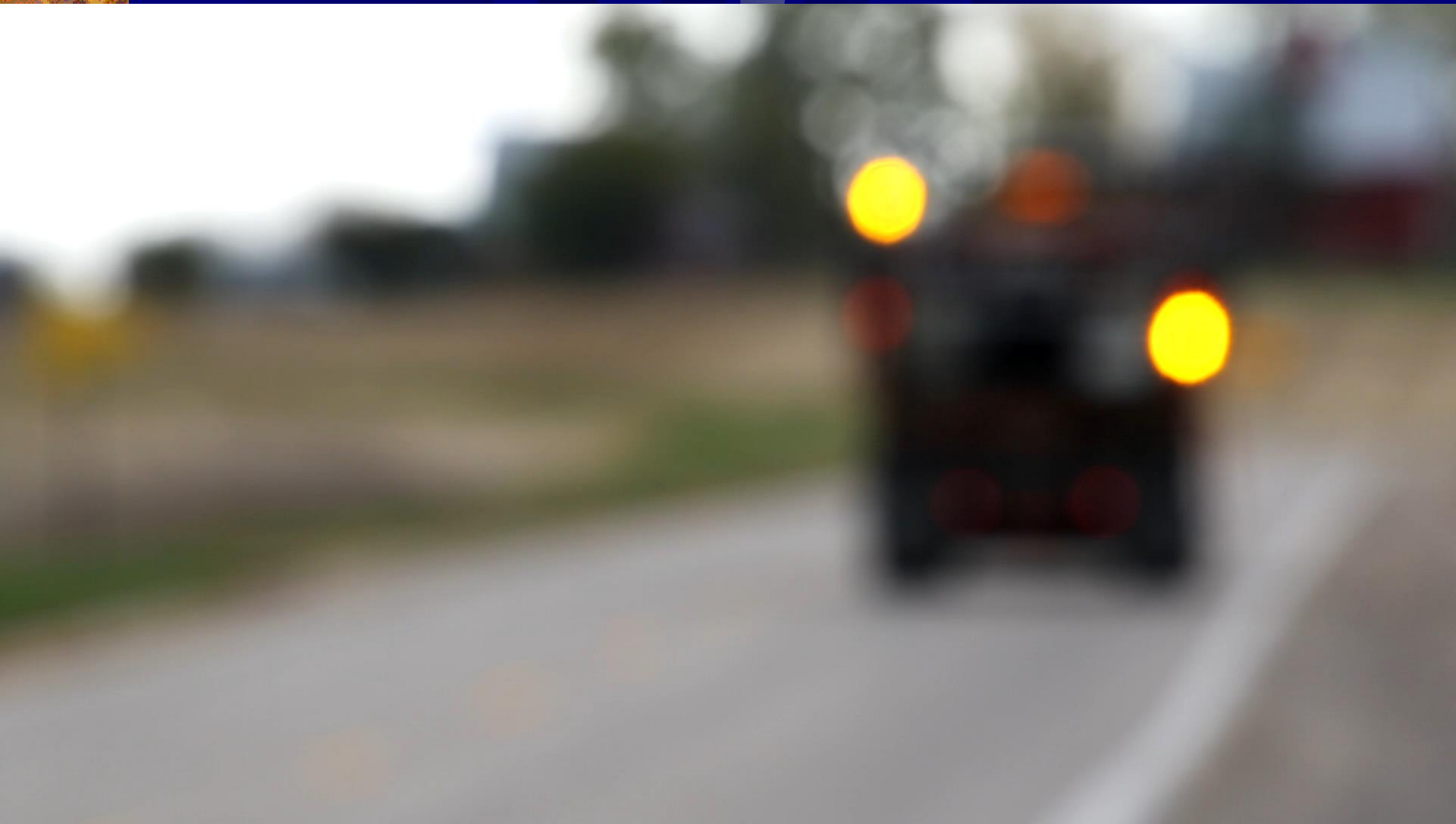
# Straight Road – Static Truck







# Straight Road – Static Truck

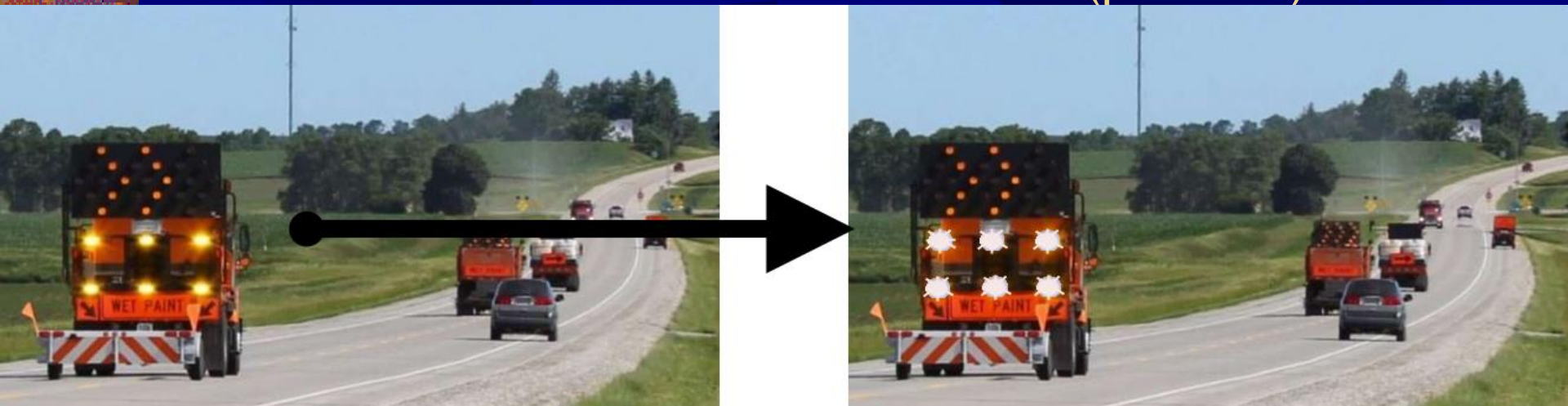


# Radar - Straight Road – Rolling Truck

scene



# Use of White Lights in Work Zones (pt 1 of 2)



## ★ Iowa Code 321.423(7) Flashing White Light ★ Subsection (a)(5) adds:

- *On a motor truck or trailer owned and operated by the department equipped with an impact attenuator and audible warning system, if the flashing white light is rear-facing on the audible warning system and used in conjunction with amber lighting devices or reflectors while the motor truck or trailer is being used for slow-moving maintenance operations.*





# Use of White Lights in Work Zones (pt 2 of 2)



## ★ Iowa Code 321.423(7) Flashing White Light

### ★ Subsection (a)(6) adds:

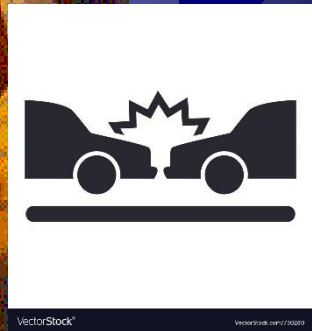
- *On a vehicle or other equipment not owned and operated by the department when used in road work zones on state or local highways as authorized by the department. The department shall adopt rules pursuant to chapter 17A regarding the vehicles or equipment eligible to use a flashing white light under this subparagraph.*



# Video retrieval For Work Zone Crashes



Crash



Dispatch



Maybe

TMC



Is a camera  
within 1/2 mile?

