Response to Request for Information

MassDOT Roadway Safety Request for Information & Ideas

Solicitation: BD-24-1030-CPO1-CPO1-97530

Submitted by **INRIX, INC.**

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1 INTRODUCTION

As a global leader in transportation technology, INRIX focuses on bringing transportation insights to your fingertips. This is achieved by leveraging our large vehicle probe network that collects and processes 35 billion real-time data points every day. Our approach allows us to provide infrastructure-free datasets and hosted services that are always on, always collecting data and always improving.

Our RFI response primarily focuses on **Area of Interest #2: Movement Telematics** and how our product, Safety View, supports a variety of use cases. This includes focusing on the analysis and prioritization of roadway safety improvements and offering a proactive approach to safety enhancements. The below passages include answers to a number of questions from the RFI to highlight how and when Safety View could be a useful part of MassDOT's programs, including Vizion Zero.

Safety View can also be used to support a number of planning and siting activities for **Area of Interest #1: Speed Safety Cameras**, so we included relevant responses in this section, too.

2 INRIX OVERVIEW

INRIX, Inc. is a U.S. Corporation founded in 2005, and based in Kirkland, Washington. We pioneered the practice of managing traffic by analyzing data from mobile data sources. This breakthrough approach enabled us to become one of the leading providers of data and insight into how people move around the world. Leveraging big data and cloud computing, INRIX delivers comprehensive services and solutions to help move people, goods, states, cities, and businesses forward. Our partners and customers are government agencies, automakers, and large and small enterprises.

INRIX is a company of 300 dedicated staff primarily based in the U.S., with international offices in Germany and the U.K. Since our inception, we have delivered nearly $100 million in government projects, with current real-time data service via APIs utilized by 17 state DOTs, archive data and/or analytics used in 20 states, and all U.S. state DOTs and MPOs utilize our NPMRDS data.

INRIX is a global industry leader in transportation analytics. Since day one, we have been focused on real-time and historical data and the comprehensive tools that empower organizations with valuable insights to help improve mobility. It has always been our core offering, and we are continually innovating to further increase the caliber and utility of our data and services for our users. Our latest innovations were launched in November: Mission Control and Compass. Proof that INRIX continues to leverage our deep knowledge of mobile data while marrying it with new tools to make your job easier.

Trusted Solutions for Public Sector Clients

- safety analysis
- origin-destination studies
- freight transport analytics
- drive testing replacement
- planning
- modeling
- performance measures
- operations/system monitoring
- work zone monitoring
- incident detection/queue monitoring
- congestion alerts
- traffic tile overlays on webpages
- routing
- … and more

3 PROPOSAL FOR SPEED SAFETY CAMERAS

3.1 Area of Interest #1: Speed Safety Cameras

INRIX has collaborated with General Motors Future Roads to develop a road safety analytics platform called Safety View. Rather than relying on manually collected — or fixed road sensor — data, Safety View provides easier access to comprehensive safety insights, including near miss data, speed distribution, volumes, the presence of vulnerable road users, and more.

The platform delivers aggregated data insights related to connected vehicles and devices and other publicly available data sources. It is a cost-effective solution that does not require special training or time intensive fieldwork. Users can easily access information they need to help identify and prioritize roadway segments for safety planning.

Safety View provides comprehensive vehicle speed information for every roadway segment in your network, at scale. Speed distribution plots allow the user to understand the spread and magnitude of top-end speeds. Speeding by time-of-day allows the user to understand when speeding is occurring. Speed-based ranking provides a sortable, downloadable (CSV, GIS) list of relative performance by roadway segment in your network. Speed-based filtering allows for quick visualization of where speeding risk is notable & filtering can be combined with other risk/crash attributes for a correlation analysis. Safety View releases updated results every 3 months (each quarter), so users can analyze rate of change and trends over time. The example screenshots below shows the speeders dataset visualized on the segment set for the Regional Urban Center of Peabody, MA for Q1 2022 and Q1 2023, with the same segment of roadway on Massachusetts State Route 128 selected.

