



# Shared Mobility Data: A Resource Guide

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# INTRODUCTION

This guide provides readers with an overview of the public sector applications of shared mobility data and directs them to information sources where additional, detailed, information can be found on specific topics of interest. It includes summaries of relevant literature and online documents, sample documents and agreements relating to provision, management, and sharing of shared mobility data, relevant data standards and open-source software related to these standards, organizations that are active in these topic areas, and examples of public data sets and dashboards provided by public agencies across the country.

## Background

Shared mobility is “the shared use of a vehicle, motorcycle, scooter, bicycle, or other travel mode; it provides users with short-term access to a travel mode on an as-needed basis” (SAE International, 2018). Its scope includes micromobility services such as bikesharing and electric scooter services, as well as carsharing, micro-transit, paratransit, Transportation Network Companies (TNCs), and traditional ride-hailing (taxi) services.

Shared mobility services have grown rapidly within just a few years. They help solve the “last mile” problem by providing links to and from mass transit stations and can replace car trips. They also may substitute for walking and transit trips. Some shared services can address longer trips, such as the use of micro-transit, where there is insufficient demand for efficient use of fixed route transit, or car sharing services, for occasional or periodic trips where a car is desirable.

When available, public agencies use the data from these providers for operations, planning & analysis, and for enforcement. *Operations* applications includes evaluating performance and deal with subjects such as vehicle utilization, vehicle caps, prohibited zones for operations or parking, and identifying areas that may be under-served or over-served. *Planning & Analysis* applications that examine how the service fits into the larger transportation ecosystem and include using data to understand demand patterns for shared mobility, what physical infrastructure is being used (e.g., for parking), what routes are being taken (and hence where new bicycle infrastructure might be suitable), what is the right price for curb space, and the relationship with transit stations. *Enforcement* activities involve monitoring and auditing provider operations to ensure that both mobility providers and their customers are complying with established regulations. Specific activities may include determining if service providers are accurately reflecting the status of their fleets, how well providers are rebalancing and maintaining their fleets, and when and where people are riding scooters in prohibited areas. In addition, there are topics of interest that cut across these application areas. Cross-cutting topics include data sharing policies and practices (including privacy protection), the use of 3<sup>rd</sup> parties for data management and analysis, and topics closely related to shared mobility, such as curb management.

Just as some cities were taken by surprise by TNCs and struggled to put in place regulatory frameworks, the same has occurred with dockless bikes and scooters in many localities. There is a clear need for public agencies to have data to better understand how all these services fit into the overall transportation network. However, there is tension between public agencies and service providers over the sharing of data. Shared mobility providers possess proprietary data as well as personally identifiable information (PII) relating to their customers. They understandably wish to protect this data. At the same time, the public sector needs some of the data in sufficient detail and with sufficient timeliness to fulfill their operations, planning, and enforcement functions. This has created tension and a lack of trust.

There is a need for model data governance agreements, adequate protection of proprietary and personal data, and a better understanding of needs and issues between the public and private sector to increase trust.

There is also a variation in the amount of standardization and data sharing across the many shared mobility modes. For example, the General Bikeshare Feed Specification (GBFS) (NABSA, n.d.) and the Mobility Data Specification (Open Mobility Foundation, n.d.) provide a fairly comprehensive, widely used standard for micromobility data, but no similar standards yet exist for TNC or other shared mobility services. State and local data reporting laws often are also very different for micromobility and TNC operators.

## Purpose and Intended Audience

The purpose of this guide is to provide public sector agencies with a curated guide to reference material to help plan for, manage, and utilize shared mobility data. The guide is not intended to be a comprehensive encyclopedia but rather to provide an overview on the data management needs related to each topic and provide the reader with summaries of resources where more detailed guidance and reference information can be found. This guide categorizes and summarizes the content of each reference so that the reader can determine the resources that best address their specific issues.

The primary intended audience includes both management and staff of public agencies responsible for shared mobility, including both those that use data for regulating shared mobility operations and those who use this type of data for broader planning purposes, such as implementing bike lanes or integrating shared mobility with transit operations. The guide assists both agencies taking on the challenge of internally managing shared mobility data as well as agencies looking to contract these services out to a third party.

## Scope

As described above, this guide summarizes over 40 references for data management. Additional related resources are also listed in some of the summaries. The bulk of the resources deal with micromobility, however many of these have information or recommendations that are equally applicable to other shared mobility services, such as TNCs, ride-hailing, and micro-transit. Topic Areas covered are:

- Applications
  - Operations
  - Planning & Analysis
  - Enforcement
- Cross-Cutting
  - Data Sharing Policies & Practices
  - Use of Third Parties for Data Management
  - Curb Management
  - Communicating with the Public

Each reference is also tagged with the type of resource it represents. Resource types are:

- Literature or Online Resource
- Sample Document or Agreement
- Standards Effort or Software Tool
- Organization

- Data Set

“Standards efforts “and “software tools” are grouped together because standards efforts almost always include software tools that support their implementation and use.

## Guide Organization

This guide is organized into modules so that the reader can easily locate the specific sections relevant to their topics of interest. The next section provides a brief discussion of each topic area. Section 3, the primary section of the guide, contains a reference sheet for each resource. The reference sheet identifies the title and author, the type of resource, where to obtain it, the topic areas covered, a short summary of the content, as well as a more detailed description. In some cases, links to additional, closely related resources are also provided. The section begins with a set of tables listing all the resources for each of the seven topics:

- Table 2 provides resources for the Application Topic of Operations
- Table 3 provides references for the Application Topic of Planning and Analysis
- Table 4 provides references for the Application Topic of Enforcement
- Table 5 provides references for the Cross-Cutting Practice Topic of Data Sharing Policies and Practices
- Table 6 provides references for the Cross-Cutting Practice Topic of Use of Third Parties for Data Management

- Table 7 provides references for the Cross-Cutting Practice Topic of Communicating with the Public
- Table 8 provides references for the Cross-Cutting Practice Topic of Curb Management

The reader can use these tables to find all the relevant resources for a given topic. For example, if the reader is interested in communicating shared mobility data to the public, the reader would go to [Resources](#) and use Table 7, a copy of which is shown in Table 1. Each entry in the tables is hyperlinked to the corresponding reference sheet for convenient cross-referencing.

**Table 1. Example Resource Cross-Reference Table (for the Topic of Communicating with the Public)**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">Privacy Guide for Cities</a></li> <li>• <a href="#">Mobility Data State of Practice</a></li> <li>• <a href="#">Leveraging Data to Achieve Policy Outcomes</a></li> <li>• <a href="#">Civic Analytics Network Dockless Mobility Open Letter</a></li> <li>• <a href="#">Dockless Open Data</a></li> </ul>	None specific to this topic	<ul style="list-style-type: none"> <li>• <a href="#">General Bikeshare Feed Specification (GBFS)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">New Urban Mobility Alliance (NUMO)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Sample Public Dashboards &amp; Data Sets</a></li> </ul>

## TOPICS

This section provides a summary of each topic and a cross-reference to the resources that contain information on each topic. The two broad topic categories are “applications,” which are the primary reason the data is needed and why it is analyzed, and “cross-cutting practices.”

### Applications

Applications can be further divided into operations, planning & analysis, and enforcement.

#### Operations

This application topic deals with the day-to-day operations of shared mobility services, which includes monitoring and managing the total number of vehicles in operation, vehicle utilization, and identifying under-served or over-served areas. Operational questions that an agency might seek to answer include:

- How does driver pay rate change based on trip type, location, and time of day?

- Where/when are there clusters of vehicles?<sup>1</sup>
- When/where are there not enough vehicles in an area? When/where are there too many?
- How many vehicles are on the street but unavailable due to a maintenance issue or low battery?
- Which parts of the city are ride-hail services and micromobility serving?
- Were dockless micromobility or ride-hail vehicles involved in crashes?

The data that is needed includes:

- The total number of vehicles deployed as well as in-use by each operator
- The distribution of vehicles by geographic area and by time
- The number of trips taken per vehicle per day and their origins and destinations
- Accident reports
- Surveys of user satisfaction

In addition to collecting data *from* service providers, public agencies also need to provide data *to* service providers. Especially for the case of dynamic information, there is a benefit to standardizing and automating this information flow, and the Mobility Data Specification (MDS) is one standard which addresses this need. The types of information that may flow from agencies to service providers include:

- Areas where usage is forbidden
- No parking areas
- Areas with reduced speed regulations
- Preferred parking locations
- Temporary rules to address both planned and unplanned events, as well as emergencies.

However, apart from MDS, there is little other material addressing the information flows from public agencies, and most of the references in this guide only deal with information coming from service providers.

Resources for Operations are indexed by type in Table 2.

### *Planning & Analysis*

This topic deals with issues that are more long term than daily operations, as well as broader topics, such as transportation planning, overall impact on the streets or city, or the impact of micromobility on street design. Some questions that public agencies may seek to answer include:

- What are the impacts on street and sidewalk safety?
- What is the impact on economic development?
- How do ride-hail services and micromobility trips relate to existing transit services?
- Which routes/streets are most commonly used by people on shared micromobility vehicles?
- How efficiently are ride-hail services using our streets?
- What share of total transportation emissions and local air pollution is coming from ride-hail services?
- How do vehicle utilization and pooling relate to congestion by geography?
- How much non-revenue VMT occurs on the street (e.g. Lyft/Uber deadheading or rebalancing dockless micromobility vehicles)?

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<sup>1</sup> Vehicles, particularly micromobility vehicles, are sometimes referred to as “devices” in the literature. The term “vehicle” will be used throughout this guide to refer to all types of shared mobility vehicles/devices, both powered and unpowered, ranging from bicycles and e-scooters through shared automobiles and micro-transit vehicles.



- What is the right price for curb space?

Usage, demand, and trip level data can be used to determine the location of new bike/scooter lanes, determine the location of vehicle parking areas, and allocate curb usage, all of which provide value to the service providers as well as the general community. Another area of interest for most localities is the inter-relationships and interactions between various shared mobility modes and public transit operations, such as the use of shared mobility to address last mile issues or the extent to which shared mobility services competes with transit for usage and ridership. These types of analyses can help service providers demonstrate the value that they are providing to the community.

Along with other data sources, the specific types of data from mobility providers that might be needed include time-dependent origin/destination data, routes taken, trip duration, number of vehicles by service type and status within specified geographic and time boundaries, the number of trips taken per vehicle per day, and parking area usage.

Resources for Planning & Analysis are indexed by type in Table 3.

### *Enforcement*

These types of applications include enforcing both service provider and user compliance with regulations. The two are interrelated, as enforcement policies may hold the service provider responsible for the actions of their users. It may include regulations related to operations in restricted areas, speed violations, parking or riding on sidewalks, and restricted hours of operation.

This topic also includes information needed to calculate any fees due from operators, which may be based on the number of vehicles deployed, the number in use per day, and/or other criteria.

Another important aspect of enforcement and fee collection is verifying the accuracy of provider-provided data with independently measured ground truth data to identify and resolve discrepancies. This can include using check rides, independent observations, and data auditing tools.

Resources for Enforcement are indexed by type in Table 4.

### *Cross-Cutting Practices*

Cross-cutting practices discussed in this section include the following:

- Data sharing policies and practices
- Use of third parties for data management
- Communicating with the public
- Curb management

### *Data Sharing Policies & Practices*

This topic deals with data sharing agreements and policies that public agencies put in place for getting data from shared mobility providers, storing, and using that data, as well as how private and proprietary data will be protected. In some cases, the requirements are included in operating agreements, permits, or licenses, while in other cases they are separate documents incorporated by reference. They may cover items such as what data must be reported, how frequently, and in what format(s), allowed uses for the data, who owns the data, and requirements for privacy protection.

Most of the material available in this area addresses micromobility services, rather than other forms of shared mobility such as TNCs. This came about for a combination of reasons. First, micromobility

services came later, and by that time cities were better prepared and had a better understanding of what information they needed, as well as the legal structures to insist that it be provided. In addition, at the urging of TNCs, several states preempted the ability of local governments to collect data from TNCs. Despite this, TNCs and traditional ride-hailing (taxi) operators may have similar data sharing requirements. For example, Seattle specifies the data that must be collected by Taxicab associations, for-hire vehicle companies and TNCs. The regulations cover what data must be collected, the data retention requirements (two years), and the reporting requirements (quarterly). (City of Seattle, Washington, 2021). Similarly, the California Public Utilities Commission lays out annual reporting requirements for TNCs (California Public Utilities Commission, 2021) and the New York City Taxi and Limousine Commission (TLC) requires regular reporting by both TNCs and ride-hailing companies (NYC Taxi and Limousine Commission, 2021).

Resources for Data Sharing Policies and Practices are indexed by type in Table 5.

### *Use of Third Parties for Data Management*

This topic is closely related and overlaps with the Data Sharing Policies & Practices topic but is distinct enough to warrant being called out into a separate topic.

Third parties are hired by the public agency. They have experience working in multiple cities and with multiple service providers, enabling them to often have a better understanding of the issues relating to data than a public agency. These third parties can audit data provided by operators and ensure that consistent definitions are used for reporting. The use of third parties to obtain, store, and analyze shared mobility data is also one method for resolving the tensions between providing adequate information for public agencies to perform their functions while ensuring adequate protection of private and proprietary information. Public agencies have a legitimate need for data to effectively plan their transportation systems, to develop regulations for the best use of shared mobility, and to enforce those regulations. Some of this analysis requires the use of the type of trip-specific information that raises privacy concerns. At the same time, the collection, storage, and use of such data by public agencies raises multiple legitimate concerns. Some agencies, especially smaller ones, may simply lack the specific skills and resources needed to effectively manage and analyze the large volumes of data. In addition, some datasets, such as trip-specific data, raise privacy concerns, requiring special handling, for which requirements sometimes come into conflict with existing state freedom of information laws. This occurs because location-specific data, while not itself Personally Identifiable Information (PII), can often be combined with other public data to enable re-identification, and thereby reveal sensitive information about individual activities. Some existing state laws do not adequately protect such data from freedom of information requests or other types of disclosure. Finally, the mobility providers themselves are rightfully protective of their proprietary data as well as their customer's privacy and see risks with sharing data with public sector agencies since disclosure to competitors could harm their business. Care must be taken even with aggregate data to ensure that it cannot be disaggregated (e.g., if there are only two providers for a given service type).

One approach for dealing with these issues is for an agency to contract with a trusted third-party to manage and analyze the data. These third parties receive raw data from mobility providers but do not provide the raw data to government agencies or to any other organizations. They securely store whatever data needs to be kept and conduct the analyses that public agencies need to manage mobility providers. The public agencies receive the results of the analyses along with anonymous aggregated data. There are currently non-profit, universities, and private, for-profit corporations providing these services.

Resources for Use of Third Parties for Data Management are indexed by type in Table 6.

### *Communicating with the Public*

This sub-topic covers the use of information to communicate with the public as well as elected government officials, community groups, and researchers. This may include publishing real-time availability data for various services as well as providing aggregated data, dashboards, and reports that show how shared mobility services are being used throughout their jurisdiction. This topic also includes collecting, investigating, and resolving resident complaints, related to operations, parking, speeding, etc., and may include the use of user surveys to collect information from the public.

Resources for Communicating with the Public are indexed by type in Table 7.

