

# Talking Transportation Technology (T3) Webinars



Tuesday, July 18, 2023 – 1:00PM

## ***Emergency and Work Zone Management, and Next Steps***

***Part 5 of 5 in the Crowdsourcing for Operations Course via Webinar  
Course developed by the Federal Highway Administration (FHWA) Every Day Counts (EDC)  
Crowdsourcing for Operations***



U.S. Department of Transportation

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**PROFESSIONAL  
CAPACITY BUILDING**

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Intelligent Transportation Systems Joint Program Office (ITS JPO)  
Professional Capacity Building Program Presents:

# ***Emergency and Work Zone Management, and Next Steps***

***Part 5 of 5 in the Crowdsourcing for Operations  
Course via Webinar***

September 19, 2023

Course developed by the Federal Highway Administration (FHWA)  
Every Day Counts (EDC) Crowdsourcing for Operations Innovation  
and delivered by the FHWA Office of Operations



U.S. Department of Transportation  
**Federal Highway Administration**





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# Today's Host and Presenters

Source: FHWA.



## Ralph Volpe, Host

EDC-6 Crowdsourcing Colead  
FHWA Resource Center  
Operations Technical Service  
Team

Source: North Carolina DOT.



## Kelly Wells

Traveler Info Engineer  
North Carolina Department of  
Transportation (DOT)

Source: FHWA.



## James Colyar

EDC-6 Crowdsourcing Colead  
FHWA Office of Operations

Source: Indiana DOT.



## Ed Cox

ITS Engineering Director  
Indiana DOT

# Webinar Agenda

- 1:05 p.m.** Crowdsourcing Course Background
- 1:10 p.m.** Emergency Management Module
- 1:30 p.m.** Work Zone Management Module
- 1:55 p.m.** Question and Answer
- 2:10 p.m.** Next Steps Lesson
- 2:30 p.m.** Webinar Close

\*EDT Time Zone

Source: Unsplash.



# Crowdsourcing Course Delivery by Webinar

| Webinar  | Date                | Course Lessons and Modules  |
|----------|---------------------|---|
| 1        | May 16              | <a href="#"><u>Crowdsourcing Introduction and Applications Lessons</u></a>          |
| 2        | June 20             | <a href="#"><u>Data Sources and Management Lessons</u></a>                          |
| 3        | July 18             | <a href="#"><u>Traveler Information and Traffic Incident Management Modules</u></a> |
| 4        | August 15           | <a href="#"><u>Road Weather and Arterial Management Modules</u></a>                 |
| <b>5</b> | <b>September 19</b> | <b>Emergency and Work Zone Management Modules and Next Steps Lesson</b>             |



# Summary of Webinar 4 Modules

## Road Weather Management

Crowdsourced data helps:

- Expand weather-reporting geography
- Facilitate real-time weather responsive strategies
- Conduct postweather performance measurement

## Arterial Management

Crowdsourced data supports:

- Performance-based rather than cyclical corridor retiming
- Continuous monitoring rather than sampling for performance
- Measuring improvements and proactive signal response

# MODULE: Emergency Management

## INSTRUCTOR: Kelly Wells, North Carolina DOT



Source: Pixabay.



# Lesson Objective

Describe how crowdsourcing data can aid traffic operations during emergency conditions like natural disasters.



Source: Unsplash

# TSMO: Day to Day versus Emergencies

- TSMO is about keeping traffic moving and letting people know when it is not moving.
- Two Variables in TSMO: roadway capacity and traffic volume
  - Increases in volume such as for holiday travel or evacuations
  - Decreases in capacity such as for work zones, crashes, debris, or flooding
- Emergencies are the extreme (not day to day)
  - Can be natural and man-made events
  - Entail a before, during, and after activity
  - May have no, little, or moderate warning and are often long in recovery.



# Emergency Management Challenges

- Traffic volumes exceed capacity
- Roadway detours
- Vehicle breakdowns
- Communicating information

***“An agency can determine how they need to be prepared by asking the question, “what must be done to ensure that the agency is prepared to respond to any natural disaster or emergency that may affect operations.”***

[FHWA Office of Operations, National Incident Management System, Preparedness](#)

# Crowdsourcing Applications for Emergency Management



Source: [Acuweather.com](http://Acuweather.com)

- Situational awareness
- Detour management
- Queue monitoring
- Improve safety

# Emergency Management Crowdsourcing Examples

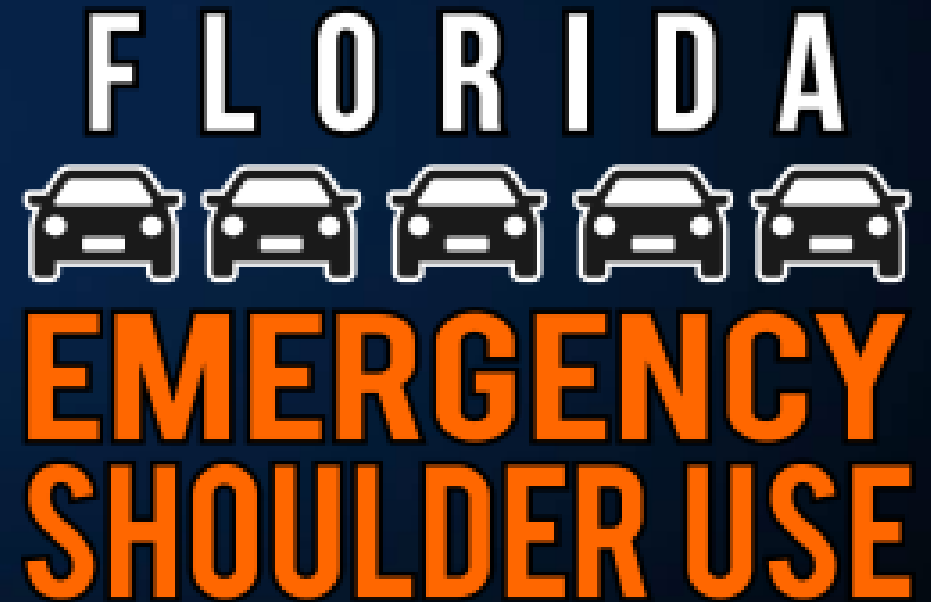
| Agency             | How Data is Used              | Crowdsourced Data                  |
|--------------------|-------------------------------|------------------------------------|
| Florida DOT        | Situational awareness, safety | INRIX® and HERE®                   |
| Alabama DOT        | Queue management              | INRIX®                             |
| North Carolina DOT | Traveler information          | Multiple navigational applications |

[https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_5/docs/crowdsourcing\\_applications.pdf](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/docs/crowdsourcing_applications.pdf)

# Example: Situational Awareness and Safety

## Florida Emergency Shoulder Use (ESU)

- Shared ESU with mapping providers, mass media, and social media.
- Florida DOT also uses road telemetry and crowdsourced data for monitoring emergency events.



*Source: Florida Department of Transportation*



# Example: Queue Management

## Hurricane Evacuation in Alabama

- Coastal areas and neighboring states contribute to network problems.
- Alabama DOT used a crowdsourced tool to identify choke points.
- Choke points prompted planning for alternate routes.
- Tracking of effectiveness possible.



Source: Pixabay

# Example: Detour Management North Carolina Roadway Flooding

- North Carolina DOT developed new information sharing procedures, working with navigation providers.
- Significant road user benefits for floods and beyond.



