

FTA Safety Research and Demonstration Program Guidance for Grantees: Data Management Plan

OCTOBER 2020

FTA Guidance Document 0001 Federal Transit Administration

PREPARED BY

Center for Urban Transportation Research University of South Florida





U.S. Department of Transportation Federal Transit Administration

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SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL	
LENGTH					
in	inches	25.4	millimeters	mm	
ft	feet	0.305	meters	m	
yd	yards	0.914	meters	m	
mi	miles	1.61	kilometers	km	
VOLUME					
fl oz	fluid ounces	29.57	milliliters	mL	
gal	gallons	3.785	liter	L	
ft ³	cubic feet	0.028	cubic meters	m ³	
yd³	cubic yards	0.765	cubic meters	m³	
NOTE: volumes greater than 1000 L shall be shown in m ³					
MASS					
oz	ounces	28.35	grams	g	
lb	pounds	0.454	kilograms	kg	
т	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")	
TEMPERATURE (exact degrees)					
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C	

Metric Conversion Table

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SECTION

Introduction

The Federal Transit Administration's (FTA's) Transportation Innovative Improvement Program is authorized in federal public transportation law (49 U.S.C. §5312(b)). The Safety Research and Demonstration (SRD) Program, which was developed under this authority, is a competitive demonstration opportunity under FTA's Safety Research Emphasis Area in support of U.S. Department of Transportation (USDOT) safety goals.

In response to the White House Office of Science and Technology Policy memorandum dated February 22, 2013, entitled "Increasing Access to the Results of Federally Funded Scientific Research," USDOT incorporates Public Access Requirements into all funding awards for scientific research. All work conducted under the SRD Program must follow USDOT data policies outlined in the USDOT Public Access Plan vI.I. Recipients are required to include these obligations in any subawards or other related funding agreements. FTA expects recipients to use data that can be made public and methodologies that are accepted by industry practice and standards, to the extent possible.

To meet these requirements, projects funded under the FY 2018 SRD Program must develop a detailed Data Management Plan (DMP) within 120 days from the award date, as indicated in the Notice of Funding Opportunity (FR Doc. 2020-02844). A DMP is a detailed plan describing how a grantee will manage all data generated during the demonstration of the project, including archiving and sharing protocols. A DMP is a critical step to ensure a successful deployment and meet FTA's requirement to evaluate the impacts and implications of all awarded SRD projects.

FTA directs an independent evaluator (IE), selected and funded separately by FTA, to evaluate each project funded under this program. The IE will work in conjunction with FTA SRD project managers to:

- 1. Review, evaluate congruency with the grantee's defined performance measures, and approve the DMP submitted.
- 2. Provide feedback to the grantee to ensure that the DMP is consistent with the grantee's project evaluation and FTA's independent evaluation effort.
- 3. Monitor the progress of the project and the grantee's adherence to the DMP.
- 4. Use the data generated by the projects for an independent evaluation of the SRD project/programs.

The grantee's responsibilities are to:

- I. Submit the DMP for review and approval.
- 2. Coordinate with the IE on development of performance measures and data collection throughout the deployment, as detailed in the DMP.
- 3. Collect, manage, maintain, archive, and share project data in accordance with the DMP.

Whereas USDOT provides general guidance to grantees on how to prepare DMPs, this document provides additional guidelines to prepare a DMP with details and requirements that are specific to the FY 2018 SRD Program.¹

Section 2 of this document describes the evaluation pillars that should be followed to align the DMP with FTA's goals of standardized evaluation and associated performance measures across all awarded projects. Section 3 outlines the minimum required content of the DMP and suggested guidelines to complete each section. Section 4 directs grantees to additional resources that provide examples of successfully submitted DMPs and online tools to create DMP templates.

¹https://ntl.bts.gov/public-access/creating-data-management-plans-extramural-research.

