



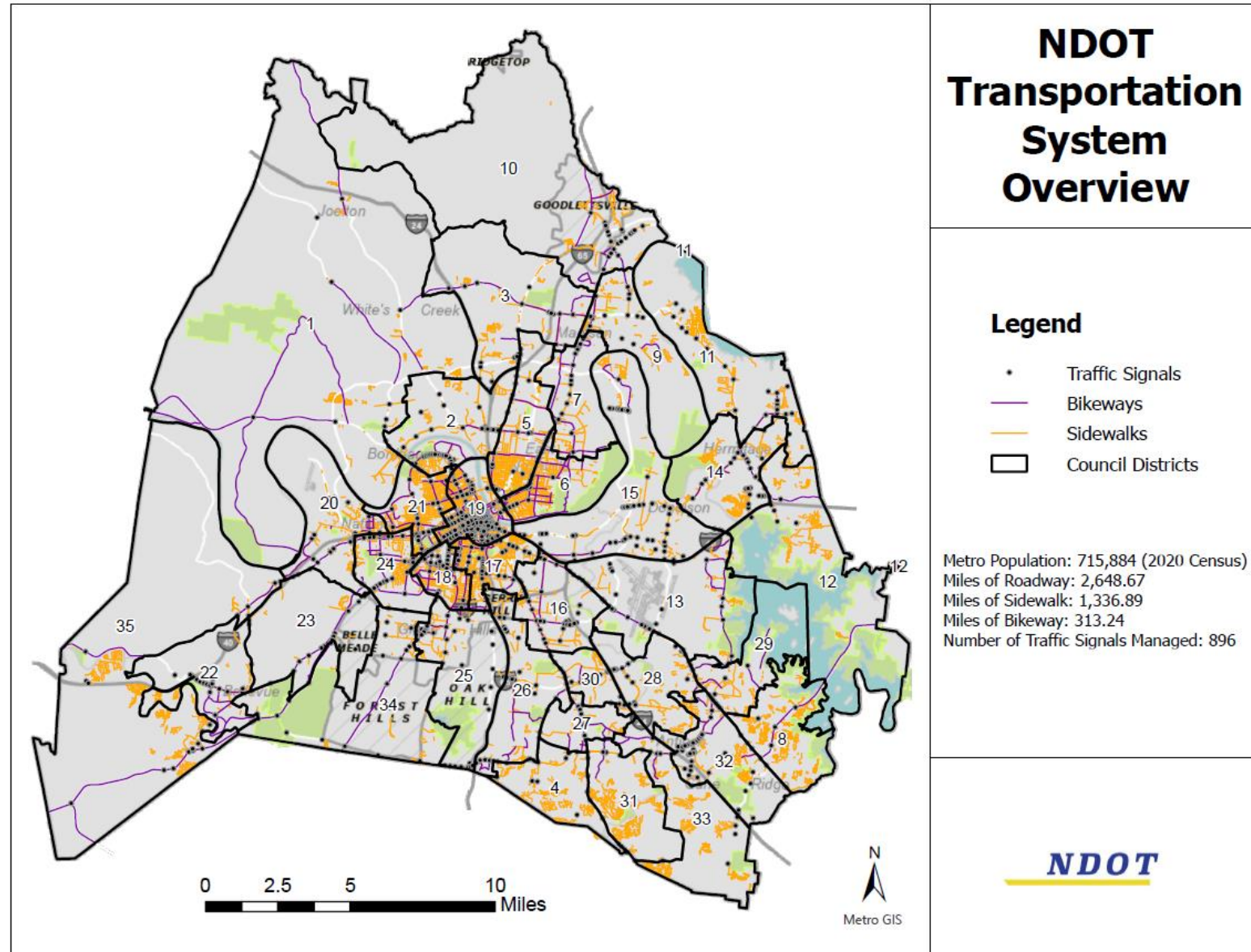
Transportation Resiliency Tools- Planning, Design, Operations, & Maintenance

Brad Freeze, Deputy Director
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Nashville-Davidson County & NDOT Numbers

- Population: 715,884
- Number of Roadway Lane Miles: 2,649
- Miles of Sidewalk: 1,337
- Miles of Bikeways: 313
- Number of Traffic Signals: 896
- NDOT Employees: 394
- NDOT Annual Operating Budget: \$77,643,633
- NDOT Average Annual Capital Budget: \$93,434,833