Source: North Carolina Department of Transportation



# NORTH CAROLINA

## Department of Transportation



# NCDOT Experience in Coordinating with Navigation Companies

Kelly Wells, PE



# Outline

- Reverse Crowdsourcing
- Hurricanes Matthew & Florence
- Understanding the Ecosystem
- Waze Crisis Team Exercise
- Day to Day Application





# Hurricane Matthew (2016)



- 1500 road closures
- Home grown ATMS/ATIS to track closures
- I-95 closed due to flooding near Fayetteville
  - State Highway Patrol “You cannot go any further. Road is closed.”
  - Driver returns one hour later “But my GPS keeps routing me back here.”

# Navigation Ecosystem

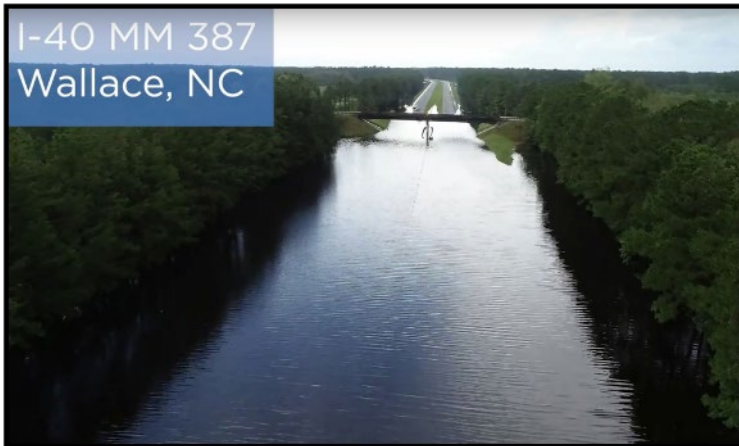
- Forced us to dig into “ecosystems” of navigation systems
- Levels of information
  - Maps
  - Incident Info
  - Speeds
  - Navigation
- Not all products you use create their own content
- Found contacts in each and keep them updated and shared them widely

| Company | How do they interface with NCDOT? | Incidents POC's | Map | Mapping POC's | End User Brands | Offers Truck Product |
|---------|-----------------------------------|-----------------|-----|---------------|-----------------|----------------------|
|---------|-----------------------------------|-----------------|-----|---------------|-----------------|----------------------|

|              |
|--------------|
| Waze         |
| Traffic Cast |
| HERE         |
| TomTom       |
| Google       |
| Apple        |
| Rand McNally |

|   |
|---|
| MapQuest  |
| Waze App  |
| Sirius XM   |
| I Heart Radio   |
| Garmin  |
| BMW, Audi & Daimler vehicle..<br>Alpine, BMW, Mercedes, Hyundai,<br>Pioneer, Volkswagen and Toyota<br>Facebook, Amazon and UPS<br>RV Life |
| Tom Tom Device  |
| On Star   |
| Mazda, Toyota & Lexus<br>Maserati, Stellantis,<br>Azure Maps, Uber  |

# Hurricane Florence (2018)



- 2574 road closures
- Waze CCP members & other contacts
- Proactive checking
- Still some challenges
- So much better than 2016
- Idalia 2023: pre and during checks



# Waze Crisis Exercise

- Engaged with Waze Crisis team to conduct a fictional tropical storm exercise in May 2022
- Shared fictional road closures and evacuation zones with Waze
- Exercise improved readiness for a real storm emergency by increasing NCDOT's familiarity with Waze tools and processes



**Road Closures**



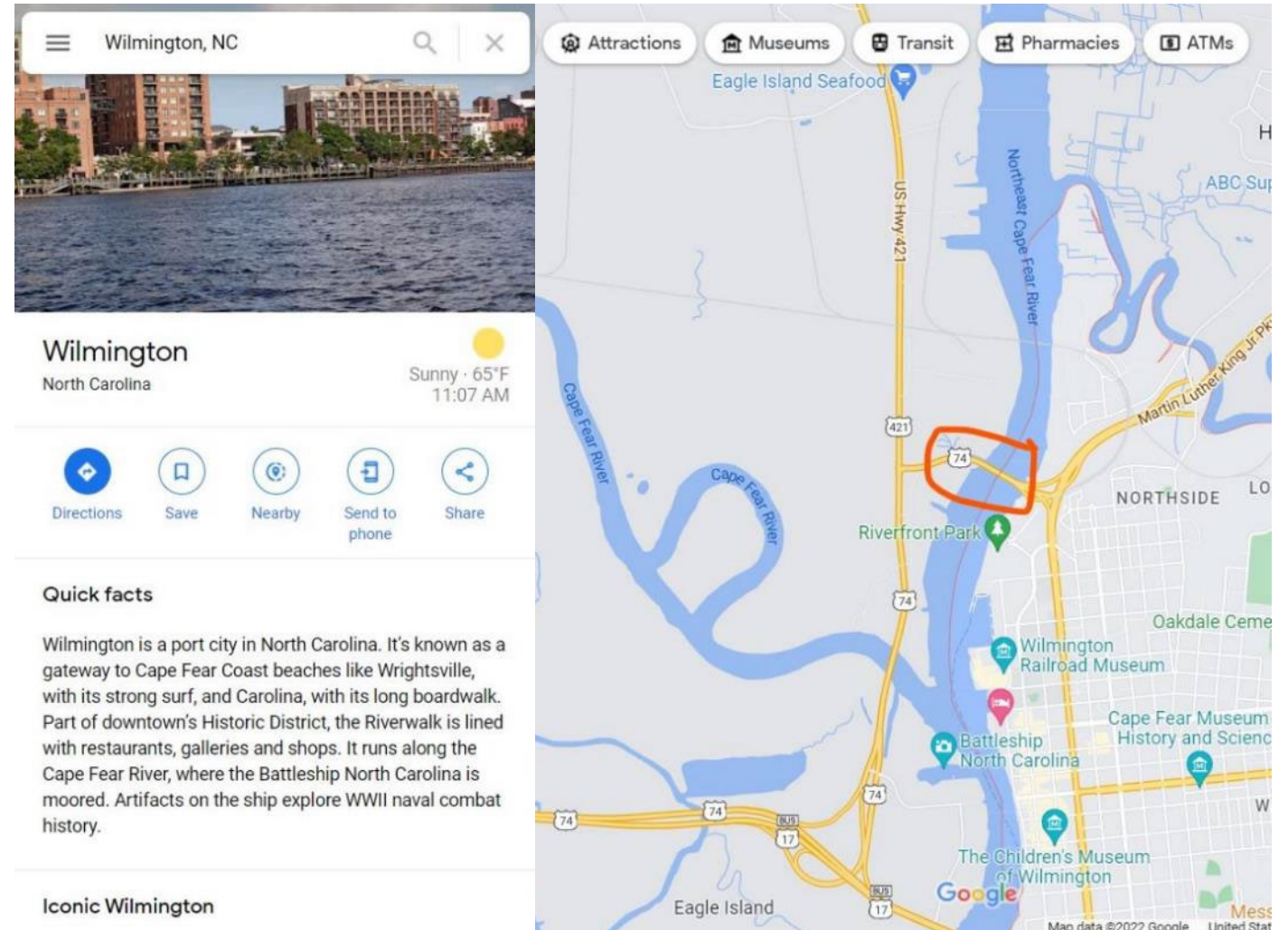
**Evacuation  
Zone**

## Road Closures

Using Waze Map Editor (WME), a Mock Event for the drill was created and the date was set 1 week in the future.

