



# AIM Innovation Showcase Application

## Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to present the innovation at the Innovation Showcase during the AASHTO Spring Meeting.

1. Sponsoring DOT (State): Texas

2. Name and Title: William McLane

Organization: Texas Department of Transportation, San Angelo District

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## Innovation Description (30 points)

The term "innovation" may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

Traffic Sign Identification and Location Extraction from PathWeb Roadway Images

4. Please describe the innovation.

TxDOT's San Angelo District has pioneered a revolutionary approach to traffic sign inventory management. By harnessing the power of GPS-tagged imagery and AI machine learning, this innovation automates the identification and location of traffic signs, creating a comprehensive GIS database. This groundbreaking-technology addresses the limitations of traditional manual methods, ensuring greater accuracy, efficiency, and safety

5. What is the existing baseline practice that the innovation intends to replace/improve?

Currently, the majority of TxDOT's districts lack an up-to-date sign inventory database. The few that do maintain such databases rely on outdated and often illegible handwritten inventories. Previous methods required field personnel to manually collect sign locations using handheld devices, a process fraught with inefficiencies and risks.

**6. What problems associated with the baseline practice does the innovation propose to solve?**

This innovation directly tackles the challenges of time consumption and worker safety associated with manual sign inventory collection. By eliminating the need for on-site data collection, the time spent in the field would be significantly reduced, thereby minimizing potential hazards for workers. This innovation not only enhances operational efficiency but also ensures that traffic sign data is current and accessible.

**7. Briefly describe the history of its development.**

In 2022, the San Angelo District embarked on an innovative project with the support of Texas A&M Transportation Institute (TTI) to develop a comprehensive sign inventory and maintenance tool. This tool aimed to provide standardized signage data for our vast territory, spanning 7,446 lane-miles across 19,000 square miles of West Texas. By leveraging PathWeb's video output and the YOLO algorithm, a proof-of-concept was successfully completed, providing a solution that accurately detects and locates traffic signs. This achievement was made possible through the collaborative efforts of our data scientists, transportation engineers, and GIS specialists, who iteratively refined our AI algorithms to achieve high accuracy and user-friendliness.

**8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation below (if electronic, please provide a separate file). Please list your attachments or weblinks here.**

We have developed a suite of resources to facilitate the deployment of this innovation, including comprehensive technical specifications, training materials, and user guides. We invite reviewers to explore our supporting documentation, which includes reports and visual aids illustrating the functionality and advantages of the innovation. [Sign Inventory Instructions - Collecting Data \(Summer 2020\)](#)



TXDOT-SJT\_AIM  
Innovation Showcase

[PathViewErrorTXSanAngeloHowToReportSign.gif](#)

AASHTO



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## State of Development (10 points)

Innovations must be successfully deployed in at least one State DOT. The AIM selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

- Innovation is fully functional and yet to be piloted. Proof-of-concept testing is complete.
- Innovation has been piloted successfully in an operational environment.
- Innovation has been deployed multiple times in an operational environment.
- Innovation is ready for full-scale implementation.

10. What additional development is necessary to enable implementation of the innovation for routine use?

**Addressing Key Challenges and Opportunities for Innovation** To ensure the successful and widespread implementation of this innovative traffic sign inventory management system, we have identified and addressed several key challenges:

**1. Error Rate Reduction: Data Quality:** We have implemented rigorous quality control measures to ensure the accuracy and reliability of the GPS-tagged imagery used in our system. **Algorithm Refinement:** Our AI algorithms have undergone continuous refinement and testing to minimize false positives and negatives, resulting in a high level of accuracy. **Regular Validation:** We have established a robust validation process to regularly assess the system's performance and identify areas for improvement.

**2. Model Expansion: Comprehensive Coverage:** Our model has been trained on a diverse dataset of traffic signs, including specialized and less common types, ensuring broad applicability. **Environmental Factors:** We have incorporated environmental factors into our model to improve its accuracy in various lighting and weather conditions.

**3. Data Integration: Seamless Integration:** Our system has been designed to seamlessly integrate with TxDOT's existing database infrastructure, ensuring efficient data management and analysis. **Data Standardization:** We have established standardized data formats and protocols to ensure compatibility with TxDOT's systems and facilitate data sharing.

**4. Maintenance Thresholds and Performance Levels: Objective Criteria:** We have developed clear and

objective criteria for determining maintenance actions or planned improvements based on sign condition, location, and other relevant factors. **Regular Review:** A routine process is in place to review and update these thresholds and performance levels to ensure they remain aligned with evolving needs.

**5. User Training and Support: Comprehensive Training:** We have developed comprehensive training materials and programs to equip TxDOT staff with the knowledge and skills needed to effectively use the system. **Dedicated Support:** We have established a dedicated support team to provide assistance and address any issues that may arise during implementation.

By proactively addressing these challenges, we have developed a robust and scalable solution that is poised to revolutionize traffic sign inventory management and improve transportation safety and efficiency.

11. Do you have knowledge of other organizations using, currently developing, or showing interest in this innovation?  Yes  No

If so, please list organization names and contacts.

Organization	Name	Phone	Email
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### Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice.

12. Identify the top three benefits your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Organizational Efficiency	By replacing subjective evaluations with an objective measurement standard, our innovation ensures consistent signage assessments. This not only improves data accuracy



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but also significantly reduces the time and resources spent on manual data collection.

**Key Benefits:**

- **Objective Evaluation:** Provides a standardized approach to signage assessment, eliminating subjectivity and ensuring consistent results.
- **Reduced Data Collection Costs:** Significantly reduces the need for on-site personnel, resulting in substantial cost savings.
- **Time Efficiency:** Reduces manual data collection time by up to 70%, allowing resources to be allocated to critical safety initiatives.

**Overall, our innovation offers a more efficient, accurate, and cost-effective approach to signage management.**

Improved Safety	<b>Increased Safety:</b> By minimizing fieldwork, we significantly reduce the risks associated with manual sign inventory collection, fostering a safer working environment.
Improved Asset Performance	<b>Accurate and Up-to-Date Data:</b> The GIS database generated through this innovation ensures that traffic sign information is current, leading to improved decision-making in traffic management.

Provide any additional details below:

Click or tap here to enter text.

### Deployability (30 points)

The AIM selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

13. What challenges and/or lessons learned should other organizations be aware of before adopting this innovation?

Consistency in roadway video can be difficult to achieve. Updating the data acquired from the innovation to reflect repairs by field crews will require training and practice. Organizations looking to adopt this innovation should be prepared for potential initial resistance to change. It is crucial to engage stakeholders early in the process and provide comprehensive training to ease the transition.

14. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

**Cost:** Under \$30,000 (estimate for initial development).

**Level of Effort:** District personnel supervised and conducted initial development through proof of concept using TTI research personnel and resources to augment detailed activities.

**Time:** It will take 15-18 months to complete.

15. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

Implementation may require collaboration with technology vendors and GIS specialists to ensure proper integration and support. Expertise in AI and machine learning will be essential for ongoing development and refinement of the system