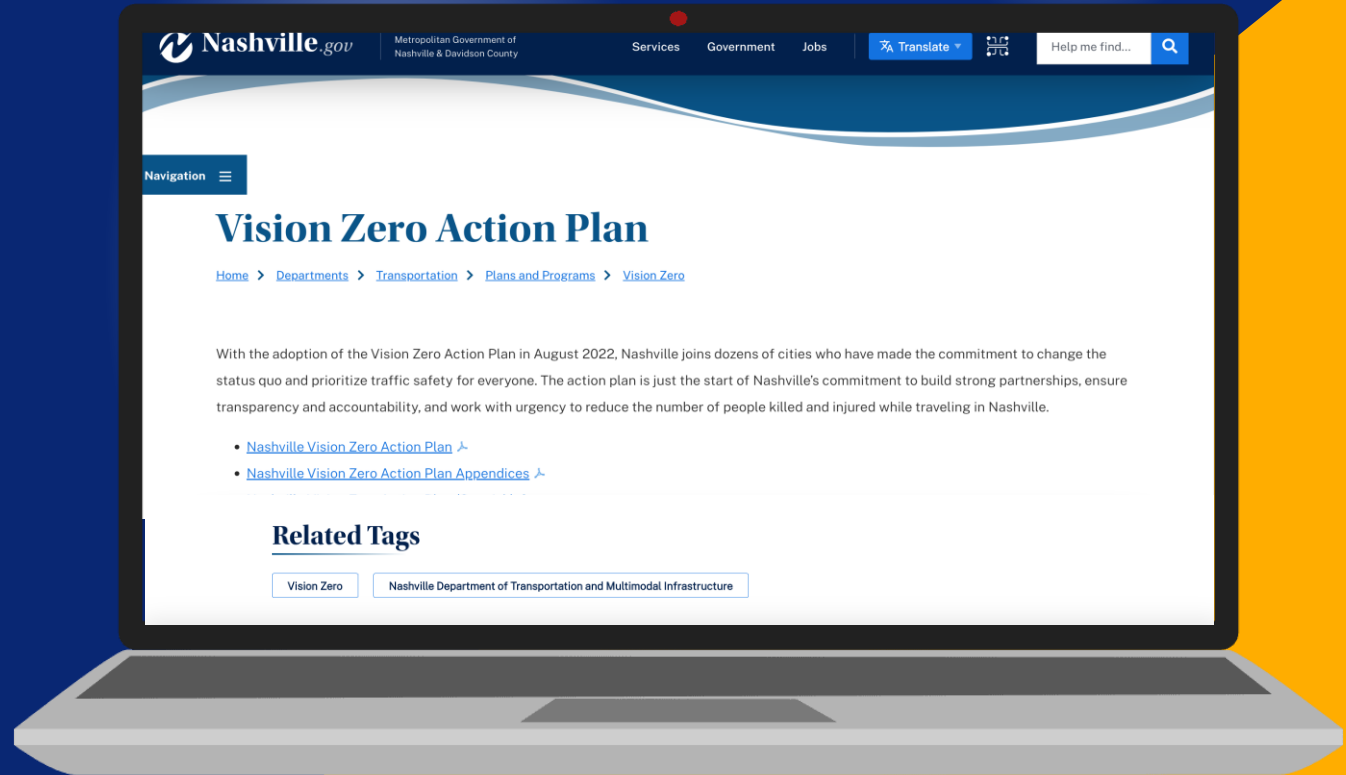


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Council adopted Nashville's Vision Zero Action Plan August 16, 2022

