

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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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: FHWA.



James Colyar
EDC-6 Crowdsourcing Colead
FHWA Office of Operations

Source: North Carolina DOT.



Kelly Wells
Traveler Info Engineer
North Carolina Department of
Transportation (DOT)

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	<u>Crowdsourcing Introduction and Applications Lessons</u>
2	June 20	<u>Data Sources and Management Lessons</u>
3	July 18	<u>Traveler Information and Traffic Incident Management Modules</u>
4	August 15	<u>Road Weather and Arterial Management Modules</u>
5	September 19	<u>Emergency and Work Zone Management Modules and Next Steps Lesson</u>

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

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

Emergency Management Crowdsourcing Examples

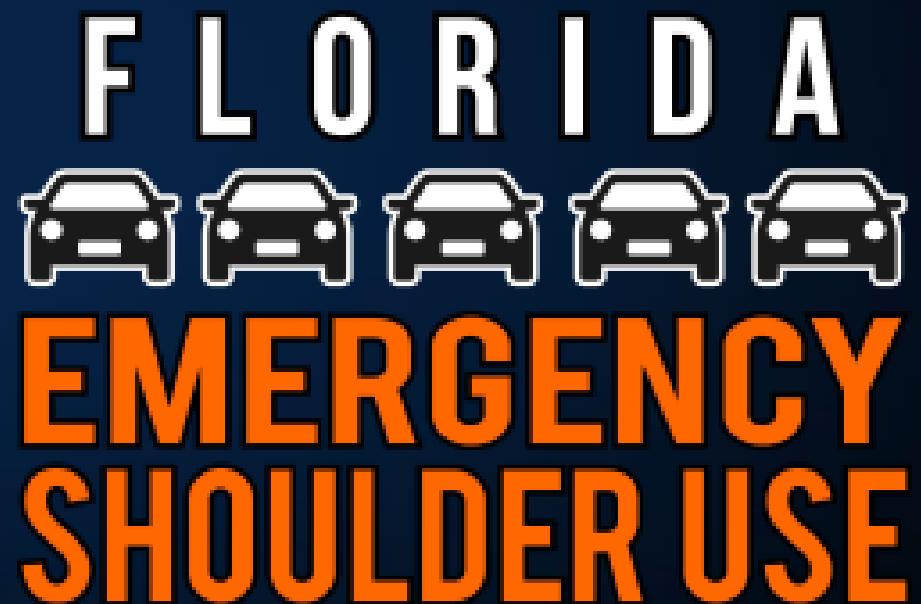
Agency	How Data is Used	Crowdsourced Data
Florida DOT	Situational awareness, safety	INRIX® and HERE®
Alabama DOT	Queue management	INRIX®
North Carolina DOT	Traveler information	Multiple navigational applications

https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/docs/crowdsourcing_applications.pdf

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..
Alpine, BMW, Mercedes, Hyundai, Pioneer, Volkswagen and Toyota
Facebook, Amazon and UPS
RV Life
Tom Tom Device
On Star
Mazda, Toyota & Lexus
Maserati, Stellantis,
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