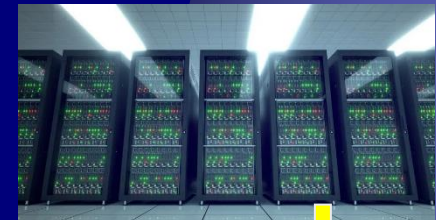


Normal storage  
= 7 days



Crash Report

Annotate Clip

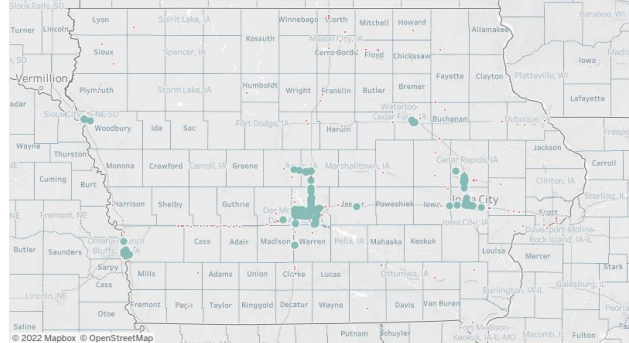


InTrans  
Downloads  
nightly



## ATMS Crash Video Download Map

Disclaimer: Some video may contain graphic imagery





# Why is this useful?

- ✦ Awareness
- ✦ Quick & easy access to data
- ✦ Look for patterns
- ✦ Able to address issues faster!





99% of the time, we design for no queueing due to recurring (known) average traffic



- ★ Applies to Multi-Lane Highways of 55 MPH or higher



- ★ It's not a written policy (PPM).
- ★ It's not in the Design Manual.
- ★ It's just part of our culture.





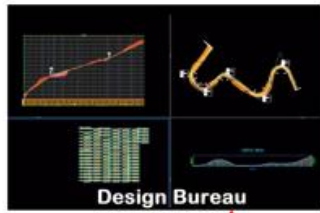
# Iowa DOT 2022 Objective #2a

## 2. Improve Work Zone Safety

The Iowa DOT will identify and implement a statewide lane closure system (LCS) and implement policies that safely keep lanes open as much as possible. The concept of a LCS has been in development, and in 2022 we will implement the best system for our use case.

*Executive Sponsors: Mitch Dillavou and Dave Lorenzen*

*Project Leaders: Willy Sorenson, Tim Simodynes, Mitch Wood,  
Sinclair Stolle*



LANE CLOSED  
FOR NO  
APPARENT  
REASON  
(Lane Rental)



Heavy Tow & Recovery  
Incentive Program



Mobile



Field Staff  
Contractor



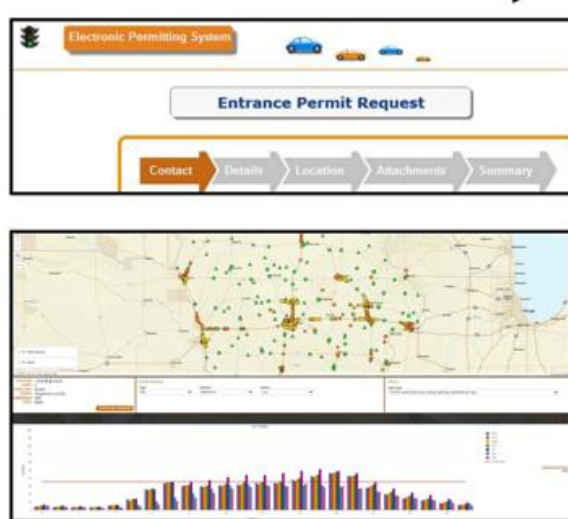
Desktop



Office Staff



IOWA TRAFFIC INCIDENT MANAGEMENT  
DIVERSION PLANS



v4 2/16/2022 (Added RMS & FieldManager)