▬



FHWA/TDOT Congestion Mitigation Air Quality Grant Award

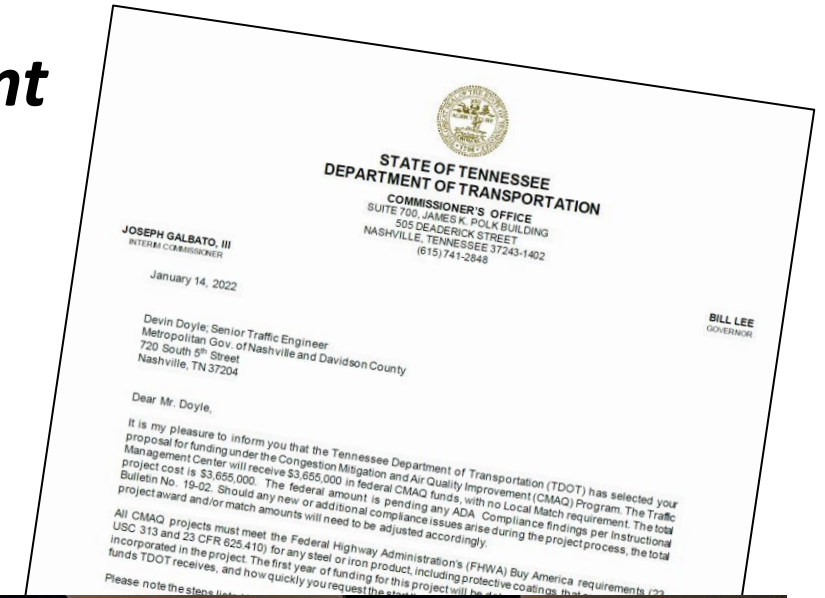
January 14, 2022

*Deployment & Implementation Funding: \$3,655,000.00 Award
(100% with No Local Match Requirement)*

TMC Grant Items:

- Video Wall Display Monitors & Ancillary Hardware
- Upgraded Workstation Consoles
- Upgraded Workstation Computers & Servers
- Upgraded Fiber Optic Cable Components
- Installations of New Communications & Network Equipment
- Signal System & Optimization Software
- Grant Funded Positions

Implementation Begins in 2024





NDOT's SMART Grant Project



Project Summary

- **Objective:** Advance NDOT Vision Zero goals to increase safety for vulnerable users
- **Need:** Traditional crash reporting methods have left gaps between pedestrian safety and data accountability
- **Where:** On part of NDOT's *high injury network* (HIN), in a historically-underserved community in North Nashville – HIN 200 miles
- **Long term goal:** Scale to other parts of the HIN and beyond



Proof of concept of LiDAR sensors

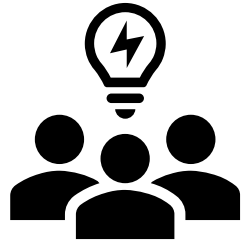


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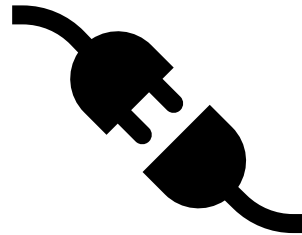
26th Ave & Clarksville Pike
Nashville, TN April 12, 2024

Project Timeline



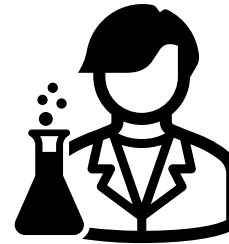
FALL 2023

- TEAM FORMATION
- PMP & DMP
- SITE WALKTHROUGH
- PUBLIC SURVEY
- ENGAGEMENT EVENT @ BAG LADY'S



WINTER 2023

- DETERMINE LIDAR SPECS
- DETERMINE ON-SITE UTILITY CAPABILITIES
- FINALIZE LIDAR PROCUREMENT



MARCH – MAY 2024

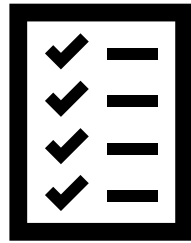
- *TSU RESEARCH SYMPOSIUM*
- FIRST DEVICES ARRIVE, BENCH TESTING AND PILOT INSTALLATION COMPLETE @ **26TH AVE N & CLARKSVILLE PIKE**
- DATA ANALYSIS (BEGINS)
- *WORKFORCE DEV TRAINING WITH CONTRACTOR*



MAY – JULY 2024

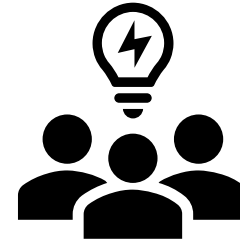
- INSTALL COUNTERMEASURES AT PILOT INSTALLATION LOCATION
- REMAINING EQUIPMENT & MATERIALS RECEIVED
- BENCH TESTING
- INSTALLATIONS FOR REMAINING INTERSECTIONS AND MIDBLOCKS
- PREP FOR PHASE 2 NOFO (AND SUBMIT)