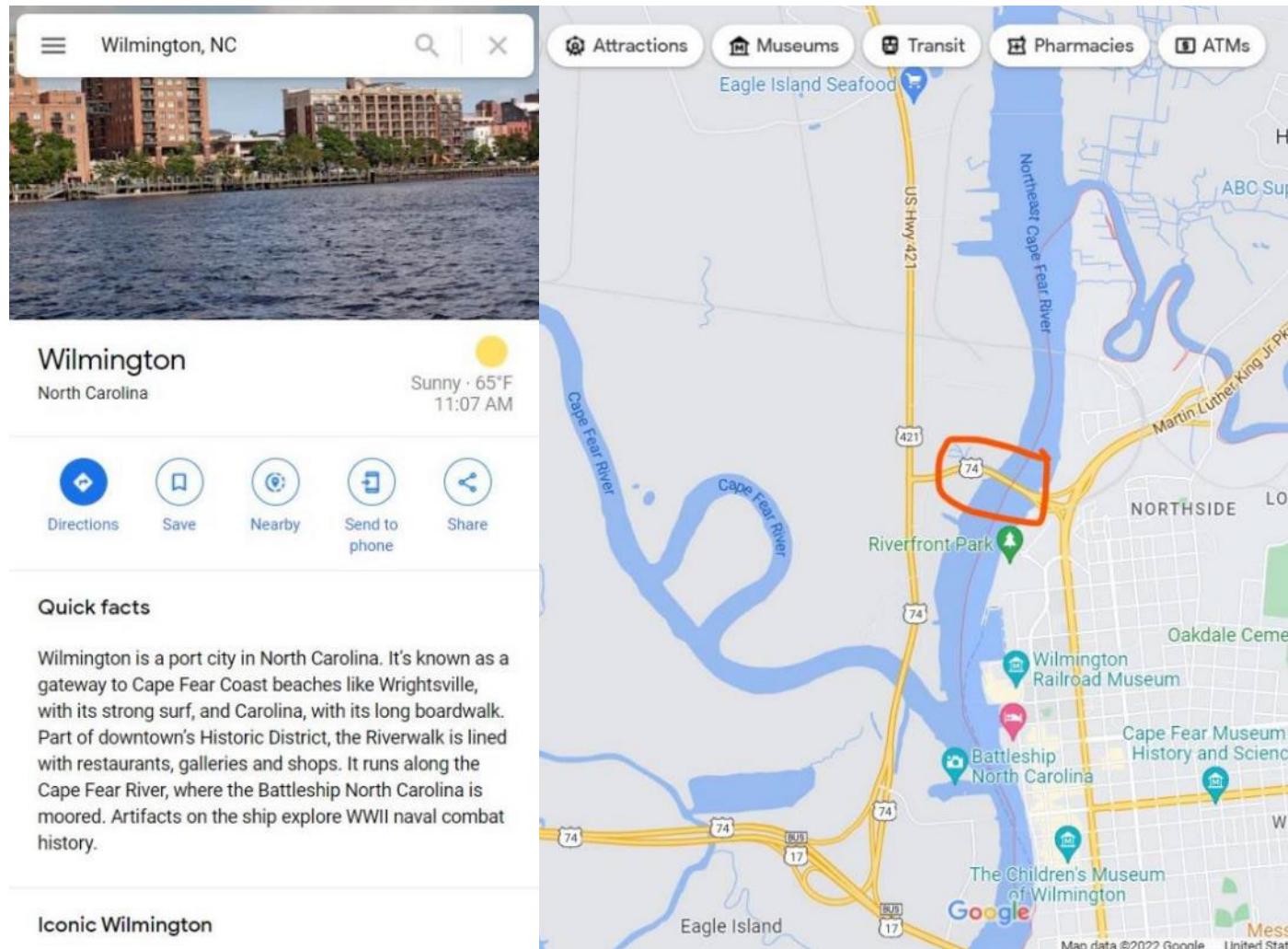
**Evacuation
Zone**

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)