This shall be visible on the Waze Events page ([waze.com/events](https://waze.com/events))

Multiple mock closures were added to the WME as they were programmed to happen

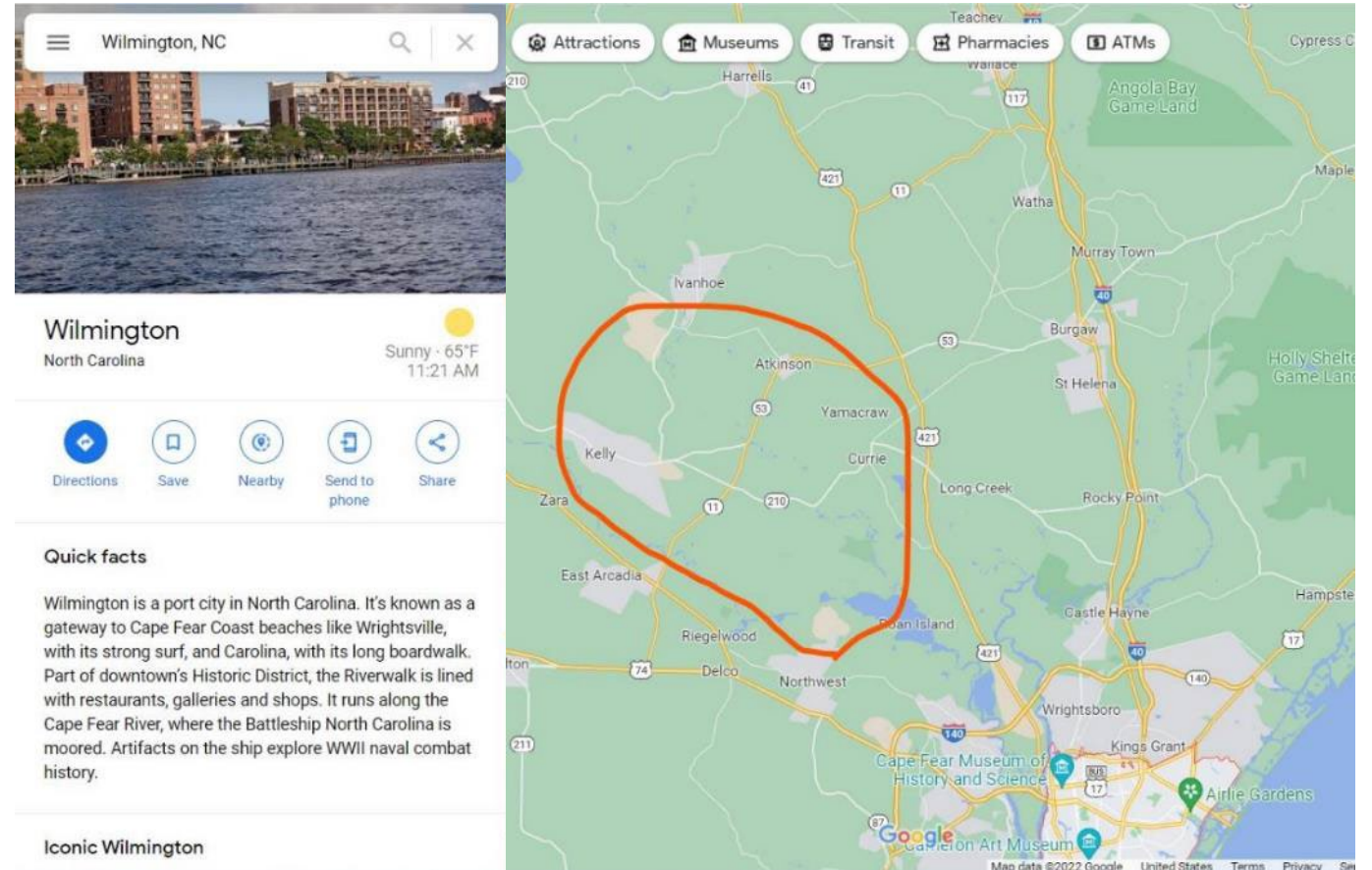


## No-Drive Zones

Evacuation zones  
not used

Polygons of areas with  
widespread flooding were used  
to create  
“No-Drive Zones”

Waze maintained a Google Map  
which tracked the polygons





# Day to Day Application

- Created Waze full closure feed from our homegrown ATIS
- Use feed for work zones and weather emergencies
- Expanding to others
  - TETC Creating “Directory”
  - Enterprise Project

**Tropical Storm Idalia**

**Road Closed – Incident 674730** New Tab

| Location  | Timeframe                                       |
|---|---|
| <ul style="list-style-type: none"><li>• SR-1124 (John Cox Rd.), Near Wright Rd.</li><li>• Near Tabor City / Both Directions</li><li>• Columbus County</li></ul> | <p><b>Start</b></p> Thu, Aug 31, 2023, 10:25 AM |
| <p><b>Weather Event: Road Closed</b></p> Road is washed out. Road Closed. Not accessible.<br>Expected impact to traffic is High.                                | <p><b>End</b></p> Fri, Sep 29, 2023, 11:25 AM   |

**Local Map**

Slow Fast

Weather Event  
Road Closed

DriveNC.gov

**Road closed**

Tom Fork Rd  
Weather Event - DriveNC 674730  
Reported by TheMet4IDod  
5 days ago

Dropped pin

waze ★★★★★  
Navigation & Live Traffic

# Knowledge Check

Which of the following *traffic operations challenges* benefit from crowdsourced data during hurricane evacuations?

A. Dynamic Toll Pricing

**B. Traffic Queuing Information**

C. Coastal Flooding

D. All of the above



Source: Unsplash



# Emergency Management Resources

## Adventures in Crowdsourcing webinars with Emergency Management content:

- Emergency Management
- Engaging Navigation Providers

FHWA Home / OIPD / Accelerating Innovation / Every Day Counts / EDC-6: Crowdsourcing for Advancing Operations

CAI Home | **Every Day Counts** | STIC Network | AID Demonstration | AMR Program | Resources

**Crowdsourcing for Advancing Operations**

**Crowdsourced data from multiple streams can be integrated and used in real time for improved operations.**

State and local transportation systems management and operations (TSMO) programs strive to optimize the use of existing roadway facilities through traveler information, incident management, road weather management, arterial management, and other strategies targeting the causes of congestion. TSMO programs require real-time, high-quality, and wide-ranging roadway information. However, gaps in geographic coverage, lags in information timeliness, and life-cycle costs for field equipment can limit agencies' ability to operate the system proactively.

Public agencies at all levels are increasing both their situational awareness and the quality and quantity of operations data using crowdsourcing, which enables staff to apply proactive strategies cost effectively and make better decisions that lead to safer and more reliable travel while protecting privacy and security of individual user data.

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**FHWA EDC-6 Crowdsourcing for Advancing Operation Resource Site ([bit.ly/CS4Ops](https://bit.ly/CS4Ops))**



# MODULE: Work Zone Management

## INSTRUCTOR: Ed Cox, Indiana DOT



Source: Pixabay.