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Purpose of the DMP

The purpose of a DMP is to define a data collection and management process that is conducive to the evaluation of the funded project research and its benchmark of its performance towards meeting FTA's research goals of a safer and more reliable public transportation. The IE will work with the grantee to ensure that adequate data collection efforts detailed in the DMP gauge minimum performance measures. The evaluation plan, to be used by the IE, will measure consistency with the DMP to ensure that the resultant datasets serve the purpose of quantifying the performance measures for the SRD project. The IE will develop the evaluation plan, with input from the grantee, to gauge, at a minimum, the four pillars of evaluation. This section identifies these four pillars, expected standard performance measures, and data needs that the DMP must address:

- I. Safety Evaluation
- 2. System Operation and Effectiveness
- 3. Return on Investment
- 4. Outreach

Safety Evaluation

Safety is a key research focus of FTA in support of USDOT's safety goals. A primary objective of the SRD Program is to explore advanced technologies to prevent transit vehicle collisions. Given the low expected probability of observing statistically-significant differences between a treated and untreated (i.e., control) sample in terms of fatalities and injuries during the period of technology deployment at the SRD-awarded agencies, avoided near-miss incidents will serve as the most informative safety improvement measure. A general definition of "near miss" (or "close call") is an event that has the potential to lead to injury, fatality, or physical damage but that is not actualized. The realized definition of a "near miss" is context-specific, depending on the technology purpose. Near-miss incidents can be used as a basis to impute expected reduction in the incidence of injuries and fatalities to establish potential benefits in cost-benefit analysis. Safety improvements will be determined by an evaluation of the impacts of the technology on the number and rate of near-miss events per 1,000 vehicle miles, number and rate of collisions per 1,000 vehicle miles, number and rate of injuries per 1,000 vehicle miles, and the number and rate of fatalities per 1,000 vehicle miles.

Near-miss Event

A near-miss is an event that has the potential to lead to injury, fatality, or physical damage but that is not actualized. The exact measures are relative to the deployed technology. For example, a system designed to mitigate collisions due to a bus driver's visual obstructions or blind spots, particularly when turning, can record situations in which a pedestrian or cyclist is observed to be within a certain distance of the bus with an impending collision not realized.

Collisions, Injuries, and Fatalities

All collisions, collision-related injuries, and collision-related fatalities must be recorded per 1,000 vehicle miles for the duration of the data collection. For further clarification, an "injury" is defined as an event that resulted in a possible/ suspected (not evident), minor, or serious injury, and a "fatality" is defined as an event that resulted in death within 30 days of occurrence.

System Operation and Effectiveness

System operation and effectiveness encompasses the practicability of the technology, i.e., that the technology performs as intended from the perspective of the operator (system user) and consumer (transit user), and that there are no technical hindrances to its widespread adoption. For all projects, system operation and effectiveness can be assessed through system accuracy and reliability.

System Accuracy

System accuracy is the system's ability to actively distinguish between false positive and false negative alerts. A "false positive" warning is one in which a warning is logged from the telematics data but not confirmed by an independent. A "false negative" warning is an instance in which independent assessment identifies a potential collision or threat but a warning was not issued by the technology. Both measures are critical, as a sufficient number of false positives could result in loss of operator trust or bias towards the system and false negatives could lead to potential collisions or near-misses. The data log should collect relevant data capable of distinguishing these warnings.

Reliability

Reliability is the ability of the system to perform at a level accepted by both the operator (system user) and the consumer (transit user) and is measured with respect to acceptance and accessibility of the deployed system. "Acceptance" is assessed through the perceptions of any individuals or groups directly involved with or impacted by the technology; this subjective assessment is typically measured through survey instruments and/or interviews and focus groups with relevant parties administered at least twice during the demonstration period. "Accessibility" is a direct measure of consumer satisfaction in terms of being able to accomplish their travel goal within the anticipated timeframe; this also is

assessed through surveys and focus groups that capture schedule and ride-time reliability.

Return on Investment

To analyze the return on investment, the operational and maintenance costs and avoided costs of the potential safety solutions are considered. Using information obtained from the safety improvement assessment, estimates of benefits in terms of avoided fatalities and injuries can be imputed and monetized. Benefits also include cost-avoidance.

