Highway Performance Monitoring System

Field Manual

U.S. Department of Transportation
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Chapter 1 INTRODUCTION

1.1 Background

The Federal Highway Administration (FHWA) is responsible for assuring that adequate highway transportation data and systems performance information is available to support its functions and responsibilities, as well as those of the Administration and United States Congress.

A biennial Conditions & Performance estimate of the future highway investment needs of the nation is mandated by Congress (23 U.S.C. 502(h)) for the United States Department of Transportation (U.S. DOT) to prepare for its customers. Highway Performance Monitoring System (HPMS) data are used for assessing highway system performance under the U.S. DOT and FHWA's strategic planning and performance reporting process in accordance with requirements of the Government Performance and Results Act (GPRA, Sections 3 and 4) and for apportioning Federal-aid highway funds under the Transportation Equity Act for the 21st Century (TEA-21), (23 U.S.C. 104). To address these needs, the HPMS was first developed in 1978 as a national highway transportation system database.

This *HPMS Field Manual* provides a comprehensive overview of the HPMS program at FHWA, and describes in detail the data collection and reporting requirements for HPMS. The requirements outlined in this *Field Manual* are authorized under 23 U.S.C. 315, which places the responsibility on the Secretary of Transportation for all management decisions affecting transportation. In addition, United States Code of Federal Regulations (CFR) title 23, §1.5 provides the Federal Highway Administrator with authority to request such information deemed necessary to administer the Federal-aid highway program. Also, 23 CFR 420.105(b) requires the States to provide data that support FHWA's responsibilities to the Congress and the public. The *HPMS Field Manual* is a valuable resource that guides the States as they address their HPMS data collection and reporting responsibilities. This manual includes detailed information on technical procedures, a glossary of terms, and various tables to be used as reference by those collecting and reporting HPMS data. Information related to the use of the HPMS software web application is contained in a stand-alone document.

1.2 Scope of the HPMS

The HPMS is a national program that includes inventory information for all of the Nation's public road mileage as certified by the States' Governors on an annual basis. All roads open to public travel are reported in HPMS regardless of ownership, including Federal, State, county, city, and privately owned roads such as toll facilities. Each State is required to annually furnish all data per the reporting requirements specified in this *HPMS Field Manual*. The District of Columbia and the Commonwealth of Puerto Rico are treated as States for HPMS reporting purposes. United States Territories (Guam, the Commonwealth of the Northern Marianas, American Samoa, and the Virgin Islands of the United States) are required to annually report limited HPMS summary data only, in addition to the separate reporting of certified public road mileage.

Public road mileage certifications are due no later than June 1 of each year to FHWA Headquarters, HPPI-20. FHWA Field Division Offices may set an earlier date. The certifications shall be provided in an electronic format via email sent to the FHWA Office of Highway Policy Information official electronic mailbox (HPInfoMail@dot.gov). The requirements for submitting the public road mileage are in accordance with CFR 23, Part 460.3; see http://www.fhwa.dot.gov/policy/ohpi/prmcguidance.cfm. HPMS uses the certified public road mileage as a control total for the mileage in each State.

HPMS covers in greater detail the National Highway System (NHS), which is a network of highways important to the nation's economy, defense, and mobility. The NHS was first designated on November 28, 1995 and expanded on October 1, 2012, to include principal arterial routes but the processes to update functional classification and NHS designation remain separate. Note that although ramps may be part of the NHS, the NHS data in HPMS does not cover ramps except for five data items: Functional System, Urban Code, Facility Type, Through Lanes, and AADT.

1.3 Uses of HPMS Data

HPMS is the official Federal government source of data on the extent, condition, performance, use, and operating characteristics of the nation's highways. Certain data items including length, lane-miles, and travel are required for all public roads that are eligible for Federal-aid highway funds. These three data items in particular are used in the apportionment of Federal-aid highway funds. The data items reported for all public roads are known as Full Extent data items.

In addition to Full Extent data items, there are data items that are reported on a partial extent basis, which are known as Sample Panel data items. The Sample Panel provides more detailed statistical data on a randomly selected sample of roadway sections in the State's public road system. Finally, there is a set of summary data included in the HPMS system known as Summary data items. The summary data are reported in aggregate form, for roadways functionally classified as minor collectors in rural areas and local roads in any area.

HPMS data are used for assessing and reporting highway system performance under FHWA's strategic planning process. HPMS data also form the basis of the analyses that support the *Conditions and Performance (C&P) Report to Congress* and are the source for a substantial portion of the information published in the annual *Highway Statistics* publication and in other FHWA publications including information that is reported to the media. Finally, the HPMS data are widely used throughout the transportation community, including other governmental entities, business and industry, institutions of higher learning for transportation research purposes, and the general public. The HPMS data may also be used for performance measurement purposes in national, State and local transportation decision-making to analyze trade-offs among the different modes of transportation as part of the metropolitan and statewide transportation planning process. Table 1.1 contains information on the source of selected length, lane-mile, and travel data from the HPMS data set.

Table 1.1 Minimum Data Reporting for Selected HPMS Products

RURAL

HPMS Product	Federal-Aid				Non-Federal-Aid	
	National Highway System (NHS)	Non-National Highway System (non-NHS)				
	Interstate & Non-Interstate	Other Freeways & Expressways and Other Principal Arterials	Minor Arterial	Major Collector	Minor Collector	Local
Miles	Full Extent	Full Extent	Full Extent	Full Extent	Summary	Summary
Lane-Miles	Full Extent	Full Extent	Full Extent	Full Extent	Summary 1/	Summary 1/
Total VMT	Full Extent	Full Extent	Full Extent	Full Extent	Summary 2/	Summary 2/
Truck VMT	Full Extent	Sample Panel	Sample Panel	Sample Panel	Summary	Summary
International Roughness Index (IRI)	Full Extent	Full Extent	Sample Panel	Optional		
Total Public Road Miles	Certified Mileage ----------					

URBAN

HPMS Product	Federal-Aid					Non-Federal- Aid
	National Highway System (NHS)	Non-National Highway System (non-NHS)				
	Interstate Non-Interstate	Other Freeways & Expressways and Other Principal Arterials	Minor Arterial	Major Collector	Minor Collector	Local
Miles	Full Extent	Full Extent	Full Extent	Full Extent	Full Extent	Summary
Lane-Miles	Full Extent	Full Extent	Full Extent	Full Extent	Full Extent	Summary 1/
Total VMT	Full Extent	Full Extent	Full Extent	Full Extent	Full Extent	Summary 2/
Truck VMT	Full Extent	Sample Panel	Sample Panel	Sample Panel	Sample Panel	Summary
International Roughness Index (IRI)	Full Extent	Full Extent	Optional	Optional	Optional	
Total Public Road Miles	Certified Mileage ----------					

1/ Data for Lane-Miles on Rural Minor Collector, and Local roads are calculated using Summary miles times 2. Since the States are not required to report the number of through lanes on these systems, except for NHS sections, FHWA uses a multiplier of 2 for the number of lanes, to be consistent across all States.
2/ Data reported for Total VMT on Rural Minor Collector and Local roads are provided at a summary level of detail. States are not required to report section level AADT on these systems, except for NHS sections.

Full Extent: Data reported for the full extent of the system (even if the data are sampled annually).
Sample Panel: Data reported for at least the HPMS sample panel sections.
Summary: Data reported in aggregate form.

1.4 HPMS Staff Roles and Responsibilities

The provision of HPMS data is a cooperative effort between State highway agencies (SHAs), local governments, and metropolitan planning organizations (MPOs) working in partnership to collect, assemble, and report the necessary information. In consultation with its HPMS partners, stakeholders, and customers, FHWA identifies the data to be reported and provides data definitions and standards. FHWA develops and maintains web-based applications, analytical models and techniques that FHWA and various State DOTs use in conjunction with HPMS data to conduct policy-level, corridor-level, and subarea planning analysis and programming. Taken together, these activities support informed highway planning, policy development, and decision-making at the Federal and State levels.

Within each SHA, the responsibilities for collecting and reporting HPMS data is generally a cooperative process between a central office, which prepares, analyzes, and submits HPMS data on behalf of the State, and other district or regional offices responsible for field data collection activities, including roadway inventory, and traffic and pavement data collection. To help facilitate this effort, this manual provides guidance to the States in support of their field data collection activities for HPMS.