Project Timeline



AUGUST - SEPTEMBER

- SUBMIT PHASE 2 APPLICATION
- DATA ANALYSIS & INTERVENTIONS
- COMMUNITY ENGAGEMENT
- WORKFORCE DEVELOPMENT
- EVALUATION & QUARTERLY REPORTING



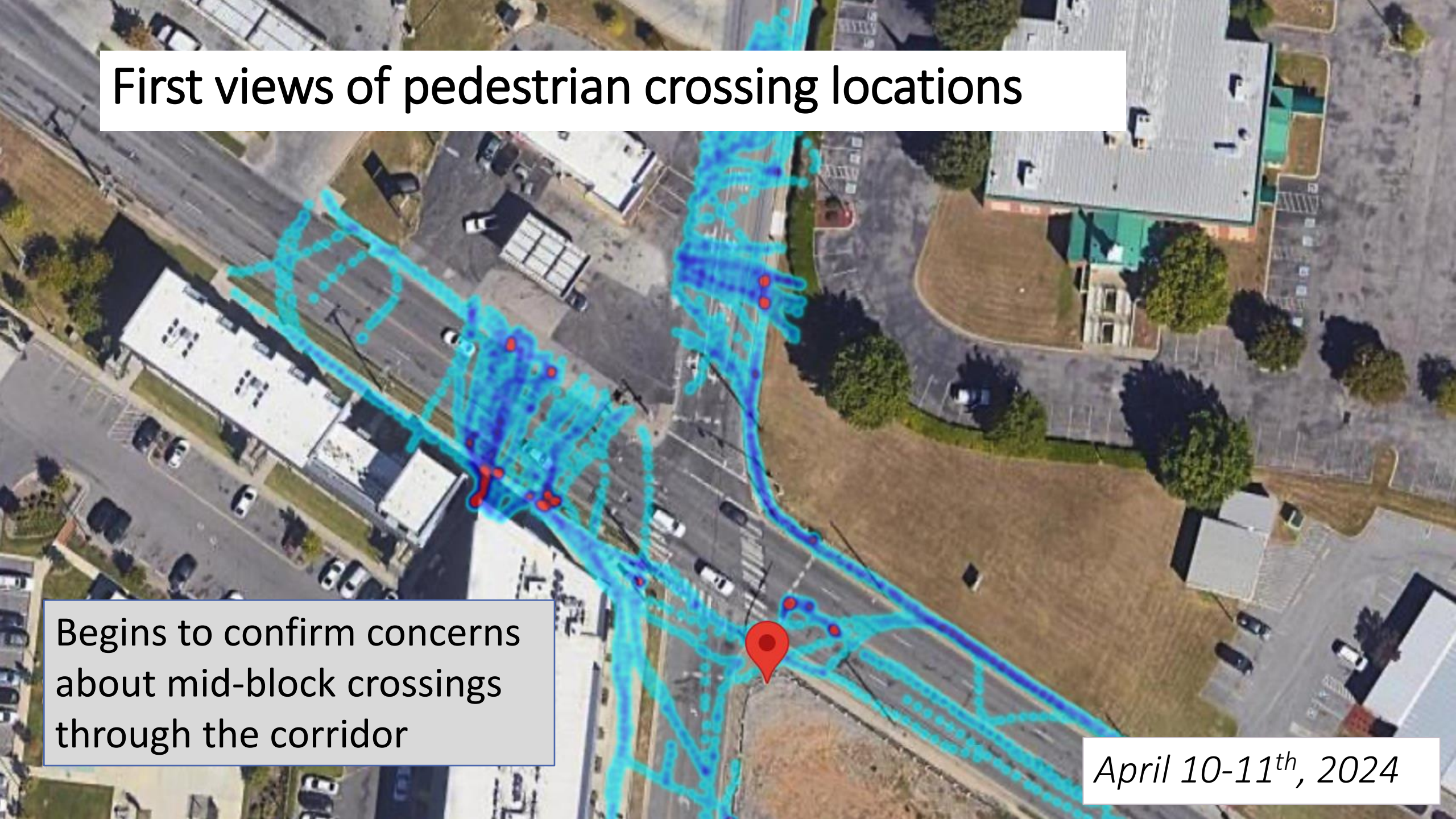
PHASE 2

- “SCALING THE COMMUNITY BENEFIT”
- I-24 MOTION FOR ARTERIALS
- EXPANDING OUTSIDE OF NASHVILLE
- SHOWING RESULTS

First views of pedestrian crossing locations

Begins to confirm concerns about mid-block crossings through the corridor

April 10-11th, 2024





Data Validation and KPI

Data Quality Drives Performance: Accuracy and reliability of data directly impact effectiveness of downstream analysis/models