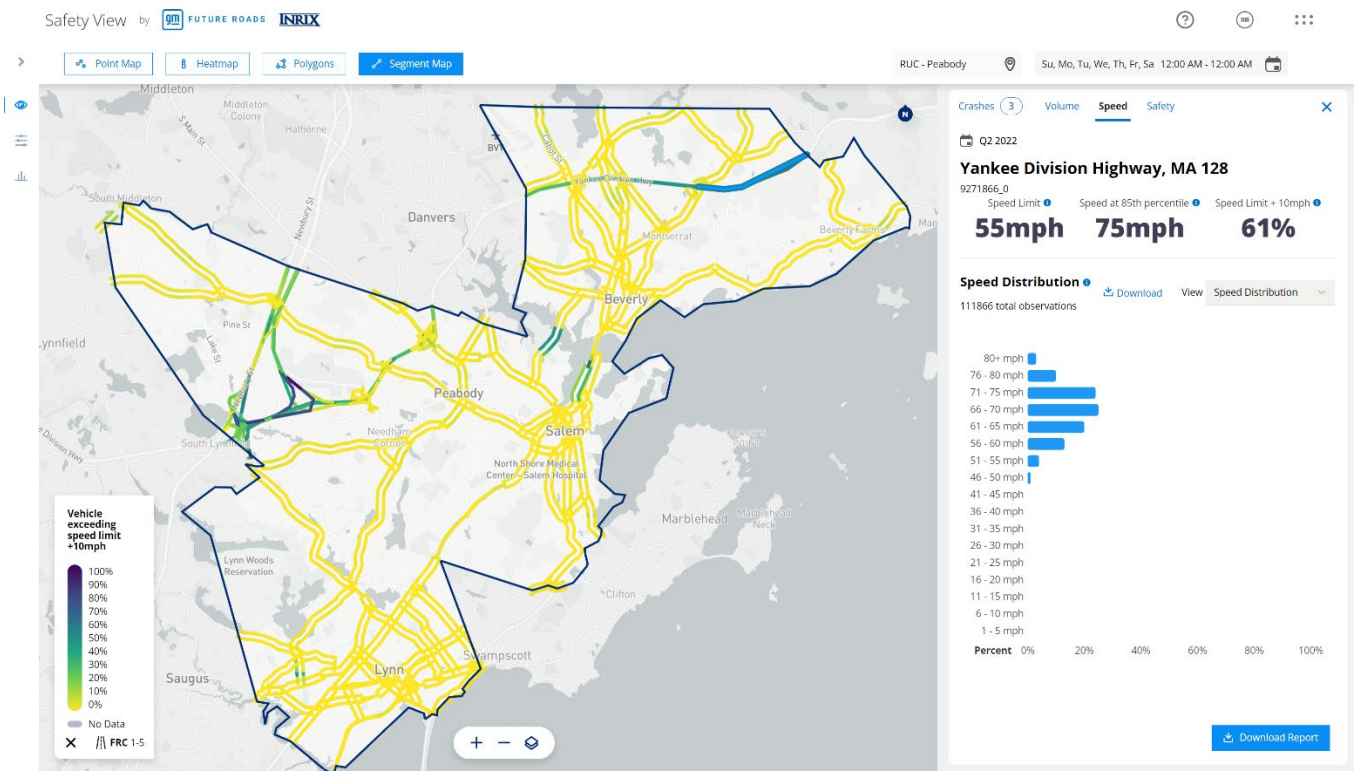


Figure 1 - Speeding in Q2 2022

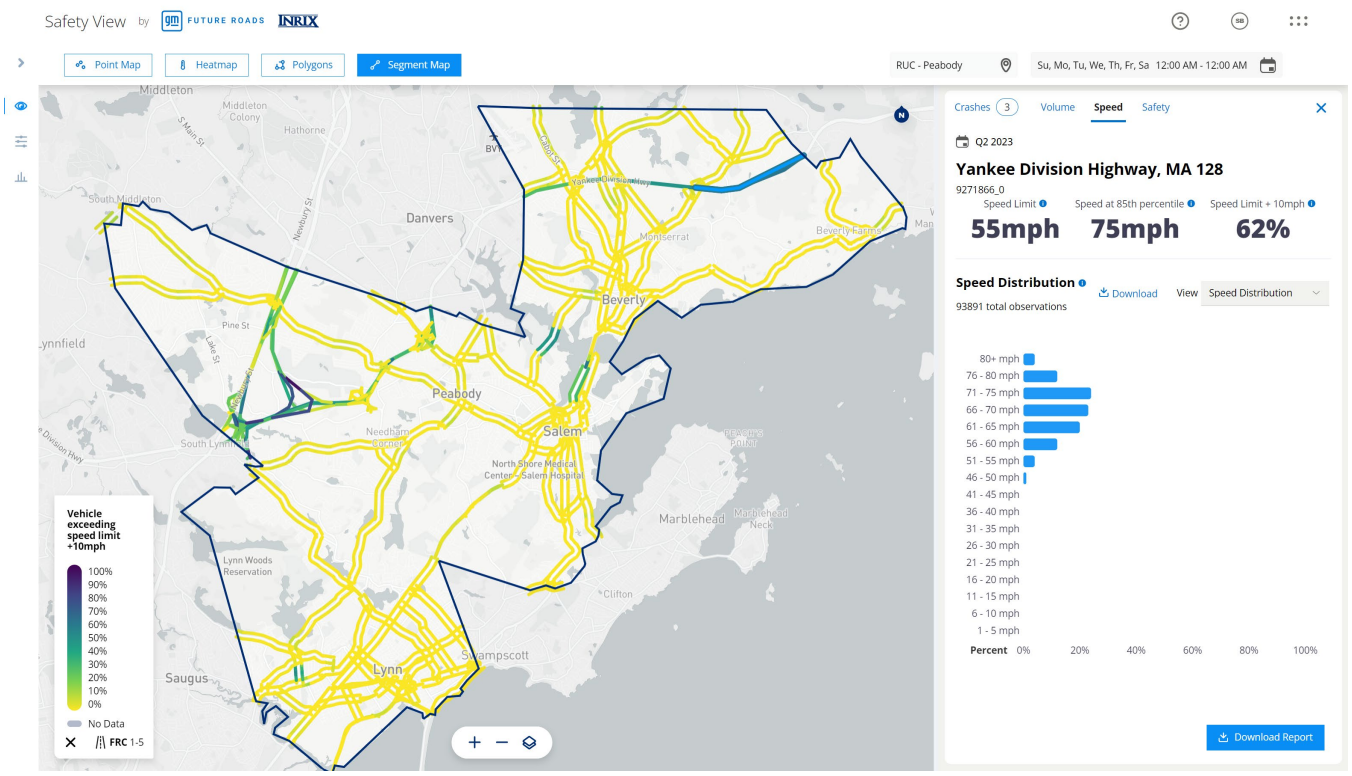


Figure 2 - Speeding in Q2 2023

The Safety View platform is an ideal visualization and analysis tool for the siting and evaluation of Speed Safety Cameras. The data helps identify high-risk areas with a significant history of speeding, crashes, risky maneuvers, and near-miss events. The additional datasets in the platform, like Vulnerable Road User Index, could be additional scoring criteria that help prioritize the placement of cameras to effectively mitigate speeding behaviors and reduce the likelihood of serios and fatal injury crashes. Regular monitoring and analysis of the data would also allow for ongoing adjustments and improvements to the camera placement strategy, ensuring a proactive approach to addressing speeding concerns and promoting safer transportation infrastructure.

If speed cameras were installed on this road segment in 2024, subsequent quarterly speeders datasets would clearly show any changes in the 85% percentile speed, the percentage of vehicles traveling 10mph over the speed limit, as well as the new speed distribution.

3.2 Data Collection Questions

Given that we are not applying to run the camera program, we do not believe the data collections questions are relevant to our vehicle probe data. We have included additional information on our data privacy policies under section 4.2, question number 2.

