CTDOT Wrong-Way Driving Detection System

By Connecticut Department of Transportation

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Benefits Statement

Connecticut Department of Transportation (CTDOT) launched a comprehensive Wrong-Way Driving Detection System (WWDDS) program after 13 wrong-way crashes in 2022 resulted in 23 fatalities. The program aims to prevent wrong-way entries, improve response times, and gather reliable data to strengthen future interventions. Since implementation, wrong-way crashes have decreased significantly in Connecticut, dropping 61.5% by 2024 compared to 2022.

In this case study you will learn:

1. Why an integrated approach of design and technology is essential to preventing wrong-way crashes.
2. How Connecticut took an analytic approach to addressing issues on over 700 ramps.
3. How construction provides an opportunity for local and traveler engagement.

2026 TSMO Award Winner for Emerging Trends and Technologies

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BACKGROUND

Wrong-way driving (WWD) is one of the highest-severity risks on divided highways. Nationally, WWD crashes are estimated to be approximately 100 times more likely to result in fatalities than typical roadway incidents, with hundreds of deaths each year. Connecticut saw a significant rise in this threat in 2022 when 13 wrong-way crashes resulted in 23 fatalities, a surge that exceeded totals from 2021 and 2020 combined. More than 80% of these fatalities involved impaired drivers, and most occurred at night, underscoring the need for enhanced visibility, rapid detection, and real-time operational coordination.

The tragic death of State Representative Quentin Williams in January 2023 galvanized statewide attention and accelerated action. Prior to this, countermeasures included signage improvements and public awareness campaigns. While valuable, these efforts were no longer sufficient to address increased incident frequency and severity and CTDOT recognized a systemic, technology-supported, and operations-integrated solution was necessary. In response, CTDOT launched a comprehensive Wrong-Way Driving Detection System (WWDDS) program to prevent wrong-way entries, improve response times, and gather reliable data to strengthen future interventions.

TSMO PLANNING, STRATEGIES, AND DEPLOYMENT

CTDOT's WWDDS initiative was designed and delivered within a structured TSMO framework that emphasized systemic analysis, scalable engineering, and integrated operations. Systemic Statewide Analysis CTDOT assessed over 700 ramps, evaluating geometry, lighting, crash history, volumes, and nearby alcohol-serving establishments. A weighted model identified the top 120 high-risk ramps for priority deployment, ensuring resources were focused where safety impact would be highest.

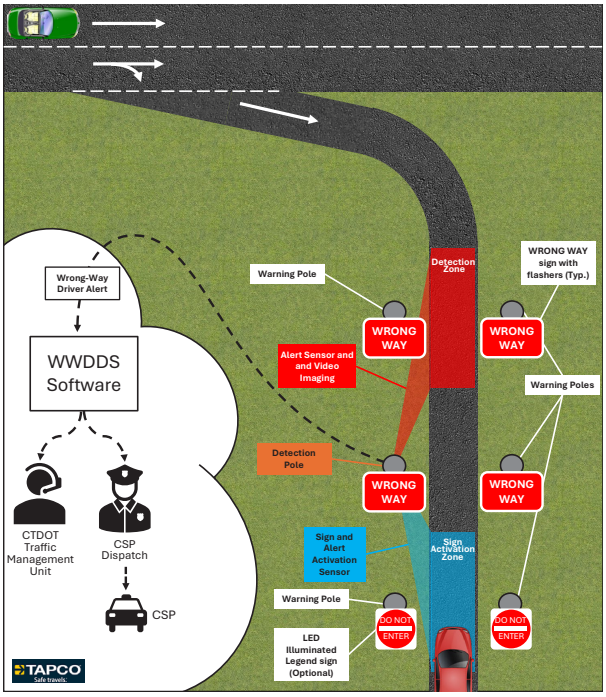
Systems Engineering Approach

To ensure consistent performance statewide, CTDOT used a full systems engineering process to document system requirements, operational scenarios, communications paths, verification and validation steps, and maintenance responsibilities.

Technology Selection and Tiered Detection

CTDOT evaluated multiple detection technologies, including radar, thermal imaging, and video analytics. The selected solution combines advanced detection sensors with high-definition optical cameras and LED-enhanced WRONG WAY signage. This configuration was deliberately chosen to balance rapid automated detection with immediate visual verification.

Each site operates using a tiered detection model. Initial detection activates highly visible LED signage to prompt immediate driver self-correction. If a vehicle continues, automated alerts are transmitted to CTDOT HOCs, where operators confirm events using live video before coordinating response with Connecticut State Police (CSP). This structure minimizes false alarms while ensuring true wrong-way events receive immediate attention.