# Our Goal

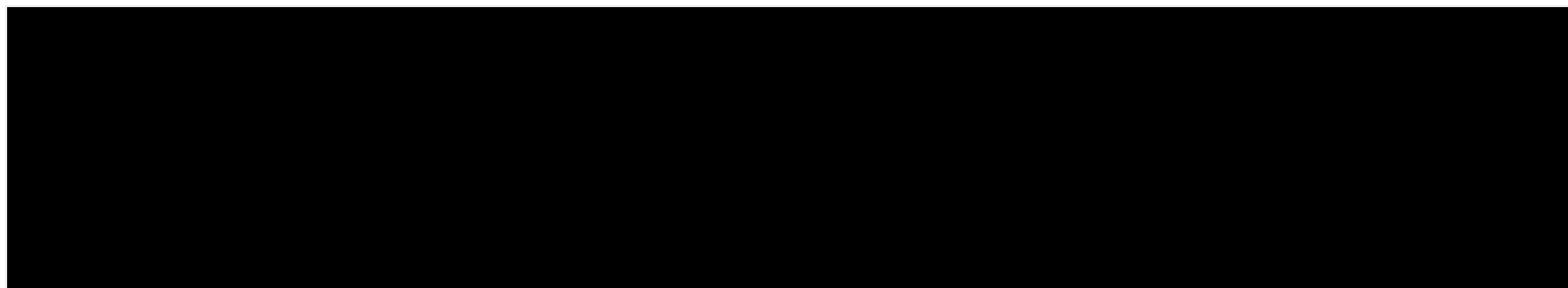
- ★ Make the software extremely powerful and connected to all databases that contain work zone information.
- ★ BUT..... It MUST be simple and easy to use for a user to enter information using a smart phone in about one minute.





# Iowa DOT 2022 Objective #2b

## 2. Improve Work Zone Safety



We will implement a pilot project that uses smart Internet of Things (IoT) technologies to help notify workers, supervisors, TMC personnel, and drivers when workers are too close to moving traffic, that provides real time work zone conditions and alerts to travelers/vehicles, and that outfits our equipment with advanced technologies for crash avoidance and mitigation.

*Executive Sponsors: Mitch Dillavou and Dave Lorenzen*

*Project Leaders: Willy Sorenson, Tim Simodynes, Mitch Wood,  
Sinclair Stolle*



# Overall Worker Safety Initiative

## Construction Safety Light

Minimize  
struck-by  
incidents and  
other jobsite  
hazards so our  
road crews can  
get home safe.



Starting Point...





# Ending Point???



## TRANSPORTATION INSTITUTE VIRGINIA TECH SMART VEST Protecting Workers & Saving Lives

- Localize Workers in Work Zone with High Accuracy
- Alert Workers to Work Zone Hazards & Potential Collisions
- Alert Connected Drivers to Presence of Workers & Potential Collisions

Class III Safety Vest  
With Integrated Processor-Package  
Visual, Audible, & Tactile Alerts  
Through LEDs, Speakers, & Vibration