# Lesson Objective

Understand how crowdsourced data can enhance work zone management.



Source: Unsplash

# Work Zone Characteristics

- Traffic pattern changes
- Narrowed lanes, shoulders, and rights-of-way
- Construction workers present
- Work vehicles frequently entering and leaving construction areas

***Effective work zones  
"minimize traffic delays  
and maintain the safety of  
all road users (motorists,  
bicyclists, pedestrians) and  
workers."***

[Federal Highway Administration,  
Office of Operations, Work Zone  
Management](#)



# Work Zone Management Challenges

- Lack of clarity if a work zone is active
- Limited cross-jurisdictional visibility
- Limited real-time speed and queue data
- Limited road user awareness of work zones



Source: AEM Corporation

# Crowdsourcing Applications for Work Zone Management



- Situational awareness
- Detour management
- Queue monitoring
- Performance management
- Safety Inspection

# Work Zone Crowdsourcing Examples

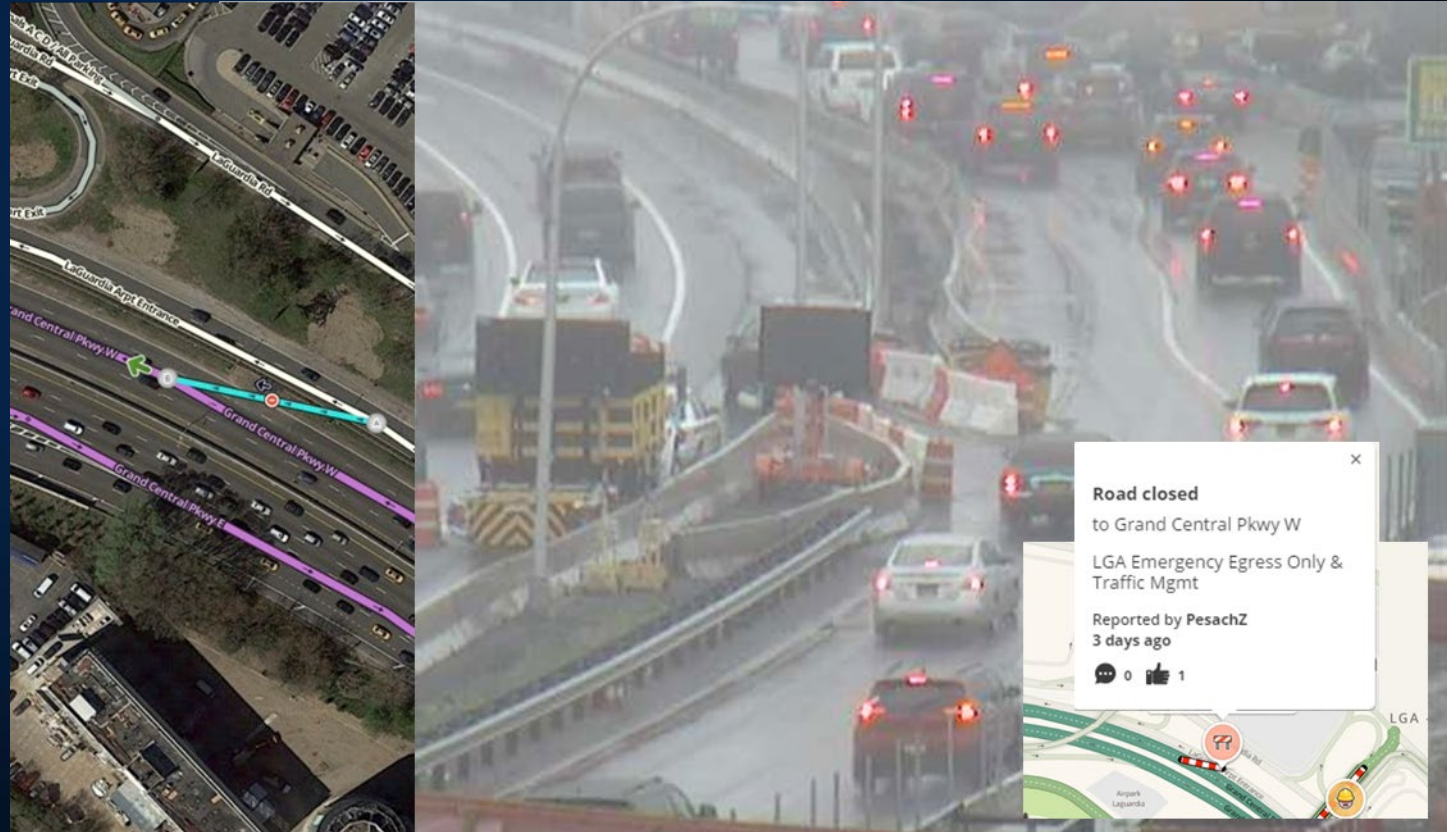
| Agency   | How Data is Used   | Crowdsourced Data |
|--|--|-------------------|
| Port Authority of New York & New Jersey (PANYNJ) | Detour management<br>Traveler information                      | Waze®             |
| Kentucky Transportation Cabinet (KYTC)           | Queue monitoring<br>Performance reporting                      | Waze®,<br>HERE®   |
| Indiana DOT                                      | Detour management<br>Queue monitoring<br>Performance reporting | INRIX®            |

[https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_5/docs/crowdsourcing\\_applications.pdf](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/docs/crowdsourcing_applications.pdf)



# Example: Port Authority of New York and New Jersey Improves Situational Awareness and Detour Management

- Segment added or removed by the Waze® LaGuardia community.
- Based on project plans created by the LaGuardia Airport command center.

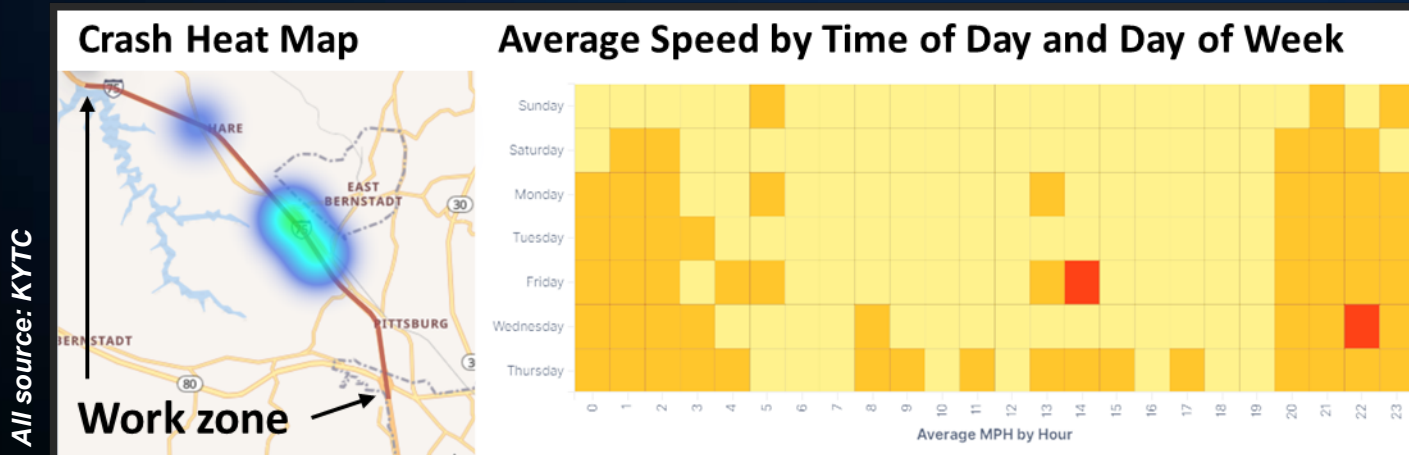


Source: Port Authority of New York and New Jersey



# Example: Kentucky Transportation Cabinet Work Zone Monitoring and Performance

- Public facing work zone information.
- DOT personnel can access detailed real-time, short term, and long-term performance data.