### *Curb Management*

Curb management and the geo-tagged digitization of curb usage and regulations is a topic of growing importance for towns and cities. Its applications are far broader than shared mobility, but because of its important role within shared mobility it has been included as a topic.

Curb space is a limited resource with increasing demands for use as pick up and drop off space for both people and goods, scooter corrals, and other uses. Multiple communities are digitizing the data associated with curb rules as well as fees that some communities are beginning to charge for curb access. The data includes the geo-referenced rules and regulations applying to various sections of curb in a municipality, as well as to pricing of curb access, whether for parking, pick-up and drop-off, or the delivery of freight.

One example is Los Angeles' *Code the Curb* initiative, which was launched in 2016 (LADOT, 2020). Code the Curb provides a digital, geo-coded reference for all the city's traffic signs, painted curbs, and other regulatory tools. Private sector and non-profit entities are also working in this area. SharedStreets, for example, has created CurbLR, a proposed standard for describing curb regulations such as those in the Code the Curb initiative (SharedStreets, 2020). Coord, a spinoff of Sidewalk Labs, is creating Open Curbs, which, in addition to regulatory information, maps curb-related infrastructure, such as wheelchair cuts, bus stops, and other physical assets (Coord, 2020). CurbFlow is another startup that works with public agencies and delivery operators to better manage, coordinate, and schedule curb access (curbFlow, 2020). CurbFlow had or is currently conducting pilot programs in several cities, including Washington, DC and Columbus, Ohio. The Open Mobility Foundation has also begun to look at developing a common specification as part of MDS for digitized curb data and is coordinating with both SharedStreets and Coord (Open Mobility Foundation, 2020) amongst numerous other public agency and private sector stakeholders.

Resources for Curb Management are indexed by type in Table 8.

## RESOURCES

This section provides short descriptions of each resource, including its title and author, the type of resource, where to obtain it, the topic areas covered, and a short summary of the content. In some cases, links to additional related resources are also provided.

### *Cross Reference for all Topics and Resources*

Tables 1 through 7 provide a cross-reference between all topics, resource type, and resources included in this section. A resource often covers multiple topics; hence, it may be listed more than once in the

tables. Each entry in the tables is hyperlinked to the corresponding reference sheet for convenient cross-referencing.

**Table 2. Table of References for the Topic of Operations Indexed by Document Type**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">Data Sharing Glossary and Metrics for Shared Micromobility</a></li> <li>• <a href="#">Leveraging Data to Achieve Policy Outcomes</a></li> <li>• <a href="#">A Practical Guide to Mobility Data Sharing and Cities</a></li> <li>• <a href="#">Objective-Driven Data Sharing for Transit Agencies in Mobility Partnerships</a></li> <li>• <a href="#">Managing Mobility Data</a></li> <li>• <a href="#">Protecting Rider Privacy in Micromobility Data</a></li> <li>• <a href="#">Effectively Managing Connected Mobility Marketplaces</a></li> <li>• <a href="#">Charlotte Takes E-Scooter Data for a Test Ride</a></li> <li>• <a href="#">CDS-M Use Case: From Policy Needs to Use Cases</a></li> </ul>	None specific to this topic	<ul style="list-style-type: none"> <li>• <a href="#">Mobility Data Specification (MDS)</a></li> <li>• <a href="#">General Bikeshare Feed Specification (GBFS)</a></li> <li>• <a href="#">Mobility Metrics</a></li> <li>• <a href="#">Open Curbs</a></li> <li>• <a href="#">CurbLR</a></li> <li>• <a href="#">SharedStreets Referencing System</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Mobility Data Collaborative (MDC)</a></li> <li>• <a href="#">New Urban Mobility Alliance (NUMO)</a></li> </ul>	None specific to this topic, though some may contain data elements useful for analyzing operations

**Table 3. Table of References for the Topic of Planning and Analysis Indexed by Document Type**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">Data Sharing Glossary and Metrics for Shared Micromobility</a></li> <li>• <a href="#">Leveraging Data to Achieve Policy Outcomes</a></li> <li>• <a href="#">A Practical Guide to Mobility Data Sharing and Cities</a></li> <li>• <a href="#">Objective-Driven Data Sharing for Transit Agencies in Mobility Partnerships</a></li> <li>• <a href="#">Managing Mobility Data</a></li> <li>• <a href="#">Protecting Rider Privacy in Micromobility Data</a></li> <li>• <a href="#">Uber Movement</a></li> <li>• <a href="#">Effectively Managing Connected Mobility Marketplaces</a></li> <li>• <a href="#">Charlotte Takes E-Scooter Data for a Test Ride</a></li> <li>• <a href="#">Using Micro-Mobility Data to Drive Transportation Policy and Investments in Greater Boston</a></li> <li>• <a href="#">CDS-M Use Case: From Policy Needs to Use Cases</a></li> </ul>	None specific to this topic	<ul style="list-style-type: none"> <li>• <a href="#">Mobility Data Specification (MDS)</a></li> <li>• <a href="#">General Bikeshare Feed Specification (GBFS)</a></li> <li>• <a href="#">Mobility Metrics</a></li> <li>• <a href="#">Open Curbs</a></li> <li>• <a href="#">CurbLR</a></li> <li>• <a href="#">SharedStreets Referencing System</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Mobility Data Collaborative</a></li> <li>• <a href="#">New Urban Mobility Alliance (NUMO)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Uber Movement</a></li> </ul>

**Table 4. Table of References for the Topic of Enforcement Indexed by Document Type**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">Leveraging Data to Achieve Policy Outcomes</a></li> <li>• <a href="#">A Practical Guide to Mobility Data Sharing and Cities</a></li> <li>• <a href="#">Managing Mobility Data</a></li> <li>• <a href="#">Protecting Rider Privacy in Micromobility Data</a></li> <li>• <a href="#">Effectively Managing Connected Mobility Marketplaces</a></li> <li>• <a href="#">CDS-M Use Case: From Policy Needs to Use Cases</a></li> </ul>	None specific to this topic	<ul style="list-style-type: none"> <li>• <a href="#">Mobility Data Specification (MDS)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">New Urban Mobility Alliance (NUMO)</a></li> </ul>	None specific to this topic, though some may contain data elements useful for enforcement

**Table 5. Table of References for the Topic of Data Sharing Policies and Practices Indexed by Document Type**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">A Practical City Guide to Mobility Data Licensing</a></li> <li>• <a href="#">Micromobility Data Policies: A Survey of City Needs</a></li> <li>• <a href="#">Data Sharing Glossary and Metrics for Shared Micromobility</a></li> <li>• <a href="#">Guidelines for Mobility Data Sharing Governance and Contracting</a></li> <li>• <a href="#">Privacy Guide for Cities</a></li> <li>• <a href="#">Mobility Data State of Practice</a></li> <li>• <a href="#">Urgent Privacy Concerns with City's Decision to Collect Traveler Mobility Location Information</a></li> <li>• <a href="#">A Practical Guide to Mobility Data Sharing and Cities</a></li> <li>• <a href="#">Civic Analytics Network Dockless Mobility Open Letter</a></li> <li>• <a href="#">Brief for Justin Sanchez and Eric Alego v. Los Angeles</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Shared Mobility Data Sharing Specifications Policy</a></li> <li>• <a href="#">Business Regulations: Transportation Network Companies: Data Reporting</a></li> <li>• <a href="#">Required Reports TNCs Must Provide the CPUC</a></li> <li>• <a href="#">LADOT Data Protection Principles</a></li> <li>• <a href="#">Shared Electric Scooters Permit Application &amp; Administrative Rules for Shared Electric Scooters</a></li> <li>• <a href="#">Director Rules for Deployment and Operation of Shared Small Vehicle Mobility Systems</a></li> <li>• <a href="#">Data Sharing Section of Minneapolis, Minnesota's Licensing Agreement</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Mobility Data Specification (MDS)</a></li> <li>• <a href="#">General Bikeshare Feed Specification (GBFS)</a></li> <li>• <a href="#">Mobility Metrics</a></li> <li>• <a href="#">Open Curbs</a></li> <li>• <a href="#">CurbLR</a></li> <li>• <a href="#">SharedStreets Referencing System</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Mobility Data Collaborative (MDC)</a></li> <li>• <a href="#">Open Mobility Foundation (OMF)</a></li> <li>• <a href="#">SharedStreets</a></li> <li>• <a href="#">UW Transportation Data Collaborative (TDC)</a></li> <li>• <a href="#">Commercial Software as a Service (SaaS) Third Party Data Management Providers</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Uber Movement</a></li> <li>• <a href="#">Sample Public Dashboards &amp; Data Sets</a></li> </ul>



Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<a href="#">Department of Transportation and the City of Los Angeles</a> <ul style="list-style-type: none"> <li>• <a href="#">Objective-Driven Data Sharing for Transit Agencies in Mobility Partnerships</a></li> <li>• <a href="#">Mobility Data Methodology and Analysis</a></li> <li>• <a href="#">Dockless Open Data</a></li> <li>• <a href="#">Managing Mobility Data</a></li> <li>• <a href="#">Shared Mobility Data: A Primer for Oregon Communities</a></li> <li>• <a href="#">Shared Mobility Data Sharing: Opportunities for Public-Private Partnerships</a></li> <li>• <a href="#">Protecting Rider Privacy in Micromobility Data</a></li> <li>• <a href="#">Prioritizing Privacy When Using Location in Apps</a></li> <li>• <a href="#">Uber Movement</a></li> <li>• <a href="#">Using Micro-Mobility Data to Drive Transportation Policy and Investments in Greater Boston</a></li> </ul>				

**Table 6. Table of References for the Topic of Use of Third Parties for Data Management Indexed by Document Type**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">A Practical City Guide to Mobility Data Licensing</a></li> <li>• <a href="#">Guidelines for Mobility Data Sharing Governance and Contracting</a></li> <li>• <a href="#">Privacy Guide for Cities</a></li> <li>• <a href="#">Mobility Data State of Practice</a></li> <li>• <a href="#">A Practical Guide to Mobility Data Sharing and Cities</a></li> <li>• <a href="#">Civic Analytics Network Dockless Mobility Open Letter</a></li> <li>• <a href="#">Objective-Driven Data Sharing for Transit Agencies in Mobility Partnerships</a></li> <li>• <a href="#">Shared Mobility Data Sharing: Opportunities for Public-Private Partnerships</a></li> <li>• <a href="#">Charlotte Takes E-Scooter Data for a Test Ride</a></li> </ul>	None	While standards and tools may be used by public and/or private agencies, none that relate specifically to the interface between public agencies and 3 <sup>rd</sup> parties providing data management as a service.	<ul style="list-style-type: none"> <li>• <a href="#">SharedStreets</a></li> <li>• <a href="#">Mobility Data Collaborative (MDC)</a></li> <li>• <a href="#">UW Transportation Data Collaborative (TDC)</a></li> <li>• <a href="#">Commercial Software as a Service (SaaS) Third Party Data Management Providers</a></li> </ul>	None that relate specifically to the exchange of data between public agencies and 3 <sup>rd</sup> parties providing data management as a service.

**Table 7. Table of References for the Topic of Communicating with the Public Indexed by Document Type**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">Privacy Guide for Cities</a></li> <li>• <a href="#">Mobility Data State of Practice</a></li> <li>• <a href="#">Leveraging Data to Achieve Policy Outcomes</a></li> <li>• <a href="#">Civic Analytics Network Dockless Mobility Open Letter</a></li> <li>• <a href="#">Dockless Open Data</a></li> </ul>	None specific to this topic	<ul style="list-style-type: none"> <li>• <a href="#">General Bikeshare Feed Specification (GBFS)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">New Urban Mobility Alliance (NUMO)</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Sample Public Dashboards &amp; Data Sets</a></li> </ul>

**Table 8. Table of References for the Topic of Curb Management Indexed by Document Type**

Literature & Online Resources	Sample Documents & Agreements	Standards Efforts & Software Tools	Organizations	Data Sets
<ul style="list-style-type: none"> <li>• <a href="#">A Practical Guide to Mobility Data Sharing and Cities</a></li> <li>• <a href="#">Effectively Managing Connected Mobility Marketplaces</a></li> </ul>	None specific to this topic	<ul style="list-style-type: none"> <li>• <a href="#">Open Curbs</a></li> <li>• <a href="#">CurbLR</a></li> <li>• <a href="#">SharedStreets Referencing System</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Open Mobility Foundation (OMF)</a></li> <li>• <a href="#">SharedStreets</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Open Curbs</a></li> </ul>

## Literature or Online Resources

This section contains articles and websites that provide information on shared mobility data management. The resources, ranging from short articles or summaries, to extensive guides, include:

- [A Practical City Guide to Mobility Data Licensing](#)
- [Micromobility Data Policies: A Survey of City Needs](#)
- [Data Sharing Glossary and Metrics for Shared Micromobility](#)
- [Guidelines for Mobility Data Sharing Governance and Contracting](#)
- [Privacy Guide for Cities](#)
- [Mobility Data State of Practice](#)
- [Leveraging Data to Achieve Policy Outcomes](#)
- [Urgent Privacy Concerns with City's Decision to Collect Traveler Mobility Location Information](#)
- [A Practical Guide to Mobility Data Sharing and Cities](#)
- [Civic Analytics Network Dockless Mobility Open Letter](#)
- [Brief for Justin Sanchez and Eric Alejo v. Los Angeles Department of Transportation and the City of Los Angeles](#)
- [Objective-Driven Data Sharing for Transit Agencies in Mobility Partnerships](#)
- [Mobility Data Methodology and Analysis](#)
- [Dockless Open Data](#)
- [Managing Mobility Data](#)
- [Shared Mobility Data: A Primer for Oregon Communities](#)
- [Shared Mobility Data Sharing: Opportunities for Public-Private Partnerships](#)
- [Protecting Rider Privacy in Micromobility Data](#)
- [Prioritizing Privacy When Using Location in Apps](#)
- [Uber Movement](#)
- [Using Micro-Mobility Data to Drive Transportation Policy and Investments in Greater Boston](#)
- [Effectively Managing Connected Mobility Marketplaces](#)
- [Charlotte Takes E-Scooter Data for a Test Ride](#)

# A Practical City Guide to Mobility Data Licensing

**Author:** Jascha Franklin-Hodge **Date:** May 2019

**URL:** <https://www.remix.com/blog/a-practical-city-guide-to-mobility-data-licensing>

**Description:** Short online article

## Summary

The article provides guidance, from a public agency's perspective, on drafting data sharing agreements. Topics covered include types of licenses, considerations regarding the right to further share data, and integration with data from other sources. The author is the former Chief Information Officer for the City of Boston and is currently the Executive Director of the Open Mobility Foundation.

The document does not provide specific language for agreements, but rather, it provides specific recommendations on what should be considered for inclusion in any agreement, as well as what should be avoided, presented on a topic-by-topic basis.

It is an excellent resource for identifying what public agencies should and should not include when drafting, reviewing, or entering into any sort of shared mobility data sharing agreement with private sector mobility providers, as well as why each is important.