4 PROPOSAL FOR MOVEMENT TELEMATICS

4.1 Area of Interest #2: Movement Telematics

Safety View was developed in line with the Comprehensive Safety Action Plan definition outlined in — and funded by —the U.S. Department of Transportation's Safe Street and Roads for All Program. Data is derived from millions of aggregated data points from connected vehicles, roadway vehicles, with crash data coming from a local crash data repository. From there, insights include speed distributions, vehicle volumes, seat belt usage, hard braking events, demographics from the U.S. Census, and much more. To remain timely, most data features are updated in the product quarterly.

For agencies, the benefits from Safety View are numerous. The platform negates extensive fieldwork, associated data cleansing and the costs associated with preliminary analysis. Plus, all roads are covered, rather than just the selected coverage with conducted fieldwork or location of physical sensors. This approach saves ample time because the data is actionable, and no preprocessing is required. Additionally, agencies do not have to place any staff in harm's way to collect necessary traffic volume or speed data out on the road. The Safety View platform is also independent of the hardware, so it can be easily used to assess actual system safety performance more frequently.

The largest benefit of this solution is the complete system-wide safety information and analysis. Most safety-related projects are driven by constituent complaints or crash frequency and severity — leading to reactive interventions only after issues are found. With Safety View, quarterly system-wide performance data enables proactive interventions before crashes occur.

Below, we addressed a number of the Civic Research Questions to provide the widest overview of Safety View and how it can be used to approach different types of analyses and use cases.

1. *Is there a geographic correlation between different types of poor driving behavior (speeding, distraction, harsh braking, etc.)?*

INRIX Response: The Safety View Risk Analyzer feature allows you to filter the entire segment set on multiple variables, so that you can identify areas with correlated safety activity. For example, the screenshot below shows the segments of the roadway network in the Peabody Community where there are high amounts of speeding (10% or more of speed observations clocked at 10mph or more over the speed limit), and a high hard braking Risk Score, using our segment filtering tool.

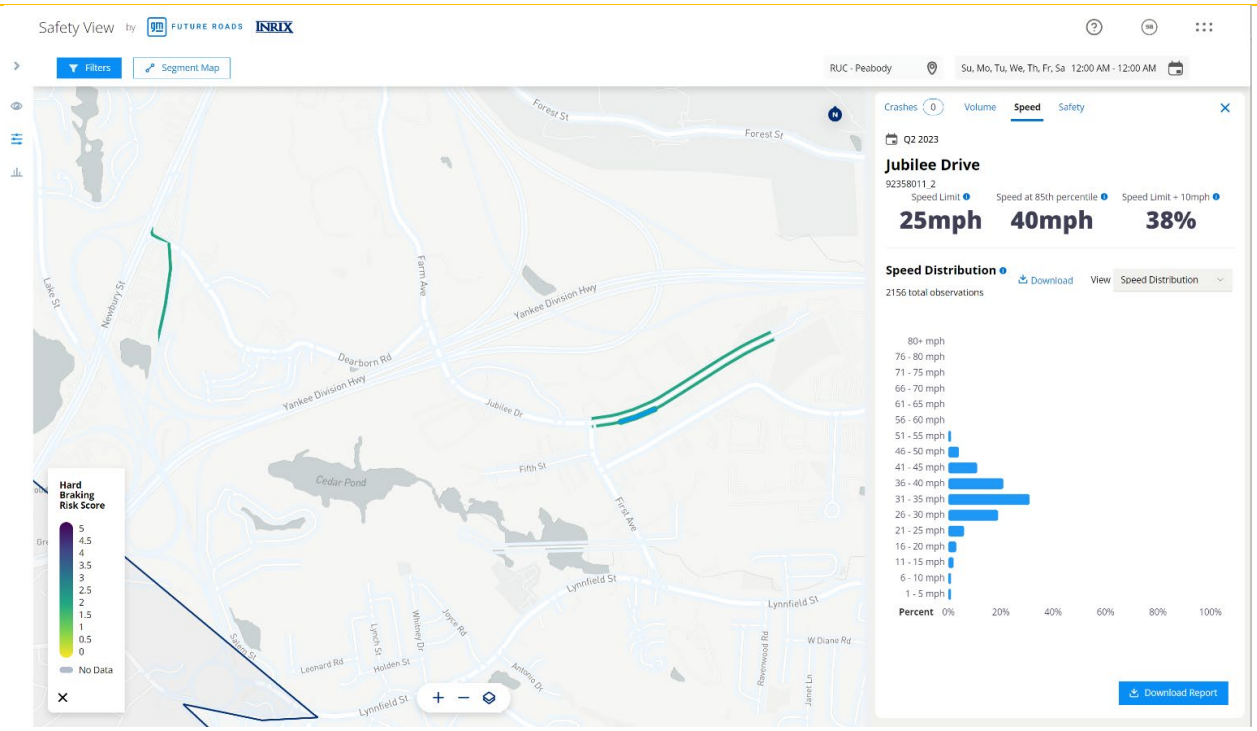


Figure 3 - Hard Braking and Speeding Filtered on the Map

Safety View also shows exact locations where the General Motors “risky maneuvers” and “near-miss” events happen on your roadways. Risky Maneuvers events are hard braking, hard accelerating, and hard cornering.