# Research

## Evaluation of Messaging Techniques to Increase Vehicle Spacing at Work Zones

- Difference messages on different day of week

Mon

CRASHES  
MAKE YOU LATE

DON'T TAILGATE

Tue

BE SAFE  
LEAVE EXTRA SPACE

Wed

TAILGATE  
CAUSES CRASHES

STAY CLEAR  
OF THE REAR

Thu

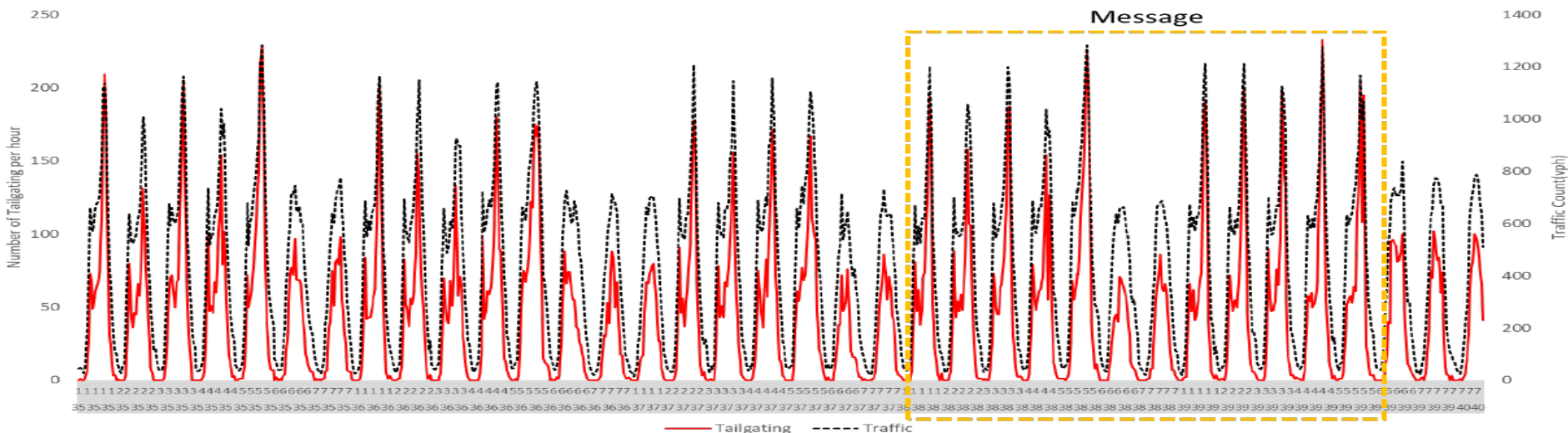
KEEP YOUR DISTANCE

SPACE IS GOOD

Fri

LEAVE EXTRA SPACE?  
THANKS!

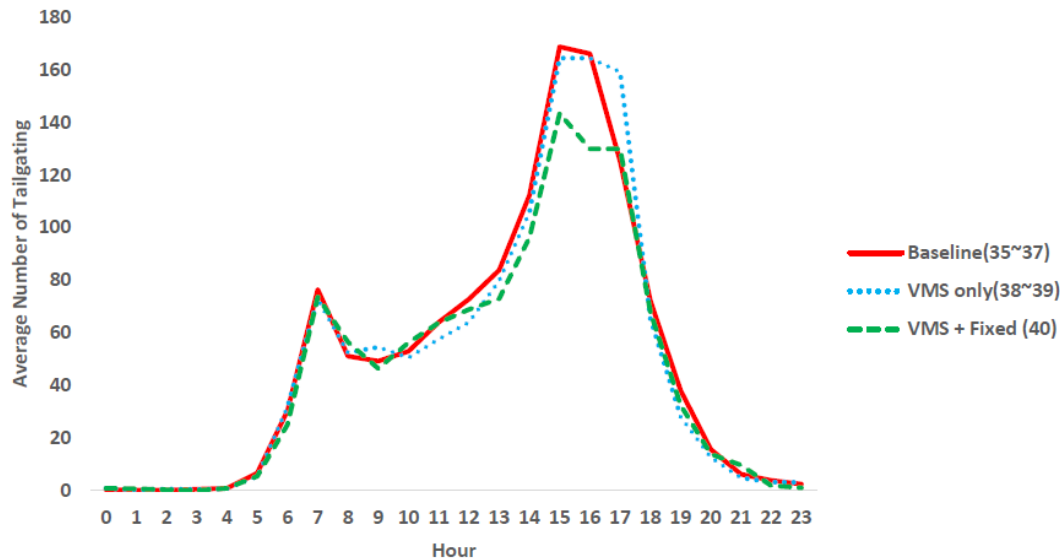
Traffic and Number of tailgating



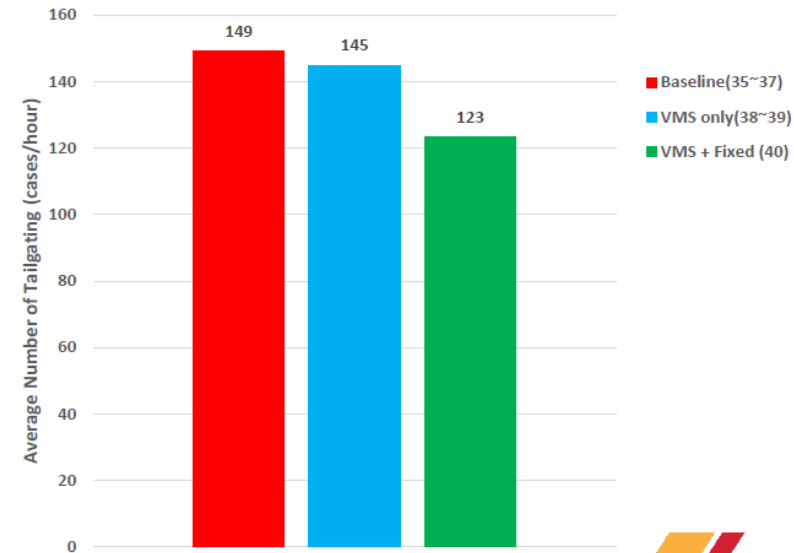


## Results – VMS + Static Signs (Weekday)

Time of Day – Tailgating



Average Tailgating Cases during Message Active Hour (14 ~ 17)