Operational and Maintenance Costs

To assess the broader national-level impact of SRD projects, it is necessary to collect costs in per-unit terms. Itemized cost per unit for all system equipment with configuration and installation costs and an expectation of the life of system components should be documented. Additionally, costs associated with maintenance of the technology should be recorded by regular driver checks and inspections and the use of maintenance trouble tickets with itemized costs of repair. These estimates will be adjusted taking into consideration potential economies of scale (e.g., average unit cost reductions) for large-scale deployment of the technologies.

Avoided Costs

In addition to the costs expended, the technologies may reduce costs in other areas. Although insurance may cover the vast majority of collision-related expenses and records may be difficult to obtain, a transit agency may incur some costs not covered by insurance that the technologies can help to mitigate or avoid. Any insurance deductible amounts that the agency would have been required to pay as a result of collision/losses should be recorded.

Outreach

Knowledge transfer is an important outcome of research demonstrations, and FY 2018 SRD awardees should reach out to other agencies with prior experience using similar technologies to learn from their best practices. The project's contribution towards the existing knowledge base as a result of community participation involving both the industry (agencies, personnel) and the consumer during the design, implementation, and validation of the system should be documented. The grantees are solely responsible for organizing and logging any outreach efforts. National program outreach will also be conducted by FTA after completion of the projects.

Industry Outreach

Detailed logs, at a minimum documenting location, date, time, number of attendees, and role (consumer or industry) of demonstrations, presentations, webinars, and other events, should be maintained to quantify outreach efforts. Surveys to capture knowledge of the system, system confidence and potential benefits, and overall confidence in the public transit system should be administered to agency supervisors and personnel at every outreach event.

Consumer Outreach

Detailed logs, at a minimum documenting location, date, time, number of attendees, and role (consumer or industry) of demonstrations, presentations, webinars, and other events should be maintained to quantify outreach efforts. Surveys to capture knowledge of the system, system confidence and potential benefits as a consumer, and overall confidence in the public transit system should be administered at every outreach event.

Table 2-1 lists the four pillars of evaluation and the minimum-required performance measures and their alignment with FTA's research goals.

Table 2-1

Pillars Used for Standardization	of Performance Measures
----------------------------------	-------------------------

Pillar	Measure	FTA Goals and Objectives Met	
Safety Evaluation	 Near miss events: Number of near-miss events and rate of near-miss events per 1,000 vehicle miles. Collisions: Number of collisions and rate of collisions per 1,000 vehicle miles. Injuries: Number of injuries and rate of injuries per 1,000 vehicle miles. Fatalities: Number of fatalities and rate of fatalities per 1,000 vehicle miles. 	Improve public safety by reducing transit-related injuries, fatalities, safety events; enhance system reliability by testing promising new technologies, designs, practices. Explore advanced technologies, designs and/or practices to mitigate and prevent safety hazards on rail transit systems.	
System Operation and Effectiveness	 System accuracy: System's ability to actively distinguish between false positive and false negative alerts. False positive: Warning issued when no threat present. False negative: No warning issued when threat was present. Reliability: System's ability to perform at a level accepted by both operator and consumer. Acceptance: Perceptions and usability surveys of the operator. Accessibility: Consumers perception of accomplishing their travel goals within the anticipated timeframe (schedule and ride-time reliability). 		
Return on Investment	 Operational and maintenance costs: Unit, installation, lifecycle, and expected maintenance costs of system. Avoided costs: Tallied saving in terms of medical expenses, insurance claims, anticipated property damage, and past maintenance costs. 	Evaluate cost- effectiveness and practicability of potential solutions	
Outreach	 Sole responsibility of grantees to organize and conduct outreach events. Industry (agencies and personnel): Outreach efforts: Details (location, date, time, number of attendees, role [consumer or industry]) of demonstrations, presentations, webinars, other events. Perception of public transit: Surveys to capture knowledge of system, system confidence and potential benefits, and overall confidence in public transit system (administered during each outreach event). Consumer (transit user): Outreach efforts: Details (location, date, time, number of attendees, role [consumer or industry]) of demonstrations, presentations, webinars, other events. Perception of public transit: Surveys to capture knowledge of system, system confidence and potential benefits as a consumer, and overall confidence in public transit: system (administered during each during each outreach event). 	Assess ways to promote better public transit safety cultures through adoption of voluntary safety standards and best practices.	