The screenshot shows the GoKY Real-Time Traffic Information interface. On the left is a 'Traffic Information' sidebar with a list of metrics:

| Metric                    | Value |
|---------------------------|-------|
| District Weather Activity | 0     |
| County Weather Activity   | 0     |
| Alerts (KYTC TRIMARC)     | 2     |
| Alerts (TOC Points)       | 1     |
| Alerts (TOC Lines)        | 7     |
| Alerts (Waze)             | 2     |
| Traffic Speeds            | 55    |

On the right is a map showing a work zone on I-264. A pop-up window provides details for the alert:

**Alert: roadwork**  
District: 5  
County: Jefferson  
City: Louisville  
Route: I-264  
Road: I-264  
Mile Point: 4.60  
Updated: 5/21/2021, 2:20 PM  
Description: KYTC District 5 advises motorists of lane closure between mile 0 (I-64) and mile 8 (Dixie Highway) for diamond grinding and joint sealing. On weeknights (Monday - Thursday) lane closures will take place between 8PM and 5AM the next morning. On weekends, lane closures will take place from 8PM Friday to 5 AM Monday. I-264 East-West Between I-64 and Dixie Highway

# Indiana DOT Crowdsourcing Work Zone Management

**Ed Cox**

ITS Engineering Director  
Indiana Department of Transportation



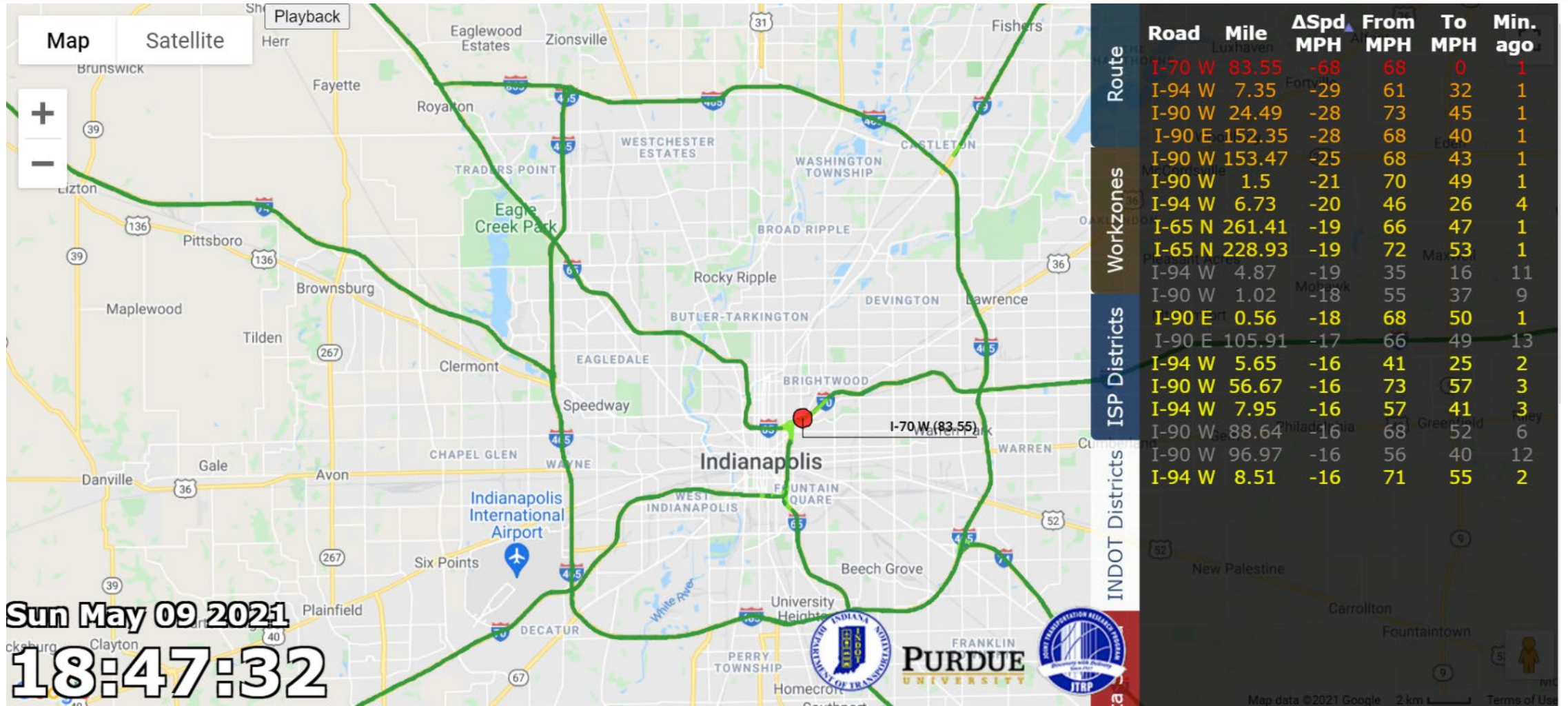
# One Crowdsourced Data – Many Uses

|   |   |  |
|---|---|--|
| <b>6659</b><br>Interstate segments per minute | <b>34829</b><br>Non-interstate segments per minute                                |  |
| <b>3.6TB</b><br>INRIX data storage annually   | <b>Built Tools</b><br>With Purdue University Partnership                          | <b>1</b><br>Minute or less data loss per day per segment |
|   | <b>INRIX data</b><br>purchased in 2011, expanded to interstate and non-interstate |  |

- Situational Awareness
- Incident Detection and Management
- **Work Zone Monitoring & Reporting**
- Snow and Ice Management
- Signal Timings
- Capital Project Selection
- Travel Time Calculations
- Coming Soon: Variable Speed Limits and Ramp Metering