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

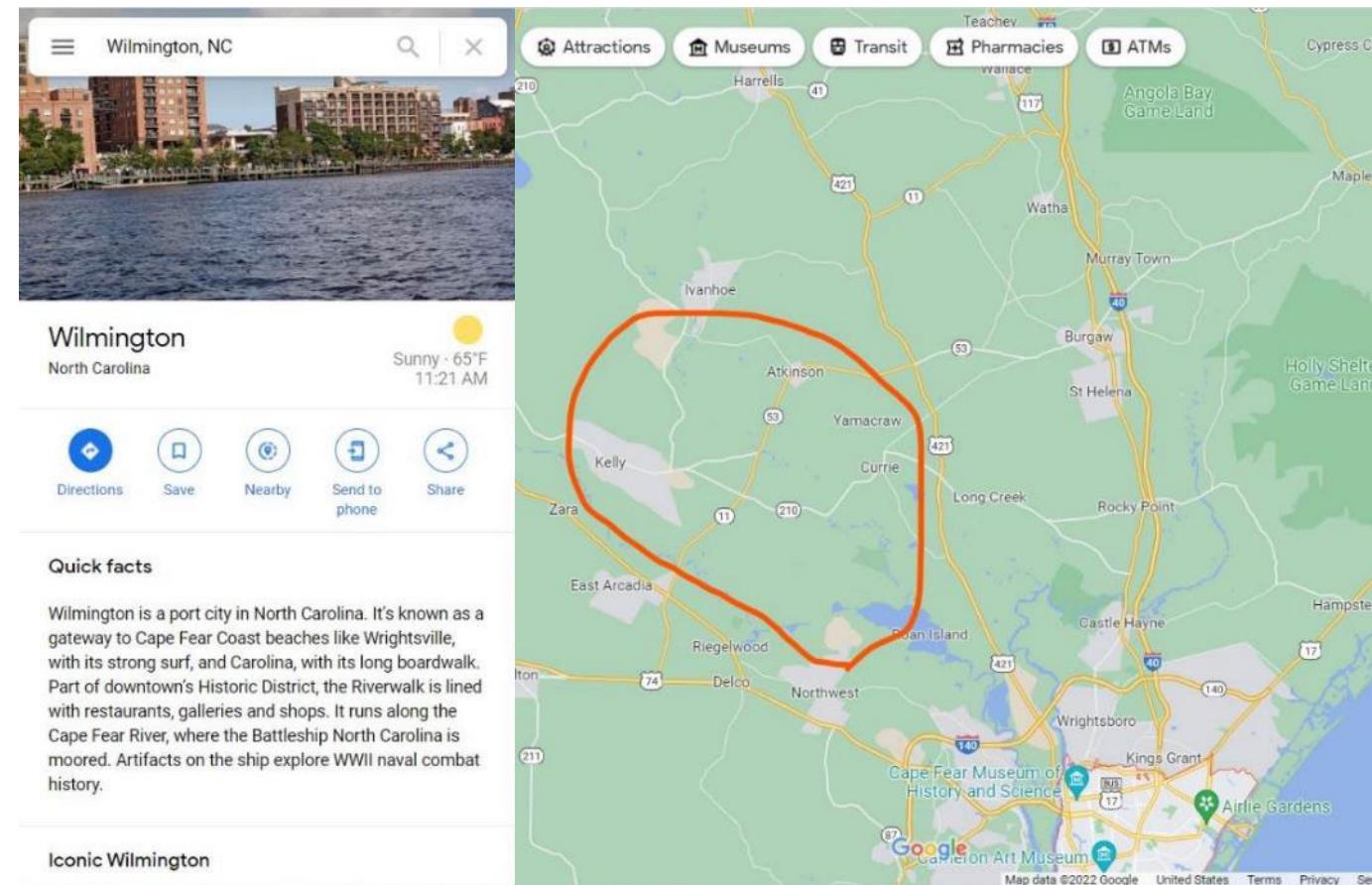


No-Drive Zones

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

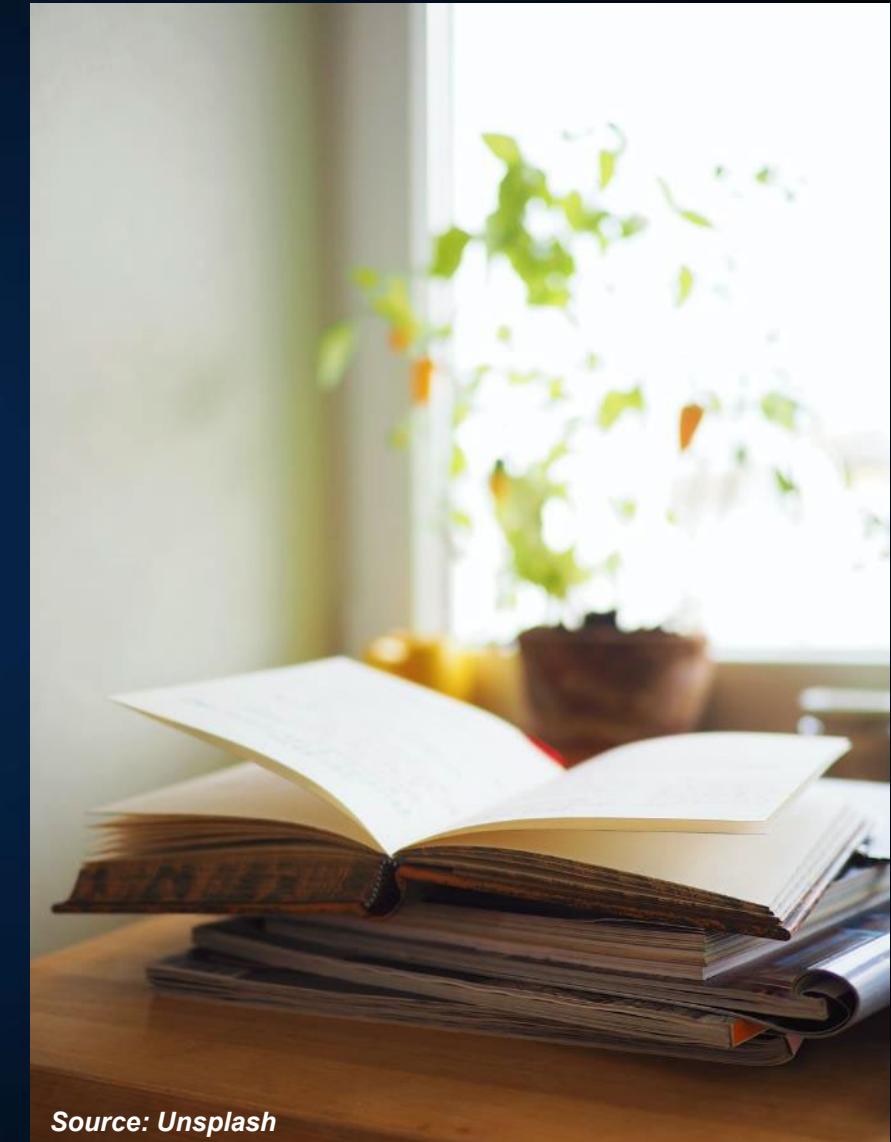
- Created Waze full closure feed from our homegrown ATIS
- Use feed for work zones and weather emergencies
- Expanding to others
 - TETC Creating “Directory”
 - Enterprise Project

The image consists of two side-by-side screenshots. The left screenshot is a web-based incident report titled "Tropical Storm Idalia" for "Road Closed – Incident 674730". It includes sections for "Location" (SR-1124 (John Cox Rd.), Near Wright Rd., Near Tabor City / Both Directions, Columbus County), "Timeframe" (Start: Thu, Aug 31, 2023, 10:25 AM; End: Fri, Sep 29, 2023, 11:25 AM), and "Weather Event: Road Closed" (Road is washed out. Road Closed. Not accessible. Expected impact to traffic is High). The right screenshot is a Waze map showing a road closure on "John Cox Rd." A callout box on the map details the "Road closed" on "Tom Fork Rd" due to a "Weather Event - DriveNC 674730" reported by "TheMet4IDod" 5 days ago. The Waze logo and "Navigation & Live Traffic" are visible at the bottom.

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



The screenshot shows the homepage of the FHWA EDC-6 Crowdsourcing for Advancing Operations website. The top navigation bar includes links for FHWA Home, OIPO, Accelerating Innovation, Every Day Counts, EDC-6, Crowdsourcing for Advancing Operations, CAI Home, Every Day Counts, STIC Network, AID Demonstration, AMR Program, and Resources. Below the navigation is a banner featuring three images: a highway scene with signal icons, a man working at a computer displaying surveillance feeds, and a traffic map. The main content area has a title "Crowdsourcing for Advancing Operations" and a sub-section titled "Crowdsourced data from multiple streams can be integrated and used in real time for improved operations." It discusses TSMO programs and their challenges. Another section highlights how public agencies use crowdsourcing for better operations. On the right side, there's a "Contacts" sidebar with names and email addresses for James Colyar, Greg Jones, and Ralph Volpe.

FHWA Home / OIPO / 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.