The process of coordinating these activities is usually performed under the direction of an HPMS Manager or HPMS Coordinator within each State highway agency. This person serves as the primary liaison with the FHWA on all matters related to the preparation and submittal of the State's HPMS submittal.

The HPMS data model, which relies heavily on a geospatial component, requires each State's Geographic Information System (GIS) staff to be actively involved in the HPMS process. Their role is to ensure that the spatial data that are to be submitted with the HPMS data are accurate as well as up-to-date. For example, a spatial dataset containing urban area boundaries should be consistent with, or based on the most recently approved census boundaries. In addition, the States must provide geospatial data in an ESRI shapefile, ESRI geodatabase, or Intergraph GeoMedia Access Warehouse format, which contains a Linear Referencing System (LRS)[1] that represents the State's road network as reported in HPMS. The LRS must be developed in such a way that it can easily be linked to the road inventory attributes that are reported. Furthermore, it is the road inventory data which provides the information about the condition, performance, use, and operating characteristics of the road network.

After each State has submitted their HPMS data, it is the responsibility of the FHWA Office of Highway Policy Information (OHPI) to integrate each submittal into the national HPMS database. The HPMS database then becomes the source of information provided in the *Conditions and Performance (C&P) Report to Congress* on a biennial basis.

The preparation and submittal of HPMS is based on a yearly cycle in each State. Data collection activities for some road inventory data items may be gathered throughout the year as part of annual road inventory programs. Other data items, such as traffic counts, may be collected on a rotating three-year cycle for various parts of the State's transportation network.

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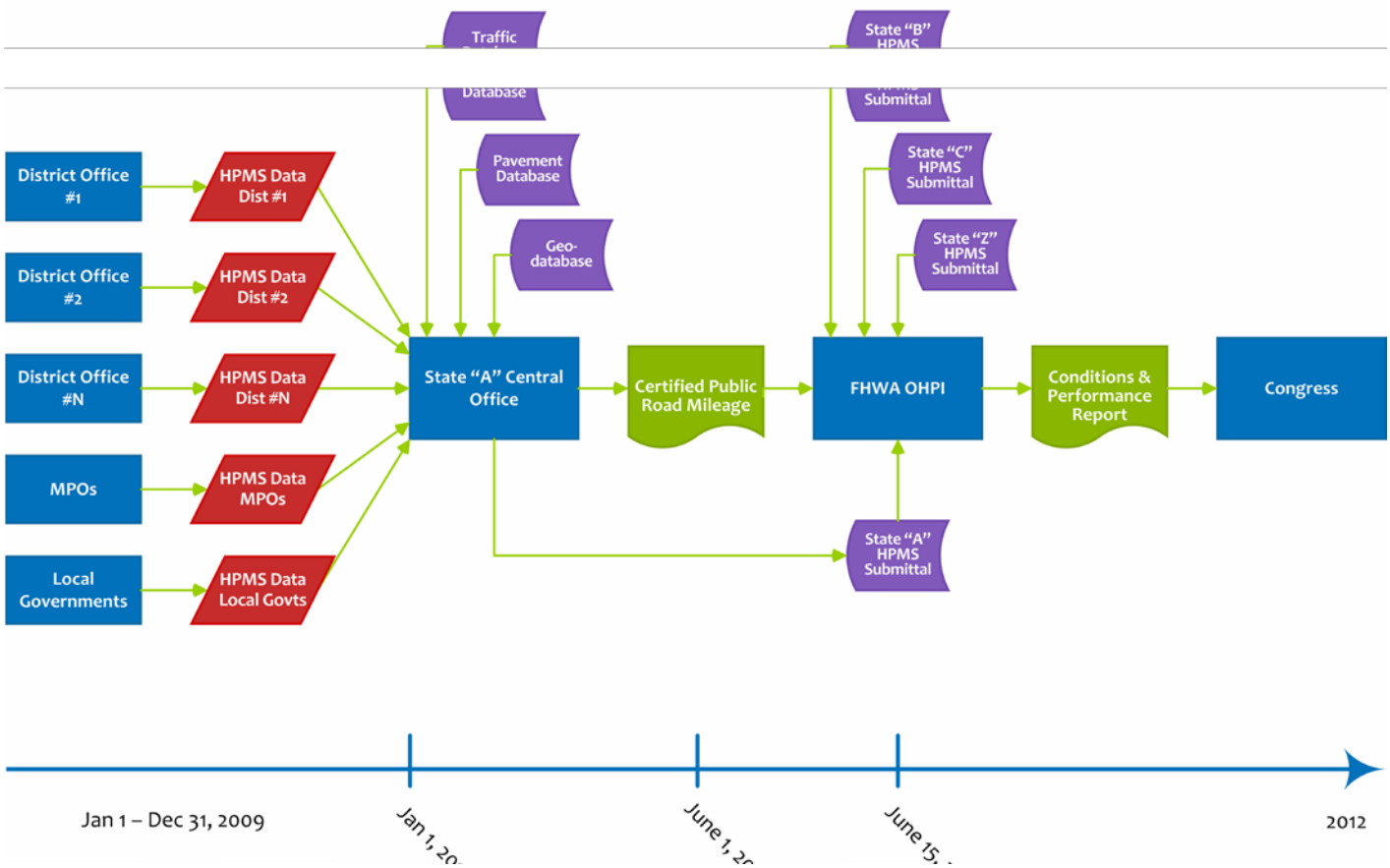
[1] A Linear Referencing System is based on a set of procedures for determining and retaining a record of specific points along a highway. Typical methods used are milepoint, milepost, reference point, and link-node.

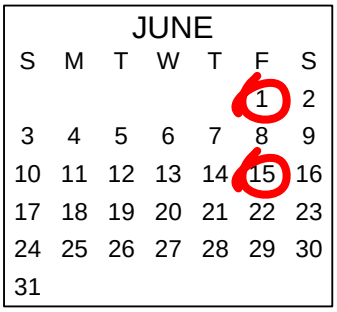
The HPMS submittal from the State represents the condition of the road network as of December 31st of each year. The submittal is due to FHWA by June 15th of the following year, to allow time for the States to integrate the additional data items such as pavement and traffic related data, which requires additional time for processing and analysis.

Figure 1.1 illustrates a potential workflow for the process and roles involved in the preparation of a State's HPMS data submittal.

Figure 1.1 State HPMS Processing Cycle



1.5 Reporting Requirements



Each State is required to prepare an annual submittal of HPMS data in accordance with the procedures, formats, and codes specified in this manual. Each State should also assure that there is agreement between the Certified Public Road Mileage and the total length (in miles) reported to FHWA via HPMS. Data from the current inventory year (i.e., year of data collection) will be reported in HPMS unless otherwise noted. Actual values for roadway attributes are to be reported for the most part, however, factoring or estimation of data is permissible where specified in this Field Manual for the individual data item attributes. Each State is to include their Linear Reference System (LRS), which links the attribute (i.e. HPMS section data) and geospatial data, as part of the annual submittal. If a State uses more than one LRS for their own purposes, it is

necessary for the State to designate one LRS to be used for Federal reporting purposes. This Federal reporting LRS is the one that should be maintained and submitted annually with the HPMS submittal.

HPMS due date: June 15th of the year following the data inventory year, e.g. data collected in calendar year 2009 are due to FHWA by June 15, 2010.

The data required for the annual submittal of HPMS includes: (1) limited data on all public roads (Full Extent), (2) more detailed data for designated sections of the arterial and collector functional systems (Sample Panel), and (3) area-wide summary information for urbanized, small urban and rural areas (Summary).

Full Extent Data

Full Extent Data refers to a limited set of data items that are reported for an entire road system such as the National Highway System (NHS) or an entire functional system.

Sample Panel Data

Sample Panel Data consists of data items added to the Full Extent data that are reported for a select portion of the total roadway system length. The sampled sections are a fixed sample panel of roadway sections that are monitored from year to year and, when expanded, represent the Full Extent of the systems that are sampled. The more detailed information collected for a Sample Panel section is used to represent similar conditions on the associated functional system after expansion.