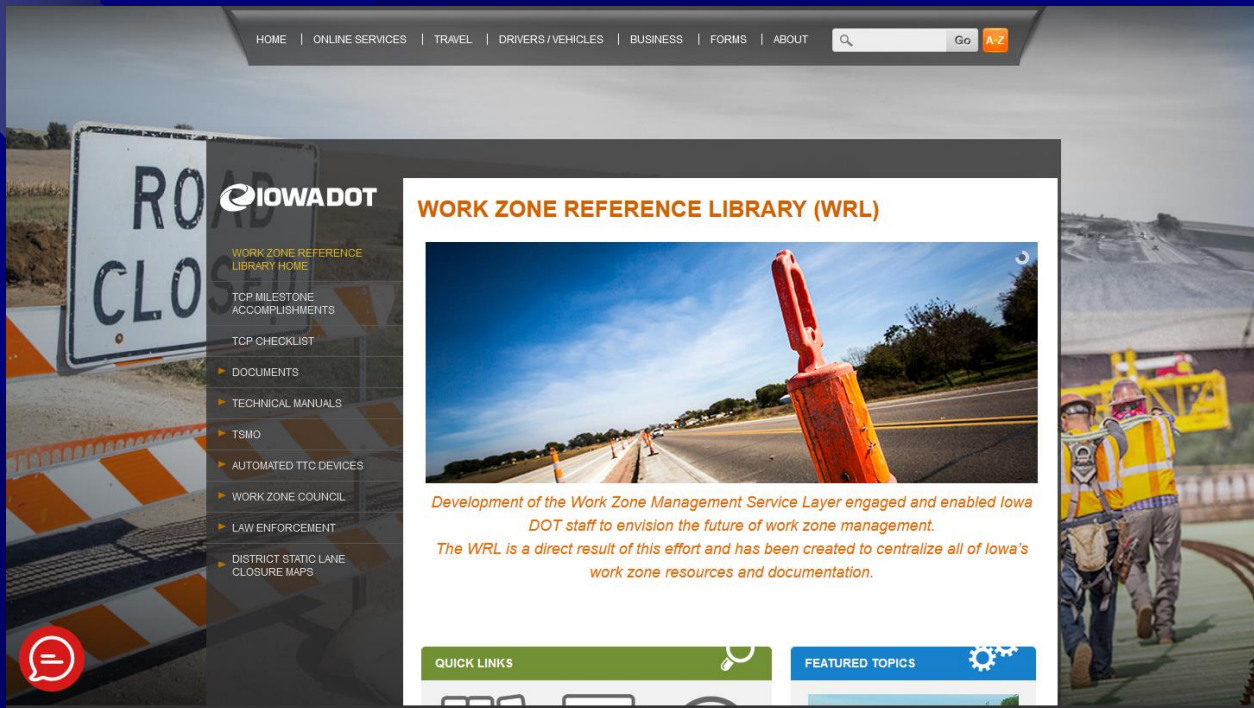




# Lastly, the “WRL”



- ☀ “Work Zone Reference Library”
- ☀ Work Zone related for Information
- ☀ Just google “WRL Iowa DOT”





# Roadside Chat (last Friday)

275  
TRAFFIC DEATHS  
THIS YEAR

UNLESS YOU HAVE A  
FLUX CAPACITOR  
BACK TO SPEED LIMIT







# Roadside Chat (Tomorrow)

273  
TRAFFIC DEATHS  
THIS YEAR

MAKE NUNNY PROUD  
WRAP YOURSELF  
IN A SEAT BELT





# Questions?