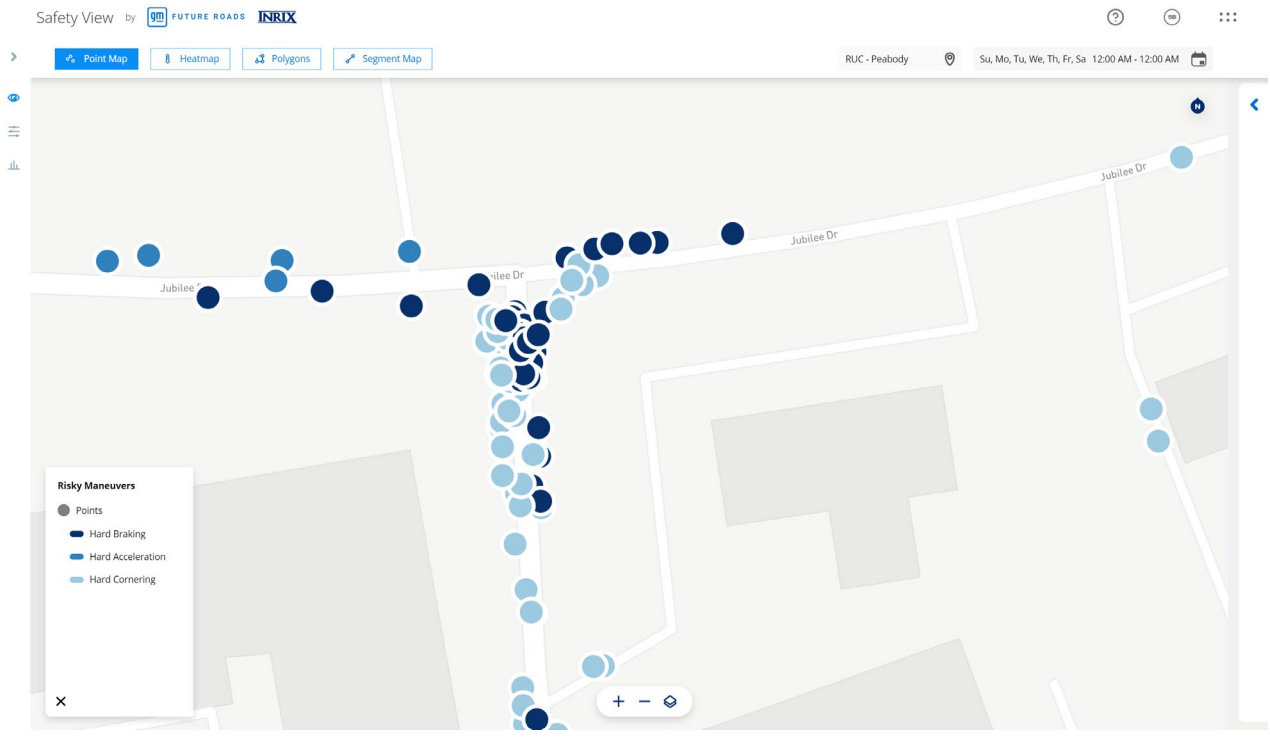


Figure 4 - Risky Maneuvers

Near-Miss is categorized as collision alerts and automatic braking events. Events can be distinguished by pedestrian-vehicle vs. vehicle-vehicle. Automatic braking events tend to represent events where a crash was avoided or severity reduced, which is a compelling safe vehicles story. It also points to where heightened safety risks occur so appropriate countermeasures can be taken.

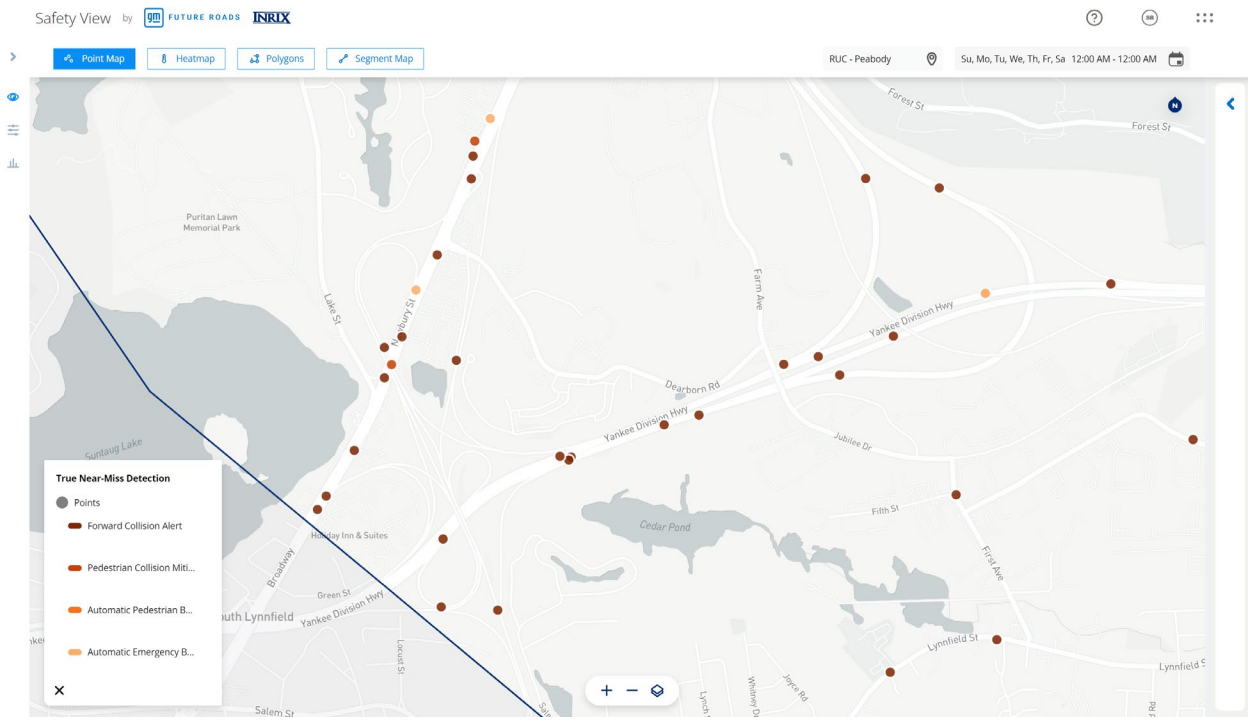


Figure 5 - True Near-Miss Detection

2. *How might we use telematics to inform traffic signal timing and phasing to improve safety for Vulnerable Road Users?*

INRIX Response: Telemetry data is emerging as a critical component in the realm of crash prediction literature due to its unique ability to provide valuable insights into the moments leading up to potential collisions. While traditional crash data is valuable for analyzing actual collisions, it only captures events that have already happened and were reported. Near-miss telemetry data captures instances where dangerous situations narrowly avoided becoming crash reports. By studying these events, we can understand the precursors, contributing factors, and dynamics of hazardous situations on the road, similar to the way a police officer or traffic engineer creates and analyzes a crash report. This data not only helps in understanding the nuances of risky behaviors and conditions but also enables the development of proactive safety measures and predictive models to prevent future crashes. Telemetry data acts as a valuable data point for traffic safety, helping identify and mitigate potential threats before they escalate into actual crashes.