Partial Extent Data

Partial Extent Data refers to those data items that are reported on a Full Extent basis for some functional systems and on a Sample Panel basis for other functional systems.

Statewide Summary Data

Statewide Summary Data includes information on travel, system length, and vehicle classification by functional system and area type, in addition to land area and population by area type. The area types include rural, small urban, and individual urbanized, non-attainment, and maintenance areas. Pollutant type is also reported as indicators of air quality in non-attainment areas.

Linear Referencing System (LRS) Data

LRS data provides a spatial reference for the Full Extent and Sample Panel data on selected highway functional systems. This spatial data coupling (i.e. representing roadway attribute data in a spatial format) enables the analysis of HPMS data in a GIS environment. Within the HPMS software, the State-provided LRS represents all roadways in a given State's road network for a designated set of functional classifications.

HPMS Regulations

Regulations governing the FHWA State Planning and Research (SPR) funded work programs [23 Code of Federal Regulations (CFR), Part 420] outline responsibilities for furnishing FHWA adequate information for administering the Federal-aid highway program. Maintaining a valid HPMS database is an item of national significance and items of national significance must be adequately addressed in each State's annual work program. This extends beyond the simple reporting of data each year and includes taking actions to assure that all data are complete, current, and accurate. Although there may be other participants in the collection and reporting process, the ultimate responsibility for the accuracy and timely reporting of HPMS data lies with the State highway agency.

The submission of false data is a violation of the United States Code (U.S.C.), Title 18, Section 1020.

The annual HPMS submittal is to be transmitted to FHWA via a web-based HPMS application. The HPMS software web application, to be used by the States, can be accessed via the Office of Highway Policy Information homepage at: http://www.fhwa.dot.gov/policyinformation/. Questions pertaining to the annual submittal should be directed to The Office of Highway Policy Information at 202-366-0175.

Chapter 2 HPMS CORE COMPONENTS

2.1 Overview

The HPMS process is designed to be a cooperative effort between the States and the Federal Highway Administration (FHWA). Chapter 1 described the background of the HPMS program and discussed the scope and uses of the national database. The roles and responsibilities of the States and FHWA regarding HPMS were also presented in the previous chapter. This chapter focuses on the States' responsibilities for collecting the HPMS data and discusses the way in which the data will be used to support the core components of HPMS.

There are three sources of data for the national HPMS database. These include:

1 - Data that are to be developed and supplied by the States

2 - Data that are obtained by FHWA from other non-State sources

3 - Data that are generated or calculated by FHWA

Data that are to be maintained by FHWA are done so in both geospatial and non-geospatial formats, and is available for use by the States for research and analysis, or to help States as they prepare their HPMS submittal. Data that are generated by FHWA are created during the submittal process, and are discussed in Chapter 4 of this manual. Since the purpose of this manual is to assist the States with their data collection and reporting activities, the remainder of this chapter focuses on the types of data that are to be supplied by the States.

The States are responsible for providing the following types of data to FHWA: Full Extent, Sample Panel, Summary, Estimates, and Metadata. The geospatial component of the HPMS data model links the data from these categories to a geographic location on each State's respective linear referencing system (LRS) network. More information on the geospatial component of the data model can be found in Chapter 3 of this manual.

2.2 Full Extent Data

Within the context of the HPMS system, some data elements must be reported for their full extent (i.e. system-wide). The Full Extent network consists of the National Highway System (NHS) routes (including intermodal connectors) and all other roads, excluding those functionally classified as minor collectors in rural areas and local roads in any area.. Data elements that are reported for these types of roads are referred to as Full Extent data items. For some data items, the Full Extent's coverage also includes ramps associated with grade-separated interchanges for which a limited number of Full Extent data items are to be reported.

2.3 Sample Panel Data

Within the extent of all Federal-aid eligible roads, a random selection of roadway sections is used to represent various attributes at a system-wide level for the purposes of assessing the performance and condition of the network. This process helps to reduce any burden that may be imposed on the States to perform data collection to meet their HPMS reporting requirements. These sections of the network are referred to as Sample Panel sections. Moreover, the Sample Panel sections are selected randomly and are intended to give a statistically valid representation of the State's road network. Due to the structure of the HPMS data model (discussed in

Chapter 3), the States are not required to extract the Sample Panel data items, as long as the data in their submittal covers the Sample Panel. States are encouraged to submit their entire dataset for each data item. FHWA will dynamically assign values to the Sample Panel sections, using the data provided by the States. This should help to lessen the data processing burden on States that are currently collecting more than the minimum coverage. Additional information on the Sample selection process is provided in Chapter 6.

2.4 Data Items Required for the Full Extent and/or Sample Panel Sections

The data items listed in Table 2.1 are to be submitted as part of the Sections dataset, which will be stored as a table in within FHWA's database. Detailed information for these data items is provided in Chapter 4.

- **Item Number** is the number assigned to each data item
- **Data Item** identifies the type of attribute data to be reported
- **Extent** indicates if the data item is required for the Full Extent (FE), Sample Panel (SP) sections, or the Full Extent and Ramp sections (FE+R)

Table 2.1 Data Items to be Reported

Data Item Type	Item Number	Data Item	Extent	
Inventory	1	Functional System	FE + R	
	2	Urban Code	FE + R	
	3	Facility Type	FE + R	
	4	Structure Type	FE**	
	5	Access Control	FE*	SP*
	6	Ownership	FE	
	7	Through Lanes	FE + R	
	8	HOV OperationsType	FE**	
	9	HOV Lanes	FE**	
	10	Peak Lanes		SP
	11	Counter Peak Lanes		SP
	12	Right Turn Lanes		SP
	13	Left Turn Lanes		SP
	14	Speed Limit		SP
	15	Toll Charged	FE**	
	16	Toll Type	FE**	
Route	17	Route Number	FE*	
	18	Route Signing	FE*	
	19	Route Qualifier	FE*	
	20	Alternate Route Name	FE	

Data Item Type	Item Number	Data Item	Extent	
Traffic	21	Annual Average Daily Traffic	FE + R	
	22	Single-Unit Truck & Bus AADT	FE*	SP*
	23	Percent Peak Single-Unit Trucks & Buses		SP
	24	Combination Truck AADT	FE*	SP*
	25	Percent Peak Combination Trucks		SP
	26	K-factor		SP
	27	Directional Factor		SP
	28	Future AADT		SP
	29	Signal Type		SP
	30	Percent Green Time		SP
	31	No. of Signalized Intersections		SP
	32	No. of Stop Sign Intersections		SP
	33	No. of Intersections, Type - Other		SP
Geometric	34	Lane Width		SP
	35	Median Type		SP
	36	Median Width		SP
	37	Shoulder Type		SP
	38	Right Shoulder Width		SP
	39	Left Shoulder Width		SP
	40	Peak Parking		SP
	41	Widening Obstacles		SP
	42	Widening Potential		SP
	43	Curve Classification		SP*
	44	Terrain Type		SP
	45	Grade Classification		SP*
	46	Percent Passing Sight Distance		SP
Pavement	47	International Roughness Index (IRI)	FE*	SP*
	48	Present Serviceability Rating (PSR)		SP*
	49	Surface Type		SP
	50	Rutting		SP
	51	Faulting		SP
	52	Cracking Percent		SP
	53	Cracking Length		SP
	54	Year of Last Improvement		SP

Data Item Type	Item Number	Data Item	Extent	
	55	Year of Last Construction		SP
	56	Last Overlay Thickness		SP
	57	Thickness Rigid		SP
	58	Thickness Flexible		SP
	59	Base Type		SP
	60	Base Thickness		SP
	61	Climate Zone		SP
	62	Soil Type		SP
Inventory	63	County Code	FE	
Special Networks	64	National Highway System (NHS)	FE**	
	65	Strategic Highway Network (STRAHNET)	FE**	
	66	National Truck Network (NN)	FE**	
	67	Future Facility (Planned/Unbuilt NHS)	FE**	
Inventory	68	Maintenance and Operations	FE	
Traffic	69	Capacity		SP

FE = Full Extent for all functional systems (including State and non-State roadways)
FE* = Full Extent for some functional systems, (see Chap. 4, Sec. 4.4 for more details)
FE** = Full Extent wherever data item is applicable, (see Chap. 4, Sec. 4.4 for more details)
FE + R = Full Extent including ramps located within grade-separated interchanges
SP = All Sample Panel Sections (as defined by HPMS)
SP* = Some Sample Panel Sections (see Chap. 4, Sec. 4.4 for more details)

2.5 Summary Data

The summary data are intended to provide general information on the use, extent, condition, and performance of the public roads, particularly on the lower functional systems (minor collectors in rural areas and local roads in any area). For example, non Federal-aid roads do not require section-level detail and can be summarized from State and local sources. These sources include statewide highway databases, inventory management systems, Intelligent Transportation Systems (ITS), traffic monitoring systems, and data made available from local governments and Metropolitan Planning Organizations (MPOs).