FHWA EDC-6 Crowdsourcing for Advancing Operation Resource Site (bit.ly/CS4Ops)

Contacts

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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

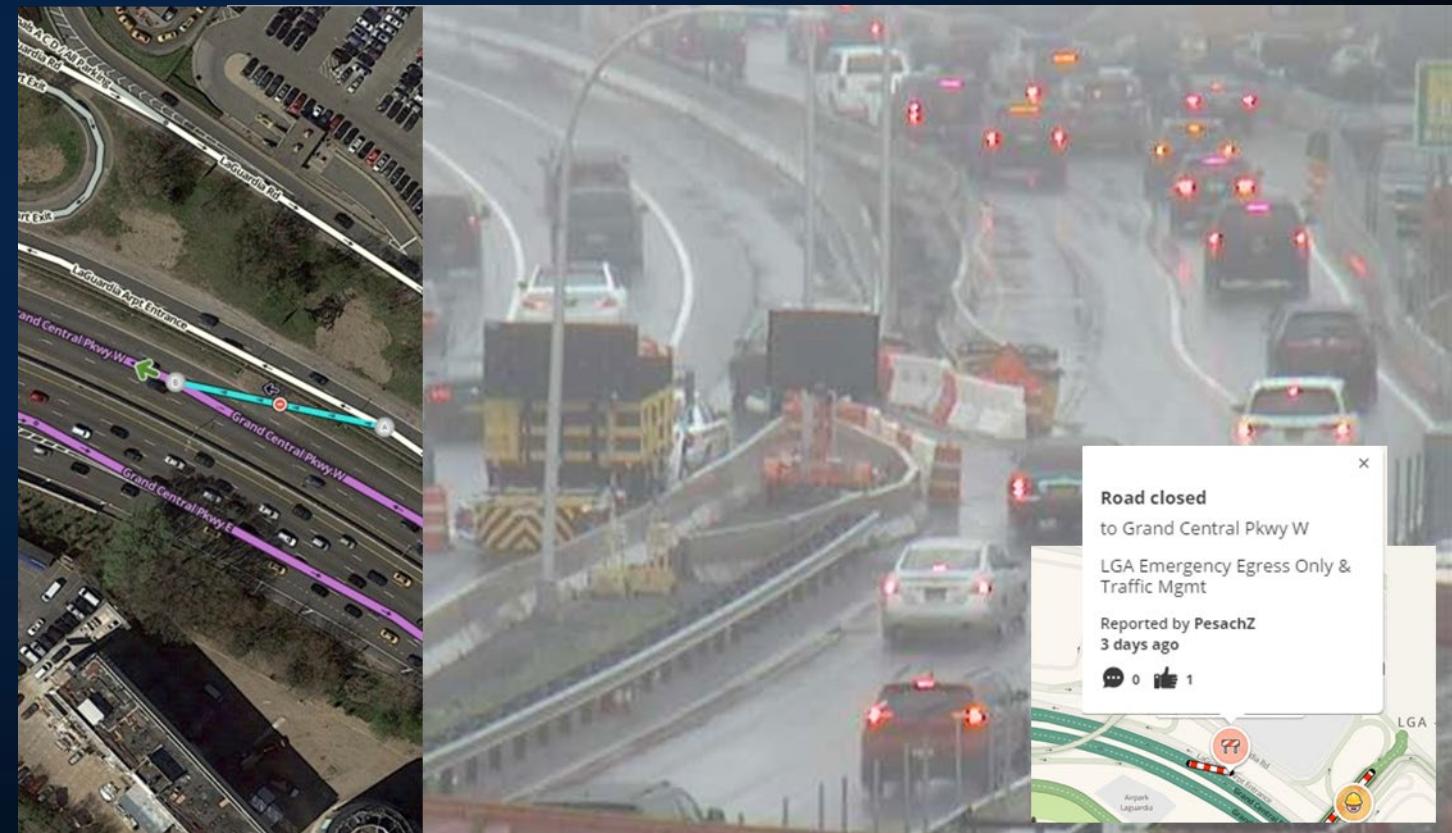
Work Zone Crowdsourcing Examples

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

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.

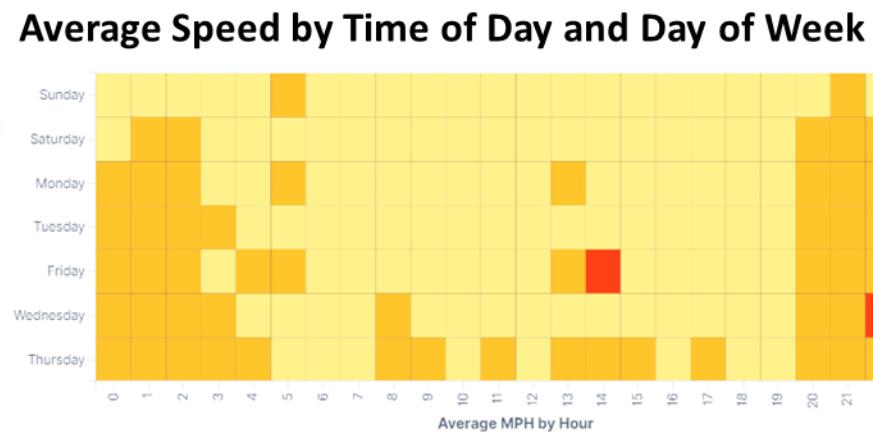


Source: Port Authority of New York and New Jersey

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.

All source: KYTC



The screenshot shows the GoKY mobile application interface. At the top, there are navigation icons: a location pin, a grid, a house, and a menu. Below that is a header bar with the "GoKY" logo and "Real-Time Traffic Information". The main content area is divided into several sections:

- Traffic Information:** Includes icons for "District Weather Activity" (0), "County Weather Activity" (0), and "Road Weather Activity" (0).
- Alerts:** A section titled "Alerts (KYTC TRIMARC)" shows an alert for "roadwork" on I-264 at mile point 4.60, updated at 2:20 PM on 5/21/2021. The alert details a motorist lane closure between mile 0 and mile 8 for diamond grinding and joint sealing. Lane closures will occur between 8PM and 5AM on weekdays, and between 8PM Friday and 5AM Monday. The alert also mentions lane closures on weekends between MM 0.1 and 8.0 between I-64 and Dixie Highway. There are dropdown arrows next to the alert items.
- Traffic Speeds:** Shows a current traffic speed of 55 MPH.