# Work Zone Monitoring: Delta Speed Tool





# Weekly Work Zone Automated Reports

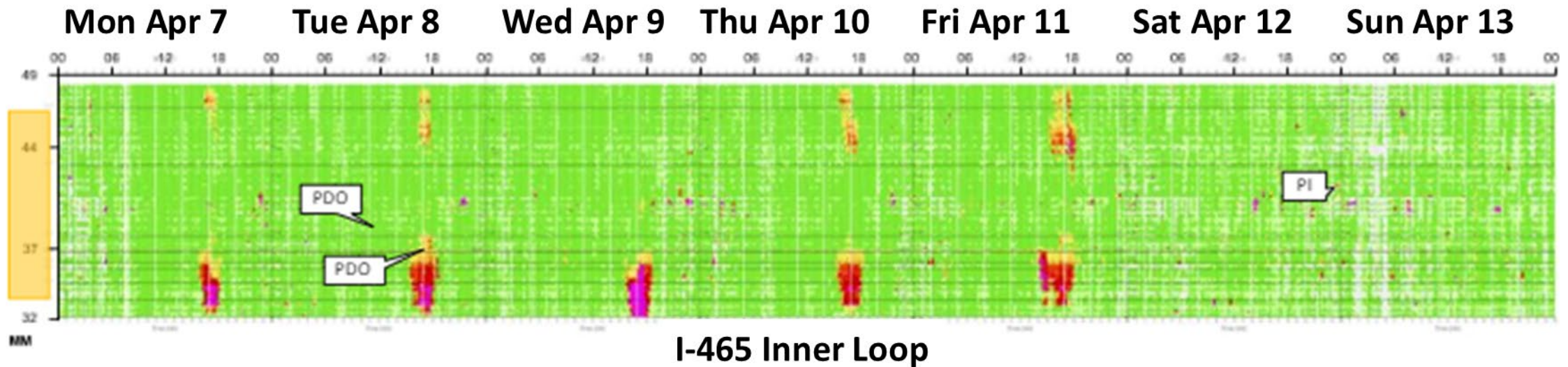
- Weekly work zone reports based on INRIX and crash data
- Managers and inspectors can target attention based on this data.
- Included are speed heat maps (next slide) and work zone location.

## Automated Weekly Work Zones Reports

| Work Zone: I-465 B: I-465 between I-70 and I-69 northeast side |            |            |
|--|------------|------------|
| Date Range   | 4/1 – 4/1  |            |
| Route  | I-465      |            |
| Mile Marker Range  | 37 to 44   |            |
| Direction  | Inner Loop | Outer Loop |
| Hours of queue length $\geq$ 5 hours                           | 0.17       | 0.00       |
| Hours of queuing upstream of WZ                                | 0.84       | 0.3        |
| Mile-hours < 45 MPH (whole week)                               | 11.92      | 29.58      |
| Mile-hours < 45 MPH (worst day)                                | 2.8        | 10.63      |
| Worst Day  | 4/5        | 4/4        |
| Number of PDO Crashes  | 2          | 3          |
| Number of PI Crashes   | 1          | 0          |
| Number of Back-of-Queue Crashes                                | 0          | 3          |

# Work Zone Speed Heat Map

Sample speed heat map included in weekly work zone report

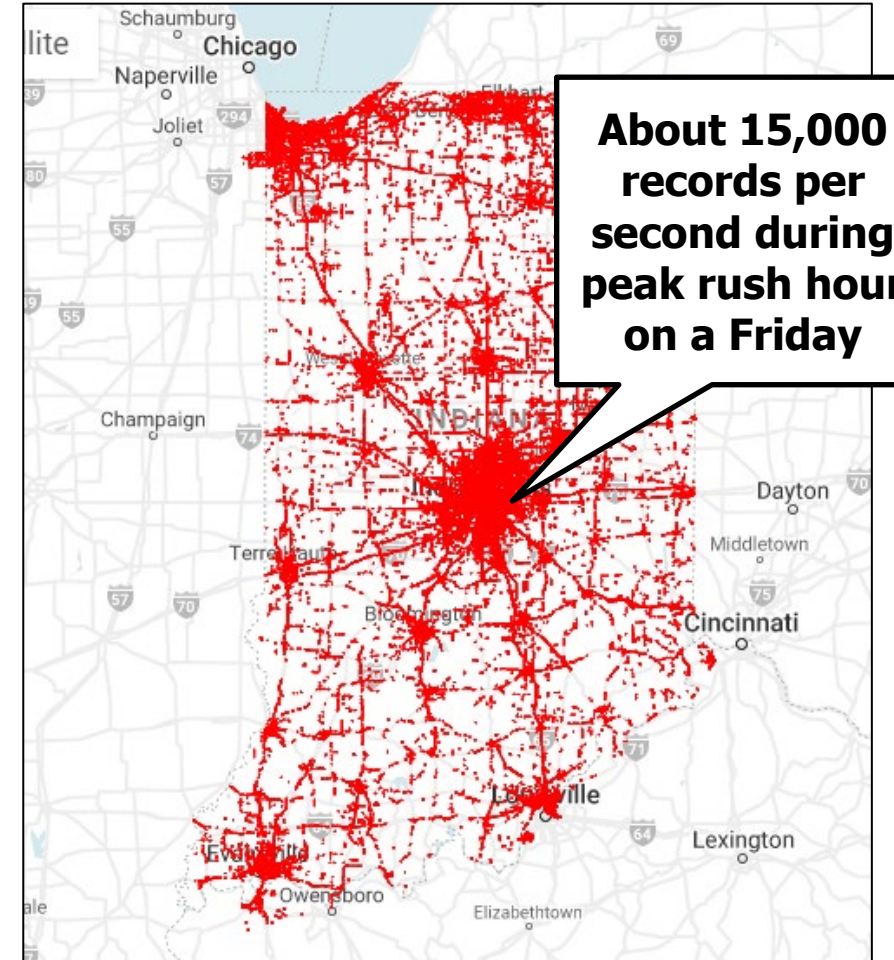


PDO = property damage only roadway crash

PI= personal injury crash

# New Crowdsourced Data: Connected Vehicles

- 45 TB over 2.5 years = 340 billion records, or roughly 1.5 TB per month
- Not yet as real-time as vehicle probe data
- Many different data available:
  - Anonymized individual vehicle trajectory
  - Speed, acceleration and deceleration
- Potentially even more uses
- Comparing CV data with vehicle probe data



# Connected Vehicle Data for Work Zone

- Research Study: **Correlating Hard-Braking Activity with Crash Occurrences on Interstate Construction Projects in Indiana**
  - Conducted by the Joint Transportation Research Program at Purdue University
  - Examined hard-braking events and crashes over a 2-month period in the summer of 2019 for 23 interstate work zones in Indiana
  - Concluded hard-braking event data can quickly identify potential high risk work zone locations for further focus.