The type of data reported in the summary data includes travel, system length, and vehicle classification by functional system and area type, in addition to land area and population by area type. The area types include rural, small urban, and individual urbanized, non-attainment, and maintenance areas. Pollutant type is also reported as an indicator of air-quality in non-attainment areas.

The following summaries are to be reported as five individual datasets, which will be stored as tables within FHWA's database:

1 - Statewide Summaries

2 - Vehicle Summaries

3 - Urban Summaries

4 - County Summaries

5 - NAAQS Summaries

Statewide Summaries

This summary contains information about population, land area (in thousands), and system length (in miles) as it pertains to rural areas, and daily travel (vehicle-miles traveled (VMT) in thousands) with respect to small urban areas. The data for the extent of the road network are further subdivided by the extent of paved and unpaved roads in the rural and small urban areas.

Vehicle Summaries

This summary contains travel activity data summarized by vehicle type and highway system group. The highway system group includes six categories: the first three for rural roads and the last three for urban roads. Each of these categories represents the group for which travel by vehicle type is summarized.

Urban Summaries

This summary contains information about travel, population, and land area for roads functionally classified as local, for each adjusted urbanized area.

County Summaries

This summary contains system length data by county for all roads functionally classified as minor collectors in rural areas and local roads in any area. Any National Highway System (NHS) routes on these roads are also included in this summary for each county. This summary also includes information about the ownership of the roads (public or private), as well as jurisdictional responsibility for the road. Some examples of the types of roads that may be included in this summary are park roads, military roads, toll roads, public roads at an airport, school, or university, and roads under the jurisdiction of the Bureau of Indian Affairs.

NAAQS Summaries

This summary includes system length and travel data for rural minor collectors and rural/urban locals summarized by non-attainment and maintenance areas, and pollutant type. HPMS uses the Environmental Protection Agency (EPA) defined non-attainment or maintenance area for identification purposes.

2.6 Estimates Data

The estimates dataset that is to be submitted will be stored as a table within FHWA's database. This data will only be used for national-level analysis. The sole purpose of these data is to provide an estimate of current State and local pavement conditions and construction practices where measured data are not available. These data are used for analysis in various FHWA models. Estimated values may be provided for the following pavement-related items:

- Last overlay thickness
- Thickness of rigid pavement
- Thickness of flexible pavement
- Base type
- Base thickness
- Binder Type
- Dowel bar presence
- Typical joint spacing

2.7 Metadata

The metadata that are to be submitted will be stored within FHWA's database. The purpose of the metadata is to provide additional information for understanding and/or explaining the variability in certain traffic and pavement-related data items that are reported in HPMS. Metadata within HPMS are used to describe data collection procedures and post-processing that may affect the consistency or quality of the data. The metadata contains information related to the collection and reporting of the following:

- Traffic counts
- Vehicle classification
- Source of the travel data
- Type of IRI equipment used to measure the International Roughness Index (IRI)
- Method and equipment used to collect rutting data
- Method and equipment used to collect faulting data
- Method and equipment used to measure pavement cracking
- Ramp termini descriptions, and traffic estimation method used for reporting traffic data on ramps

Some metadata may be published annually in the *Highway Statistics* publication, or, are provided to data users as requested. The metadata provided by each State will not be used by FHWA to alter a State's HPMS submittal.

Chapter 3 DATA MODEL & REQUIRED DATASETS

3.1 Overview

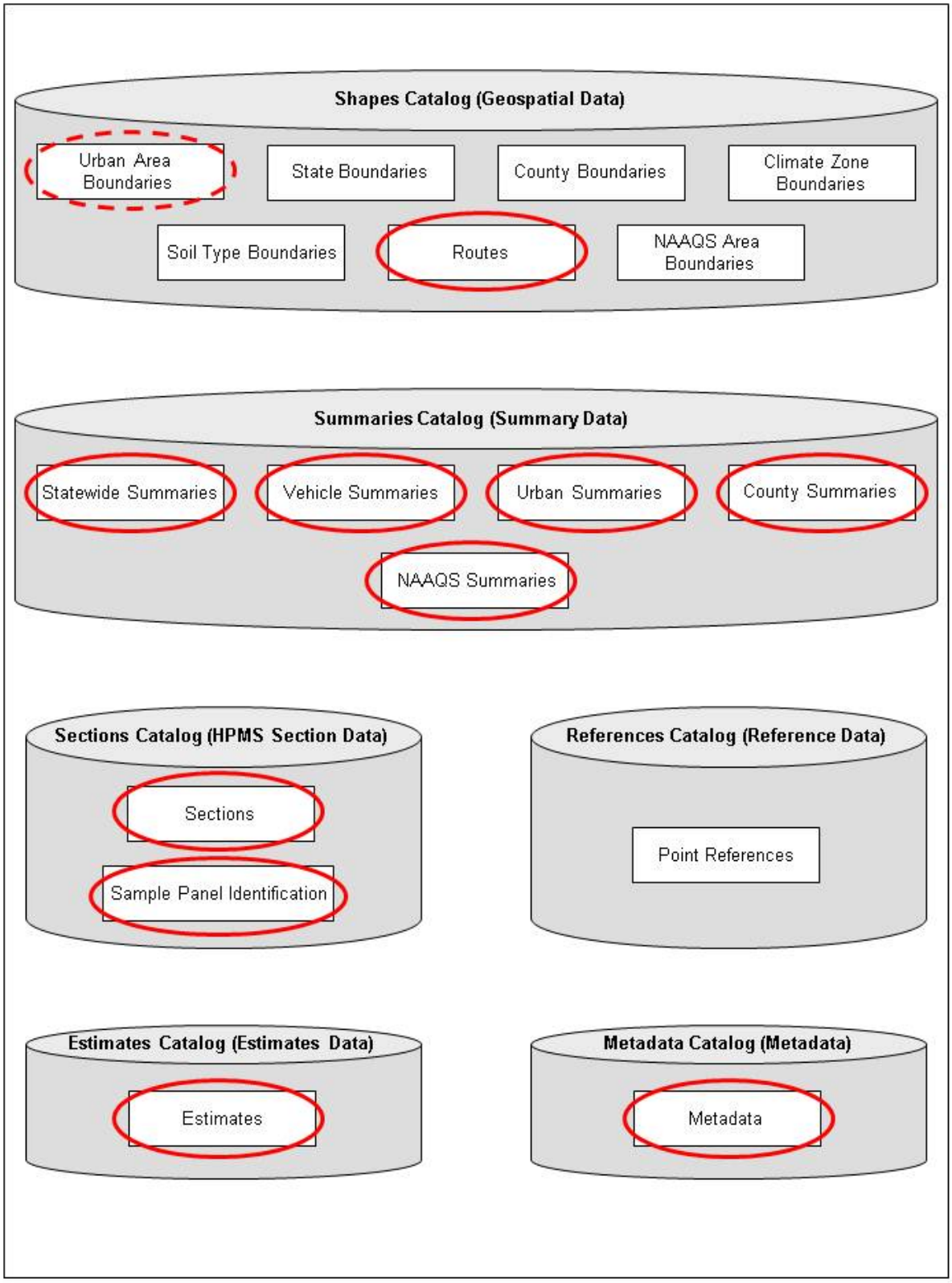
The HPMS data model has been developed within a Geographic Information System (GIS) framework, to take full advantage of the spatial relationships that exist between data elements which are both internal and external to HPMS. The data model is designed to be flexible in terms of compatibility with other data sources and expandable as additional data becomes available. In addition, the data model is designed to achieve independence with respect to the way in which the various data components relate to one another. This approach allows for future modification to a particular area of the model (e.g. a dataset, or data item) with little or no impact on other datasets or data items. For instance, if a change is needed to a roadway section's surface type (e.g. changing it from a code 1-unpaved to code 2-conventional asphalt concrete), it can be done so without impacting the value that is coded for that section's annual average daily traffic (AADT).