- How does the system perform in heavy rain, snow, etc.?
- How does near-miss identification align with current standards?
- How does the environment effect true-detection range?

Key Performance Indicators:

- Detection Accuracy
- Classification Precision
- Tracking-Reliability
- Response Time
- System-Availability (HA)
- Near-Miss Identification



Phase 2 Application

- \$10M
- 100x locations
- Overlap with Nolensville SS4A
- Bring program to 10x other local or state governments
- Awaiting award



Data analysis

Research Question: Can we detect atypical conditions before crashes occur?

Motivation: The data will soon be too large to look at manually

Approach: Semi-supervised anomaly detection (e.g., graph auto-encoders). Successfully deployed on other Nashville transportation datasets



Counter Measures



Crosswalk Visibility Enhancements:

- High-visibility crosswalks
- Enhanced Signing and Pavement Markings



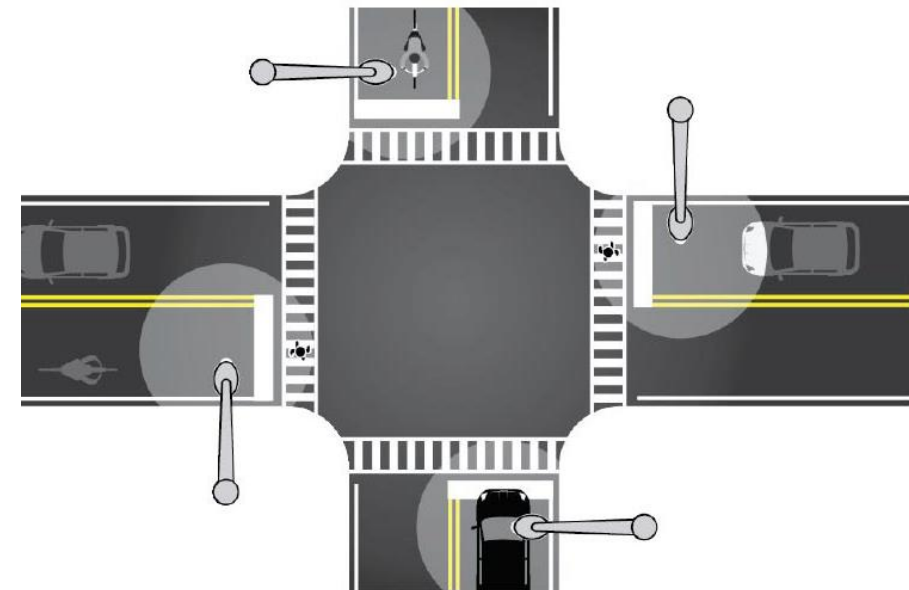
Rectangular Rapid Flashing Beacons (RRFB):