Our team is currently focused on tracing the true near-miss and risky-maneuvers events through the intersection (approximately 150 feet offset from the stop-bar or equivalent). This provides a fine-grained dataset – including insights like location, speed, and distance to object – that helps augment existing big-data safety performance measures. All General Motors vehicles provide high-speed vehicle telemetry data, which contain a dynamic perspective on road user behavior and traffic conditions. Unlike historical crash data, which can be limited in scope and retrospective in nature, near-miss telemetry data offers information from vehicles and road users as they navigate the road network, before a potential high-risk location leads to a crash that results in death or serious injury.

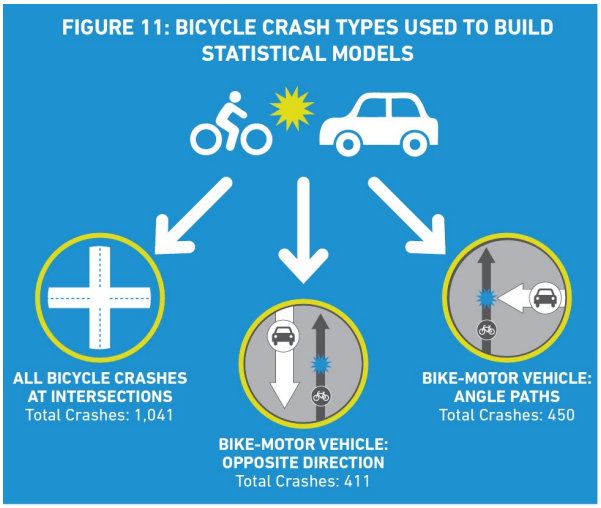
Figure 6 - Example for Near Miss Telemetry Tracing and Object Identification

Figure 7 - Example Image for risky maneuvers Telemetry Tracing combined with additional intersection performance measures like volume and vulnerable road user trip paths

This mapping allows for more granular monitoring and modeling of traffic behaviors to help identify trends and recognize high-risk scenarios that we can't observe with crash data alone. Creating a structured near-miss telemetry dataset – including insights like approach speed, departure speed, and distance to objects – complements the traditional risk assessment methodologies by correlating between patterns of near miss, observed crashes, and built environment characteristics. This is a missing link in the need for large, scalable datasets for our prediction methodologies. By matching this data with known crash hot-spots, researchers and policymakers can design targeted interventions that not only react to past events but proactively prevent future ones. Near-miss telemetry data fills a critical gap in the need for large, structured data sets to train our prediction models.

Near-miss telemetry data holds the promise of unlocking new frontiers in the development of systemic risk profiles and safety performance functions, scaling beyond the conventional methods that rely solely on limited crash and built environment data. By incorporating the wealth of granular, dynamic information provided by near-miss telemetry data, researchers and safety experts can gain deeper insights into the behavioral and environmental factors that contribute to road safety risks.

Unlike crash data, near-miss data provides a rich, nation-wide dataset that identifies close-calls that occur due to risky maneuvers, aggressive driving, or environmental hazards that won't show up in the crash data. This will reveal patterns of behavior and decision-making by road users that may not lead to immediate crashes but are indicative of increased risk. The development of systemic risk profiles or exposure models, such as those performed as part of a typical safety assessment, will be enhanced by incorporating these behavioral markers, enabling a more comprehensive understanding of risk factors that may have previously gone unnoticed.



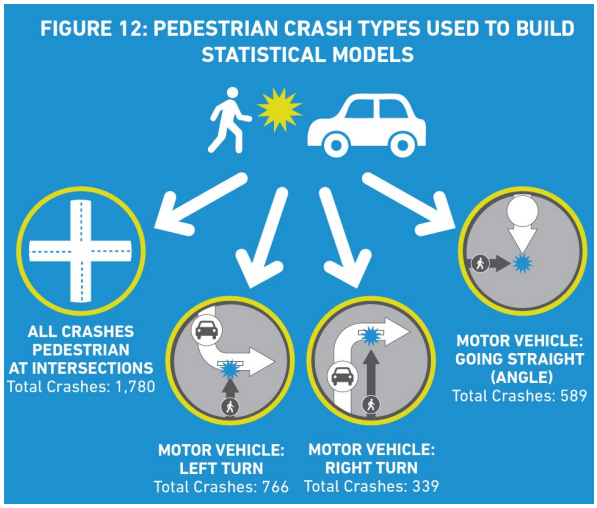


Figure 8 - Example Statistical Models from a typical Safety Analysis that will be strengthened with the new dataset

Near-miss telemetry data provides valuable context to the existing research on how crashes and the built environment contributes to safety outcomes. By capturing near-miss events in specific locations or at particular intersections, areas with heightened risk potential will be pinpointed even before actual crashes occur. This allows for a proactive approach to safety enhancements, such as targeted infrastructure improvements or changes in traffic management strategies. The integration of near-miss telemetry data with other data sources, such as weather conditions, traffic flow, and vehicle characteristics, offers a holistic view of the factors influencing risk. This holistic approach enables the identification of complex, interrelated risk factors that may not be evident when analyzing crash data in isolation. Near-miss telemetry data has the

potential to revolutionize the development of systemic risk profiles by adding a granular, behavioral dimension that enhances our understanding of risk factors and informs more effective safety interventions.