The data model's design is structured in a way that allows external data sources to be used to populate the various data fields in HPMS. For example, National Ambient Air Quality Standards (NAAQS) boundary spatial data can be used to assign a pollutant standard to each roadway section for the purpose of generating area-wide totals (e.g. vehicle miles of travel).

This data model is organized conceptually into a group of six catalogs. Each catalog groups the various datasets by type and/or function. The types of data can be categorized as: (1) geospatial data, representing various highway systems, geographic boundaries etc., (2) roadway attribute data that can be linked to a related GIS dataset, which allows the attribute data to be represented spatially via linear referencing or (3) metadata, which provides additional global information about the data.

Figure 3.1 illustrates the structure of the HPMS data model. The HPMS attribute data that are submitted by the States are grouped within the Sections Catalog. The Sections dataset that is identified in this catalog stores all of the records for each data item as they are reported by the States. The Sample Panel Identification dataset stores the limits for each State's sample panel as identified by the States. The Data Item field in the Sections dataset specifies the type of record (e.g. AADT, Lane Width, etc.), with the corresponding data stored in the Value (Numeric, Text, or Date) fields. These records act independently of one another, as they indicate the properties of the attribute they portray. Furthermore, the records in both the Sections and Sample Panel Identification datasets are linked to each State's geospatial network (i.e. LRS network) via its attribute table, which is identified as the Routes dataset that is identified in the model's Shapes Catalog. Data associated with the lower functional systems (i.e. minor collectors in rural areas and local roads in all areas) are summarized and reported in the datasets identified in the Summaries Catalog. The level of data for these functional systems is commensurate with the Federal need for analyzing and reporting these data. The Estimates Catalog contains a dataset of pavement attributes that will be used as input to FHWA's pavement models. The Metadata Catalog contains data that describe the methods and tools that are used for the collection and reporting of traffic, pavement, and ramp data. The References Catalog identifies the geospatial data which will ultimately be maintained by FHWA or other non-State entities. The data in these datasets are available for use by the States throughout the year for reference.

Figure 3.1 HPMS Data Model Structure



<u>Note</u>: Circled items in Figure 3.1 must be developed by the States and submitted to FHWA

3.2 Geospatial Component

The geospatial component of the data model provides the foundation for a national-level linear referencing system (LRS) that will serve primarily as a resource for HPMS, but will also be used to support a number of other interagency work program objectives. It will also be used to facilitate analysis and research efforts, using HPMS data.

Incorporating a geospatial component enhances the HPMS sampling process by providing an alternative methodology for sample selection and maintenance. This component allows a GIS-based process to be used to identify sections of road that have homogenous (or uniform) characteristics for key data items, which can be used for sampling purposes. More information on the GIS procedures associated with sampling is found in Chapter 6, Sampling.

The primary catalog used to identify the model's geospatial data is the Shapes Catalog. However, the Sections Catalog identifies the attribute data that is linked to the geospatial data, which can be spatially located on the network for mapping, analysis, and reporting purposes.

Furthermore, the geospatial component of the data model involves the use of a LRS, which links the HPMS attribute data to a series of shape files. Both the geospatial and attribute data contain three referencing elements that are used to perform the linkage for linear features: (1) A unique Route ID, (2) a beginning milepoint, and (3) an ending milepoint. Point features use a route milepoint in place of a beginning and ending milepoint for referencing purposes. Data Items are identified in the Point References datasets of the model's References Catalog and are linked to and spatially referenced in the same manner.

3.3 Catalogs and Associated Datasets

This section describes each of the following catalogs and their associated datasets, which will be stored as tables in FHWA's database. <u>The datasets which are required to be developed by the States and provided to FHWA are circled in the figures for each catalog description contained in this section of the manual</u>.

1 - Shapes

2 - Sections

3 - Summaries

4 - References

5 - Estimates

6 - Metadata

The datasets that are to be assembled by the States can either be submitted to FHWA as character separated value (CSV) files or entered manually on-screen via the HPMS software web application provided by FHWA.

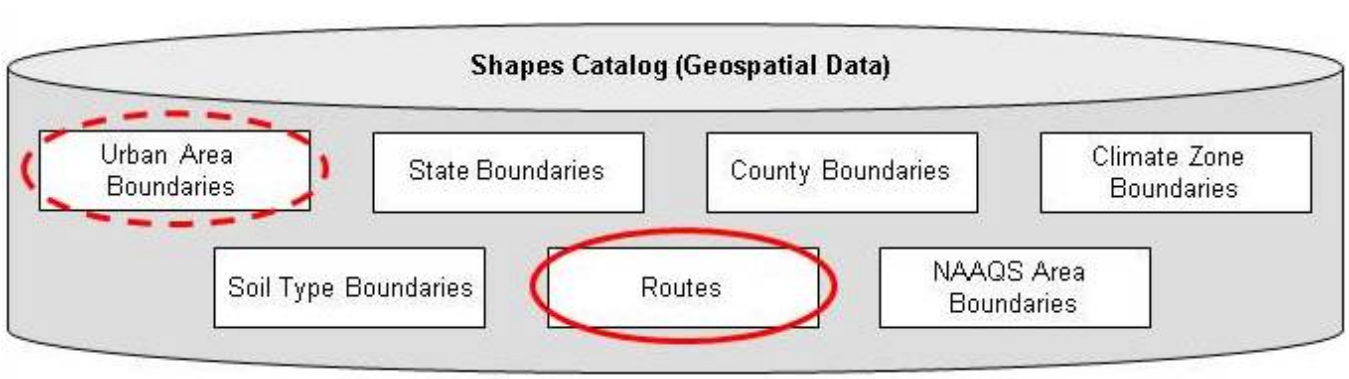
The remainder of this section describes the structure of the various datasets that are to be provided by the States, as well as those that will be developed and maintained by FHWA. Tables 3.1-3.21 include the identification of constraints (indicates if the field is part of a key field, either primary (PK) or unique (UK), and is used to establish relationships within the model), field name (identifies the field of information), data type (contains the format for each data item), and description (definition of the field). Valid values for the fields are also included in the tables, where appropriate. Furthermore, the data types used in the tables are as follows:

- Text – text entries are permitted
- Variable Character or VarChar (X) – alphanumeric entries are with a maximum length of X are permitted
- Numeric (X) – numeric values with a maximum length of X are permitted
- Decimal (X, Y) – numeric values with a maximum length of X and a length of Y decimal places are permitted

Shapes Catalog

The Shapes Catalog identifies the geographic data that are used for geospatial analysis in HPMS. This catalog is comprised of seven datasets which are as follows:

- Routes
- State Boundaries
- County Boundaries
- Climate Zone Boundaries
- Soil Type Boundaries
- Urban Area Boundaries
- NAAQS Boundaries



The information in these datasets is derived from Federal, State and local geospatial data sources. It is preferred that the States submit their data to FHWA in an ESRI shapefile, ESRI geodatabase, or Intergraph GeoMedia Access Warehouse format. However, other formats will be accommodated provided that they are in compliance with Open Geospatial Consortium (OGC) standards: Well Known Text (WKT), Well Known Binary (WBT), and/or Geography Markup Language (GML).[1]

The Routes dataset will be stored in FHWA's database per the following specifications:

- Spatial Reference (i.e. Coordinate System) – North American Datum 1983 (NAD83), unprojected coordinates (Longitude/Latitude)
- Linear Units – Miles

The spatial boundaries and associated data in many of these datasets will not change from year to year, but are expected to be updated as needed to reflect any changes made over the course of the year. Furthermore, some of these datasets will be maintained by FHWA using data provided by the States and other Federal Agencies.

The States must submit their Routes and adjusted Urban Area Boundaries (if applicable) spatial data to FHWA annually. The State Boundaries, County Boundaries, Climate Zone Boundaries, Soil Type Boundaries, Census Urban Area Boundaries, and NAAQS Area Boundaries datasets are maintained by FHWA and used for display and data management/analysis purposes.