- Edge-to-edge communication with LiDAR



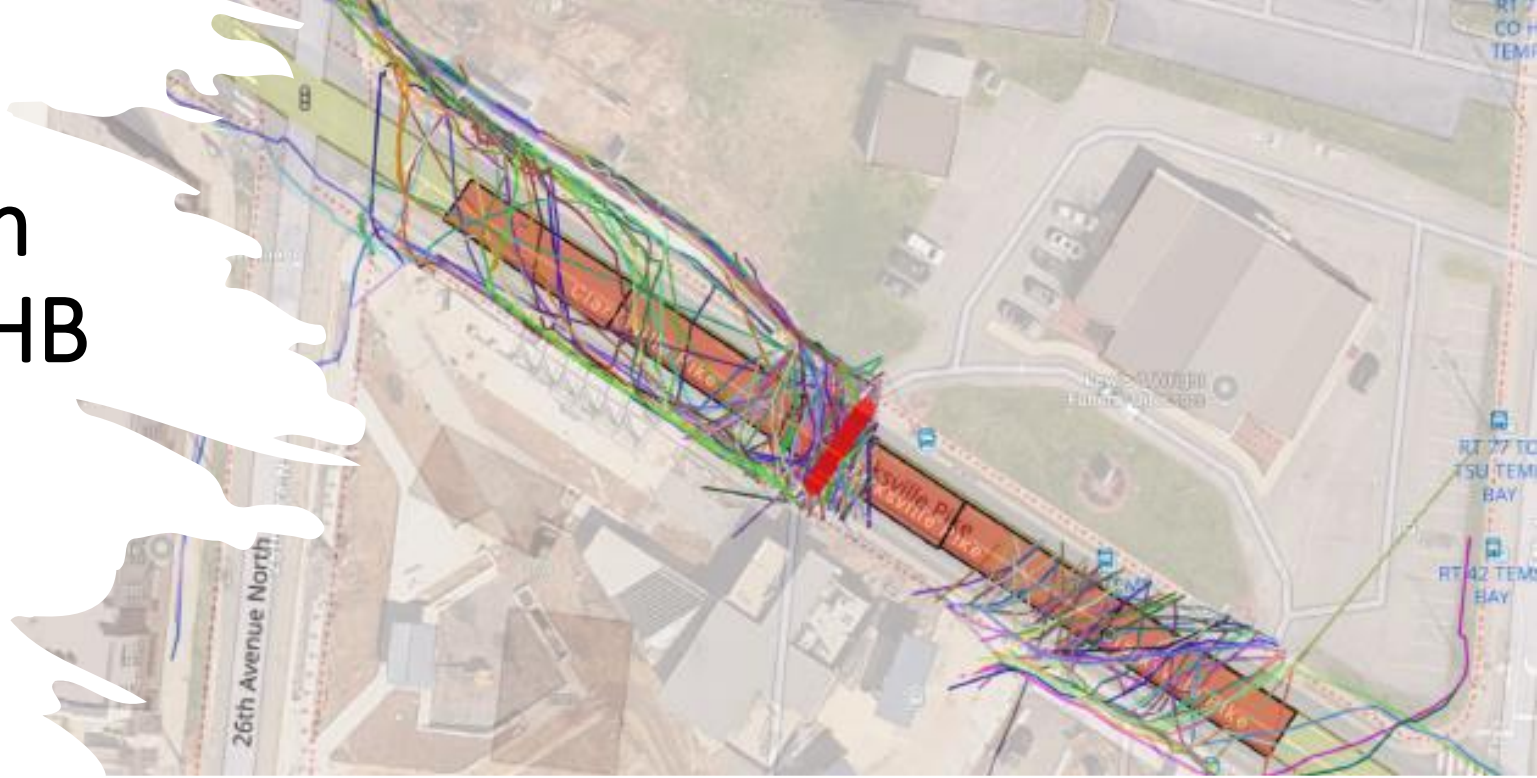
Lighting Improvements:

- Lighting at Intersections
- Lighting at Mid-block Crossings



Counter Measures – North Nashville Transit Center PHB

- Captures every pedestrian crossing to inform optimal location of pedestrian crossing.
- Currently in design with anticipated early 2025 construction.