## Additional Details

The recommendations are divided into three major parts, each of which includes several focus areas. The article discusses the various types of licenses and recommends that data sharing agreements should be either embedded in permit agreements or incorporated by reference. It also recommends the use of a standard agreement with all providers, rather than negotiating different agreements with each provider. Other topics discussed include, but aren't limited to:

- Rights of use
- Access to raw vs. pre-aggregated data
  - Ability to share data with other public agencies, third party data management organizations, and the public
- Integration with other data sets
- Requirements on the public agency to adequately protect the data
- Privacy protection
- Relations of the data to state level Freedom of Information laws
- Liability issues

## Additional Resources

*An Updated Practical City Guide to Mobility Data Licensing*, Tiffany Chu and Rachel Zack, <https://www.remix.com/blog/an-updated-practical-city-guide-to-mobility-data-licensing>, August 22, 2019.

### Topic Area(s):

Data Sharing Policies & Practices  
Use of Third Parties for Data Management

### Resource Type:

Literature or Online Resource

# Micromobility Data Policies: A Survey of City Needs

**Author:** Charlie Bailey

**Date:** October 2018

**URL:** <https://remix.docsend.com/view/8sw4wj7>

**Description:** 10-page survey of data sharing policies across multiple U.S. cities.

## Summary

### Topic Area(s):

Data Sharing Policies & Practices

### Resource Type:

Literature or Online Resource

The author surveyed the data sharing policies of over a dozen cities, including Nashville, Chicago, Santa Monica, San Francisco, Pittsburgh, Austin, and Dallas. Some of these cities had pilot programs, some post-pilot operational programs, and one had an emergency data sharing rule in place.

Based on the survey results, the author identified four major findings:

- Universal agreement on the need for trip data and fleet availability data
- A wide range of requirements regarding the frequency of data reporting
- Multiple approaches for handling customer feedback information
- The need for formal data sharing agreements

Note that at the time the survey was conducted, MDS was a newly emerging standard being developed by LADOT. The subsequent widespread adoption of MDS may change some of the findings.

## Additional Details

The report includes a comprehensive table of 12 cities and the types of data collected by each city (trips, fleet, customer survey, parking, maintenance, safety/incidents, and data validation). All 12 cities required trip data, and 11 of the 12 required fleet data. Only two specifically addressed data validation.

For trip and fleet data, the report provides details, walking through an overview of the findings, why the data type is important, and how it is being collected across the surveyed cities. The results for the other data types are covered more briefly. In addition, there is a good discussion on reporting frequency and the use of APIs vs. static, periodic reports. Since the report was published, the widespread adoption of MDS makes the case for APIs even stronger than what is included in the report.

# Data Sharing Glossary and Metrics for Shared Micromobility

**Author:** Mobility Data Collaborative

**Date:** April 2020

**URL:**

<https://www.sae.org/standards/content/mdc00002202004/>

**Description:** As stated in the document’s introduction, it “provides a consensus-based set of definitions for terms and metrics that are commonly used. It outlines key vehicle, trip, and geospatial definitions and metrics to reduce discrepancies in the terminology used across jurisdictions and sectors and allow public agencies to clarify policies related to shared micromobility.”

**Topic Area(s):**

Data Sharing Policies & Practices  
Operations  
Policy & Analysis

**Resource Type:**

Literature or Online Resource

## Summary

The 19-page document focuses on vehicle and trip level data. It provides standardized, often hierarchical, definitions of terms as well as vehicle-based and trip-based performance metrics and standardized methods for calculating these metrics.

## Additional Details

The definitions are short English text descriptions. For example, a vehicle is “a motorized or human-powered vehicle could include an automobile, motorcycle, (e-)bike, e-scooter, or moped that is used for transportation.” At the highest level, a vehicle may be in “Deployed,” “Removed,” or “Unknown” status. Deployed Vehicles may be “Operational” or “Non-Operational”. Operational Vehicles may be “In-Use” or “Available.” Both “Available” and “Non-Operational” vehicles are in the “Idle” state.

To fully define vehicle and trip terms, several geographic (e.g., “Service Area,” “Waypoint”) and time related (e.g., “Available Time,” “Operational Time”) terms are also defined.

The document then defines many vehicle and two trip-based performance metrics, along with mathematical formulas for how they should be calculated. For example, the average number of vehicles of a specified status in a specified geographic area over a specified time period is given as:

$$avg_{ve} = \frac{\sum_i^T veh_i}{T}$$

Where:

- $avg_{veh}$  = average number of vehicles of a specified status
- $veh_i$  = number of vehicles of a specified status at  $i$
- $i$  = sampling frequency (e.g., time units in minutes)
- $T$  = time period of interest (i.e., total number of  $i$  samples)

# Guidelines for Mobility Data Sharing Governance and Contracting

**Author:** Mobility Data Collaborative

**Date:** April 2020

**URL:**

<https://www.sae.org/standards/content/mdc00001202004/>

**Description:** Recommended guidelines for data sharing.

**Summary**

Recommended guidelines for data sharing that consider the goals of both public agencies and mobility service providers, as well as the need to protect consumer privacy.

This resource is a short (10 page) document intended to be used as discussion input when formulating specific agency policies and agreements, and to be used across disciplines (e.g., planning, legal, policy, data, and information system professionals).

**Additional Details**

The document lays out 10 guidelines, defines each guideline's objective, and provides actionable recommendations to which all parties should commit. The discussion, however, is at a rather high level as opposed to including specifics. The guidelines are:

1. Address benefits and challenges associated with mobility data sharing
2. Evaluate consumer-facing risks through standard impact assessments
3. Consider anonymization and de-identification techniques for mobility data sharing
4. Engage consumer groups in conversations around privacy and mobility data
5. Establish data governance frameworks to support mobility data sharing
6. Determine and incorporate appropriate role of third parties around management and analysis of mobility data
7. Develop a consistent approach to open records requests
8. Develop policies for compliance with law enforcement requests
9. Allocate resources for training on applicable laws and best practices for safeguarding data
10. Develop workable liability frameworks to mitigate risks

**Topic Area(s):**

Data Sharing Policies & Practices  
Use of Third Parties for Data Management

**Resource Type:**

Literature or Online Resource



# Privacy Guide for Cities

**Author:** Open Mobility Foundation      **Date:** September 15, 2020

**URL:** <https://github.com/openmobilityfoundation/governance/blob/main/documents/OMF-MDS-Privacy-Guide-for-Cities.pdf>

**Description:** A 14-page guide to aid cities in developing policies and procedures for managing sensitive mobility data, particularly data collected using the Mobility Data Specification (MDS)

## **Topic Areas(s):**

Data Sharing Policies & Practices  
Use of Third Parties for Data Management  
Communicating with the Public

## **Resource Type:**

Literature or Online Resource

## **Summary**

While MDS data, as well as most shared mobility data collected by public agencies contains data about vehicles, not individuals, there are risks that this data could, in combination with other data, be used to re-identify individual users and violate their privacy.

This Guide provides specific recommendations on factors, policies, and techniques to consider for protecting privacy.

## **Additional Details**

After explaining why MDS and similar shared mobility data should be considered sensitive, the guide then addressed five major topics, most of which are further broken down into subtopics:

- Planning Your Implementation
  - Identify Your Use Cases
  - Review Applicable Laws and Regulations
  - Assess Your Readiness
  - Consider a Mobility Data Solution Provider
  - Provide for Transparency
- Managing Risk
  - Minimization
  - Retention
  - Access Controls
  - Obfuscation and Aggregation
- Working with Mobility Service Providers
- Sharing MDS Data
  - Sharing Through Open Data Portals
  - Sharing with Mobility Data Solution Providers
  - Sharing with Academic Institutions or Researchers
  - Sharing with Other Agencies
- Disclosure Based on Public Records Requests

# Mobility Data State of Practice

**Author:** Open Mobility Foundation

**Date Accessed:** January 26, 2021

**URL:** <https://github.com/openmobilityfoundation/privacy-committee/blob/main/products/state-of-the-practice.md>

**Description:** A set of links to policy and technical resources relating to handling and protection of shared mobility data

## Summary

This document provides a collection of links to diverse resources organized by topic. These include samples of data licensing and policy documents from various localities, guidance and methodology guides, open source software, risk assessment documents, open mobility data sets, guides for publishing mobility data, and data visualizations.

### Topic Areas(s):

Data Sharing Policies & Practices  
Use of Third Parties for Data Management  
Communicating with the Public

### Resource Type:

Literature or Online Resource

## Additional Details

The document provides a wide-ranging categorized list of resources, some of which are included in this Resource Guide, but many of which are not. The content ranges from sample policies, e.g., the *LADOT Data Protection Principles*, to sample permit requirements (e.g., Louisville, Kentucky's *Dockless Vehicle Policy*) to data protection methodologies (ranging from Minneapolis, Minnesota's mobility-specific *Mobility Data Methodology and Analysis* to NIST's general *De-Identification of Personal Data*), to open source software (e.g., the *MDS Provider Toolkit*), and more, including a half dozen open mobility data sets, guides for publishing mobility data, and examples of data visualizations. Unlike this guide, the list only identifies the source and title, without any descriptions. The categories of resources are:

- Privacy Principles, Policies, and Guidelines
- Permit & Licensing Requirements
- Data Sharing
- Data Processing, Aggregation, and Anonymization
- Risk Assessment
- Open Data
- Data Visualization
- Outreach and Education

# Leveraging Data to Achieve Policy Outcomes

**Author:** New Urban Mobility Alliance

**Date Accessed:** March 2, 2021

**URL:** <https://policydata.numo.global/>

**Description:** This document is an interactive web-based tool for cities to evaluate micromobility services against policy goals that foster safe, sustainable, and equitable communities. It addresses equity, safety, environmental, and usage outcomes.

## Summary

A tool for identifying metrics addressing equity, safety, environment, and usage. The document defines outcomes, metrics for each outcome, the data that is required for each metric, and data source.

## Additional Details

The guide covers metrics for a dozen outcomes:

- Access to Necessities
- Access to Platforms
- Access to Vehicles
- Safety
- Infrastructure
- Observation and Enforcement
- Vehicle Condition
- Environment
- Operations
- Lifespan
- General Usage
- Education

Each outcome has a short definition, one or more questions to answer to assess the outcome measure, and then evaluation, policy, and equity metrics that relate to each question. The data required for each specific metric is then identified. For example, one question under the Access to Vehicles outcome is “How far does the average user have to travel to find a vehicle?” A policy metric associated with that question is the “Percentage distribution coverage (total area covered by a quarter-mile radius around each vehicle divided by the total service area). A goal might be “50% coverage 75% of the time.” The data required would be:

- device\_id
- service area spatial file
- neighborhood spatial file
- event\_type
- event\_time
- event\_location
- event\_type\_reason

All but the two spatial files are data that is specified in the Mobility Data Specification. The spatial data is expected to be found in a locality’s open data.

## Additional Resources

*Micromobility & Your City: Leveraging Data to Achieve Policy Outcomes Webinar*, NUMO and the Mobility Data Collaborative, <https://www.numo.global/resources/micromobility-your-city-leveraging-mobility-data-achieve-policy-outcomes-webinar>, July 6, 2020.

### Topic Area(s):

Planning and Analysis  
Operations  
Enforcement  
Communicating with the Public

### Resource Type:

Literature or Online Resource

# Urgent Privacy Concerns with City’s Decision to Collect Traveler Mobility Location Information

**Author:** Center for Democracy & Technology

**Date:** March 20, 2020

**URL:** <https://cdt.org/wp-content/uploads/2020/03/2020-03-20-CDT-Letters-to-DDOT-LADOT-regarding-mobility-data.pdf>

**Topic Area(s):**

Data Sharing Policies & Practices

**Resource Type:**

Literature or Online Resource

**Description:** Two letters from the Center for Democracy and Technology, one to the Washington DC Department of Transportation (DDOT) and the other to the Los Angeles Department of Transportation, raising privacy issues and concerns with data provided using the Mobility Data Specification (MDS).

## Summary

The first letter expresses concerns over DDOT’s decision to require trip reporting via MDS and to require that the data be reported in near real-time. The letter references the second letter to LADOT, which goes into much more detail, with references, over the privacy concerns raised by the collection of detailed trip-level data and makes specific policy recommendations.

## Additional Details

The first letter cites the U.S. Supreme Court’s finding that time-stamped location data “provides an intimate window into a person’s life, revealing not only his particular movements, but through them his ‘familial, political, professional, religious, and sexual associations.’” It urges that DDOT meet its needs for planning data using aggregated data.

The second letter acknowledges LADOT’s recognition that the data collected via MDS should be classified as “confidential” data under the City’s Information Handling Guidelines but calls on LADOT to be more specific into how the data will be safeguarded, including data retention policies, the uses that will be made for the data, and how access will be controlled.

The letter cites specific examples, with references, on how confidential location-specific data can and have been misused and explains why the trip data raises serious privacy concerns. The letter then lays out specific privacy policy recommendations for the city to consider.

# A Practical Guide to Mobility Data Sharing and Cities

**Author:** Populus

**Date:** May 2020

**URL:** <https://www.populus.ai/white-papers/mobility-data>

**Description:** This 20-page guide identifies several use cases and the data needed for these use cases, current methods for data sharing and analysis, and data privacy challenges.

## Summary

The paper provides a good high-level introduction and overview of all the major topics related to the use of shared mobility data.

## Additional Details

The paper discusses the following use cases:

- Operations
  - Utilization rates
- Planning and Analysis
  - Equity analysis, such as allocations to low income neighborhoods, usage in such areas, and the impacts of subsidizing the cost of rides
  - Parking needs for shared mobility services, e.g., heat maps of vehicle parking events can identify where micromobility “corrals” are needed
  - Trip path data can identify where bike lanes or “slow street” policies are most needed
  - Input to curb management policies and regulations for specific areas of the curb
- Enforcement
  - Monitoring that each operator’s fleet size stays within the cap for that fleet
  - Adherence to geographic service restrictions
  - Addressing complaints about inappropriately parked or broken vehicles.

The data sharing and analysis section describes the GBFS and MDS standards and discusses the impact of the change made to GBFS to rotate or remove vehicle IDs, improving customer privacy but reducing the ability of the feeds to meet certain analytic use cases.

The discussion of MDS includes some of the real-world issues that were identified in using MDS data to meet certain use cases and the changes that were recently made to MDS to address these issues.

The report ends with a brief discussion of some of the privacy regulations that may impact programs, such as Europe’s General Data Protection Regulation (GDPR), the California Consumer Privacy Act (CCPA), and the California Electronic Communication Privacy Act (CalECPA).

### Topic Areas(s):

Data Sharing Policies & Practices  
Operations  
Planning and Analysis  
Enforcement  
Curb Management  
Use of Third Parties for Data  
Management

### Resource Type:

Literature or Online Resource

# Civic Analytics Network Dockless Mobility Open Letter

**Author:** Civic Analytics Network

**Date:** December 2018

**URL:** <https://datasmart.ash.harvard.edu/news/article/civic-analytics-network-dockless-mobility-open-letter>

**Description:** The document is a short letter authored by chief data officers from 13 urban municipalities laying out recommendations both on dockless mobility policies in general and data policies in particular.

## Summary

The letter provides a set of recommendations for communities that are embarking on micromobility programs. It discusses the types of reporting that should be required, what types of data should be made available to the public, how privacy should be maintained through data aggregation before publishing data, and more general recommendations such as recommendations related to equity, compliance tracking, and the use of surveys. The guidance is specific but not comprehensive.

## Additional Details

Interestingly, this letter recommends against the use of third parties for data management, listing a variety of reasons for this recommendation. This recommendation runs counter to all other guides included in this resource guide that address the topic. All other references recommend that this option be at least be given consideration, depending upon the circumstances of the locality.