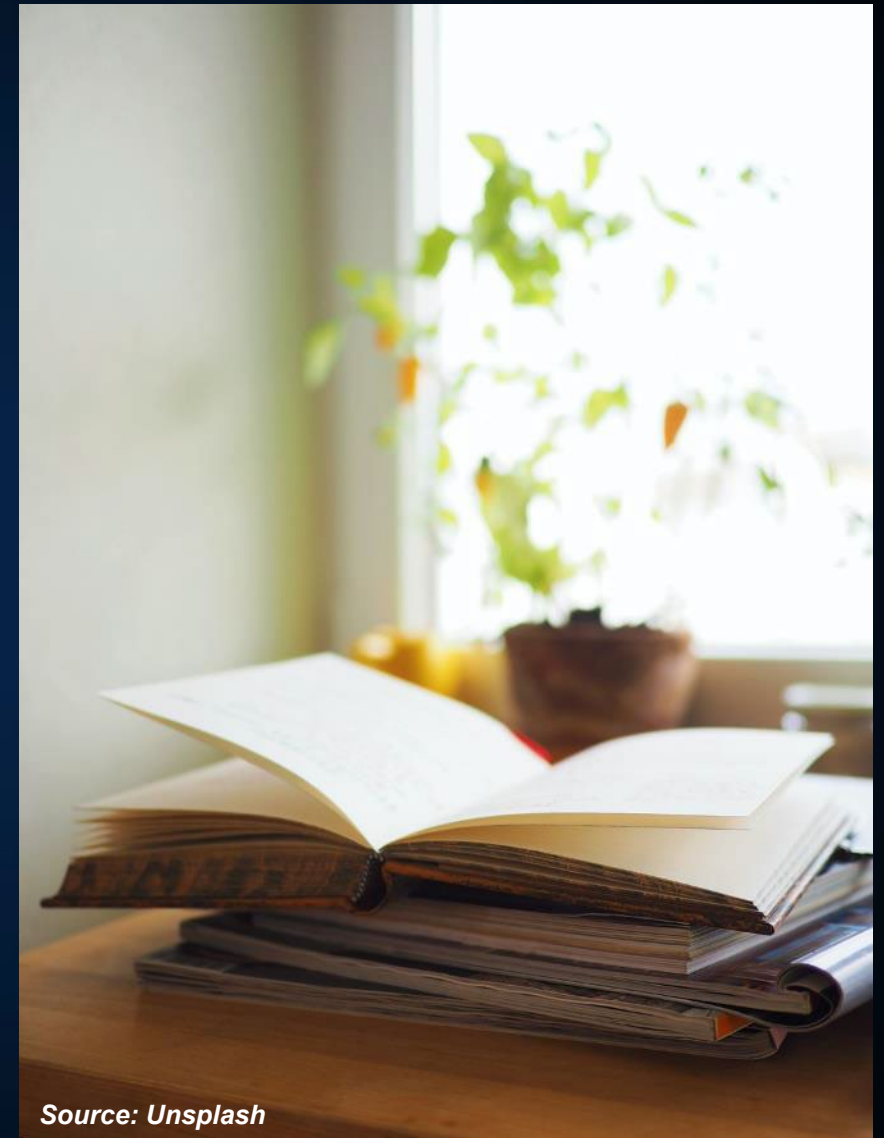


# Knowledge Check

How can crowdsourced data improve work zone management?

- A. Situational awareness
- B. Queue monitoring
- C. Performance management

**D. All of the above**



Source: Unsplash

# Work Zone Crowdsourcing Resources

## Adventures in Crowdsourcing webinars with work zone content:

- [Work Zone Data and Crowdsourcing](#)
- [Active Work Zone Monitoring and Management](#)
- [Identifying and Managing Back of Queues](#)

## [Talking TIM](#) webinar with work zone content:

- Protecting the Queue through Crowdsourcing (October 2020)



**Crowdsourcing for Advancing Operations**

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Source: Pixabay.

# *Question, Answer, and Discussion*



# LESSON: Next Steps

INSTRUCTOR: James Colyar, FHWA



Source: Pixabay.



# Lesson Objective

Become familiar with high-level steps to initiate the use of crowdsourced data and tools for a specific application.



*All Photo Source: Unsplash*

# Checklist for Crowdsourcing Quick Start

- Identify the need.
- Extrapolate from peer experiences.
- Socialize solution to gain support.
- Conduct pilot.
- Refine, recommend, and expand.

***Some applications may take months or years, some only a few hours!***



Source: Unsplash

# 1. Identify the Need

Identify the “problem” that you, your group, your agency, or your division has that crowdsourced data may help solve.

- Explain the problem through various lenses.
- Clarify what and how crowdsourced data helps.
- Link the solution to division or group goals and objectives.



Source: Pixabay



## 2. Extrapolate from Peer Experiences

- Review literature from peers.
- Speak with peer experts or the EDC-6 Crowdsourcing program.
- Explore within your agency for data and tools.
- Refine need and justify the proposed pilot/solution; use peer data points.
- Create a briefing that explains the problem, solution, value, and its link to goals and objectives.



Source: Unsplash

# 3. Socialize Solution to Gain Support

Be ready to serve as the subject matter expert and champion for your solution.

- Begin with internal consensus-building.
- Be sure necessary pilot components are ready as per agency processes.
- Develop a clear value proposition or business case.
- Present idea to leadership to build executive-level champions.



Source: Unsplash

# 4. Conduct Pilot

The pilot offers staff and leaders the first-hand opportunity to “test the tires.”

- Log questions, issues, feedback.
- Collect data to quantify outcomes.
- Align scope and expectations.
- Take necessary time, focus on where value resides.

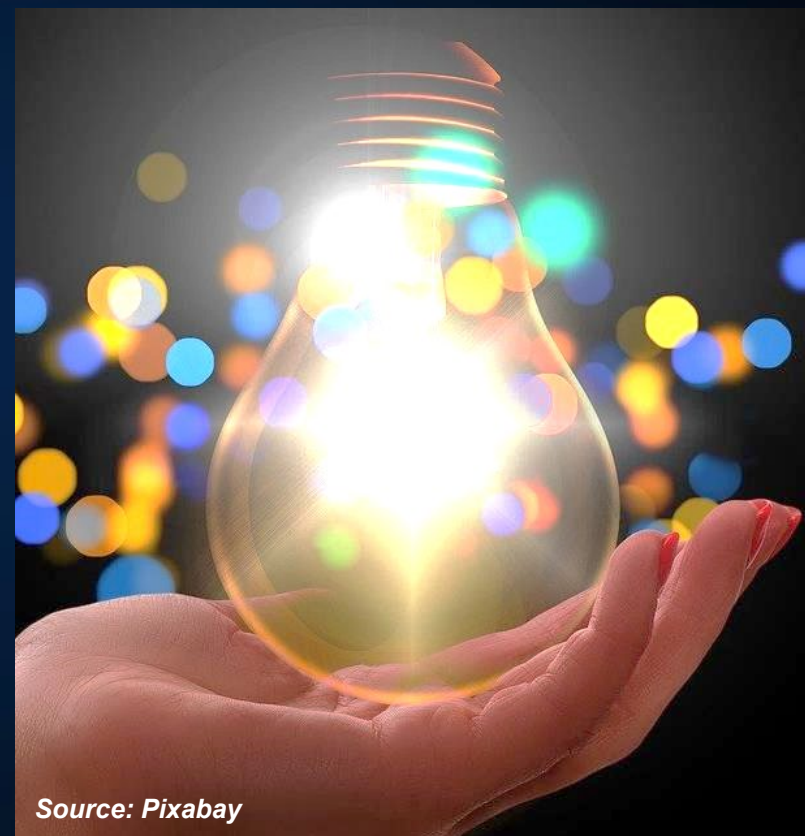




# 5. Refine, Recommend, Expand

Lessons from the pilot should guide what comes next.

- Document quantitative and qualitative feedback or experience.
- Provide actionable recommendations, possibly for routine use.
- Share outcomes and lessons within agency and potentially the broader peer community.
- **Follow a structured process** (Systems Engineering, Agile, etc.)..