3. *How would your tool support insights in both heavily populated areas and more rural areas in Massachusetts?*

INRIX Response: One of the primary benefits of Safety View is that it provides data and insights at scale, everywhere in your network, filterable by multiple variables. One of the key variables present in the platform is the Functional Road Classification, as defined by Open Street Map. A user could filter the tool to only look at activity on Functional Road Classifications 1 (highways) and 2 (major arterials) and perform ranking, filtering, and other analysis just on those roadways in different regions of the state, in order to support insights in both heavily populated areas and more rural areas. The below screenshots show this exact workflow in both an urban and rural community in the Boston area Metropolitan Planning Organization, looking just at vehicle volume data.

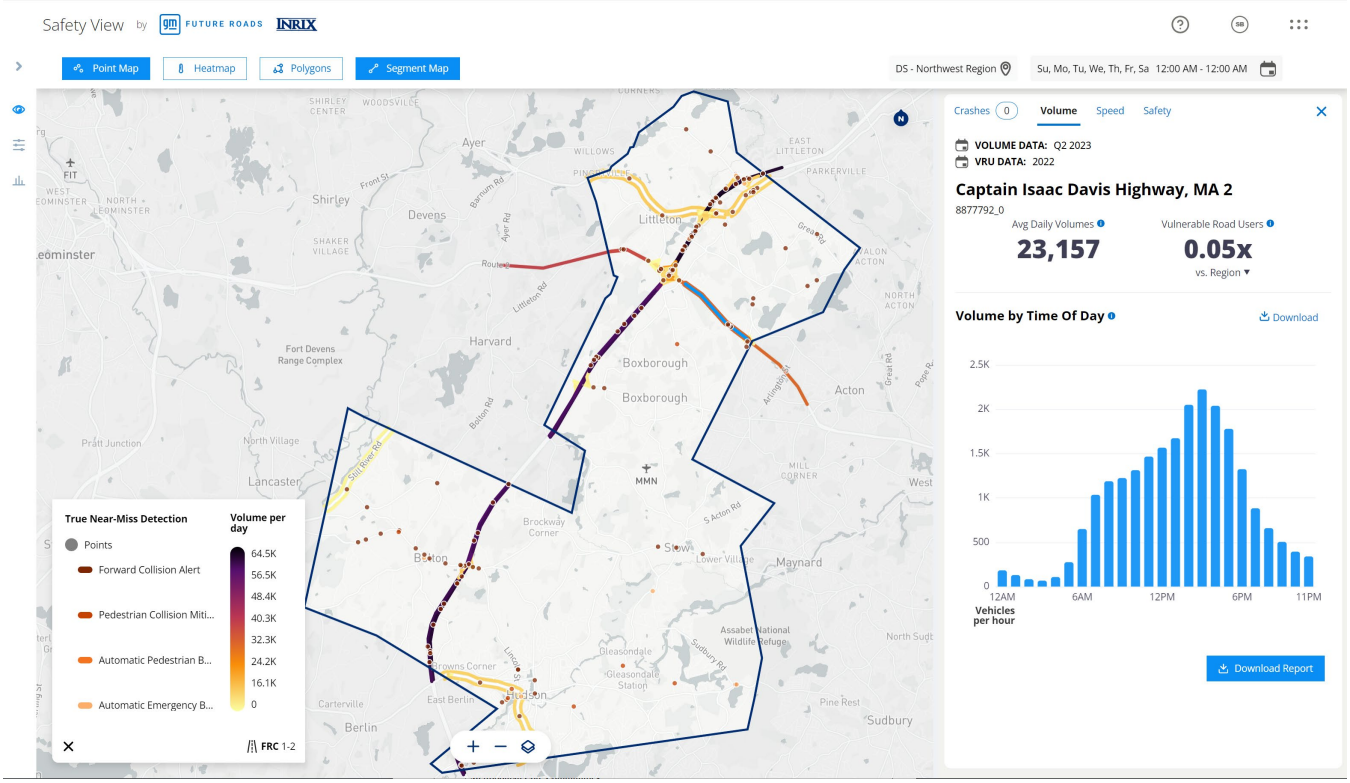


Figure 9 - Volume Per Day in the Developing Suburb of Northwest Region

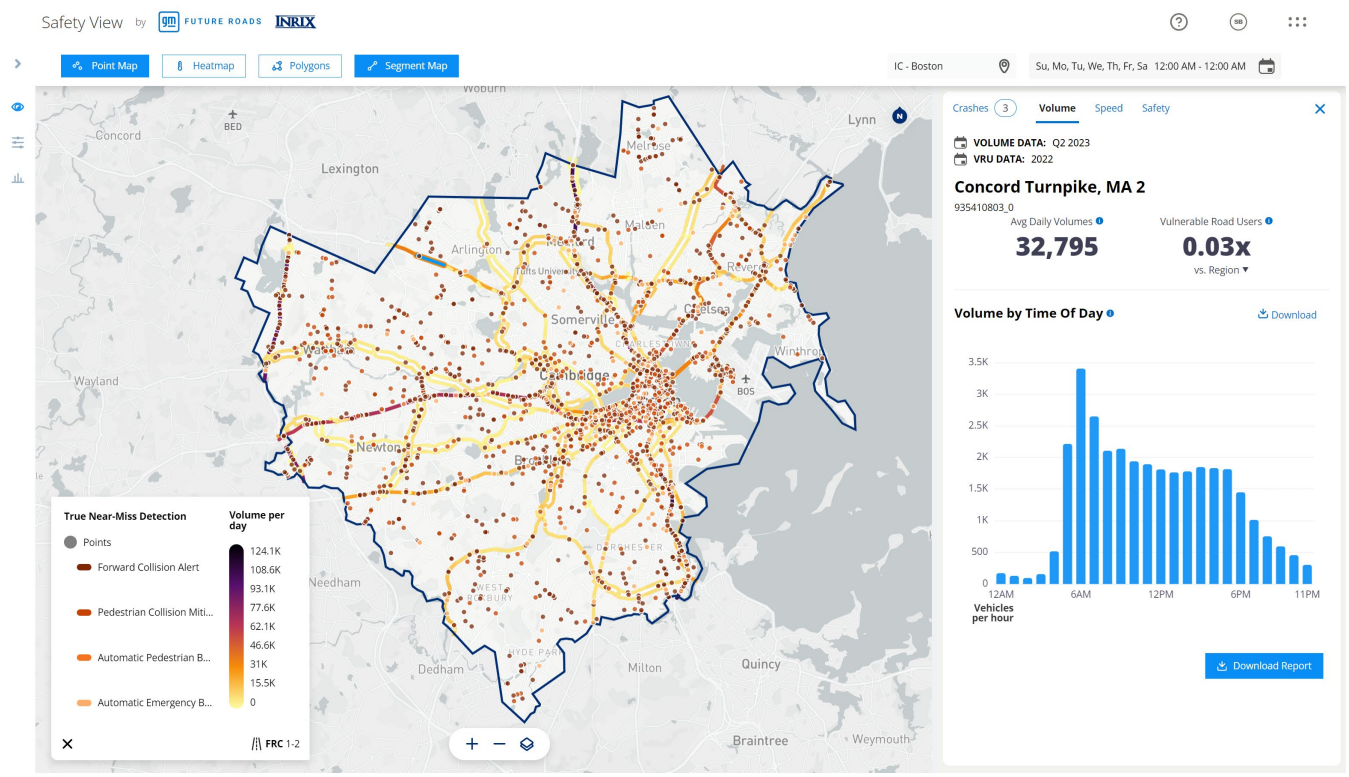


Figure 10 - Volume Per Day in the Inner Core of Boston