The letter includes a link to a public spreadsheet showing the various fees that cities charge dockless mobility service providers, including per vehicle fees, annual fees, application fees, and bonding requirements. As of February 2021, 20 communities were listed. It is not clear how up to date the spreadsheet is, but many of the rows include online links to the original sources.

The letter also recommends considering that service providers be required to distribute a city-designed survey to their users to provide insight into behavior patterns, preferences, and customer satisfaction. The survey used by Portland, Oregon is linked to and recommended as a good model.

## Additional References

Dockless Vehicle Fees, a spreadsheet of vehicle fees by community, assembled by the Civic Analytics Network (<https://docs.google.com/spreadsheets/d/17ftRB4q2gzqMNrldP6ZiP84fpMxl0Zb3XbcsQVSqs-0/>), accessed February 10, 2021.

2018 E-Scooter Pilot User Survey Results, City of Portland, OR., <https://www.portlandoregon.gov/transportation/article/700916>, 2018.

### Topic Area(s):

Data Sharing Policies & Practices  
Use of Third Parties for Data  
Management.

Communicating with the Public

### Resource Type:

Literature or Online Resource

# Brief for Justin Sanchez and Eric Alejo v. Los Angeles Department of Transportation and the City of Los Angeles

**Authors:** Mohammad Tajsar, Jacob Snow, et. al.

**Date:** June 8, 2020

**URL:** <https://www.eff.org/document/sanchez-v-ladot-complaint>

**Description:** The document is a legal brief challenging the legality of LADOT requiring the provision of detailed, location-specific trip data from dockless mobility providers.

## Topic Area(s):

Data Sharing Policies & Practices

## Resource Type:

Literature or Online Resource

## Summary

The brief challenges the legality of this data collection under the 4<sup>th</sup> Amendment to the U.S. Constitution, the California state constitution, and the California Electronic Communications Privacy Act (CalECPA).

The brief is included in this resource guide because it provides an excellent, detailed discussion of the privacy concerns raised by the collection of detailed, location-specific trip data, including numerous references that further demonstrate or discuss these concerns. It is included for its comprehensive discussion of legitimate privacy issues rather than the legal arguments.<sup>2</sup>

## Additional Details

The legal brief explains how location-specific individual trip data can be combined with other, publicly accessible data (such as who lives at a given address or what business is at an address) to reveal both the individual who took the trip and why the trip was taken (e.g., to visit a reproductive health clinic). The brief explains that this data is sensitive regardless of whether it is collected in real-time or provided after the fact.

The brief also provides examples of how such de-anonymized data can harm an individual and examples of where location information has been abused in the past, as when automatic license plate reader information was used by stalkers and domestic abusers.

Citations to research and reports with additional detail are provided.

## Additional Resources

*Justin Sanchez, et al. v. Los Angeles Department of Transportation, et al. Case 2:20-cv-05044-DMG-AFM Document 27*, Judge Dolly M. Gee, [https://drive.google.com/file/d/1YJhqVBxzipOSBy2Z5qgRRphG8\\_sD9fVT/view](https://drive.google.com/file/d/1YJhqVBxzipOSBy2Z5qgRRphG8_sD9fVT/view), Filed 02/23/21.

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<sup>2</sup> In February 2021, this case was dismissed on legal grounds by the judge, who ruled that collecting MDS data did not constitute a search in legal terms, and that even if it did, it was not an unreasonable one. As of June 2021, that ruling is now being appealed (see Additional Resources, above).

# Objective-Driven Data Sharing for Transit Agencies in Mobility Partnerships

**Author:** Shared Use Mobility Center

**Date:** July 2019

**URL:** [https://sharedusemobilitycenter.org/wp-content/uploads/2020/04/SUMC\\_IKA\\_DataSharingforTransitAgencies.pdf](https://sharedusemobilitycenter.org/wp-content/uploads/2020/04/SUMC_IKA_DataSharingforTransitAgencies.pdf)

**Description:** The document is a 25-page white paper intended to support the decision-making of transit agencies that are considering implementing a Mobility on Demand (MOD) or similar integration with private mobility service providers, with a focus on data exchange requirements.

## **Topic Areas(s):**

Data Sharing Policies & Practices  
Use of Third Parties for Data  
Management  
Operations  
Analysis

## **Resource Type:**

Literature or Online Resource

## **Summary**

The paper outlines the types of information transit agencies might need, depending upon the type of project and its objectives. The paper then discusses the challenges that agencies have faced in attempting to obtain the data, including concerns over privacy, proprietary data, security, level of aggregation, data needed for the National Transit Database and to support federal funding, and the capability limitations of the agencies.

The white paper then presents project level, regulatory, and legislative options for overcoming these challenges. It includes a decision tree to aid agencies with sequential decision-making to determine the best approaches based on project type, project objectives, and constraints.

## **Additional Details**

The white paper states that reaching data sharing agreements between the public and private partners was one of the primary challenges of MOD Sandbox projects. Throughout the paper, specific MOD Sandbox projects are discussed as examples for data needs, challenges, and solutions. Much of the content is based on lessons learned from the FTA's MOD Sandbox program.

The decision tree at the end addresses two types of projects: MOD service projects and Multimodal Trip Planning App projects. Project and policy level decisions are identified in the tree, and the advantages and disadvantages of each decision are presented in a table. Decisions include whether to pursue modernizing public record laws, whether to manage data in-house versus using a third party, and whether to establish a common API or pursue individual API agreements with each service provider.

## **Additional Resources**

*Webinar: Objective-Driven Data Sharing for Transit Agencies in Mobility Partnerships*, Shared-Use Mobility Center, <https://learn.sharedusemobilitycenter.org/multimedia/webinar-objective-driven-data-sharing-for-transit-agencies-in-mobility-partnerships/>, July 10, 2019.



# Mobility Data Methodology and Analysis

**Author:** City of Minneapolis, MN    **Date:** October 2018

**URL:** <http://www2.minneapolismn.gov/www/groups/public/@publicworks/documents/webcontent/wcmssp-218311.pdf>

**Description:** The document is a short, 7-page, but detailed description of the methodology followed by Minnesota to manage and analyze data collected as part of a motorized scooter pilot program that ran from July through November in 2018. The focus is on how they protected privacy and minimized any potential use or release of sensitive information through anonymization and aggregation.

## Topic Area(s):

Data Sharing Policies & Practices

## Resource Type:

Literature or Online Resource

## Summary

The license agreements between the city and scooter operators prohibited the city from obtaining any personally identifiable information (PII) and required that service providers put in place good security practices to protect any PII that they collected as part of their operations. The agreements also laid out the city's purpose in collecting the data, how the data was to be provided, what data the city would make publicly available, and what data each provider had to make available to the public.

Although no PII data was collected by the city, location specific trip level data was collected, and this data is potentially re-identifiable. The report describes the methods used by the city to minimize this possibility.

The methodology was developed to be consistent with the Minnesota Government Data Practices Act (<https://www.house.leg.state.mn.us/hrd/pubs/dataprac.pdf>)

## Additional Details

The city used a Python front-end and a Microsoft SQL server to consume and store the data. Server access was restricted, as was access to the API authorization tokens. Analysis and visualizations were done using Python, R, and Tableau.

The paper describes the seven techniques were used to anonymize the data, including:

- Processing all incoming API data in memory using Python. No raw data was stored, only anonymized data.
- The trip IDs sent from MDS, while already hashed into a unique value intended for anonymization, were discarded and a new ID generated to make it more difficult to link back to the providers' data.
- Trip times and locations were binned, and the original trip times and locations discarded.

The report describes several specific issues that arose, such as differing interpretations of standards, the absence of historical data in GBFS (the project did not initially use MDS), and bad data.

The project began using only GBFS data. The MDS standard became available mid-way through the project, and this was incorporated into the data reporting requirements. The specific MDS and GBFS data fields used in the pilot are provided and discussed in the two appendices to the document.

# Dockless Open Data

**Author:** City of Louisville, Kentucky

**Date Accessed:** February 3, 2021

**URL:** <https://github.com/louisvillemetro-innovation/dockless-open-data>

**Description:** The document is a short technical guide covering “how and why cities can convert MDS trip data to anonymized open data, while respecting rider privacy.”

## Summary

The MDS standard does not support collecting personally identifiable information (PII), however it does support collecting detailed trip data that could potentially be combined with other data to re-identify individuals. This guide describes a method for ensuring data collected using MDS is sufficiently anonymized so that it cannot be used for this purpose. The resulting data sets can be published or released via open data requests without fear that individuals can be identified from the data.

## Additional Details

Trip start and end time data is binned into 15-minute increments. The geographic location data is both binned and fuzzed. The data is first binned by truncating the latitude and longitude data to 3 decimal places. The data is then “fuzzed” using a k-anonymity generalization function that groups multiple similar trips together and replaces their individual origins and destinations with the prototypical origin and destination for that group. This fuzzing is only done for trips where there are fewer than 5 trips made between the origin / destination bin pair. The entire process is described in detail, with SQL and other sample code provided and described. The processed data can be seen on Louisville’s public dashboard (<https://cdolabs-admin.carto.com/builder/f57ee92e-09c3-4efd-b7c0-3d561cc9e951/embed>).

The guide also provides links to open data from six other localities, and a general description of how each anonymizes its published data.

## Additional Resources

*Louisville Dockless Trips Dashboard*, City of Louisville, KY, <https://cdolabs-admin.carto.com/builder/f57ee92e-09c3-4efd-b7c0-3d561cc9e951/embed>, accessed February 11, 2021.

*How Chicago Protects Privacy in TNP and Taxi Open Data*, City of Chicago, <http://dev.cityofchicago.org/open%20data/data%20portal/2019/04/12/tnp-taxi-privacy.html>. April 12, 2019.

### Topic Area(s):

Data Sharing Policies & Practices  
Communicating with the Public

### Resource Type:

Literature or Online Resource

# Managing Mobility Data

**Author:** National Association of City Transportation Officials (NACTO) and the International Municipal Lawyers Association (IMLA) **Date:** April 2019

**URL:** [https://nacto.org/wp-content/uploads/2019/05/NACTO\\_IMLA\\_Managing-Mobility-Data.pdf](https://nacto.org/wp-content/uploads/2019/05/NACTO_IMLA_Managing-Mobility-Data.pdf)

**Description:** The authors describe this 14-page document as setting out “principles and best practices for city agencies and private sector partners to share, protect, and manage data to meet transportation planning and regulatory goals in a secure and appropriate manner. While this document focuses mainly on the data generated by ride-hail and shared micromobility services, the data management principles can apply more broadly.”

## Topic Area(s):

Data Sharing Policies & Practices  
Operations  
Planning  
Enforcement

## Resource Type:

Literature or Online Resource

## Summary

The document discusses the challenges of balancing the need for information with providing adequate privacy protection. It has an excellent discussion on how geo-specific trip data can become Personally Identifiable Information (PII), which is why such data needs to be treated as sensitive information.

The document defines and discusses four principles for managing mobility data: Public Good, Protected, Purposeful, and Portable. Specific, actionable best practices for public agencies are provided to put each principle into practice. It then provides additional, more detailed best practices for data governance and data management. The document concludes with examples of the types of questions that public agencies wish to address through the collection of mobility data, broken out into planning, oversight, analysis, and enforcement topics.

## Additional Details

As an example, the Purposeful principle is defined as needing to have clearly defined the types of questions that they are seeking to answer and map their data requests to those needs. Four high-level recommendations are then discussed, including developing an internal capacity to audit the data to ensure its accuracy.

Specific, bulleted examples of best practices, such as “aggregate all geospatial data before committing it to permanent storage” are provided for seven areas: storage, sharing, access, oversight, expanding staff capacity, data aggregation, and common data queries.

## Additional Resources

*Guidelines for Regulating Shared Micromobility (Chapter 5, Mobility Data and User Privacy)*, NACTO, [https://nacto.org/wp-content/uploads/2019/09/NACTO\\_Shared\\_Micromobility\\_Guidelines\\_Web.pdf](https://nacto.org/wp-content/uploads/2019/09/NACTO_Shared_Micromobility_Guidelines_Web.pdf), September 2019

# Shared Mobility Data: A Primer for Oregon Communities

**Author:** Trillium Solutions, Inc.

**Date:** September 2020

**URL:** <https://www.oregon.gov/odot/RPTD/RPTD%20Document%20Library/Shared-Use-Mobility-Data-Primer.pdf>

**Description:** The document is a 37-page primer on data policies and practices for shared mobility systems. While written for Oregon communities the content is applicable to any locality.

**Topic Area(s):**

Data Sharing Policies & Practices

**Resource Type:**

Literature or Online Resource

## Summary

The guide is easy to read and provides an excellent introduction to the topic, while giving specific, actionable advice.

## Additional Details

The guide consists of an executive summary, a glossary of terms, five chapters (Understanding Shared Mobility Data, Policy Development, Collection of Recommended Mobility Data Practices, Summary of Third-Party Data Analysis Tools, and Information Resources), and an appendix that provides sample licensing terms for various types of share mobility services, drawn from across the country.

The first chapter provides a very easy to read and understand explanation of open data specifications, open data, and then describes the roles and capabilities of GBFS and MDS.

The second chapter draws on the decision tree in the [\*Objective-driven Data Sharing for Transit Agencies in Mobility Partnerships\*](#) guide to lay out and define a four-step process for developing data sharing policies: 1) lay the groundwork, 2) establish the purposes for shared mobility data, 3) clearly define the data scope and data protection policies, and 4) draft the data policies. Guidance is provided on each of these steps.

The third chapter goes into some detail on seven recommended practices:

- Strategic Requests for Proposals
- Pilot Programs
- Codified Data Requirements
- Using Open Data Specifications
- User Surveys
- Privacy Risk Assessments
- Using Shared Mobility Data to Manage Sidewalk Space

The fourth chapter contains a unique table of six shared mobility data management dashboard products, including the distinguishing features of each, the cost for some of the products, and examples of locations using each product.

The final chapter briefly describes eight references to investigate for additional information, many of which are also described in this resource guide.

# Shared Mobility Data Sharing: Opportunities for Public-Private Partnerships

**Author:** Rainer Lempert

**Date:** April 23, 2019

**URL:** <https://playbook.t4america.org/data/>

**Description:** The document is a 29-page report written for TransLink, the Vancouver, Canada area's transportation authority to help the agency plan a path forward with respect to developing a data sharing policy and data sharing agreement.

## Topic Areas(s):

Data Sharing Policies & Practices  
Use of Third Parties for Data Management.

## Resource Type:

Literature or Online Resource

## Summary

The document discusses issues associated with data sharing in some detail, including good examples of each. It also presents overviews of the GBFS and MDS standards and the rationale and state of the practice at the time for 3<sup>rd</sup> party data management. The report concludes with a set of specific recommendations and options for Translink to consider.

The shared mobility data sharing environment is evolving rapidly. Although this study is only a couple of years old, it's somewhat negative view of MDS reflects the then-new and not yet widely adapted status of the standard. This has changed over just the past two years. The concerns expressed on the viability of some of the third-party data providers, however, remain accurate as of early 2021.