On the right side of the screen, there is a map view showing the location of the work zone on I-264. A search bar at the top of the map says "Search for Address Here". Below the map, it says "(1 of 4)" and "Alert: roadwork". The map shows the road network with green lines for highways and local roads, and various colored areas representing different traffic conditions or alerts.

Indiana DOT

Crowdsourcing Work Zone Management

Ed Cox

ITS Engineering Director
Indiana Department of Transportation



One Crowdsourced Data – Many Uses

6659

Interstate
segments
per minute

3.6TB

INRIX data
storage
annually

34829

Non-interstate segments per minute

Built Tools

With Purdue University Partnership

INRIX data

purchased in 2011, expanded to
interstate and non-interstate

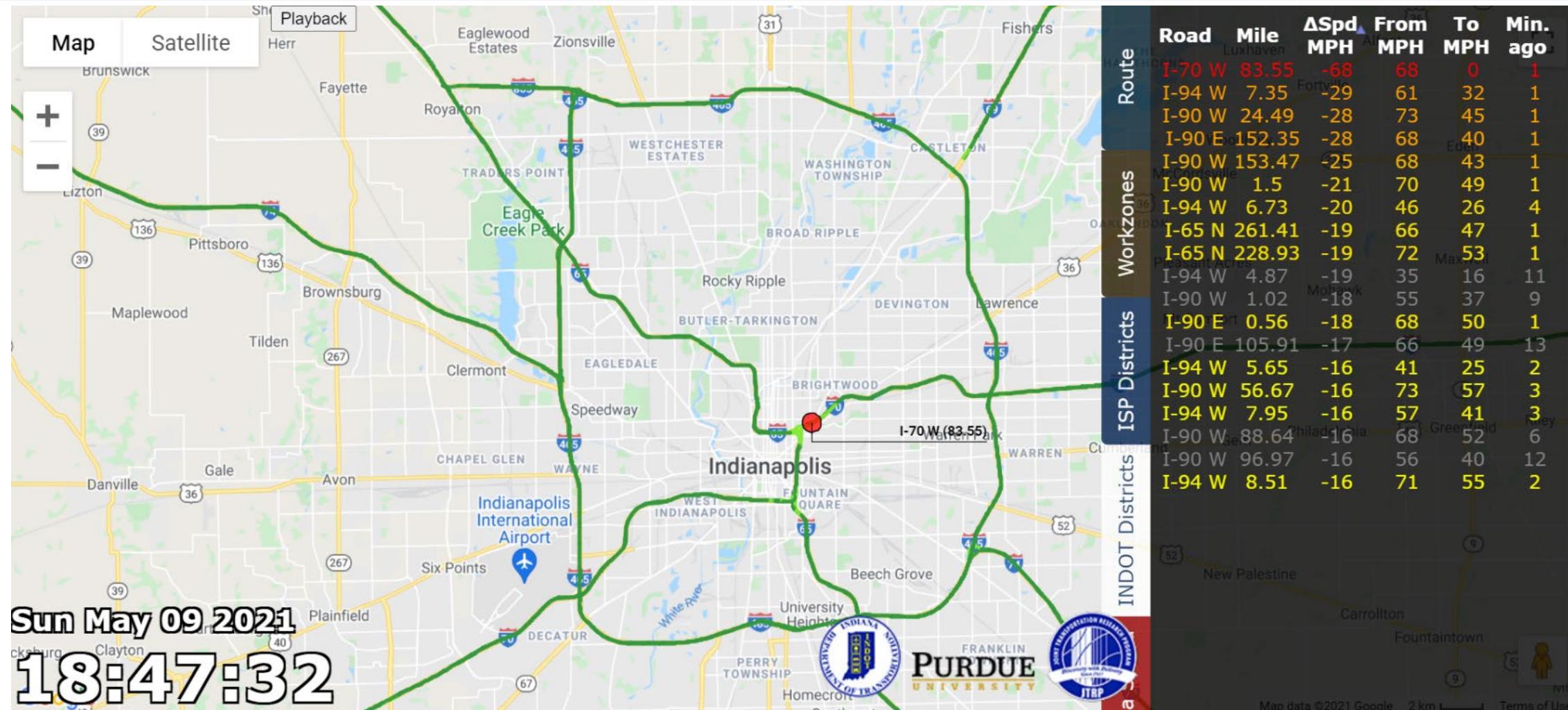
1

Minute or
less data
loss per
day per
segment

- 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.