4. *How could your tool be leveraged to support the work of cities and towns in making their roadways safer through annual construction project planning?*

INRIX Response: Safety View is beneficial for the following steps in the annual construction planning process:

- **Grant applications:** Safety View helps identify areas of your network with systemic risk to apply for grant funding, including the identification of "before" data to help with project justification.
- **Project prioritization:** Safety View has existing features that allow for quick network screening with just a few mouse clicks. You can filter your segmentation based on any variables or perform a sliding window analysis to identify key corridors. You can also perform a quick ranking analysis to answer the questions "What are the top 10 highest crash locations?" or "Where are the locations with the highest instance of speeding."

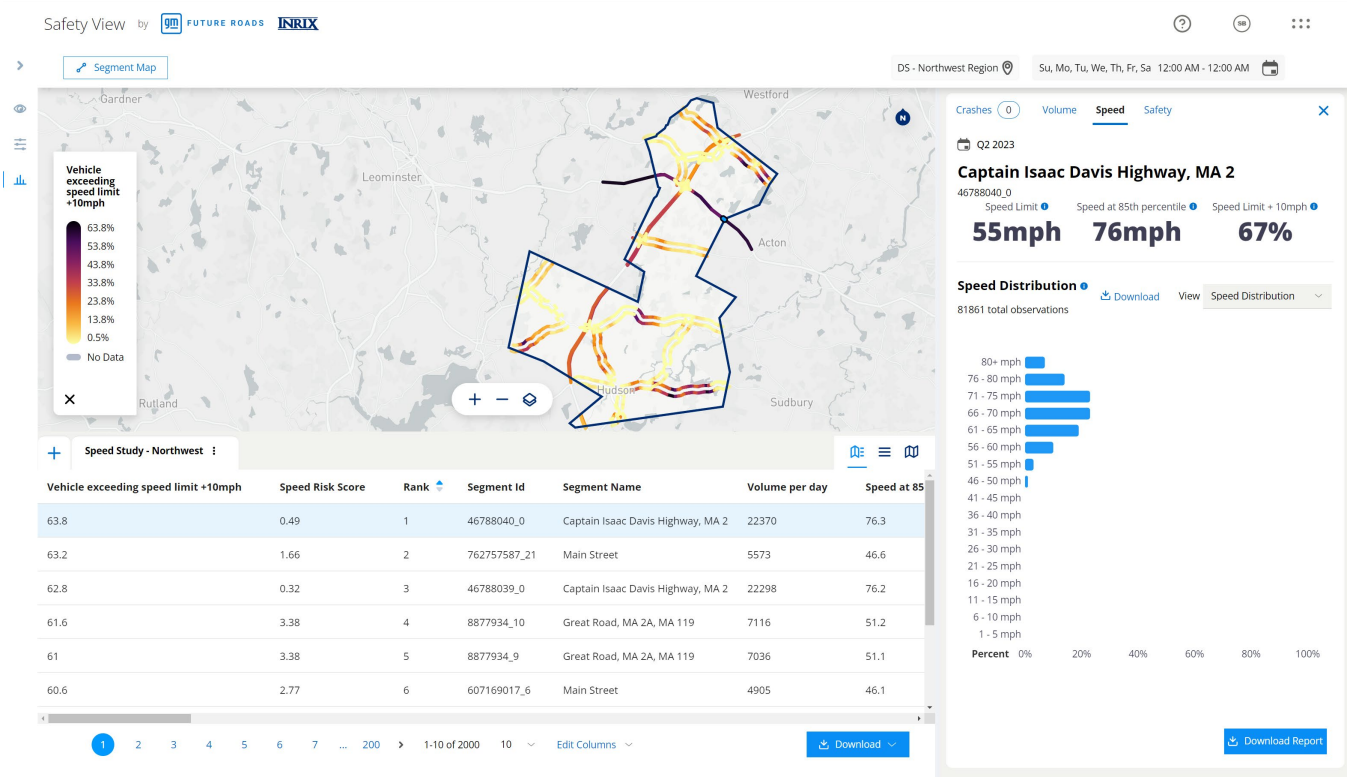


Figure 11 - A ranking analysis that shows you the top ranked segment with speeders

- **Project evaluation:** Because Safety View is updated on a quarterly basis, it is an ideal tool for before/after evaluation and identifying trends over time.