## Additional Details

The document discusses two major sets of issues with data sharing: the private sector's concerns with sharing their proprietary data and privacy concerns. The report includes several instructive real-world examples of how location data can be re-identified and why the resulting information may reveal sensitive personal information. It describes how bike and scooter sharing services have generally been more willing to share data than TNCs.

The report then introduces the GBFS and MDS data standards, their relationship to one another, their uses, as well as benefits and challenges. MDS has evolved somewhat since the summary provided in this report. The discussion and examples of the challenges with implementing MDS is good, but also dated. For example, it cites Washington DC's initial decision that MDS was too complex to implement, but this decision was changed in 2020, with a new requirement that service providers implement an MDS API for obtaining data.

The report's discussion of SharedStreets provides a good introduction to the ShareStreets Referencing System in addition to discussing its roles as a data aggregator and analytics provider.

# Protecting Rider Privacy in Micromobility Data

**Author:** Tarani Duncan

**Date:** April 23, 2019

**URL:** <https://blog.mapbox.com/protecting-rider-privacy-in-micromobility-data-81f6c93c868e>

**Description:** A brief article describing privacy concerns with detailed trip level data and examples of how aggregated trip data that protects data can be used for operations, planning and analysis, and enforcement.

## Summary

After a brief description of the privacy concerns raised by location-specific trip data, the article talks about how aggregated data can be used to demonstrate the usage and value of bike lanes, identify popular areas for trip origins and destinations to plan micromobility parking and mobility hubs, and to monitor compliance.

## Additional Details

The compliance discussion is further broken out to discuss monitoring out of service vehicles and inspection data, track fleet size, identify vehicles in prohibited areas in real-time, and ensure equitable distribution across their jurisdiction.

## Additional References

### Topic Areas(s):

Data Sharing Policies & Practices  
Operations  
Planning & Analysis  
Enforcement

### Resource Type:

Literature or Online Resource

*Dockless Open Data* (<https://www.ridereport.com/webinar/micromobility-data-security>), Ride Report, April 8, 2020 is a very good introductory webinar to the value of data sharing between providers and public agencies as well as the need for security. It consists of approximately 30 minutes of presentation, including 7 best practices, and 30 minutes of questions and answers

## Prioritizing Privacy When Using Location in Apps

**Author:** Tom Lee

**Date:** January 29, 2019

**URL:** <https://blog.mapbox.com/prioritizing-privacy-when-using-location-in-apps-f31cdec85fc9>

**Description:** This short article that provides five specific recommendations for preserving privacy when dealing with location data, such as that associated with shared mobility trips.

**Topic Area(s):**

Data Sharing Policies & Practices

**Resource Type:**

Literature or Online Resource

### Summary

The article discusses five specific recommendations for any use of location data:

1. De-identification and anonymization. Specific suggestions are to remove any obvious identifiers (vehicle ID may be a linkable identifier in MDS), break trip data down into shorter segments (useful for traffic data, but likely not a viable strategy for many applications of shared mobility data), and discarding the origins and destination end points for trips (again, not a viable strategy for many of the use cases for shared mobility data).
2. Fuzzing and aggregation. Aggregation groups individual trips with some similarity together into larger groups of trips. Fuzzing can shift trip origins or destinations (perhaps by simply truncating the latitude and longitude data), while still maintaining the level of fidelity needed for a specific use case. Both practices are relevant to shared mobility data and are being used today.
3. Encryption of data, both at rest and in transit. Location data should be routinely encrypted, and the process should use widely adopted and vetted libraries. While not discussed in this article,



New York taxi data that had been released under a freedom of information request was deanonymized because a poorly chosen hashing algorithm was used to encrypt the medallion IDs. (Hern, 2014)

4. Access Control. Data access should be limited to those who need it, and procedures put in place for onboarding and offboarding staff who require access.
5. Providing User Choice. This recommendation is partially relevant for shared mobility. It is likely that neither individual users nor service providers will be given a choice about providing data to the public agency, however agencies should make clear and transparent what data will be collected and how it will be used.

**Additional Details**

None.

**Additional References**

**Dockless Open Data** from the City of Louisville goes into detail on how they fuzz and aggregate the shared mobility data they collect, down to the level of code examples. That document is [summarized](#) in this report.

# Uber Movement

**Author:** Uber

**Date Accessed:** February 11, 2021

**URL:** <https://movement.uber.com/>

**Description:** Uber Movement is an initiative undertaken by Uber to publish data sets to aid cities in planning and management.

## Summary

In 2017, Uber Technologies, the largest and best-known Transportation Network Company (TNC), began sharing limited data about their services in some cities through a program called Uber Movement. It provides historical data on average travel times, speeds, and movement for rides provided by Uber. Data are geographically aggregated to preserve privacy. As of February 2021, data is available for 13 Cities in US and 38 other cities throughout the world. The data is historical and updated at most quarterly. (Sivaram, 2020)

The website provides access to download the data (in CSV format), as well as interactive visualizations, tutorials, and case studies.

## Additional Details

Use cases described on their website include using speed data to evaluate the effects of a traffic calming project in Cincinnati, using travel time data, also in Cincinnati, to evaluate access to healthy food options, quantifying the travel times impact of a bridge closure in London, to evaluate travel time changes due to Metrorail shutdowns in Washington D.C., and examining seasonal variations and the impact of special events on travel times in Brussels, Belgium.

In an interview with the authors of this resource guidebook, (Sivaram, 2020) Uber executives described the program as a great learning experience. They described initial reaction from the public sector as very positive and that they found the visualizations compelling. However, public agencies soon identified limitations. The data aggregation is handled by Uber, and the pre-aggregated data that is released often cannot be integrated into regional planning and forecasting models. In addition, by its nature, the data is limited to Uber vehicle movements, which represent at most 12% of vehicles. The data sets are also quite large, and the resources needed by public agencies to manage and analyze the data are significant.

As of 2020, Uber was in the process of rethinking their next steps given the limitations and concerns cited by public agencies, and at the same time, they told us that public agencies are still sorting out what data would be most useful for Uber to provide. In addition to Uber Movement, they have been involved in several other data sharing initiatives, such as the one with SharedStreets and Washington D.C. that is described in the article listed below.

## Additional Resources

*Uber Makes Peace with Cities by Spilling Its Secrets* (<https://www.wired.com/story/uber-nacto-data-sharing/>), Aarian Marshall, April 16, 2018.

### Topic Area(s):

Data Sharing Policies & Practices  
Planning and Analysis

### Resource Type:

Literature or Online Resource  
Data Set

# Using Micro-Mobility Data to Drive Transportation Policy and Investments in Greater Boston

**Author:** Stephen Goldsmith and Matthey Leger

**Date:** February 26, 2020

**URL:** <https://datasmart.ash.harvard.edu/news/article/using-micro-mobility-data-drive-transportation-policy-and-investments-greater-boston>

**Description:** A short article describing the dockless bike share program run by the Boston area Metropolitan Area Planning Council (MAPC) as well as the MAPC's approach to data sharing with Lime, the bike share service provider.

**Topic Areas(s):**

Data Sharing Policies & Practices  
Planning & Analysis

**Resource Type:**

Literature or Online Resource

## Summary

The goal for data sharing was to better understand how dockless bike sharing was being used, and then to use the results to inform policy and investment decisions. After 18 months, MAPC analyzed 300,000 trips covering 380,000 miles.

## Additional Details

The analysis showed that about 20% of trips were on "very high stress roadways" with high traffic volumes, multiple lanes in each direction, and no protected bike lane infrastructure. In many cases, there were few or no alternate routes for these portions of a trip. These results are being used to prioritize infrastructure investments.

Over half of the riders were not primarily bike riders, either not having ridden their own bike in over 30 days or not owning a bicycle. Fifteen percent began or ended at a transit station, indicating that while last mile trips were a significant minority, they were not the primary reason for choosing a bike share. One third of trips began and ended in different localities, showing the importance of coordination across jurisdictions.

The full report on the analyses is available at the link provided below.

## Additional Resources:

*First Miles*, Metropolitan Area Planning Council,

[https://storymaps.arcgis.com/stories/f9c8e9cddc444dd7a47a678158fd3580?utm\\_source=Ash+Center+for+Democratic+Governance+and+Innovation](https://storymaps.arcgis.com/stories/f9c8e9cddc444dd7a47a678158fd3580?utm_source=Ash+Center+for+Democratic+Governance+and+Innovation), November 7, 2019.

# Effectively Managing Connected Mobility Marketplaces

**Author:** Stephen Goldsmith and Matthey Leger

**Date:** February 2020

**URL:** <https://www.innovations.harvard.edu/sites/default/files/connected-mobility-marketplaces.pdf>

**Description:** A 23-page white paper recommending the implementation of data-driven investment and regulatory policies for mobility.

## Summary

The report addresses the policies and regulations that government agencies can put in place to ensure equity, enforce regulations, make investment decisions, plan zoning and land use, and protect sensitive data. The scope of the paper is broader than shared mobility, encompassing transit and freight movement as well.

## Additional Details

The paper is written at a high level, with broad recommendations on the types of policies that should be put in place and the role of data in informing and enforcing these policy decisions. Sections of the paper include:

- Investments in Physical and Digital Infrastructure
- Regulating and Licensing
- Public Safety
- Zoning and Land Use Planning
- Regulating the Digital Realm (specifically, dealing with private apps routing vehicles onto low volume residential streets)
- Advancing Equitable Access
- Public-Private Mobility Partnerships

## Additional Resources

*Moving Beyond Mobility as a Service: Interview with Seleta Reynolds*, Betsy Gardner, <https://datasmart.ash.harvard.edu/news/article/moving-beyond-mobility-service-interview-seleta-reynolds-0>, December 18, 2019.

### Topic Areas(s):

Operations  
Planning & Analysis  
Enforcement  
Curb Management

### Resource Type:

Literature or Online Resource

# CDS-M Use Case: From Policy Needs to Use Cases

**Author:** Amsterdam, Utrecht, Eindhoven, Rotterdam, and The Hague **Date:** March 31, 2021

**URL:** <https://www.polisnetwork.eu/wp-content/uploads/2021/03/Use-cases-G-52.pdf>

**Description:** A 15-page paper that begins to describe the application data needs for the City Data Specification for Mobility (CDS-M), which is under development in the Netherlands

## Topic Areas(s):

Operations  
Planning & Analysis  
Enforcement

## Resource Type:

Literature or Online Resource

## Summary

CDS-M is a proposed alternative or modification to MDS that is under development in the Netherlands. It is intended to address specific European needs, including use of standardized European vehicle classification systems and compliance with the General Data Protection Regulation (GDPR).

This document describes needs for quantitative data from each of the five Dutch cities, so that these can be turned into requirements that the CDS-M standard must address. The use cases are divided into policy, planning, and enforcement use cases.

For each sufficiently defined policy question, the document then provides the purpose of the need, the type of analysis (at an extremely high level), and the specific data that would be required to be provided via the standard.

The report dives deeper into a specific use case in Utrecht. Utrecht is interested in the extent to which shared electric carrier bikes will save on short car trips. The relevant need definitions are mapped to this use case.

## Additional Details

The needs are formatted in the form of “policy questions.” Example of the included use cases include:

- How are the existing parking areas being used and which parking areas need to be enlarged/reduced/removed or made more visible?
- At what places is shared mobility creating nuisance/unsafe situations in the public space?
- Do the vehicles have the correct speed limits built in?

## Additional Resources

*Dutch Cities Develop New Mobility Data Standard*, Polis, <https://www.polisnetwork.eu/news/dutch-cities-develop-new-mobility-data-standard/>, March 31, 2021.

# Charlotte Takes E-Scooter Data for a Test Ride

**Author:** Stephanie Kanowitz

**Date:** February 13, 2020

**URL:** <https://gcn.com/articles/2020/02/13/charlotte-micromobility-data-pilot.aspx>

**Description:** A short article describing Charlotte, North Carolina's e-scooter pilot program and how data is used to make decisions on how to move forward

## Summary

In 2018, the city of Charlotte, NC began an e-scooter pilot program. They used a private 3<sup>rd</sup> party, [Passport](#), to manage and analyze the data. In addition to understanding how much the system was used and how it was being used, they implemented a 6-month trial period of a dynamic pricing system for service providers, rather than a flat per-vehicle charge.

## Additional Details

For the dynamic pricing pilot, the city was divided into different zones with different prices to incentivize access to transit and discourage over-concentration in congested areas. In addition, the fee varied by how long each vehicle was parked.

Hot spot visualizations of the data helped the city determine where scooter corrals should be located.

### Topic Areas(s):

Operations

Planning & Analysis

Use of Third Parties for Data Mgmt.

### Resource Type:

Literature or Online Resource

## Sample Documents or Agreements

This section contains five examples of permitting or license agreement terms that public agencies are using to regulate the exchange of information between shared mobility service providers and public agencies. Some localities include the terms within the general permit or license document, while others use separate agreements related specifically to data sharing that are incorporated by reference. The examples included in this section cover requirements for TNCs and taxi operators, as well as micromobility service providers.

In addition, this section includes the Los Angeles Department of Transportation's (LADOT) Data Protection Principles, which are the principles that LADOT has placed upon themselves to securely handle the data they collect. The section contains the following documents:

- [Business Regulations: Transportation Network Companies: Data Reporting](#) (City of Seattle)
- [Required Reports TNCs Must Provide the CPUC](#) (California Public Utilities Commission (CPUC))
- [LADOT Data Protection Principles](#) (Los Angeles DOT)
- [Shared Electric Scooters Permit Application & Administrative Rules for Shared Electric Scooters](#) (Portland Bureau of Transportation)
- [Director Rules for Deployment and Operation of Shared Small Vehicle Mobility Systems](#) (Austin, TX Transportation Department)
- [Shared Mobility Data Sharing Specifications Policy](#) (City of Indianapolis)
- [Data Sharing Section of Minneapolis, Minnesota's Licensing Agreement](#) (Minneapolis, MN)



# Business Regulations: Transportation Network Companies: Data Reporting

**Author:** City of Seattle

**Date:** Accessed January 2021

**URL:** <http://www.seattle.gov/business-regulations/taxis-for-hires-and-tncs/transportation-network-companies/tnc-companies#datareporting>

**Description:** City regulations

## Summary

City regulations specifying the data collection, maintenance, and reporting requirements for taxicab associations, for-hire vehicle companies and transportation network companies (TNCs)

## Additional Details

The document lays out the following requirements:

“Taxicab associations, for-hire vehicle companies and transportation network companies must compile accurate and complete operational records and keep these records for two years. The records must include:

- The total number of rides provided by each taxi, for-hire vehicle license holder or transportation network company.
- The type of dispatch for each ride (hail, phone, online app, etc.).
- The percentage or number of rides picked up in each ZIP code.
- The pickup and drop off ZIP codes of each ride.
- The percentage by ZIP code of rides that are requested by telephone or applications but do not happen.
- The number of collisions, including the name and number of the affiliated driver, collision fault, injuries, and estimated damage.
- The number of rides when an accessible vehicle was requested.
- Reports of crimes against drivers.
- Records of passenger complaints.
- Any other data identified by the director of the Department of Finance and Administrative Services to ensure compliance.

Records may be maintained electronically.

Data must be reported quarterly to the director of the Department of Finance and Administrative Services. Reports are to be made electronically on [forms](#) provided by the director.”