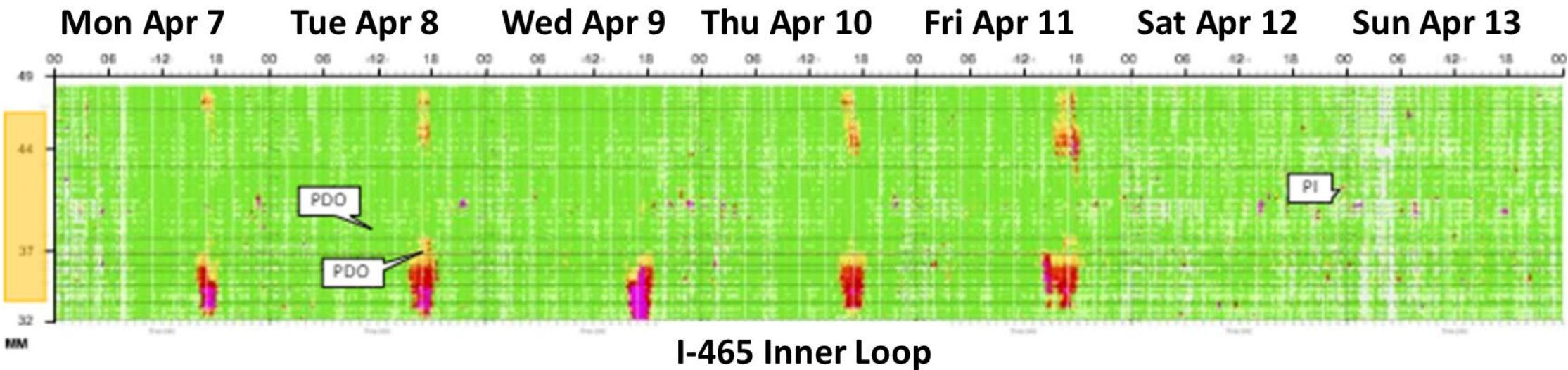
Automated Weekly Work Zones Reports

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

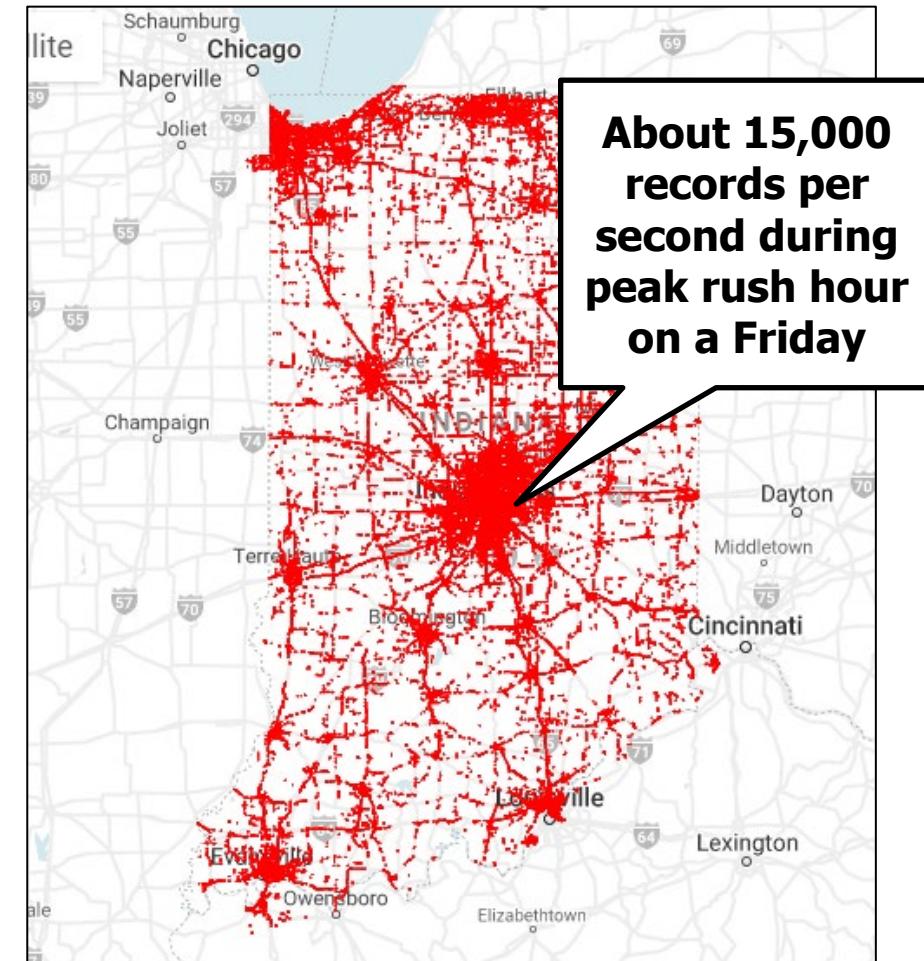


PDO = property damage only roadway crash

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

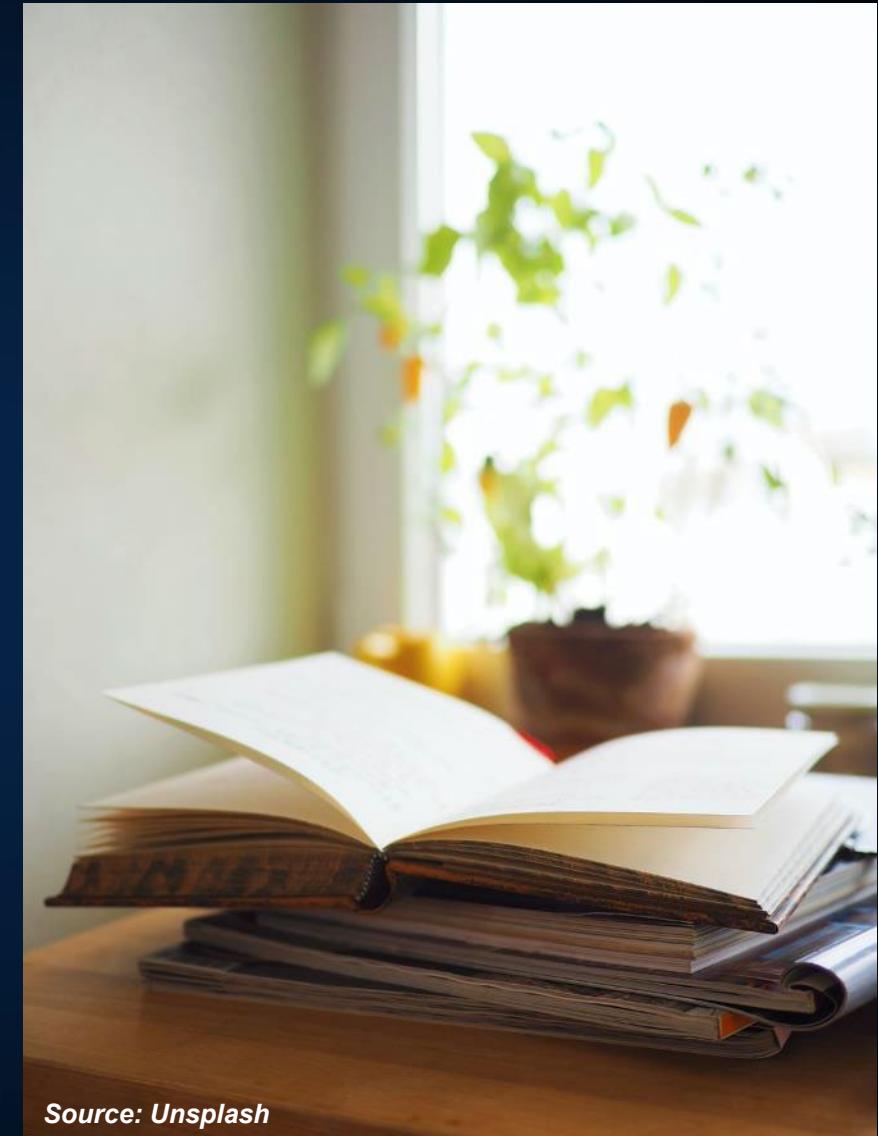
- Research Study: **Correlating Hard-Braking Activity with Crash Occurrences on Interstate Construction Projects in Indiana**
 - Conducted by the Joint Transportation Research Program at Purdue University
 - Examined hard-braking events and crashes over a 2-month period in the summer of 2019 for 23 interstate 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)



The screenshot shows the homepage of the FHWA EDC-6 Crowdsourcing for Advancing Operations website. The top navigation bar includes links for 