Source: Pixabay

# Example: City of Irving, Texas

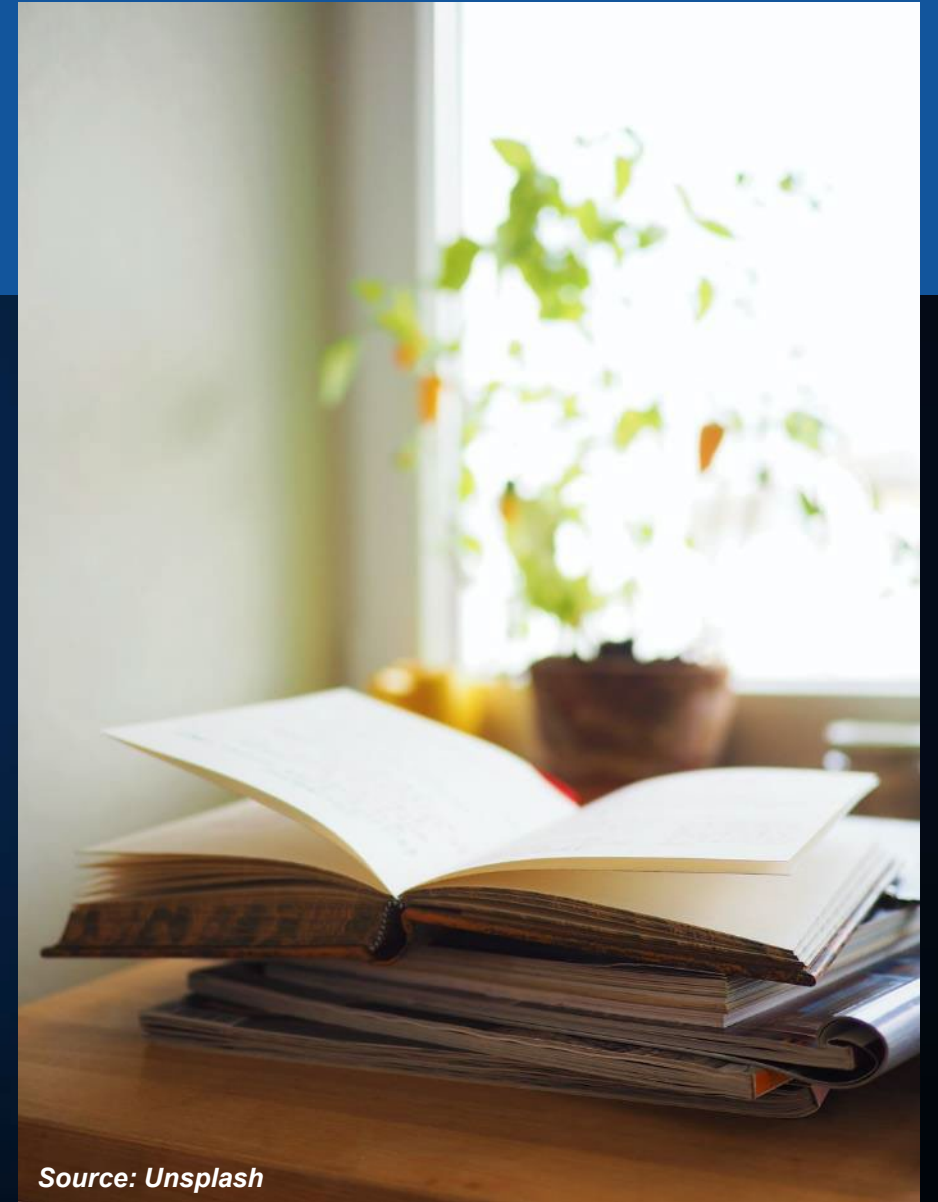
- City of Irving, Texas became a Waze® for Cities partner.
- They reached out to Lake County, Illinois peer to use open-source code on GitHub.
- With a half-day's effort, City operators can more quickly detect congestion on key arterial roads through email alerts.



# Knowledge Check

Which of the following **is not a step** for adopting crowdsourcing?

- A. Identify a need
- B. Expand the database**
- C. Conduct pilot
- D. Extrapolate from peer experiences



Source: Unsplash

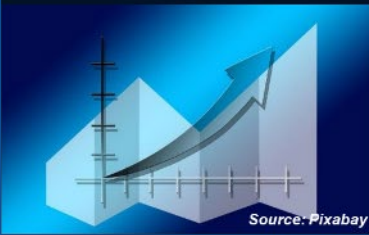


# What “Need” Might Crowdsourcing Solve for Your Organization?

Traveler Information



Performance Management



Arterial Management



Traffic Incident Management



Traffic Studies



Road Weather Management



Freeway Management



Work Zone Management



Road/ITS Maintenance



Project Prioritization



Emergency Management



Other Applications?



# Crowdsourcing Beyond EDC-6

- New Web presence
- Continue course delivery
- Continue technical support
- Continue free access to the EDC-6 Adventures in Crowdsourcing webinar series hosted by the National Operations Center of Excellence

The screenshot shows a concept website for the FHWA. At the top, it features the FHWA logo and a navigation menu with links to Home, Case Studies and Fact Sheets, Crowdsourcing Course, Crowdsourcing Webinars, Crowdsourcing in Action, Frequently Asked Questions, and Contact Us. The main content area is titled "Crowdsourcing for Advancing Operations" and includes a sub-header "Crowdsourced data can improve real time operations and operational planning." Below this, there is a paragraph explaining that TSMO programs aim to optimize existing roadway facilities through traveler information, incident management, road weather management, arterial management, and other strategies. It notes that TSMO programs require real-time, high-quality, and wide-ranging roadway information, but gaps in geographic coverage, information timeliness, and life-cycle costs for field equipment can limit agencies' capacity for proactive systems' operations. A second paragraph states that transportation agencies now access and integrate crowdsourced data with traditional transportation systems data to improve operations, increase safety and reliability, and save on operational infrastructure costs, as illustrated by the following examples:

- The Indiana Department of Transportation uses third-party probe data and connected car to actively manage traffic on major highways and corridors of interest. The agency worked with Purdue University to create [Traffic Ticker and other dashboard tools](#) that improve real-time operational decision-making and support training and after-action reviews. The agency has saved \$28 million in infrastructure deployment costs and \$750,000 per year in communications service and maintenance cost by leveraging crowdsourced data ([view Business Case for Crowdsourced Data webinar](#))
- In Illinois, the Lake County Department of Transportation uses real-time tools and dashboards to integrate free navigational application-based crowdsourced data with automated traffic signal performance measure (ATSPM) data to efficiently adapt traffic management systems to transportation system disruptions, increasing arterial systems safety and reliability. They also apply their crowdsourced data to improve project prioritization.
- The Maricopa Association of Governments, the regional metropolitan planning organization in Phoenix, Arizona, makes use of [archived connected car crowdsourced data](#) to improve their arterial operations, conduct before/after studies, and to better calibrate and validate their regional planning models.

On the right side of the page, there is a "View Crowdsourcing Storyboard" button and a graphic consisting of three overlapping circles (pink, blue, and orange) with icons representing people, a question mark, and a laptop, with the word "Crowd-sourcing" in the center.

At the bottom of the page, there is a footer with the FHWA logo and navigation links: [US DOT Home](#) | [FHWA Home](#) | [Operations Home](#) | [Privacy Policy](#).

Concept website in development and intended for FHWA Office of Operations.

# Thank you.

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U.S. Department of Transportation  
**Federal Highway Administration**





- A link to a feedback questionnaire is provided in the chat pod. Please take a few minutes to fill it out – we value your input
- To receive notifications of upcoming events, send an email to [T3@dot.gov](mailto:T3@dot.gov) with “Add to mailing list” in the subject line

**Thank you!**