### Topic Area(s):

Data Sharing Policies & Practices

### Resource Type:

Sample Document or Agreement

# Required Reports TNCs Must Provide the CPUC

**Author:** California Public Utilities Commission (CPUC)    **Date:** Accessed March 3, 2021

**URL:** <https://www.cpuc.ca.gov/General.aspx?id=3989>

**Description:** State regulations

## Summary

This regulation defines the annual data reporting requirements for TNCs. It provides a data dictionary reference and Excel templates for reporting. Numerical reports must be filed in Excel or comma separated value format, while narrative reports must be provided in PDF format.

### Topic Area(s):

Data Sharing Policies & Practices

### Resource Type:

Sample Document or Agreement

## Additional Details

The reporting requirements are extensive, with twenty different report types listed:

- Driver Names & IDs
- Accessibility Report (Confidential)
- Accessibility Report (Public)
- Accessibility Complaints (Confidential)
- Accessibility Complaints (Public)
- Accident & Incidents
- Assaults & Harassments
- 50,000+ Miles
- Number of Hours
- Number of Miles
- Driver Training
- Law Enforcement Citations
- Off-platform Solicitation
- Aggregated Requests Accepted
- Requests Accepted
- Aggregated Requests Not Accepted
- Requests Not Accepted
- Suspended Drivers
- Total Violations & Incidents
- Zero Tolerance

# LADOT Data Protection Principles

**Author:** City of Los Angeles

**Date:** March 22, 2019

**URL:** [https://ladot.io/wp-content/uploads/2019/03/LADOT\\_Data\\_Protection\\_Principles-1.pdf](https://ladot.io/wp-content/uploads/2019/03/LADOT_Data_Protection_Principles-1.pdf)

**Description:** The City of Los Angeles Department of Transportation (LADOT) policies for protecting data collected from dockless mobility service providers

## Topic Area(s):

Data Sharing Policies & Practices

## Resource Type:

Sample Document or Agreement

## Summary

Specifies that dockless mobility service providers are required to provide data using the MDS standard and lays out how LADOT will protect the data as well as user privacy.

## Additional Details

The principles statement lays out five “standards” it will use when collecting, storing, analyzing, and publishing data. These are:

1. *Data minimization.* LADOT specifies that they will only collect data to meet specific operational and safety needs. Except where required to meet a specific need, data will be aggregated, obfuscated, de-identified, and/or destroyed, as appropriate.
2. *Access limitation.* Raw trip data will be limited to what is needed to meet operational needs. No raw data will be provided to any other local, state, or federal agency, including law enforcement agencies, unless required by law such as through a court order or subpoena. Third parties will only be allowed access to raw data under contracts that limit its use to those directed by LADOT. After the pilot dockless program ends, the agency will produce a transparency report that documents the requests for data received from third parties and how LADOT responded.
3. *Data categorization.* Raw trip data is designated as Confidential Information under the city’s data handling guidelines and handled accordingly. One consequence of this designation is that it is exempt from release under the California Public Records Act.
4. *Security.* LADOT will follow existing city data security policies and will conduct ongoing security tests.
5. *Transparency for the public.* LADOT will publish the types of data collected through MDS and how long it is retained. De-identified data may be published through the city’s [Open Data Portal](#).

In addition to this document, LADOT also has the *LADOT Guidelines for Handling of Data from Mobility Service Providers*

(<https://ladot.lacity.org/sites/default/files/documents/ladotguidelinesforhandlingofdatafrommsps2018-10-25.pdf>) That document refers back to the data protection principles, but, unlike several other public agencies and recommended practices, states that “To the extent that Confidential data is used for transportation policy making, it will be stored unobfuscated for no less than two years and in accordance with the City of Los Angeles Information Handling Guidelines.”

# Shared Electric Scooters Permit Application & Administrative Rules for Shared Electric Scooters

**Author:** Portland Bureau of Transportation

**Date:** March 25, 2019

**URLs:** Permit Application:

<https://www.portlandoregon.gov/transportation/article/726366>

Administrative Rules:

<https://www.portlandoregon.gov/citycode/article/690212>

**Topic Area(s):**

Data Sharing Policies & Practices

**Resource Type:**

Sample Document or Agreement

**Description:** The permit application for the city of Portland, Oregon. Appendix C is the incorporated Data Sharing Agreement and the administrative rules for shared electric scooters establishes the policies, regulations, and permit requirements.

## Summary

The data sharing agreement requires permit applicants to agree to provide certain information, in specified formats, to either the city of Portland or a city-identified third part researcher. In addition, applicants must agree to distributed user, employee, and contractor surveys developed by the city.

The administrative rules cover the pilot program that is in effect at the time this guide was written, running from April 26, 2019 through June 30, 2021. Section 4 describes the metrics terminology used for reporting and Section 7 of the administrative rules covers the data requirements.

## Additional Details

The data sharing agreement requires permit holders to provide MDS data as well as a publicly available API for accessing data in the GBFS format. This is an update from their 2018 pilot permit application, which defined the API in an appendix to the permit application, rather than referring to MDS. The 2018 pilot program also did not have the requirement for a public GBFS feed.

It is interesting to note, however, that the permit application references the Portland version of the entire MDS, which as of January 18, 2021, appears to be a copy of an earlier version of the Open Mobility Foundation version. It does not specify specific portions, which may imply that all portions relating to data originating from the mobility service provider is required.

Similarly, while a public API to files “consistent with GBFS standards” is required, what elements are or are not required is not called out in the permit application.

The agreement includes language that if they receive a public records request, are sued to release confidential information, or a court determines certain information is not confidential or a trade secret, the city will notify the mobility service provider so that they can take steps to prevent disclosure.

It states that the “city-identified third-party researchers” will be working with the city to help evaluate the pilot program.

An interesting aspect of the Administrative Rules Data Requirements section is that the specific metrics discussed in Section 4 and the API requirements in Section 7 are incorporated by reference to a GitHub site maintained by the city (<https://github.com/CityofPortland/mobility-dataspecification/tree/dev/provider#realtimedata>). This gives the city the flexibility to make changes without needing to redefine their rules at the elected official level, streamlining the process. Many other cities are taking a similar approach.

# Director Rules for Deployment and Operation of Shared Small Vehicle Mobility Systems

**Author:** Austin, TX Transportation Department

**Date:** Accessed March 3, 2021

**URL:** [http://austintexas.gov/sites/default/files/files/Transportation/Dockless\\_Final\\_Accepted\\_Searchable.pdf](http://austintexas.gov/sites/default/files/files/Transportation/Dockless_Final_Accepted_Searchable.pdf)

**Description:** This document presents a set of rules for dockless shared mobility service providers by the city of Austin, Texas.

**Topic Area(s):**

Data Sharing Policies & Practices

**Resource Type:**

Sample Document or Agreement

## Summary

The document presents rules for city licensees operating dockless shared small vehicle systems such as scooters, bikes, and e-bikes. Section 7 covers the rules for “Privacy, Data Reporting, and Sharing.”

These rules include provisions for limiting the data that service providers can collect from users, which is a subject not addressed in many other communities’ requirements.

## Additional Details

- All operators must implement and submit a privacy policy that safeguards users’ information. It also limits the types of data that licenses can require customers to provide.
- Monthly complaints and crash history reports are required. The formats are not specified but may be set by the city.
- Other real-time and historic information must be provided through an API to either the city or a city-specified third party. The format is not specified in the rules but will be specified by the city.
- Incomplete or inaccurate information may result in license revocation.

# Shared Mobility Data Sharing Specifications Policy

**Author:** City of Indianapolis      **Date:** May 14, 2020

**URL:** <https://citybase-cms-prod.s3.amazonaws.com/f6a12e18ac654afa8fdad85c4923de25.pdf>

**Description:** The document presents the data sharing policies and requirements of the city of Indianapolis, Indiana.

**Topic Areas(s):**

Data Sharing Policies & Practices

**Resource Type:**

Sample Document or Agreement

## Summary

This document lays out the data reporting requirements that must be followed by shared mobility operators in Indianapolis, Indiana. It lays out the requirements for real-time and quarterly reporting to support “compliance, long range planning, and real-time device availability.”

The real-time reporting must use an API, and the MDS standards are used as the format for the data. There is also a requirement to make GBFS feeds publicly available.

Quarterly reporting uses a mix of pdf, csv, and/or Excel file formats, with the detailed reporting format specified in the policy document.

## Additional Details

For real-time reporting, anonymized trip level data must be provided in the format specified in MDS. Real-time GBFS feeds must be provided to the public, and the policy document lays out 12 specific GBFS files that must be included.

Quarterly reports are used to support planning, compliance, and other reporting. Four reports are required:

- A summary of device ridership (Summary Report of Data)
- Anonymized details for individual trips (Trip Report)
- A list of customer-reported issues (Customer Complaint and Violation Report)
- Details on device maintenance (Maintenance Report)

The specific fields for each report, along with the data type and a description of each field is included in the policy document.

# ***Data Sharing Section of Minneapolis, Minnesota's Licensing Agreement***

**Author:** Minneapolis, MN

**Date:** Provided June 2021

**URL:** N/A. See [Appendix A](#).

**Description:** The document presents the data collection and sharing requirements contained in the licensing agreement for micromobility service providers in Minneapolis.

**Topic Areas(s):**

Data Sharing Policies & Practices

**Resource Type:**

Sample Document or Agreement

## **Summary**

This document lays out the data reporting requirements that must be followed by shared micromobility operators in Minneapolis' latest pilot program. It lays out the requirements for operators to provide APIs for MDS and GBFS data feeds and for the operator to conduct two customer surveys using questions provided by the city.

The city reserves the right to require that the operator provide an API that may be shared with a third party to facilitate the city's Mobility as a Service (MaaS) program.

## **Additional Details**

The agreement lays out specific data that must be provided. In addition to the APIs and surveys, operators must also provide either a dashboard or a report that includes the following summary data: "number of Fleet Scooters distributed; total number of trips; trips per Fleet Scooter per day; number of new customers; total number of customers; total number of low-income program customers; average miles per trip; and average minutes per trip."

Falsified data or deliberately inaccurate reporting may be grounds for termination of the operator's license.

The city may share any public data collected with other government entities for common public purpose objectives but will not share or disclose non-public data as defined under Minnesota law.

The city agrees to abide by its "[Mobility Data Methodology](#)" and to inform operators of any substantive changes in advance of their implementation.



## Standards Efforts & Software Tools

This section covers resources related to standards for data formats and data exchange, as well as open source software tools that have been written to support the implementation and use of these standards. The two primary standards are the Mobility Data Specification (MDS) and the General Bikeshare Feed Specification (GBFS), but there are others that relate to shared mobility, such as efforts to standardize the digitization of geo-referenced curb use regulations. The section contains the following references:

- [Mobility Data Specification \(MDS\)](#)
- [General Bikeshare Feed Specification \(GBFS\)](#)
- [Mobility Metrics](#)
- [Open Curbs](#)
- [CurbLR](#)
- [SharedStreets Referencing System](#)

# Mobility Data Specification (MDS)

**Author:** Open Mobility Foundation

**Date Accessed:** January 29, 2021

**URL:** <https://github.com/openmobilityfoundation/mobility-data-specification>

**Description:** The MDS is a widely used, open, standardized Application Programming Interface (API) for exchanging data between micromobility operators and public sector agencies.

## Summary

MDS is a set of open, standardized APIs for two-way, automated exchange of information between micromobility service providers and public agencies.

It has been adopted by more than 90 agencies across the world and by most major mobility providers. The inclusion of detailed, trip-specific data has been controversial, due to privacy concerns; however, agencies can choose which portions to implement, and providers support the use of a single reporting standard across cities.

## Additional Details

MDS currently has three sets of APIs:

- **Provider:** Implemented by mobility providers and used by public agencies. It is how providers report historical data to these agencies
- **Agency:** Implemented by public agencies and used by mobility providers. It is generally accessed at the start of each vehicle trip and is how the providers send real-time updates, such as new vehicle registrations and location data
- **Policy:** Implemented by public agencies and used by mobility providers. Allows providers to query for information about rules and regulations affecting their operations.

Various open source software tools have been developed to support the use of MDS.

## Additional Resources

There is a wealth of resources available to learn more about MDS:

*About MDS*, Open Mobility Foundation, <https://www.openmobilityfoundation.org/about-mds/>, accessed January 29, 2021

*Understanding MDS APIs*, Open Mobility Foundation, <https://github.com/openmobilityfoundation/governance/blob/main/technical/Understanding-MDS-APIs.md>, accessed February 11, 2021

### Topic Area(s):

Data Sharing Policies & Practices  
Operations  
Planning & Analysis  
Enforcement

### Resource Type:

Standards Effort or Software Tool

*Understanding the Relationship Between GBFS and MDS*, Open Mobility Foundation,  
[https://github.com/openmobilityfoundation/governance/blob/main/technical/GBFS\\_and\\_MDS.md](https://github.com/openmobilityfoundation/governance/blob/main/technical/GBFS_and_MDS.md),  
accessed February 11, 2021

*Mobility Data Specification (MDS) feed, interpretation and challenges*, Ride Report,  
<https://www.ridereport.com/blog/mds-feed-interpretation-challenges>, accessed June 10, 2021.

*White Paper: 4 Ways Cities can put Mobility Data to Work*, Ride Report,  
<https://www.ridereport.com/white-paper/mobility-data-use-cases>, accessed June 10, 2021.

*Data from the Mobility Data Specification: Technical Considerations* webinar (2 parts), Ride Report,  
<https://www.ridereport.com/webinar/mds-data> and <https://www.ridereport.com/webinar/mds-data-2>,  
accessed June 10, 2021

# General Bikeshare Feed Specification (GBFS)

**Author:** Charlie Bailey

**Date:** October 2018

**URL:** <https://github.com/NABSA/gbfs>

**Description:** The GBFS is a widely used standard for public dissemination of real-time micromobility data.

## Summary

GBFS is, by design, an open standard for providing public, real-time, read-only data on bikeshare (and shared e-scooter) systems. It does not provide trip-level data nor historical data.

GBFS was originally developed as a stand-alone standard for providing real-time information to consumers via an open, standard data feed. It can be used on its own for this purpose. MDS is intended for private data exchange between providers and public agencies, contains historical data, and unlike GBFS, may contain sensitive information. The data exchanged using the two standards complement one another, and in fact, MDS requires that providers also have a GBFS data feed.

## Additional Details

GBFS was originally developed by a volunteer at the North American Bike Share Association (NABSA), working in collaboration with many public and private sector organizations. In 2019, NABSA selected MobilityData to become technical steward for the standard. NABSA and MobilityData continue to partner on the effort, improving the specification and its governance to meet evolving industry needs.

GBFS provides information on stations where vehicles may be located, available vehicles, operating locations, dates, and hours, pricing, alerts, and more.

A significant number of software tools have been developed to support the implementation and use of GBFS.