SECTION

3

DMP Minimum Required Content

The DMP must include the following sections:

- Project Overview
- Data Collection
- Data Storage and Access Policies
- Archiving and Preservation Plans
- Responsibility and Resources

Project Overview

The Project Overview section of the DMP should provide a summary of the SRD project and its goals, along with a description of the general performance measures and how the data will be used to support the measures. The section should include at a minimum:

- Project Title
- Project Description Describe SRD project, including project goals and objectives
- Project Timeline Estimate timeline of phases of SRD project
- **Project Performance Measures** Describe measures to be used to determine the success and efficacy of the SRD project and how the collected data will support the performance measures

Data Collection

The Data Collection section of the DMP must specify the nature, scope, and scale of the data that will be collected. It should detail the characteristics of the data and must provide information on the following data elements:

- Data Name Provide name of each data frame collected
- **Description** Describe data frame that provides context in terms of the how the data supports the defined performance measures
- **Source** Identify data-generating source (e.g., vehicle telematics) and process used to collect the data
- **Frequency** Note frequency at which data are collected (e.g., 10 times per second, daily, monthly, etc.)
- **Format** Describe format adopted to store data (e.g., compressed file, comma-separated value, etc.).

All data expected to be generated through the deployment should be described using a single table summarizing the different data elements and characteristics. Table 3-1 shows an example of data description information.

	Data Name	Description	Source	Frequency	Format
	Near Miss Events	Number of near miss events	Telematics data recording from deployed application	Daily	Comma- separated values (.csv)
	Collisions	Number of collisions and rate of collisions per 1,000 vehicle miles	Collision reports from agency records during demonstration	Monthly	Excel file (.xls or .xlsx)
	Fatalities	Number of fatalities and rate of fatalities per 1,000 vehicle miles	Fatality reports obtained from agency NTD S&S reporting during demonstration	Entire deployment duration	Excel file (.xls or .xlsx)

Table 3-1

Data Description Example

Data Storage and Access Policies

The Data Storage and Access Policies section of the DMP must describe in detail the process used to store the collected data and the policies for accessing the final research data. In general, data from research projects funded entirely or in part by USDOT must be made publicly accessible.² If the data include personally identifiable information requiring restricted access, these restrictions must be detailed. The DMP should include provisions to ensure protection of privacy, confidentiality, security, and other requirements. This section must describe which data elements (if any) need to be protected from public access and made available only internally to the agency or to relevant stakeholders identified in the demonstration.

If the research includes data collection on human subjects, the DMP should describe how the Institutional Review Board (IRB) informed consent process will be used to protect privacy and how collected data will be shared with the research community.

This section also should provide a detailed description of the platforms and processes used to store the data. If data are expected to be generated by vehicle equipment, the DMP should detail the process to extract the information from vehicles and transmit data to storage and the process used to share such data across users and platforms. For example, if the demonstration calls for installation of technologies on transit or rail vehicles, how the data extraction will be done from the vehicles to a storage platform for sharing should be detailed. The use of a figure to describe the process is highly recommended. Figure 3-I shows an example of data storage and archiving procedures of connected vehicle data as part of USDOT deployment.³

²Executive Office of the President, Office of Science and Technology Policy, Memorandum for the Heads of Executive Departments and Agencies, "Increasing Access to the Results of Federally Funded Research," February 2013.

³https://rosap.ntl.bts.gov/view/dot/31732.