Tables 3.1-3.7 contain information on the structure of each dataset identified in the Shapes Catalog.

The States must include the field names, which are specified in Tables 3.5-3.8, 3.10, 3.11-3.15, 3.17, and 3.19, in the datasets that are to be submitted to FHWA.

Table 3.1 State Boundaries

Table 3.1 describes the polygon shapes dataset representing each of the US States. This data will be maintained by FHWA.

STATE BOUNDARIES TABLE			
Constraint	Field Name	Data Type	Description
PK	State Code	Numeric(2)	State FIPS code
	State Abbreviation	Text	State abbreviation
	State Name	Text	State name
	Shape	Geometry	Polygon feature

Table 3.2 County Boundaries

Table 3.2 describes the polygon shapes dataset representing all counties for each State. This data will be maintained by FHWA.

COUNTY BOUNDARIES TABLE			
Constraint	Field Name	Data Type	Description
PK	State Code	Numeric(2)	State FIPS code
PK	County Code	Numeric(3)	County FIPS code
	County Name	Text	County name
	Shape	Geometry	Polygon feature

Table 3.3 Climate Zone Boundaries

Table 3.3 describes the polygon shapes dataset representing the different climate zones for each State. This data will be maintained by FHWA.

CLIMATE ZONE BOUNDARIES TABLE			
Constraint	Field Name	Data Type	Description
PK	Climate Zone	Numeric(1)	Climate zone code
	Climate Zone Name	Text	Climate zone description
	Shape	Geometry	Polygon feature

Table 3.4 Soil Type Boundaries

Table 3.4 describes the polygon shapes dataset representing the AASHTO soil zones for each State. This data will be maintained by FHWA.

SOIL TYPE BOUNDARIES TABLE			
Constraint	Field Name	Data Type	Description
PK	Soil Type	Numeric(5)	Soil type code
	Soil Type Name	Text	Soil type description
	Shape	Geometry	Polygon feature

Table 3.5 Routes

Table 3.5 describes the State's linear referenced network dataset. HPMS attribute data (i.e. Sections data) are linked to the network through the Route ID field in this dataset. The Route IDs, which must be unique in character, are to be defined by the States and must be in concert with the Route IDs that are contained in the Sections data. Furthermore, the submitted LRS must include, at a minimum, all Federal-aid highways, with its component National Highway System (NHS) routes and NHS intermodal connectors. The LRS may also include roads that are classified as local or rural minor collector if the submitting State maintains a valid LRS for these functional systems.

ROUTES TABLE				
Constraint	Field Name	Data Type	Description	Valid Values
PK	Year_Record	Numeric(4)	Year for which the data apply	The four digits of the year that the data represents.
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.
PK	Route_ID	VarChar(60)	ID for the linear feature	Up to 60 alpha-numeric digits that identify the route. This ID must be unique within the State.
	Comments (optional)	Text(50)	Text descriptor for the route	Up to 50 text characters to be used for specifying an English descriptor for the route (e.g. Interstate 70, I-70, I-70 from Exit 2 to Exit 4, etc.).
	Shape*	Geometry	Line feature	This field is automatically generated when the State's LRS network is developed. Coordinates for geometries have 3 dimensions – Longitude(x), Latitude(y), and Measure/Station (m). The LRS network is expected to contain lines with valid X and Y points.

*Automatically generated when the dataset is created.

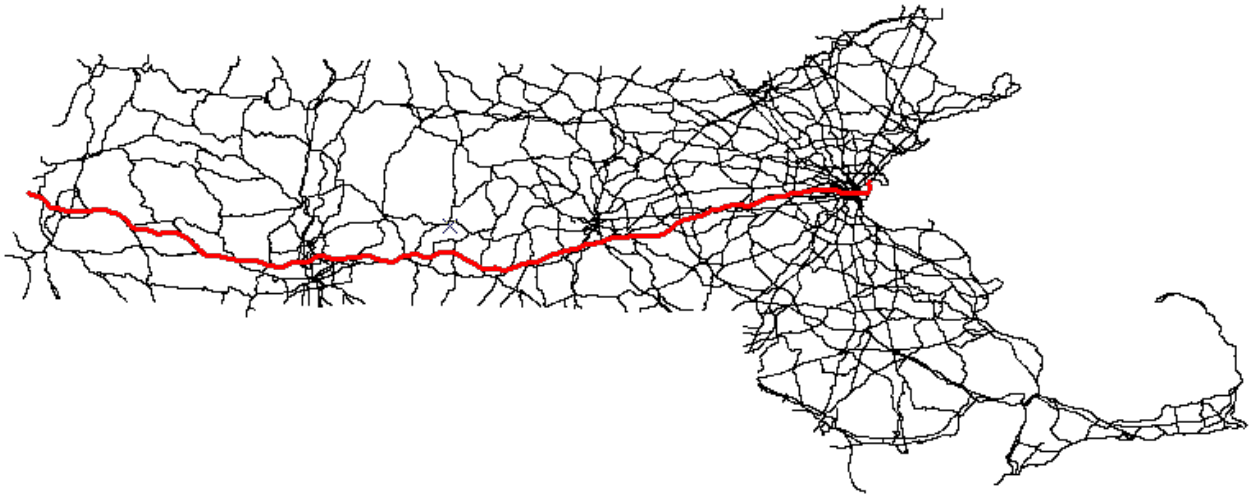
Extent – All Federal-aid highways and ramps located within grade-separated interchanges (including NHS routes).

Specific Requirements for Routes dataset:

1. File Format – ESRI Shapefile, ESRI geodatabase, or Intergraph GeoMedia Access Warehouse
2. Single Centerline or Dual Carriageway geometry
3. Spatial Reference with either projected or unprojected X/Y coordinates must be assigned
4. Linear units – miles, feet, etc.
5. Resolution - 1:100,000 or better

Figure 3.2 is an illustration of the road network for State of Massachusetts. The red (bold) line represents the route for Interstate-90 (I-90), which is represented as a single record in the example Routes dataset excerpt (shown below Figure 3.2). It should be noted that a route can consist of a single polyline feature (i.e. one record) or multiple polyline features (i.e. multiple records).

Figure 3.2 Example Routes File



The following is an example record for this route (I-90) as it would appear in the Routes dataset:

Year_ Record	State_Code	Route_ID	Shape	
2007	25	0000I90	Polyline M	Where M indicates that there are individual measures for each line segment embedded in the record for this dataset.

Table 3.6 Urban Area Boundaries

Table 3.6 describes the polygon shapes dataset representing either the Census urban area boundaries, or the adjusted Census urban area boundaries for each State. Each time the Census generates new urban boundaries, the FHWA will acquire and use them for mapping and analysis purposes. <u>If a State makes adjustments to their urban area boundaries that are approved by the FHWA Division Office, they are required to submit their adjusted urban boundaries as part of their next annual submittal</u>. States are cautioned to submit only <u>approved</u> urban boundaries, not boundaries that are pending approval.

URBAN AREA BOUNDARIES TABLE			
Constraint	Field Name	Data Type	Description
PK	Year_Record	Numeric(4)	Year for which the data apply
PK	Urban_Code	Numeric(5)	Census urban code
	Urban_Name	Text	Urban name
	Census_Pop	Numeric(8)	Census population
	Census_Land_Area	Numeric(4)	Census land area (in square miles)
	Shape	Geometry	Polygon feature

Table 3.7 NAAQS Area Boundaries

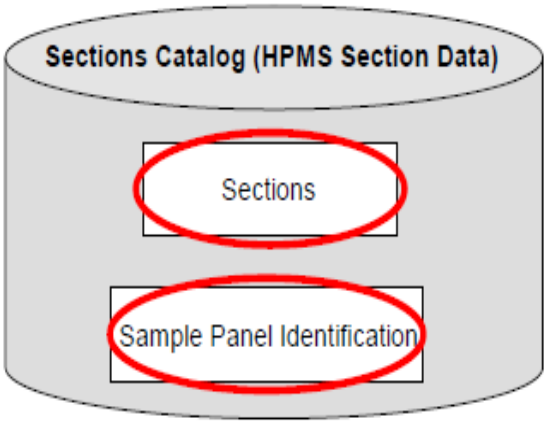
Table 3.7 describes the polygon shapes dataset representing the EPA-defined non-attainment and maintenance areas for each State. This dataset will be maintained by FHWA.