## Additional Resources

*MDS, GBFS, and How Cities Can Ask for Data from Micromobility Providers*, Charlie Bailey, <https://www.remix.com/blog/mds-gbfs-and-how-cities-can-ask-for-data-from-micromobility-providers>, October 2018

*GBFS Resource Center*, MobilityData, <https://gbfs.mobilitydata.org/>, accessed January 29, 2021

*Understanding the Relationship Between GBFS and MDS*, Open Mobility Foundation, [https://github.com/openmobilityfoundation/governance/blob/main/technical/GBFS\\_and\\_MDS.md](https://github.com/openmobilityfoundation/governance/blob/main/technical/GBFS_and_MDS.md), accessed February 11, 2021

### Topic Area(s):

Data Sharing Policies & Practices  
Operations  
Planning & Analysis  
Communicating with the Public

### Resource Type:

Standards Effort or Software Tool

# Mobility Metrics

**Author:** SharedStreets

**Date:** Accessed March 3, 2021

**URL:** <https://github.com/sharedstreets/mobility-metrics>

**Description:** This document is an Open Source Software package.

## Summary

An open source software package for ingesting Mobility Data Specification (MDS) data feeds and aggregating the data in such a way that it is useful for analysis while protecting privacy.

### Topic Area(s):

Data Sharing Policies & Practices  
Operations  
Planning & Analysis

### Resource Type:

Standards Effort or Software Tool

## Additional Details

The software runs on either OSX or Linux (Windows users can either use a Docker image or Windows Subsystem for Linux). It is open-source software licensed under the MIT License.

Raw data, which, per MDS, may include detailed individual trip-level data, raising privacy concerns are aggregated and analyzed to produce multiple metrics. These include summary metrics, fleet level snapshot metrics, as well as geographic and time filtered data. Summary metrics include the total number of vehicles on the street for a given day, the number of active vehicles for the day, average trips per vehicle, and average trip distance.

It produces three fleet level snapshot metrics: the number of vehicles deployed and available for use, the number of vehicles deployed but unavailable (e.g., due to a dead battery or awaiting maintenance), and the number of vehicles actively engaged in a trip.

Filtered data can be produced using a variety of different geographic and time filters, and includes metrics such as trip volume, number of vehicles available, and the number of pickups within the specified area and time frame.

## Additional Resources

*Announcing SharedStreets' Trusted Data Exchange*, Mollie Pelon McArdle, <https://medium.com/sharedstreets/announcing-sharedstreets-trusted-data-exchange-51a0c0e25a53>, September 20, 2019.

# Open Curbs

**Author:** Coord

**Date Accessed:** January 28, 2021

**URL:** <https://github.com/coordcity/open-curb-assets/blob/master/open-curb-assets-spec.md>

**Description:** Open Curbs is an open standard for curb data as well as an open, publicly accessible repository for curb data run by Coord.

## Summary

Open Curbs and the online tools provided by Coord provide a digitized, geo-located repository for curb data and allow cities to maintain an inventory of curb resources, allocate and price curb resources, and automatically provided information to fleet operators through a standardized API.

In addition to regulatory information, Open Curbs maps curb-related infrastructure such as wheelchair cuts, bus stops, signage, crosswalks, bike racks, and other physical assets. As of January 2021, Coord reports to have curb information coded for portions of 15 US cities and have released 11 coded data sets under an open database license. The data was collected for the cities by a variety of vendors.

## Additional Details

The data exchange format for Open Curbs is geoJSON. A simple example of a curb feature coded in Open Curbs format (in this case, a section of curb painted red) is:

```
{
  "type": "Feature",
  "properties": {
    "asset_type": "Curb Paint",
    "asset_subtype": "Red",
    "curb_id": "bGE6Njc2Mzk",
    "distance_start_meters": 5.02,
    "distance_end_meters": 13.33
  },
  "geometry": {
    "coordinates": [
      [-118.256495, 34.049384],
      [-118.256549, 34.049324]
    ],
    "type": "LineString"
  }
}
```

Coord is working with the Open Mobility Foundation's Curb Management Working Group to develop a uniform agreed standard for curb data, with Open Curbs as an input to the process. [CurbLR](#) is a similar effort that is also working with the Open Mobility Foundation.

## Additional Resources

*Curb Management for Fast-Changing Cities*, Coord, <https://www.coord.com/>, accessed January 28, 2021

### Topic Area(s):

Curb Management  
Data Sharing Policies & Practices  
Operations  
Planning & Analysis

### Resource Type:

Standards Effort or Software Tool  
Data Set

# CurbLR

**Author:** SharedStreets

**Date Accessed:** January 28, 2021

**URL:** <https://curblr.org/>

**Description:** SharedStreets, a non-profit organization, has developed and uses CurbLR, an open standard for curb data. as well as an open, publicly accessible repository for curb data.

## Summary

CurbLR is an open standard for digitized, geo-referenced curb information. In addition to regulatory information, CurbLR maps curb-related assets such as wheelchair cuts, bus stops, fire hydrants, signage, crosswalks, bike racks, and other physical assets. CurbLR makes use of the SharedStreets Linear Referencing System for location data.

## Additional Details

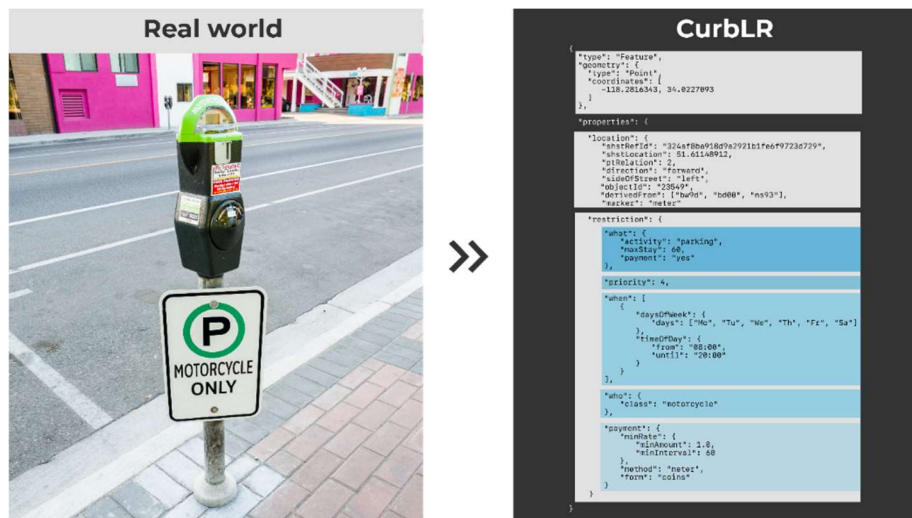
The data exchange format for CurbLR is geoJSON. An example of a curb feature coded in CurbLR format (in this case, a motorcycle-only paid parking space) is shown in **Figure 1**:

### Topic Area(s):

Curb Management  
Data Sharing Policies & Practices  
Operations  
Planning & Analysis

### Resource Type:

Standards Effort or Software Tool



**Figure 1. An example of a curb feature coded in CurbLR (Source: SharedStreets)**

SharedStreets is working with the Open Mobility Foundation's Curb Management Working Group to develop a uniform agreed standard for curb data, with CurbLR as an input to the process. [Open Curbs](#) is a similar effort that is also working with the Open Mobility Foundation.

# SharedStreets Referencing System

Author: SharedStreets

Date Accessed: January 28, 2021

URL: <https://github.com/sharedstreets/sharedstreets-ref-system>

**Description:** SharedStreets is a non-proprietary system for describing streets and locations to allow porting of data between differing basemaps, such as a commercial GIS, a city-managed GIS, and OpenStreetMap.

## Summary

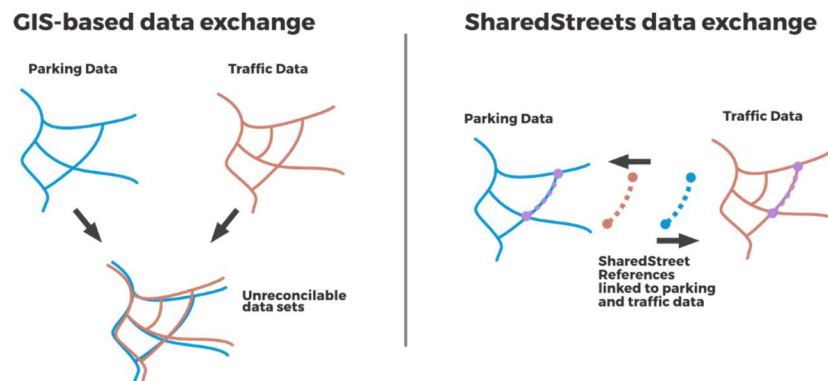
As shown below in **Figure 2**, differing basemaps often do not align, making it difficult to combine data from different sources. The SharedStreets Referencing System provides a common framework to solve this problem.

### Topic Area(s):

Data Sharing Policies & Practices  
Operations  
Planning & Analysis  
Curb Management

### Resource Type:

Standards Effort or Software Tool



**Figure 2.** Illustration of how different base maps may not align, making linkage difficult (Source: SharedStreets)

## Additional Details

Organizations using the SharedStreets Referencing System maintain their own basemaps and can share the non-proprietary information in their GIS. The system provides a stable, non-proprietary, basemap independent identifiers for identifying street segments, intersections, and geometries. Data is exchanged using these common identifiers. The types of data that might be exchanged or combined includes traffic data, street, and curb inventories ([CurbLR](#) makes use of the SharedStreets Referencing System), incident reporting, and road closure reporting.

## Additional Resources

*Getting Started with the SharedStreets Referencing System*, Emily Eros, <https://www.sharedstreets.io/getting-started-with-the-sharedstreets-referencing-system/>, May 2019.

*A Powerful Map Promises to Help Cities Keep Streets Free*, Laura Bliss, <https://www.bloomberg.com/news/articles/2018-02-22/a-powerful-map-to-share-city-streets-with-uber-and-lyft>, February 22, 2018.



## Organizations

This section provides information on five organizations that are active in providing resources related to shared mobility data. Three of these are membership organizations that public agencies may also wish to consider joining or participating in their work:

- [Mobility Data Collaborative \(MDC\)](#)
- [New Urban Mobility Alliance \(NUMO\)](#)
- [Open Mobility Foundation \(OMF\)](#)

The other organizations are those that, in addition to other activities, serve as 3<sup>rd</sup> parties for data management and analysis. [SharedStreets](#) is a non-profit initiative, while the [Transportation Data Collaborative](#) is an initiative of the University of Washington. There are also [for-profit companies](#) that offer similar shared mobility data management and analysis services.

# Mobility Data Collaborative (MDC)

URL: <https://mdc.sae-itc.com/>

**Description:** The Mobility Data Collaborative is a forum, established by SAE ITC, for public and private sector participants to develop frameworks for mobility data sharing.

## Summary

The group is comprised of public sector agencies such as Miami-Dade County and Bellevue, Washington, TNCs such as Uber and Lyft, micromobility providers such as Spin and Bird, data analysis companies such as Populus and Streetlight Data, and membership organizations such as the North American Bikeshare Association and the New Urban Mobility Alliance.

They define their initial focus as protecting data privacy and defining performance metrics.

## Additional Details

As of January 2021, the collaborative had developed two products:

- [\*Data Sharing Glossary and Metrics for Shared Micromobility\*](#): this provides standardized definitions for terms used in micromobility, and common, formal definitions and formulas for calculating several key metrics.
- [\*Guidelines for Mobility Data Sharing Governance and Contracting\*](#): this provides 10 recommended guidelines intended to be used as discussion input when formulating specific agency policies and agreements, and to be used across disciplines (e.g., planning, legal, policy, data, and information system professionals).

### Topic Areas(s):

Data Sharing Policies & Practices  
Use of Third Parties for Data  
Management  
Operations  
Policy & Analysis

### Resource Type:

Organization

# New Urban Mobility Alliance (NUMO)

URL: <https://www.numo.global/>

**Description:** NUMO is a global organization of cities, NGO's, companies, mobility service providers and community advocates that work together to implement the *Shared Mobility Principles for Livable Cities* (<https://www.sharedmobilityprinciples.org/>).

## Summary

NUMO is a global alliance focused on urban transportation policies that benefit all residents.

One focus area for NUMO is micromobility. They have three major initiatives in this area: The *NUMO New Micromobility Atlas*, the *Shared Micromobility Playbook*, and the *Micromobility & Your City: Leveraging Data to Achieve Policy Outcomes*.

## Additional Details

The *NUMO Micromobility Atlas* tracks micromobility programs around the world. As of January 2021, they tracked dockless scooter, bicycles, and moped deployments across 626 cities in 53 countries, which includes 127 mobility service providers. The data is all open source and available for download.

The *Shared Micromobility Playbook*, originally developed by Transportation for America, is a policy guidebook for communities and addresses eight topics:

- General Provisions
- Operations
- Equipment & Safety
- Parking & Street Design
- Equity
- Communications & Community Engagement
- Data
- Metrics

The *Micromobility and Your City* project has produced [Leveraging Data to Achieve Policy Outcomes](#), an interactive, web-based tool for selecting outcome measures of interest, defining specific metrics for each outcome, and identifying the data needed for the metric. The focus is on safe, sustainable, and equitable services.

### Topic Areas(s):

Planning & Analysis  
Operations  
Enforcement  
Communicating with the Public

### Resource Type:

Organization

# Open Mobility Foundation (OMF)

**URL:** <https://www.openmobilityfoundation.org/>

**Description:** OMF is a city-led open source software foundation that governs the Mobility Data Specification (MDS) standard. Beyond MDS, they address other technical issues related to shared mobility, including curb management. They intend to “create and manage a set of model policies, privacy and data security, procurement, and technical guidelines.”

## **Topic Areas(s):**

Data Sharing Policies & Practices  
Curb Management

## **Resource Type:**

Organization

## **Summary**

The OMF was founded to take over governance of the Mobility Data Specification (MDS), that was originally developed by the Los Angeles Department of Transportation. MDS is a specification for API's to allow for mobility service providers to provide information to government agencies and for government agencies to provide both static and dynamic information (e.g., temporary street closures) to the service providers.

While MDS was originally written to cover shared scooters, it can be used in its current form for other micromobility services as well. One of the goals of the OMF is to explore either expanding the scope of MDS or developing related APIs to cover other shared mobility modes such as TNCs.

## **Additional Details**

In addition to multiple working groups focused on various aspects of MDS, the OMF has recently created a Curb Management Working Group that will work on developing common data definitions and API specifications for digital, geo-coded curb assets, regulations, and occupancy (<https://github.com/openmobilityfoundation/curb-data-specification/wiki>).

In addition, OMF has a Privacy, Security, and Transparency committee that has published an extensive state of the practice inventory on location data privacy and anonymization ([Mobility Data State of Practice](#)) and a [Privacy Guide for Cities](#). They are developing a set of privacy principles to guide future work by the foundation.

OMF has both public and private sector members, however board members must come from the public sector. As of January 2021, their website lists 31 public sector members, most from the United States, but also including non-U.S. members such as Ulm Germany and Bogota, Colombia. They list nine private sector members, including service providers (e.g., Bird), data management organizations (e.g., Ride Report) and others (e.g., Ford Autonomous Vehicles LLC).

# SharedStreets

**URL:** <https://sharedstreets.io/>

**Description:** SharedStreets is a non-profit organization working on open source software, digital infrastructure, and governance for urban transportation data.

## Summary

Shared Streets has a number of different projects and programs, including the [SharedStreets Referencing System](#) for allowing data to be transferred between different base maps, [CurbLR](#), an open data standard for geo-referenced curb data, [Mobility Metrics](#), and open source software supporting these initiatives. In addition, they function as an independent third party for managing and analyzing data.

## Additional Details

[Shared Streets' Referencing System](#) provides an open, common referencing system that can be used to convert data from one base map to another, so that data from different geographic reference systems can be effectively combined and analyzed.