Source: Connected Vehicle Pilot Deployment Program Performance Measurement and Evaluation Support Plan – Data Collection Plan (FHW-JPO-16-314).

Figure 3-1

Example Data Storage and Sharing Framework

Data Storage Description

In the Data Storage and Access Policies section, the system that will be used for data storage should be described, including information about data backup and access limitations, and should include information on the following elements:

- Data Storage System Name
- Data Storage System Type State whether the storage system is a public system, a USDOT-managed system, a third-party system, or a system that will be developed as part of the SRD project.
- Data Storage Access Limitations State whether the data storage system is open to public access or if controlled access limitations exist.
- Dataset Title(s) Include all datasets anticipated to be stored.
- **Data Extraction Procedures** Detail the data extraction process, using appropriate figures for clarification as necessary.
- Frequency of Data Storage Transfer Include frequencies at which the collected data are expected to be transitioned into the data storage system.

Data Sharing with Independent Evaluator

To achieve a comprehensive understanding of the impacts and implications of the entire SRD Program, each SRD demonstration is subject to evaluation by an independent evaluator (IE). Grantees are required to coordinate with the IE to assist in developing an evaluation plan and collecting, storing, and managing data required to fulfill the evaluation plan. To carry out its activities, the IE is required to have access to the data in a manner that is consistent with the demonstration evaluation plan and the IE evaluation.

The Data Storage and Access Policies section should include a separate subsection, Data Sharing with Independent Evaluator, that describes how the data will be made available to the FTA-assigned IE to carry out its independent evaluation effort during the deployment. It should present a schedule of data deliveries to the IE that are consistent with the demonstration overall schedule, and data deliveries should be consistent with the overall data storage and access policies detailed in this section.

Policies and Procedures

The Data Storage and Access Policies section should include any policies or procedures that apply to the data storage system, including any applicable cybersecurity policies, data security policies, and back-up and recovery policies and procedures. It also may include policies related to the re-use, redistribution, and derivative products.

Archiving and Preservation Plans

The Data Archiving and Preservation Plans section of the DMP describes the process to archive the data and available options for data preservation. This may include use of publicly-available archives or other forms of self-dissemination via online platforms. It also should discuss how and where the data will be archived and indicate the expected timeframe between data collection and submission to the archive.⁴

Responsibility and Resources

The Responsibility and Resources section of the DMP provides details on grantee points of contact who are responsible for the implementation of DMP preparation, overall data management activity, including all parties involved in data generation and collection, and how such responsibilities will be split across research partners. This section also should discuss the resources required to execute the DMP. This section should detail data stewardship, including:

- Dataset Title(s) Separately list datasets with different data owners and/or stewards.
- **Data Owner** Detail the owner of each dataset as the person or organization with the authority, ability, and responsibility to access, create, modify, store, use, share, and protect the data.
- **Data Steward** Detail the steward for each dataset as the person or organization delegated the privileges and responsibilities to manage, control, and maintain the quality of the data throughout the data lifecycle
- Point(s) of Contact Provide contact information for the person or organizational position responsible for the implementation of the DMP.
- Additional Stakeholder Responsibilities Define expected responsibilities of all additional data stakeholders, inclusive of all research partners.

DMP Modification Process

DMP modifications may be necessary due to unforeseen project delays, data availability, change in technology vendors, or other constraints. Any modifications to the DMP must be reviewed and approved by the IE and FTA. A modification request, including justification for the change, must be submitted by email to FTA and the IE, who will review the modification request and provide a determination to the grantee.

⁴Data should be maintained for a minimum of five years before it is archived.

SECTION

Available Resources

USDOT provides guidance on DMP preparation and publicly-available DMPs that have been approved under extramural research. The following links are resources for preparation of a DMP:

- USDOT DMP preparation guidance: https://ntl.bts.gov/public-access/creating-data-management-plans-extramuralresearch
- Examples of USDOT Public Access Data Management Plans: https://rosap.ntl.bts.gov/collection_pa_dmp
- Online DMP creation tool: https://dmptool.org/



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