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, and Resources. Below the navigation is a collage of three images: a highway with cars and signal icons, a man working at a computer monitor displaying traffic data, and an aerial view of a highway with multiple lanes of traffic. The main title "Crowdsourcing for Advancing Operations" is displayed, along with a paragraph about the integration of crowdsourced data for improved operations. The "Contacts" section lists James Colyar, Greg Jones, and Ralph Volpe with their respective details. At the bottom, a brown banner reads "FHWA EDC-6 Crowdsourcing for Advancing Operation Resource Site (bit.ly/CS4Ops)".



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.

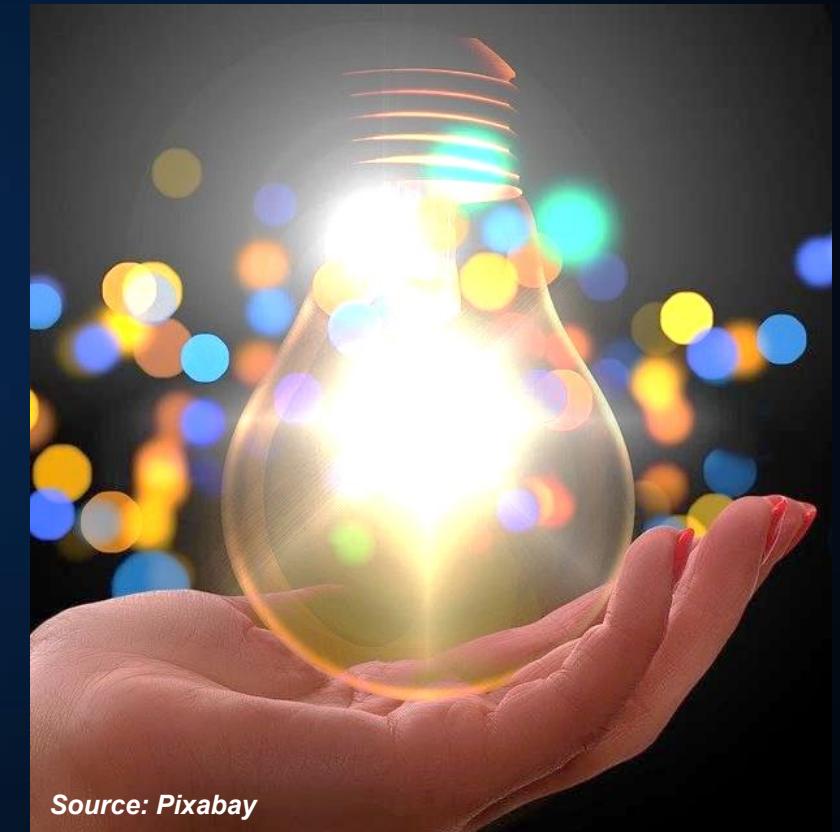


Source: Unsplash

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.