The definition of a Maintenance Area is any geographic region of the Unites States previously designated as non-attainment pursuant to the Clean Air Act (CAA) Amendments of 1990 and subsequently re-designated to attainment subject to the requirement to develop a maintenance plan under Section 175A of the CAA, as amended. The national HPMS database is used for tracking travel for air quality assurance purposes in non-attainment and maintenance areas as required by EPA under the 1990 CAA (Section 187) and the Transportation Conformity Rule, 40 CFR parts 51 and 93. More specifically, the database is used primarily for establishing regional transportation-related emissions for transportation conformity purposes. Estimated travel based on these data is used for the calibration and validation of base-year network travel models when required for non-attainment or maintenance areas.

NAAQS AREA BOUNDARIES TABLE			
Constraint	Field Name	Data Type	Description
	NAAQS Area Name	Text	NAAQS area name
PK	Pollutant Standard	Text	Pollutant standard
	Shape	Geometry	Polygon feature

Sections Catalog

The Sections Catalog identifies the HPMS attribute data that are submitted by the States. The data identified in this catalog are spatially linked to the *Routes* network file, using a unique identifier (i.e. Route ID). In general, these data are required for all Federal-aid highways and NHS routes. This requirement excludes the need to report data for any roads functionally classified as minor collector in rural areas or local in any area. Moreover, these data are optional for non-Federal-aid highways. This catalog is comprised of two datasets, Sections and Sample Panel Sections. The Sections dataset stores each State's entire HPMS attribute dataset as they provide it to FHWA. The Sample Panel Identification dataset stores the limits for each State's sample panel as identified by the States. The descriptions for each of the data items that are to be reported in the Sections dataset are listed in Chapter 4. The data items that are only required on a Sample Panel basis are identified as such in the individual data item descriptions (Chapter 4).



Sections data can either be imported as a file in Character Separated Value (CSV) format, or entered manually on-screen via the HPMS software web application. The data requirements for each dataset identified in this catalog are listed below.

Table 3.8 Sections

Table 3.8 describes the State reported HPMS Section dataset representing all Federal-aid highways and other applicable sections. Table 3.9 contains the list of valid Data Items which will be stored as part of the records in this dataset. The specific requirements for the Data Item field are defined in detail in Chapter 4.

SECTIONS TABLE				
Constraint	Field Name	Data Type	Description	Valid Values
PK	Year_Record	Numeric(4)	Year for which the data apply	The four digits of the year the data represents.
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.
PK	Route_ID	VarChar(60)	ID for the linear feature	Up to 60 alpha-numeric digits that identify the route. This ID must match a record in the Routes dataset.
PK	Begin_Point	Decimal(8,3)	Beginning Milepoint	Decimal value in thousandths of a mile.
PK	End_Point	Decimal(8,3)	Ending Milepoint	Decimal value in thousandths of a mile.
PK	Data_Item	Text	HPMS Data Items	See Chapter 4 for detailed Data Item descriptions and valid values. Table 3.9 shows the Data Item names that can be entered in this field.
	Section_Length	Decimal(8,3)	Section length	Decimal value in thousandths of a mile. This could be calculated from End MP – Beg MP
	Value_Numeric	Numeric	Numeric value for data item	Must be numeric value as specified in the detailed Data Item descriptions (see Chapter 4).
	Value_Text	VarChar(50)	Text value for data item	Must be text value as specified in the detailed Data Item descriptions (see Chapter 4). This field is available for State use where data is not required for a particular Data Item. This field is limited to 50 characters.
	Value_Date	Date	Date Value for data item	Must be a date value as specified in the detailed Data Item descriptions (see Chapter 4). This field is available for State use where data is not required for a particular Data Item.
	Comments	VarChar(100)	Comment for State use	Variable Text up to 100 characters. This field is optional.

Extent: All Federal-aid highways and ramps located within grade separated interchanges and applicable items on other sections where a toll facility exists; optional for other sections.

Table 3.9 Data Items

Item Number	Data_Item	Item Number	Data_Item	Item Number	Data_Item
1	F_System	24	AADT_Combination	47	IRI
2	Urban_Code	25	Pct_Peak_Combination	48	PSR
3	Facility_Type	26	K_Factor	49	Surface_Type
4	Structure_Type	27	Dir_Factor	50	Rutting
5	Access_Control	28	Future_AADT	51	Faulting
6	Ownership	29	Signal_Type	52	Cracking_Percent
7	Through_Lanes	30	Pct_Green_Time	53	Cracking_Length
8	HOV_Type	31	Number_Signals	54	Year_Last_Improv
9	HOV_Lanes	32	Stop_Signs	55	Year_Last_Construction
10	Peak_Lanes	33	At_Grade_Other	56	Last_Overlay_Thickness
11	Counter_Peak_lanes	34	Lane_Width	57	Thickness_Rigid
12	Turn_Lanes_R	35	Median_Type	58	Thickness_Flexible
13	Turn_Lanes_L	36	Median_Width	59	Base_Type
14	Speed_Limit	37	Shoulder_Type	60	Base_Thickness
15	Toll_Charged	38	Shoulder_Width_R	61	Climate_Zone
16	Toll_Type	39	Shoulder_Width_L	62	Soil_Type
17	Route_Number	40	Peak_Parking	63	County_Code
18	Route_Signing	41	Widening_Obstacle	64	NHS
19	Route_Qualifier	42	Widening_Potential	65	STRAHNET_Type
20	Alternative_Route_Name	43	Curves_A…Curves_F	66	Truck
21	AADT	44	Terrain_Type	67	Future_Facility
22	AADT_Single_Unit	45	Grades_A…Grades_F	68	Maintenance_Operations
23	Pct_Peak_Single	46	Pct_Pass_Sight	69	Capacity

The following is an example AADT record as it would appear in the Sections dataset:

Year_ Record	State_ Code	Route_ ID	Begin _Point	End_ Point	Data_ Item	Section_ Length	Value_ Numeric	Value_ Text	Value_ Date	Comments (optional)
2007	25	0000I90	0	10.5	AADT	10.5	25000	This is a 2006 factored AADT	2007	This record represents the traffic volume data on I90 for the section extending from milepoint 0.0 to milepoint 10.5

Table 3.10 Sample Panel Identification

Table 3.10 describes the dataset containing the geographic limits for each States' Sample Panel. Therefore, the States must provide FHWA with the geographic limits for their sample data for the purposes of this table. The Sample Panel Identification dataset will be used to properly identify the Sample Panel data that is contained within the Sections dataset. Each Sample Panel data item must be, at the very least, reported for the entire extent of the Sample Panel, where applicable. The data in Table 3.10 should represent only the samples resulting from the random selection process discussed in Chapter 6, Sampling. This dataset will be used in conjunction with the Sections and References datasets to create a View or Export of the sample data for use in various national models, such as the HERS (Highway Economic Requirements System) model. As this view/export is generated, each sample will have a single attribute for each data item corresponding to the Data Item field in the Sections dataset. The single attribute will be calculated based on a particular Calculation Method, as discussed in Appendix G.

