

Expand Work Zone Data Exchange to Local Roads in Wisconsin Using Smart Work Zone ITS

Dataset and Contact Information

Please provide as much of the the following information as possible:

1. Name of the project;
2. Grant number;
3. Name of the person submitting this DMP;
4. ORCID of the person submitting this DMP (need an ORCID? Register here: <https://orcid.org/>);
5. Email and phone number of the person submitting this DMP;
6. Name of the organization for which the person submitting this DMP is working;
7. Email and phone number for the organization;
8. Link to organization or project website, if applicable; and,
9. Date the DMP was written.

1. Expand Work Zone Data Exchange to Local Roads in Wisconsin Using Smart Work Zone ITS
2. USDOT NOFO #20.941
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8. <https://wisconsindot.gov/>
9. 12/15/2023

Data Description

Please provide as much information as possible:

1. Provide a description of the data that you will be gathering in the course of your project or data from a third party that you will re-use, if any;
 1. If there will be no data collected or re-used from another source, state that this is case;
2. Address the expected nature, scope, and scale of the data that will be collected, as best as you can at this stage;
3. As best as you can, describe the characteristics of the data, their relationship to other data, and provide sufficient detail so that reviewers will understand any disclosure risks that may apply;
 1. If data might be sensitive, please describe how you will protect privacy and security, if you know that now;
 2. You may need to update your DMP later to add more detail;
4. Discuss the expected value of the data over the long-term.

1. Work zone event data for each pilot work zone deployment was collected by the WisDOT Smart Grant project team from four sources:

- Planned lane closure event history from the Wisconsin Lane Closure System (WisLCS).
- Reported lane closure event data from the Wisconsin Work Zone Data Exchange (WZDx) archived at one-minute intervals over the duration of the pilot period.
- Connected work zone device feed data (Ver-Mac) archived at one-minute intervals over the duration of the pilot period.
- Ground truth data collected through pilot work zone site visits by the WisDOT Smart Grant project team.

This data was analyzed by the WisDOT Smart Grant project team to evaluate the performance of the Wisconsin WZDx and Advanced Traffic Management System (ATMS) connected device integration for each local road work zone pilot deployment with respect to the technical performance measures described in the Evaluation Plan.

Connected work zone device integration logs from the ATMS were included in the original DMP but were removed from the final report since they were not considered essential by the WisDOT Smart Grant project team to conduct the pilot evaluations.

2. The expected nature, scope, and scale of data for each dataset is described below:

- The WisLCS provides a comprehensive description of planned lane closures in Wisconsin including type of work, roadway and lane level impacts, schedule, location, geometry, restrictions, and detours. It currently serves as the primary source for all highway lane closures statewide in the Wisconsin 511 traveler information system and the Wisconsin WZDx. The WisLCS was further enhanced at the start of the project to include attributes for local road lane closures. Closure history is available for download through WisLCS user interfaces. The Wisconsin Traffic Operations and Safety (TOPS) Laboratory at the University of Wisconsin-Madison maintains the WisLCS on behalf of WisDOT.
- The Wisconsin WZDx provides a standardized GeoJSON data feed containing up-to-date information about active work zone events. The WZDx was enhanced over the course of the project to incorporate field verified work zone status attributes through connected work zone device integration in the ATMS. It has also been enhanced to include additional attributes for local road lane closures. The UW TOPS Lab has an existing process that archives the WZDx GeoJSON data feed from the ATMS at 1-minute intervals. This archive is managed in a large-scale PostgreSQL database.
- Connected work zone device status updates (connected arrow boards and location markers) from the Ver-Mac WZDx Device Feed were archived for all pilot sites at 1-minute intervals over the duration of the pilot. This archive is managed in a large-scale PostgreSQL database at the UW TOPS Lab.
- The WisDOT Smart Grant project team conducted site visits to the pilot work zone locations to collect ground truth data including GPS measurements of the CWZ devices and logged observations based on interaction with the devices. *Recorded video was included in the original DMP but were removed from the project plan since the site visits were considered sufficient to evaluate the performance of the CWZ devices and online device feed.*

3. Data collected for this study consisted primarily of publicly available work zone event data. Over the course of the pilot project, evaluation results and data were shared amongst the project team via a secure UW Box account. For purposes of the final project data repository, all personal identifying information (PII) has been removed.

4. Work zone event history from the WisLCS, WZDx, and various CWZ device feeds is continuously archived at the UW TOPS Lab in collaboration with WisDOT due to its value for work zone related research, analysis, and performance management. Understanding the accuracy of these datasets is therefore a critical need. The additional evaluation datasets generated by this project (ground truth observations) will potentially serve as a future reference and template for evaluating Wisconsin work zone event data quality.

Data Format and Metadata Standards Employed

Please provide as much information as you can:

1. Describe the anticipated file formats of your data and related files;
2. To the maximum extent practicable, your DMP should address how you will use platform-independent and non-proprietary formats to ensure maximum utility of the data in the future;
 1. If you are unable to use platform-independent and non-proprietary formats, you should specify the standards and formats that will be used and the rationale for using those standards and formats.
3. Identify the metadata standards you will use to describe the data.
 1. At least one metadata file should be a DCAT-US v1.1 (<https://resources.data.gov/resources/dcat-us/>) .JSON file, the federal standard for data search and discovery.