4.2 The "Challenge"

Below are our responses to the six "Challenge" questions.

1. *Demonstrate that you can conflate your data insights to MassDOT's road inventory file (see MassDOT Assets below) and to Open Street Map or describe in some detail the process required to do this for roadway segments and the estimated time involved to do so.*

INRIX Response: INRIX has been an industry leader in map generation and conflation for 15+ years. We pioneered the XD segmentation method, which breaks the road network at significant intersections. We update our map quarterly and conflate for each map version. We currently build our products on either XD or Open Street Map (OSM) segmentation. We are capable of conflating our insights to MassDOT's road inventory if properly budgeted and scoped.

2. *Please describe how you protect and preserve privacy with your product.*

INRIX Response:

INRIX's Privacy Policy includes information about the types of personal information collected and processed by INRIX, and the measures taken to comply with applicable data protection laws such as the GDPR and CPRA. Here is the link to the Privacy Policy: https://inrix.com/site-privacy-policy/. INRIX is also certified under the Data Privacy Framework and here is the link related to its data collection and processing practices: https://www.privacyshield.gov/participant?id=a2zt00000008URzAAM&status=Active/.

INRIX complies with applicable data protection laws and takes the approach that the EU General Data Protection Regulation (GDPR) currently serves as the highest common denominator for data protection laws. Accordingly, we apply the data protection principles of GDPR to all countries, even those outside of the European Economic Area (EEA) and make modifications where necessitated. INRIX also continuously reviews and improves our privacy compliance programs and processes to remain in compliance with updates in applicable laws (such as the California Consumer Privacy Act/California Privacy Rights Act, Virginia Consumer Data Protection Act, Connecticut Data Privacy Act, Utah Consumer Privacy Act, and the Colorado Privacy Act).

To help ensure continued compliance, INRIX has appointed a Data Protection Officer (DPO) to oversee the company's data protection policies. INRIX also has a Data Protection Committee (DPC), comprised of legal and technical advisors to the DPO, including individuals who are CIPP-US and CIPP-E certified. The DPC meets with Engineering, Product and other internal stakeholders to conduct privacy impact assessments of proposed changes to uses of existing input data and new data uses or data types that are planned. The DPC also meets with the DPO to inform and discuss with the DPO of any new updates or company policies that may impact data protection and privacy.

From a technical standpoint, INRIX uses multiple input data sources to create its traffic, parking, and analytics products. The input data includes location-based GPS data from multiple supplier sources. The input data received from our suppliers typically includes a hashed Device ID. This is an identifier that has already been hashed or obfuscated such that INRIX cannot reasonably identify a particular individual from that data. For many of INRIX's suppliers, the hashed identifier is also rotated at least daily if not more frequently. For an additional degree of anonymization and de-identification, INRIX performs an additional hash of any identifiers from the input data feeds upon receiving the suppliers' data. Additionally, we implement technical and process measures to prevent "linking" the internally hashed identifiers with the identifiers provided from suppliers.

Next, INRIX combines the supplier's anonymized data with other suppliers' data to create INRIX's traffic, parking, and analytics products. The products as provided to INRIX's customers contain aggregated data such as traffic speed, parking availability, origin and destination information, traffic signals information, and other information. The underlying data provided by the suppliers is modified, combined, and aggregated such that our customers cannot re-identify a particular individual. Because of the measures we take to anonymize data, we do not act as a data broker and do not sell or license personal data as defined by the applicable state privacy laws.

Finally, IINRIX products are served from a mixture of Amazon Web Services and on-premises server systems. Administrative access is restricted to a small list of employees whose roles require such access and the list is reviewed regularly. Also, the information is not accessible outside of INRIX's secured production datacenters, which are governed by an industry standard internet security framework known as CIS Critical Security Controls (CSC). All of these standards-based approaches, including the CSC internet security framework, are tightly governed by INRIX's SOC 2 Type 2 certification and ISO 9001:2015 Quality Management System (QMS).

3. *Please explain your business model or models for working with government transportation authorities.*

INRIX Response: Safety View can be licensed in two ways: 1) As a single use application, which means only MassDOT staff and your consultants can use the platform for analytics; or 2) As a full use license, where MassDOT can then authorize the use for any member agency in the state. Our pricing model is based on population. Given Massachusetts' population of roughly 7 million, the annual subscription fee for the single use is $900,000 and the full use is $1,080,000.

Safety View is included in two different purchasing collectives for ease of procurement: Sourcewell or the Eastern Transportation Coalition Transportation Data Marketplace, which MassDOT already uses to purchase similar INRIX datasets and services.

4. *If relevant, please share how MassDOT would be involved in developing the product or if there are any opportunities for customization.*

INRIX Response: Safety View is an existing INRIX product, with extensive off-the-shelf functionality. Safety View has regular planned releases with functionality improvements multiple times a year. Most of the improvements are made directly from customer feedback or our user group meetings, which are designed to share use cases and best practices across all users. If MassDOT becomes a customer, you will immediately be plugged in to our quarterly user group convening, and we would also schedule regular one-on-one interviews to inform our product roadmap.

5. *Please indicate the monthly volume of drivers/vehicles reflected in your data for Massachusetts roadways and the estimated percentage of drivers out of all of those on the roadway represented in your dataset.*

INRIX Response: The 2023 and early 2024 penetration rate of the INRIX data is 7% – 7.5% of all vehicle miles traveled (VMT) in Massachusetts. The penetration rate of the GM connected vehicle datasets is 2.7 – 3%.

6. *Indicate if you have a demonstration with Massachusetts-based data that you would like to present in a workshop with MassDOT staff. Please include the topic you'd like to address and a few sentences on what you want to share.*

INRIX Response: Yes, we can do a Safety View demo for the whole state of Massachusetts. Our topic of interest would be demonstrating the risk-based insights that exist off the shelf in the platform, and the network screening workflows that are possible within the tool.