[CurbLR](#) is one of several initiative for standardizing digital, geo-referenced curb locations, rules, regulations, and usage.

In addition to proposed standards and open source software, SharedStreets functions as an independent third party for managing and analyzing mobility data. One example of this was the Washington, DC Data Sharing Partnership. Washington DC's Department of Transportation and Department of For-Hire Vehicles teamed with SharedStreets and Uber to launch a data sharing and data analysis partnership, under which Uber agreed to share data that may be privacy-sensitive and/or proprietary with SharedStreets, who agreed to use the data only for specific, agreed-to purposes, and not redistribute it. SharedStreets then used the data to provide both aggregate data and analysis results to the city government. (Marshall, 2018)

This model, using a trusted third party, holds promise for helping to allow localities to receive the data analysis that they require while protecting the data from, for example, state Freedom of Information (FOIA) requests or other concerns with government possession of the data (e.g., its use for law enforcement).

While SharedStreets is a non-profit organization, there are also [for-profit companies](#) and university programs, such as the [University of Washington's Transportation Data Collaborative](#), working to establish themselves as trusted third-party data managers and analysts.

## Additional Resources

*Announcing SharedStreets' Trusted Data Exchange*, Mollie Pelon McArdle, <https://medium.com/sharedstreets/announcing-sharedstreets-trusted-data-exchange-51a0c0e25a53>, September 20, 2019.

### Topic Areas(s):

Data Sharing Policies & Practices  
Curb Management  
Use of Third Parties for Data Management.

### Resource Type:

Organization

# UW Transportation Data Collaborative (TDC)

URL: <https://www.uwtdc.org/>

**Description:** UWTDc is a data repository for shared mobility data operated by the University of Washington.

## Summary

The goal of the collaborative is to provide a common protected and linked repository for both public and private sector data. The concept is that data can be managed, protected, analyzed, and, where appropriate, shared, more efficiently and effectively by a single collaborative organization with a common set of policies and procedures.

TDC identifies the barriers to data sharing that 3<sup>rd</sup> Party management can help overcome as:

- “The need for policies to govern data sharing, ownership, access, security, and privacy;
- A shortfall of capacity (both human and computational) in the public sector for data analytics, visualization, privacy, and cybersecurity;
- Interoperability challenges between information systems, including schema, format, and structure;
- The potential for non-uniform coverage and biases in individual datasets that can lead to misinterpretation or misuse of shared results; and
- Laws and regulations which place transportation data at risk of disclosure to any interested party.”

## Additional Details

The TDC currently provides services to the city of Seattle. Seattle planners want access to Census Block level data on shared mobility in order to better understand impacts, such as curb usage, but recognize the need to protect privacy and that Washington state’s open records laws currently don’t fully protect location-specific trip data that might have to be disclosed should it be stored by city agencies. The TDC is looking to expand its services to other major metropolitan areas.

In addition to the TDC, operated by a university, there are other non-profit organizations, such as [SharedStreets](#) and [for-profit organizations](#) that provide third party shared mobility data management and analysis services

## Additional Resources

*Cities & Data Sharing – Part 2: Seattle*, Aapti Institute, <https://aapti.medium.com/part-2-global-mobility-data-sharing-seattle-8e07bf73e543>, July 31, 2020.

### Topic Area(s):

Data Sharing Policies & Practices  
Use of Third Parties for Data  
Management.

### Resource Type:

Organization

# Commercial Software as a Service (SaaS) Third Party Data Management Providers

## URLs of Example Providers:

- Passport (<https://www.passportinc.com/>)
- Populus (<https://www.populus.ai/>)
- Remix (<https://www.remix.com/>)
- Ride Report (<https://www.ridereport.com/>)

**Description:** Commercial third-party companies that provide data management and analysis services related to shared mobility on a Software as a Service basis.

### Topic Area(s):

Data Sharing Policies & Practices  
Use of Third Parties for Data Management.

### Resource Type:

Organization

## Summary

These types of organizations are typically hired by a public agency. Operators are required to provide their data to the third party, which processes, stores, and analyzes the data. They provide metrics, analysis, visualizations, as well as public and private dashboards for the public agencies that hire them.

The 3<sup>rd</sup> party providers have experience dealing with multiple operators across multiple jurisdictions, and can provide public agencies with data collection, standards, data management, security, and analytic expertise that they may not have in-house.

In addition, this model holds promise for helping to allow localities to receive the data analysis that they require while protecting the data from, for example, state Freedom of Information (FOIA) requests or other concerns with government possession of the data (e.g., its use for law enforcement). Mobility operators may be more comfortable working with an 3<sup>rd</sup> party provider that they have worked with in other communities, rather than dealing with a new (to them) and municipality.

## Additional Details

The scope of services provided will vary with the provider. Some only cover micromobility services while others also cover additional forms of shared mobility such as car sharing, or even transit systems. Some provide digital geographic tools for curb and street management and for communicating regulations and changes to outside parties. Some of the companies support the collection operating fees that localities may place on mobility operators and some also support parking enforcement. In addition, these companies will audit the reports provided by mobility operators, checking that they are accurately reporting ground truth.

## Sample Public Dashboards and Data Sets

The next page provides links to seven representative public data sets, visualizations, and dashboards. It includes examples of micromobility, TNC, and taxi data sets.

An important consideration is for there to be a clear understanding and agreement between agencies, operators, and 3<sup>rd</sup> party data managers (if any) as to what data and which metrics are “publicly shareable” versus what needs to be kept as internal data available only to the agency.

Metrics that may be appropriate to share publicly may include: (Schwartz, 2021)<sup>3</sup>

- Total trips aggregated across operators, rounded to the nearest 1,000.
- Trips/vehicle/day aggregated across operators, rounded to the nearest whole number.
- Total vehicles aggregated across operators, rounded to the nearest 100.
- Total number of trips and percent of trips with origins and destinations from a particular geography (e.g., neighborhood), aggregated across operators, rounded to the nearest 1,000, minimum 1,000 trips.
- Heat maps aggregated across operators that do not show specific numbers (i.e., screenshots or reconstituted maps; not downloaded GeoJSON files).
- Origin/destination maps from dashboard aggregated across operators that do not show specific numbers (i.e., screenshots or reconstituted maps; not downloaded GeoJSON files).
- Parking clustering data (e.g., heat maps) aggregated across operators.
- The following specific stats related to compliance:
  - Number of days meeting geographic requirements
  - Number of days meeting minimum and maximum deployment levels
  - Fines
  - Number and percent of days with trips (or other behavior) above/below benchmarks for increasing or decreasing caps; this does NOT include the specific number, but rather an estimate of frequency of meeting the criteria

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<sup>3</sup> Note that there may still be issues with aggregated data, however, and care must be taken. For example, if there are only two providers of a type of service, aggregate data will provide insight into each other’s operations, as each provider can simply subtract out their own data.



# Sample Public Dashboards & Data Sets

**Author:** Multiple (see below)

**Date:** Multiple

**URL:** See below

**Description:** Listed below are public dashboards and data sets available on the internet from various public agencies, to provide a sample of the types of information and visualizations that are used.

**Topic Area(s):**

Data Sharing Policies & Practices  
Communicating with the Public

**Resource Type:**

Data Set

## Examples

- LA Metro Bike Share (<https://bikeshare.metro.net/about/data/>). Provides quarterly trip data and station reports. Since this is a docked system, the origins and destinations are established bike dock locations, reducing the sensitivity associated with precise location data.
- City of Austin (<https://data.austintexas.gov/Transportation-and-Mobility/Shared-Micromobility-Vehicle-Trips/7d8e-dm7r>). Austin, TX provides open, downloadable data for either bulk downloads or via the Socrata Open Data API (SODA), which allows the ability to filter, query and aggregate data. The data is aggregated into census tracts to preserve anonymity. The software used to implement the API is open source and available on GitHub (<https://github.com/cityofaustin/atd-micromobility-api>). Austin also provides a web summary dashboard (<https://data.mobility.austin.gov/micromobility-data/>) and an interactive map-based data explorer tool (<https://micro.mobility.austin.gov/>).
- Minneapolis, MN Scooter data by year and pilot program applications by service provider (<https://opendata.minneapolismn.gov/search?q=Scooters>)
- New York City Taxi and Limousine Commission (TLC) Data (<https://www1.nyc.gov/site/tlc/about/tlc-trip-record-data.page>). The New York TLC publishes geographic, temporal, financial, and service data for trips made by both traditional ride-hailing (taxi) companies and Transportation Network Companies (TNCs). Individual medallion (driver) information is stripped from the dataset before it is published to assist in protecting privacy, however some trips can still be linked to individual homes. Excellent examples of how this data can be analyzed and used can be found in the blog post *Analyzing 1.1 Billion NYC Taxi and Uber Trips, with a Vengeance* by Todd W. Schneider (<https://toddwshneider.com/posts/analyzing-1-1-billion-nyc-taxi-and-uber-trips-with-a-vengeance/>), accessed February 9, 2021.
- Portland E-Scooter Trips Dashboard (<https://www.portland.gov/transportation/escooterpdx/trips-dashboard>). The dashboard provides visualizations of aggregated trip data as well as the ability to download the actual data. Statistics can be viewed by year and type of day (weekday or weekend), by time and distance, by census block group, or as a heat map of trip start times.
- *Louisville Dockless Trips Dashboard*, City of Louisville, KY (<https://cdolabs-admin.carto.com/builder/f57ee92e-09c3-4efd-b7c0-3d561cc9e951/embed>). Louisville provides a map view of aggregated trip origins and destinations, which can be selected by data and time. The methodology used for aggregation is documented in *Dockless Open Data* (<https://github.com/louisvillemetro-innovation/dockless-open-data>).

- *Bay Wheels trip data* (<https://www.lyft.com/bikes/bay-wheels/system-data>). Lyft provides trip level data to the public for their San Francisco Bay area bikeshare service, as required by their license agreement. They also provide a GBFS feed of real-time system data.
- *Uber Movement* (<https://movement.uber.com/>). Provides travel times and speeds based on Uber vehicle data. As of February 2021, data is available for 51 cities, including 13 in the U.S.

## APPENDIX A: DATA SHARING SECTION OF MINNEAPOLIS, MINNESOTA'S LICENSING AGREEMENT

This section of Minneapolis' licensing agreement is provided as an appendix because while a public document, it is not available online.

Text:

### Data Collection/Sharing (City of Minneapolis, MN)

- a. The City and Licensee each understand and agree that the City is not requesting or requiring the collection or creation of any new data with this Agreement, unless expressly provided and stated herein. Any new data collected, created or stored by Licensee shall be considered Licensee's private data, and not government data, unless a provision of this Agreement expressly requires its collection or creation, and/or the City requests and receives such data from Licensee.
- b. The City and Licensee each understand and agree that the City is not requesting or requiring sharing of user data deemed to be Personally Identifiable Information as defined by the US Department of Commerce, with the exception of data as specified herein.
- c. Licensee agrees to administer two customer surveys during the Program term, including survey questions submitted by the City. The surveys must address travel behavior and basic socioeconomic indicators to aid the City in evaluating whether and how Licensee's Operation supports City goals for transportation. The surveys shall not include, and Licensee shall not collect, any personally identifiable data related to or in furtherance this provision.
- d. Licensee shall provide an API that meets the requirements of the Mobility Data Specification ("MDS") as published online at <https://github.com/openmobilityfoundation/mobility-data-specification>. Licensee may not change the API URL without notifying at least 30 days in advance of change. The City shall only require compliance with the "Provider" component of MDS, and shall not require compliance with the "Agency" component of MDS without explicit agreement from Licensee.
- e. Licensee shall provide an API that meets the requirements of the General Bikeshare Feed Specification (<https://github.com/NABSA/gbfs>). Licensee may not change the API URL without notifying at least 30 days in advance of change. Licensee is required to make the API endpoint available for public consumption.
- f. The City may request that the Licensee provide an API that may be shared with a third party, which allows for fleet vehicle location, as well as user access and payment, to facilitate the City's Mobility as a Service program.
- g. Licensee shall keep a record of maintenance activities, including but not limited to Fleet Scooter identification number and maintenance performed. Licensee will provide a complete copy of the same to the City upon request.

- h. Licensee shall deliver to the City, upon request, all specified real-time and archival information for each device in its Scooter Fleet.<sup>14</sup> Information covered by this provision includes real-time location, event, and status information gathered by on-board GPS tools, data for each trip record, historic/archival data, and key system information. All requested data will be shared via the documented MDS and GBFS APIs. Except as otherwise provided in this Agreement, Licensee will not be asked to share any new data sharing specifications, nor personally identifiable information with the City. At a minimum, Licensee will supply the City with the following upon request:
  - i. Daily drop-off locations or aggregation sites/zones
  - ii. Real-time location, event, and status information
  - iii. Trip-level details including start/end location/time, duration, and distance traveled
  - iv. Trip-level breadcrumb trails listing all GPS readings for each scooter

This provision is intended to and applies to only such data collected by Licensee pursuant to Licensee's own initiative. The City is not requiring Licensee to generate or collect any of the above-described data with this Agreement. To the extent that Licensee does generate and/or collect such data, the Parties each understand and agree that the City may seek, and Licensee must then provide, a copy of any such City-requested data.

- i. Licensee shall create a dashboard and/or reports illustrating the following: number of Fleet Scooters distributed; total number of trips; trips per Fleet Scooter per day; number of new customers; total number of customers; total number of low-income program customers; average miles per trip; and average minutes per trip. The foregoing summaries shall be delivered to City upon request at mutually agreed upon intervals.
- j. Licensee shall deliver to the City, upon request, a reporting of total vehicle miles travelled resulting from all of Licensee's employee or contractor operations in support of participation in the Program.
- k. Licensee is directly responsible for providing the API key, and all other required information and data covered by this Agreement to the City. The City will be permitted to publicly utilize Licensee's API and display real-time GBFS data.
- l. If any data requested by City and covered by this Agreement is falsified, or the City suspects dishonest reporting, the City reserves the right to either sanction or perform an audit of vehicle availability and/or trip data at any time during the Program term. If a third-party audit finds that falsified or dishonest reporting exists, the City reserves the right to terminate the Agreement and debar Licensee from future agreements with the City.
- m. Unless otherwise required by law, Licensee agrees that it will not retain any raw trip data related to this Agreement for a period longer than set forth in Licensee's adopted, City-approved records retention policy.
- n. In addition to responding to valid requests for public data under the Minnesota Government Data Practices Act, Licensee understands that the City may share, without notice to Licensee,

any public data related to this Agreement with separate government entities for purposes of collaborating or furthering common public purpose objectives.<sup>[2]</sup> The City will not unlawfully share or disclose any data that is classified as nonpublic due to the existence of trade secrets or other qualifying reasons under Minnesota law. Licensee agrees that it will, to the extent practicably feasible, notify the City of any data in the City's possession that Licensee believes to be a trade secret or protected proprietary information implicated by this provision. This duty to notify shall not operate to relieve the City of its responsibilities stated herein, and this Section 7.I. shall not operate so as to modify, override, or negate the legal responsibilities, duties or definitions set forth by the Minnesota Government Data Practices Act or other applicable law.

- o. The City shall abide by its "Mobility Data Methodology" as outlined in Appendix D, and shall inform Licensee of substantive changes to methodology in advance of implementation of changes.

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