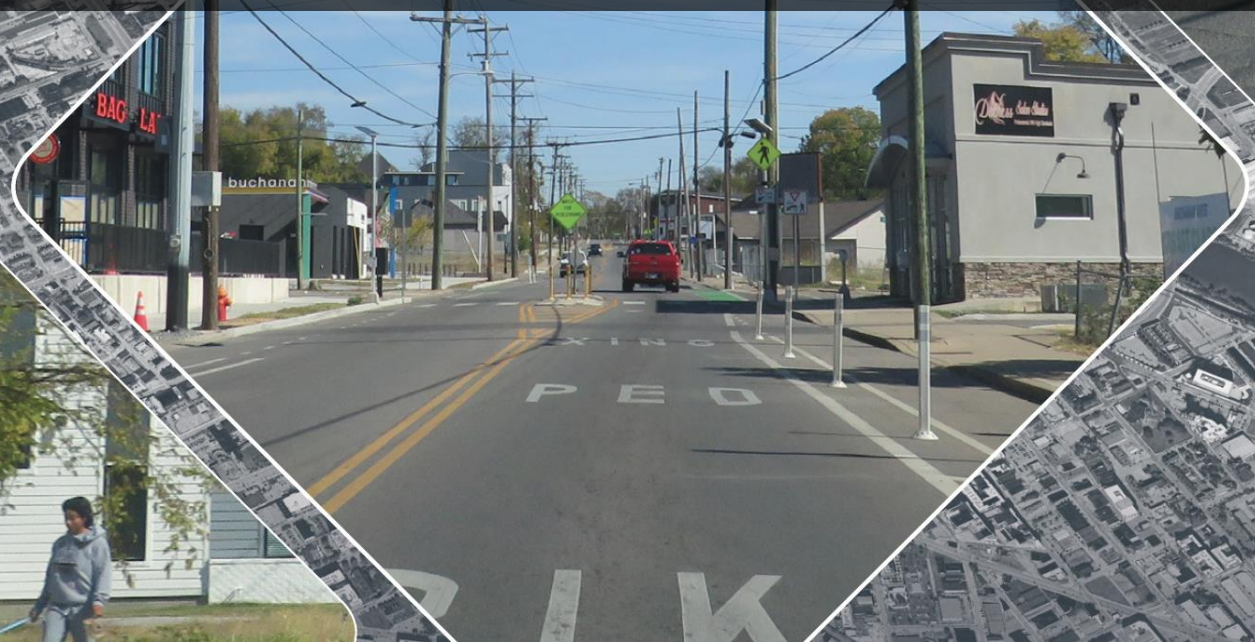
Big Hairy Audacious Goal

- Cover every segment of the 222.26 miles of the Vision Zero HIN
- Real Time Operations
- Planning and Evaluation





Leveraging Advanced Data to Deliver Multimodal Safety (LADDMS)



U.S. Department of Transportation Bureau of Transportation Statistics

Transportation Vulnerability and Resilience (TVAR) Program

October 29, 2024



U.S. Department of Transportation
Office of the Secretary of Transportation

Bureau of Transportation Statistics



What is the TVAR Program?



Where it came from:

Mandated by the **Consolidated Appropriations Act, 2023** (Public Law 117-119, December 2022).

Aligns with the needs identified by local decision-makers and recommendations from the **2021 TRB Consensus** report.



Its purpose:

Supports development and implementation of programs and projects to **improve transportation infrastructure readiness, resilience, and performance across all modes by providing access to data, tools, and other resources that support decision-making.**

The TVAR Program, as envisioned, will provide a space for transportation resilience practitioners.