Deployment Pace & Scale (Aug 2023–Dec 2025)
The first WWDDS site became operational in August 2023. By the end of 2024, CTDOT had completed 121 installations. Deployment continued at a sustained pace of 8–10 systems per month, resulting in 211 active systems statewide by December 2025, one of the largest wrong-way detection networks in the nation.

Complementary Static Countermeasures
WWDDS deployments were accompanied by parallel safety improvements, including upgraded "WRONG WAY", "DO NOT ENTER", and "ONE WAY" signage at more than 700 ramps. CTDOT also refreshed pavement markings and delineation statewide and targeted relamping at 74 intersections and 130 signalized locations. By combining these measures, CTDOT established a layered approach that increased driver awareness while maintaining consistent detection performance.

Operational Integration WWDDS alerts are fully embedded within CTDOT's incident management framework. Standard operating procedures guide operator verification, law enforcement notification, and follow-up actions. Verified event data also informs targeted holiday and weekend operations, including pre-positioned patrols and coordinated impaired-driving enforcement.

COMMUNICATIONS PLANNING AND EXECUTION

Effective communication was treated as an operational component of the WWDDS program rather than a standalone outreach effort.

Public Safety Campaign: "One Wrong Move"
To address the behavioral root causes of wrong-way incidents, Connecticut launched the "One Wrong Move" campaign, a statewide public awareness initiative deployed across television, radio, billboards, social media, and streaming platforms. The campaign emphasizes the severe risks associated with impaired driving and the life-or-death consequences of entering a highway in the wrong direction.

Stakeholder and Internal Communications
CTDOT developed updated training, workflows, and communication protocols for HOC operators, CSP, district staff, and maintenance teams. Municipalities were notified in advance of ramp closures and overnight construction, supporting efficient deployment and minimizing disruptions.

External Engagement and Transparency
CTDOT regularly shared deployment progress, system maps, and early outcome metrics with the public and media. This transparency strengthened public confidence and demonstrated how TSMO-driven investments delivered measurable safety benefits.

OUTCOME, BENEFIT, AND LEARNINGS

Prior to WWDDS deployment, most wrong-way events were discovered through delayed 911 calls, often minutes after a vehicle had already entered the highway. The new system shifted detection upstream to the point of entry, enabling earlier intervention and reducing the duration and severity for motorists and responders alike. The WWDDS program has delivered measurable safety outcomes while reshaping how Connecticut manages one of the most severe traffic risks.

Crash and Fatality Reduction
Since the initial deployments, statewide wrong-

way crashes have decreased significantly, dropping 61.5% by 2024 compared to 2022. Fatalities show a similar downward pattern, falling from 23 in 2022 to 7 in 2023 and 4 in 2025. Together, these reductions demonstrate the program's growing effectiveness. The declines correlate with both WWDDS coverage and improved lighting, enhanced geometric treatments, and targeted impaired driving messaging which together support both crash prevention and severity reduction.

Driver Behavior Impact and Event Data

From program launch through December 2025, CTDOT verified 858 wrong-way driving events. More than 80 percent (710 drivers) self-corrected after encountering the LED-enhanced signage, demonstrating strong behavioral influence from the immediate visual cue. For the remaining 148 events that continued driving the wrong way, automated alerts reached operators within seconds, allowing rapid video verification and coordination with CSP. This real-time response dramatically improves the ability to intervene early and prevent potential crashes or fatalities, far exceeding the speed and effectiveness of the traditional 911-based reporting.

Program Performance Management

As the network expanded, CTDOT developed Counts Per System Installed (CPSI) to normalize event data across deployments. CPSI allows leadership to evaluate system performance independent of scale, compare corridors objectively, and guide future deployment priorities based on risk and effectiveness rather than raw counts.

Key Learnings

The analysis of verified events confirmed the following:

- Lighting enhancements, particularly relamping, meaningfully improve driver self-correction.
- Ramp geometry and delineation remain significant contributors to potential wrong-way movements.
- Impaired driving continues to be the primary causal factor, reinforcing the value of communication campaigns.
- Use of complementary detection technologies and visual verification is essential for maintaining accuracy in nighttime and low-visibility conditions.
- Pavement markings play a critical role in driver expectancy; locations with faded or missing markings show a noticeable increase in wrong-way events, highlighting their importance as a countermeasure.

Long-Term Public Benefit

The WWDDS program has already saved lives, reduced severe crashes, and strengthened CTDOT's operational capabilities. It also establishes the architecture needed for:

- V2X integration, allowing wrong-way alerts to be broadcast directly to connected vehicles.
- Predictive analytics, helping CTDOT identify emerging hotspots.
- Future system expansions, including arterial deployments and enhanced incident management platforms that can give the ability to see trends and increase targeted enforcement.

This program represents a sustainable, scalable investment that will continue returning safety benefits for years to come.