1. Anticipated file formats:

- WisLCS closure records for the pilot local road work zones are provided in CSV (comma separated value) format with an accompanying data dictionary. All data elements in the WisLCS are based on non-proprietary and/or open standards.
- Wisconsin WZDx data is based on the WZDx 4.2 specification. Data was collected at 1-minute intervals and archived in static files in GeoJSON format.
- Connected work zone device data (connected arrow boards and location markers) from the Ver-Mac WZDx Device Feed were collected at 1-minute intervals and archived in static files in GeoJSON format.
- Ground truth data collected through pilot work zone site visits includes GPS measurements and logged observations.
- The Wisconsin SMART WZDx Project Dashboard (<https://transportal.cee.wisc.edu/services/smart-pilot/device-history/>), a map-based utility, was developed for the project team to view real-time and archived status information from the ATMS WZDx and Ver-Mac device feeds. This utility allows a user to select a point in time to view the GeoJSON contents along with mapped device locations and work zone multi-string geometries. This tool has been updated to provide a public-facing, single point of access to all four datasets collected from the pilot work zones over the course of the project for purposes of the project data repository.
- Additional pilot evaluation results are provided in the project final report and implementation plan.

2. How will the project use platform-independent and non-proprietary formats to ensure maximum utility of the data in the future?

- All datasets are readily available in CSV or GeoJSON format. The technical analysis for this project was conducted primarily within PostgreSQL and the PostGIS extension, a prevailing open source relational database system using standard SQL.
- Site visit field observations and pilot evaluation analysis results are provided in the project final report and implementation plan.

3. This project uses the Project Open Data Metadata Schema v1.1 (DCAT-US v1.1) to describe the datasets.

Access Policies

In general, data from DOT-funded projects must be made publicly accessible. Exceptions to this policy are: data that contain personally identifiable information (PII) that cannot be anonymized; confidential business information; or classified information. Protecting research participants and guarding against the disclosure of identities and/or confidential business information is an essential norm in scientific research. Your DMP should address these issues and outline the efforts you will take to provide informed consent statements to participants, the steps you will take to protect privacy and confidentiality prior to archiving your data, and any additional concerns. In general, in matters of human subject research, your DMP should describe how your informed consent forms will permit sharing with the research community and whether additional steps, such as an Institutional Review Board (IRB), may be used to protect privacy and confidentiality. Additionally, when working with, or conducting research that includes Indigenous populations or Tribal communities, researcher will adhere to the CARE Principles for Indigenous Data Governance <https://www.gida-global.org/care> and make an explicit statement to that effect in this portion of the DMP.

Please provide as much information as possible:

- 1. Describe any sensitive data that may be collected or used;**
- 2. Describe how you will protect PII or other sensitive data, including IRB review, application of CARE Principles guidelines, or other ethical norms and practices;**
 - 1. If you will not be able to deidentify the data in a manner that protects privacy and confidentiality while maintaining the utility of the dataset, you should describe the necessary restrictions on access and use;**
- 3. Describe any access restrictions that may apply to your data;**

4. If necessary, describe any division of responsibilities for stewarding and protecting the data among Principal Investigators or other project staff.

1. This project has not collected any personal identifying information (PII). The original DMP noted the possible exception of stakeholder and control room staff interviews, however the connected work zone field device setup, configuration, and evaluation was handled primarily by the project team, hence there was no need to remove references to individuals.
2. For purposes of the final data repository, all project data has been reviewed by the project team and confirmed to be free of personal identifying information (PII).
3. There are no access restrictions to the data.
4. The TOPS Lab will retain an archive of the Smart Grant project datasets for a minimum of three years from the date of final payment. Retention and access to project records will be in accordance with requirements established under 49 Code of Federal Regulations 18.42. A copy of the datasets will also be made available to the USDOT ROSA P repository for long-term retention.

Re-use, Redistribution, and Derivatives Products Policies

Recipients are reminded:

1. **Data, as a collection of facts, cannot be copyrighted under US copyright law;**
2. **Projects carried out under a US DOT SMART Grants is federally funded; therefore, as stated in grant language:**
 1. **Recipients must comply with the US DOT Public Access Plan, meaning, among other requirements, project data must be shared with the public, either by the researchers or by US DOT;**
 2. **That by accepting US DOT funding through this grant, recipients have granted to US DOT a comprehensive non-exclusive, paid-up, royalty-free copyright license for all project outputs (publications, datasets, software, code, etc.). This includes all rights under copyright, including, but not limited to the rights to copy, distribute, prepare derivative works, and the right to display and/or perform a work in public; and,**
 3. **In accordance with Chapter 18 of Title 35 of the United States Code, also known as the Bayh-Dole Act, where grant recipients elect to retain title to any invention developed under this grant, US DOT retains a statutory nonexclusive, nontransferrable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any such invention throughout the world.**