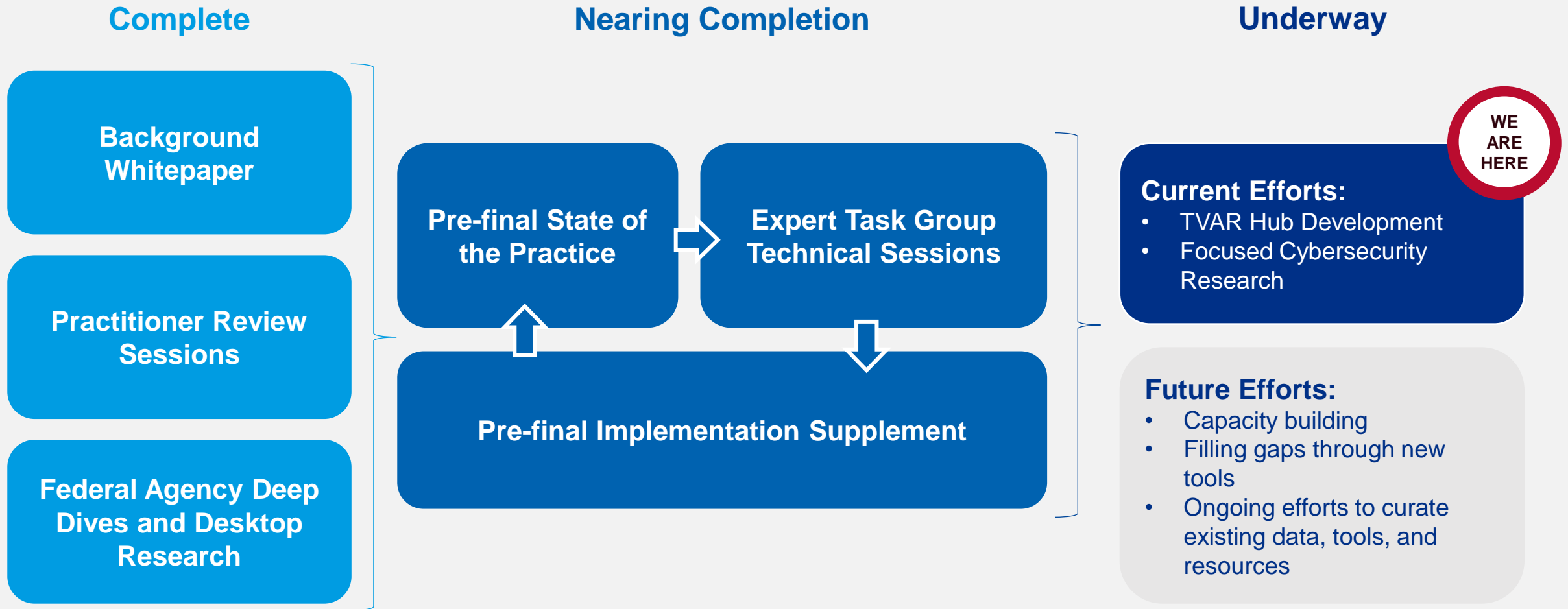


What it's made of:

The nerve center of this space will be the **TVAR Hub serving as a web-based central access point.**

BTS will continue to provide **additional coordination and development based on priorities needs** identified in the State of the Practice phase on consultation with the Expert Task Group. This is a long-term, ongoing effort.

TVAR Program Development Map



State of the Practice Takeaways



Agencies need data and tools to think about the resilience of related systems outside of transportation, such as incorporating criticality of utility infrastructure and impacts on society.



Practitioners need tools capable of performing advanced network analyses to move beyond basic criticality assessments.



Data on manufactured and cyber hazards require further research.



Practitioners need insights and support to efficiently conduct vulnerability assessments and improve agency-level technical capacities.



A TVAR Data Hub would be a foundational component that can address multiple needs simultaneously in the near term and facilitate progress toward longer-term objectives.

Key Considerations Raised by the ETG

Time to move from the conceptual to the practical



Agencies have operational and long-term planning needs



Agencies need to prepare for hazards and respond to their impacts



Practitioners and decision-makers need to know about underlying data quality and characteristics to use it appropriately



Agencies have unaddressed legacy needs that leave them vulnerable to systemic disruptions



Agencies are responsible for providing timely, accurate, consistent, and useful information to the public

Implementation Recommendations



Near-term Initiatives

(Targeting Completion By January 2025)

- NT-1. Establish A Centralized TVAR Data Hub
- NT-2. Conduct Additional Research On Manufactured And Cyber Hazards
- NT-3. Define Hub Maintenance Plan And Feedback Mechanism



Long-term Initiatives

(Spanning 2025-2030)

- LT-1. Develop Value-add Tools For Practitioners
- LT-2. Provide Training, Technical Support, And Capacity Building
- LT-3. Enhance Data Scope And Integration
- LT-4. Improve Understanding Of Manufactured And Cybersecurity Hazards
- LT-5. Expand Real-time Response Capabilities
- LT-6. Develop And Support National Resilience Statistics
- LT-7. Evolve The TVAR Data Hub And Overall Program

From the Ground Up: How the Hub Meets Multiple Objectives

We will discuss more about the TVAR Hub this afternoon, including a demonstration.



Data Integration & Accessibility
Centralized platform for resilience data, enabling comprehensive risk assessments.



Enhanced Risk Assessment
Data and tools for evaluating infrastructure vulnerabilities and natural hazard risks.



Facilitates Collaboration
Shared resource supporting interagency coordination across local, regional, and state levels.



User-Centric & Customizable
Showcases tools, many of which can be tailored to different regions and specific user needs.



Tracks Progress & Best Practices
Platform for disseminating resources and highlighting resilience efforts.



Supports Strategic Decision-Making
Help practitioners ability to prioritizes projects and allocate resources for maximum impact.