Source: City of Irving, Texas

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



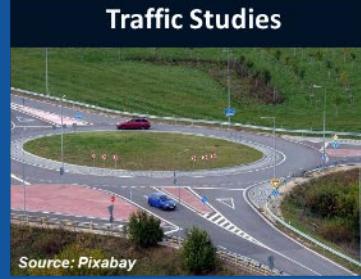
Arterial Management



Traffic Incident Management



Traffic Studies



Road Weather Management



Freeway Management



Work Zone Management



Road/ITS Maintenance



Project Prioritization



Emergency Management

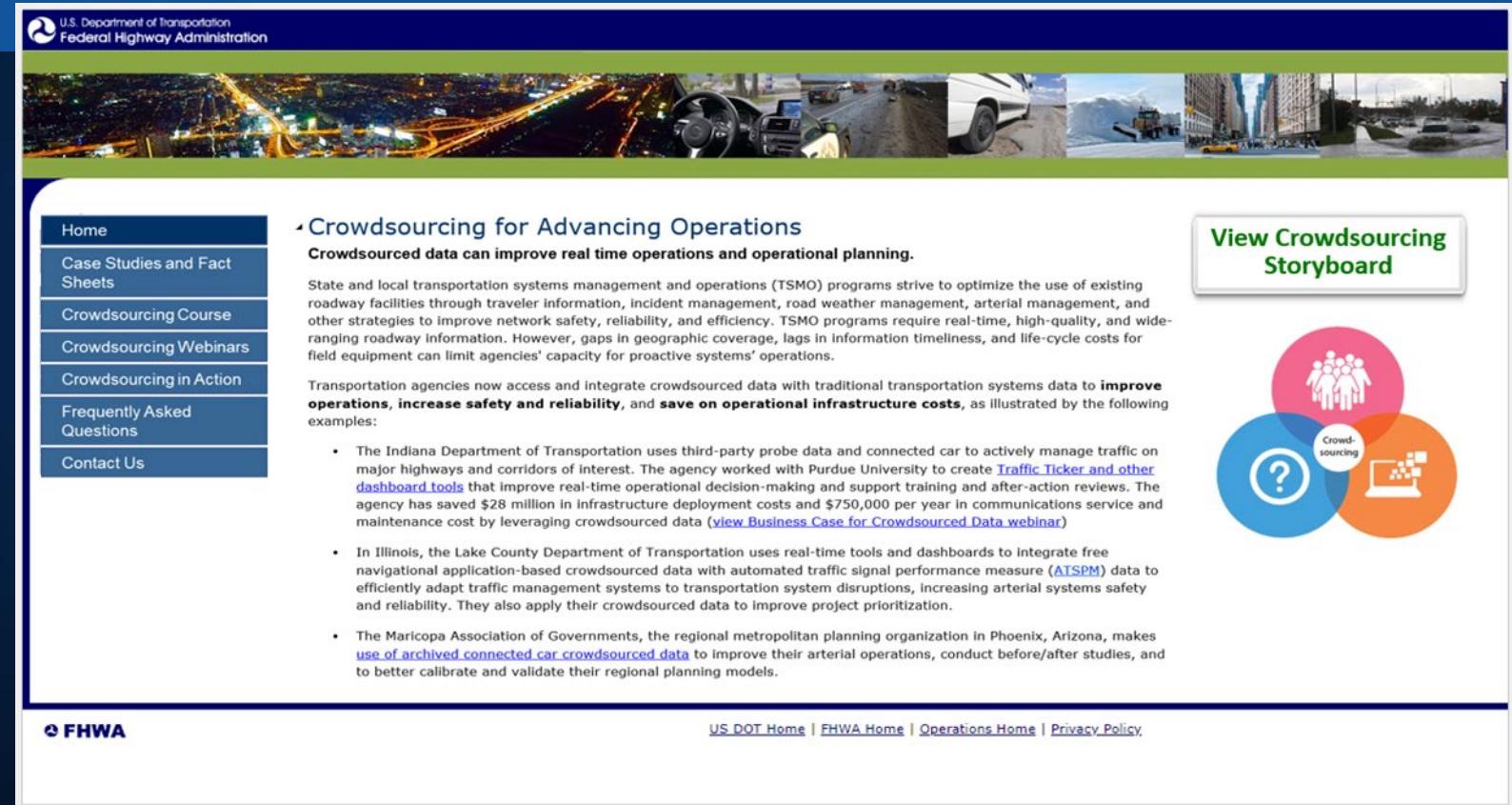


Other Applications?



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 FHWA's Office of Operations. At the top is a blue header bar with the FHWA logo and the title "Crowdsourcing Beyond EDC-6". Below it is a green banner featuring three images: a night view of a highway interchange, a driver's view from inside a car, and a truck on a snowy road. The main content area has a white background. On the left is a sidebar with a dark blue background containing links: Home, Case Studies and Fact Sheets, Crowdsourcing Course, Crowdsourcing Webinars, Crowdsourcing in Action, Frequently Asked Questions, and Contact Us. To the right of the sidebar is a section titled "Crowdsourcing for Advancing Operations" with the subtext "Crowdsourced data can improve real time operations and operational planning." It includes a detailed paragraph about TSMO programs and examples from Indiana, Illinois, and Maricopa. A "View Crowdsourcing Storyboard" button is located in the top right corner. In the bottom right corner is a graphic showing three overlapping circles in pink, blue, and orange. The pink circle contains icons of people, the blue circle contains a question mark, and the orange circle contains a laptop with a chart. The word "Crowd-sourcing" is written vertically between the circles. At the bottom of the page are links to US DOT Home, FHWA Home, Operations Home, and Privacy Policy.

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



Thank you.

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Federal Highway Administration



Feedback

- 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 with “Add to mailing list” in the subject line

Thank you!