Please provide as much information as possible:

1. **Describe who will hold the intellectual property rights for the data created or used during the project;**
 2. **Describe whether you will transfer those rights to a data archive, if appropriate;**
 3. **Identify whether any licenses apply to the data;**
 1. **If you will be enforcing terms of use or a requirement for data citation through a license, indicate as much in your DMP;**
 4. **Describe any other legal requirements that might need to be addressed.**
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1. Intellectual property rights for data created or used:
 1. The Wisconsin WZDx data feed is owned by the Wisconsin Department of Transportation.
 2. The Wisconsin Lane Closure System database is owned by the University of Wisconsin-Madison.
 3. The Advanced Traffic Management System database is owned by Arcadis.
 4. The intellectual rights to all other data collected and/or created specifically for this project is retained by the respective WisDOT SMART Grant project team members that performed the data collection or creation.
 2. All data created and used for this project will be transferred into a separate archive repository maintained by the TOPS Lab on behalf of the project. The Wisconsin Department of Transportation and the U.S. Department

of Transportation (USDOT) shall have a non-exclusive, perpetual right to unlimited use of any and all datasets in the repository.

3. There are no licenses that apply to the datasets.

Archiving and Preservation Plan

Please provide as much information as possible:

1. State where you intend to archive your data and why you have chosen that particular option;
2. Provide a link to the repository;
3. You must describe the dataset that is being archived with a minimum amount of metadata that ensures its discoverability;
 1. Whatever archive option you choose, that archive should support the capture and provision of the US Federal Government DCAT-US Metadata Schema
<https://resources.data.gov/resources/dcat-us/>
4. In addition, the archive you choose should support the creation and maintenance of persistent identifiers (e.g., DOIs, handles, etc.) and must provide for maintenance of those identifiers throughout the preservation lifecycle of the data;
5. Your plan should address how your archiving and preservation choices meet these requirements.

1. Project data will be archived by the TOPS Lab at the University of Wisconsin-Madison. This option has been chosen since the TOPS Lab maintains a mature data management platform (see bullet 4 below) that serves as the system of records for several large-scale Wisconsin Department of Transportation datasets. The TOPS Lab also conducted the data collection and analysis tasks for this project.
 2. The project archive repository will be available from the UW TOPS Lab website, <https://topslab.wisc.edu/research/>, via a link to the Wisconsin SMART WZDx Project Dashboard: <https://transportal.cee.wisc.edu/services/smart-pilot/device-history/>
 3. Persistent identifiers are already incorporated in the WisLCS, WZDx, and ATMS for work zone events and connected devices. This concept will be extended to include all records in the project archive repository. The archive will also provide metadata per the DCAT-US v1.1 schema standard.
 4. The TOPS Lab has a large-scale data management platform (WisTransPortal) that has been developed over the past 20 years through sponsorship of the Wisconsin Department of Transportation. The WisTransPortal infrastructure consists of a combination of virtual and on-premises servers and storage arrays managed by full-time TOPS Lab IT professional staff through the UW-Madison Division of Information Technology (DoIT) Campus Data Center. Technical data for this project will be available at the TOPS Lab for download as static files. All databases and servers are managed to meet or exceed campus network and data security requirements.
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Planned Research Outputs

Interactive resource - "Wisconsin SMART WZDx Project Dashboard"

The Wisconsin SMART WZDx Project Dashboard (<https://transportal.cee.wisc.edu/services/smart-pilot/device-history/>), a map-based utility, was developed for the project team to view real-time and archived status information from the ATMS WZDx and Ver-Mac device feeds. This utility allows a user to select a point in time to view the GeoJSON contents along with mapped device locations and work zone multi-string geometries. This tool has been updated to provide a public-facing, single point of access to all datasets collected from the pilot work zones over the course of the project for purposes of the final data repository. Four datasets are included:

- Wisconsin Lane Closure System (WisLCS) data for the pilot local road work zones in CSV (comma separated value) format.
- Wisconsin WZDx data for the pilot local road work zones collected at 1-minute intervals in GeoJSON format per the WZDx 4.2 specification.
- Connected work zone device data (connected arrow boards and location markers) from the Ver-Mac WZDx Device Feed for the pilot local road work zones collected at 1-minute intervals in GeoJSON format.
- Ground truth GPS measurements collected by the project team through pilot work zone site visits.

The ATMS WZDx and Ver-Mac data is comprised of several hundred thousand GeoJSON records taken over the project duration. These datasets are also available for download in zip format.

The project final Implementation Plan and export of this Data Management Plan are also linked to this resource.

This repository is also accessible via the DOI: <https://doi.org/10.21949/aevd-ef03>.

Planned research output details

Title	Type	Anticipated release date	Initial access level	Intended repository(ies)	Anticipated file size	License	Metadata standard(s)	May contain sensitive data?	May contain PII?
Wisconsin SMART WZDx Project Dashboard	Interactive resource	2025-06-14	Open	University of Wisconsin-Madison TOPS Lab - Wisconsin SMART WZDx Project Dashboard		Creative Commons Attribution 4.0 International	DCAT-US	No	No