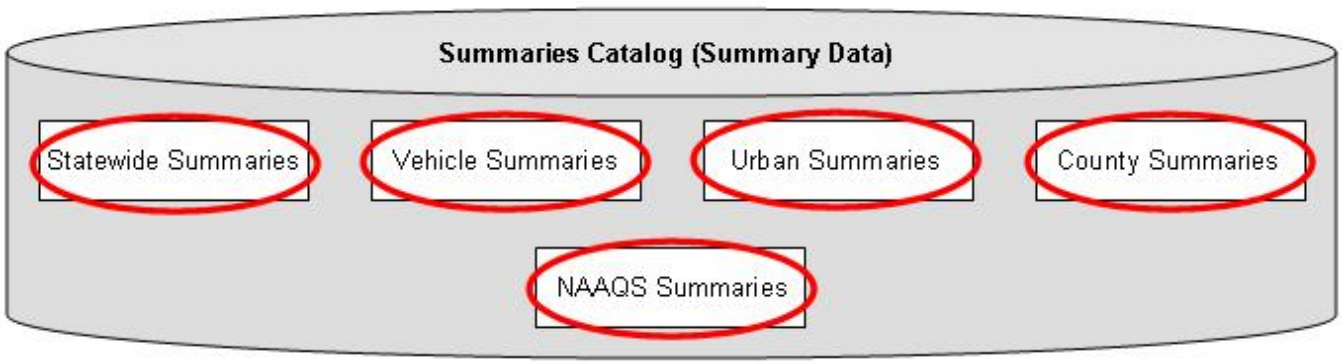
SAMPLE PANEL IDENTIFICATION TABLE				
Constraint	Field Name	Data Type	Description	Valid Values
PK	Year_Record	Numeric(4)	Year for which the data apply	The four digits of the year the data represents.
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.
PK	Route_ID	VarChar(60)	ID for the linear feature	Up to 60 alpha-numeric digits that identify the route.
PK	Begin_Point	Decimal(8,3)	Beginning Milepoint	Enter a decimal value.
PK	End_Point	Decimal(8,3)	Ending Milepoint	Enter a decimal value.
	Section_Length	Decimal(8,3)	Section length	Enter a decimal value. This could be calculated from End MP – Beg MP.
UK	Sample_ID	VarChar(12)	Sample Identifier	12-character unique ID
	Comments	VarChar(100)	Comment for State use	Variable Text up to 100 characters. This field is optional.

Extent: All Sample Panel Sections.

Summaries Catalog

The Summaries Catalog identifies the datasets that store a variety of data for a defined area, such as a State or an Urban Area. The datasets that comprise this catalog are provided by the States to FHWA as a supplement to the data that is identified in the Sections Catalog. These datasets consist of summarized data for the local and rural minor collector roads, as these roads do not require section-level detail and can be generalized from State and local sources. Moreover, the datasets identified in this catalog store summary-level data for travel, highway system length, and demographics. These datasets capture travel by vehicle type, since only State estimates are required.

Summary data can either be imported as a file in Character Separated Value (CSV) format, or entered manually on-screen via the HPMS software web application. The data requirements and specifications for each dataset identified in this catalog are listed below.



This catalog is comprised of the following five datasets:

- Statewide Summaries
- Vehicle Summaries
- Urban Area Summaries
- County Summaries
- NAAQS Summaries

The data requirements for each dataset are identified in the following pages.

Table 3.11 Statewide Summaries

Table 3.11 describes the dataset which contains demographic and system length estimates for all Urban and Rural public roads, functionally classified as minor collector in rural areas or local in any area, summarized by State. In addition, this dataset contains daily vehicle-miles traveled (VMT) estimates for all public roads located in Small Urban areas, functionally classified as minor collector or local. This includes NHS roads located on these functional systems.

STATEWIDE SUMMARIES TABLE				
Constraint	Field Name	Data Type	Description	Valid Values
PK	Year_Record	Numeric(4)	Calendar year for the data	The four digits of the year the data represents.
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.
	RMC_VMT	Numeric(8)	Daily Travel for Rural Minor Collectors	Report total daily vehicle-miles of travel as a whole number (round to the nearest 1,000 if preferred).
	RL_VMT	Numeric(8)	Daily Travel for Rural Locals	Report total daily vehicle-miles of travel as a whole number (round to the nearest 1,000 if preferred).
	SU_VMT	Numeric(8)	Daily Travel for Small Urban Locals	Report total daily vehicle-miles of travel as a whole number (round to the nearest 1,000 if preferred).
	Rural_Pop	Numeric(8)	Rural Population (> 5,000)	Estimate/report rural population as a whole number (in thousands)
	Rural_Land_Area	Numeric(8)	Rural Land Area	Estimate of rural land area to the nearest square mile.
	SU_Pop	Numeric(8)	Small Urban Population (5,000 to 49,000)	Estimate/report rural population as a whole number (in thousands)
	SU_Land_Area	Numeric(8)	Small Urban Land Area	Estimate of small urban land area to the nearest square mile.
	Paved_RMC_Length	Decimal(8,3)	Paved Rural Minor Collectors	Report total miles of paved roads to the nearest mile.
	Paved_RL_Length	Decimal(8,3)	Paved Rural Locals	Report total miles of paved roads to the nearest mile.
	Paved_UL_Length	Decimal(8,3)	Paved Urban Locals	Report total miles of paved roads to the nearest mile.
	Unpaved_RMC_Length	Decimal(8,3)	Unpaved Rural Minor Collectors	Report total miles of unpaved roads to the nearest mile.
	Unpaved_RL_Length	Decimal(8,3)	Unpaved Rural Locals	Report total miles of unpaved roads to the nearest mile.
	Unpaved_UL_Length	Decimal(8,3)	Unpaved Urban Locals	Report total miles of unpaved roads to the nearest mile.

Extent: All public roads functionally classified as Rural Minor Collector/Local and Small Urban Local. Any NHS routes or toll roads on these functional systems should be included.

Metadata: See Metadata Catalog

Table 3.12 Vehicle Summaries

Table 3.12 describes the dataset which contains Travel Activity data summarized by Highway System Group and Vehicle Type.

VEHICLE SUMMARIES TABLE					
Constraint	Field Name	Data Type	Description	Valid Values	
PK	Year_Record	Numeric(4)	Calendar year for the data	The four digits of the year the data represents.	
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.	
PK	FS_Group	Numeric(1)	Highway System Group	*Code*	*Description*
				1	Rural Interstate
				2	Rural Other Arterial (includes Other Freeways & Expressways, Other Principal Arterials, and Minor Arterials)
				3	Rural Other (includes Major Collectors, Minor Collectors, and Locals)
				4	Urban Interstate
				5	Urban Other Arterial (includes Other Freeways & Expressways, Other Principal Arterials, and Minor Arterials)
				6	Urban Other (includes Major Collectors, Minor Collectors, and Locals)
	Pct_MC	Decimal(5,2)	Percent of motorcycle VMT (Vehicle Class 1)	Code percentage as 0.00 to 100.00.	
	Pct_Cars	Decimal(5,2)	Percent of passenger car VMT (Vehicle Class 2)	Code percentage as 0.00 to 100.00.	
	Pct_Lgt_Trucks	Decimal(5,2)	Percent of light truck VMT (Vehicle Class 3)	Code percentage as 0.00 to 100.00.	
	Pct_Buses	Decimal(5,2)	Percent of bus VMT (Vehicle Class 4)	Code percentage as 0.00 to 100.00.	
	Pct_SU_Trucks	Decimal(5,2)	Percent of single-unit truck VMT (Vehicle Classes 5-7)	Code percentage as 0.00 to 100.00.	
	Pct_CU_Trucks	Decimal(5,2)	Percent of combination-unit truck VMT (Vehicle Classes 8-13)	Code percentage as 0.00 to 100.00.	

Extent: All public roads

Metadata: See Metadata Catalog.

Reporting cycle: Review annually; update as needed.

Collection requirements: Percentages for each FS Group reported to the nearest hundredth of a percent (i.e., 45.33).

Table 3.13 Urban Area Summaries

Table 3.13 describes the dataset which contains daily travel and demographics data for all local functional system roads for each adjusted urbanized area.

URBAN AREA SUMMARIES TABLE				
Constraint	Field Name	Data Type	Description	Valid Values
PK	Year_Record	Numeric(4)	Calendar year for the data	The four digits of the year the data represents.
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list of FIPS codes.
PK	Urban_Code	Numeric(5)	Census Urban code	Up to five digits for the Census Urban code. See Appendix I for the complete list of codes.
	Local_VMT	Numeric(8)	Local (daily) travel	Report total daily vehicle-miles of travel as a whole number (round to the nearest 1,000 if preferred). Metadata: See Metadata Catalog
	State_Portion_Pop	Numeric(8)	Population for State portion	Estimate/report current population as a whole number (in thousands)
	State_Portion_Land	Numeric(8)	Land area for State portion	Estimate of current land area to the nearest square mile.

Extent: All urbanized area public roads functionally classified as Local. Any NHS routes or toll roads on these functional systems should be included.

Table 3.14 County Summaries

Table 3.14 describes the dataset which contains system length data for all roads functionally classified as minor collector in rural areas or local in any area, summarized by county.

COUNTY SUMMARIES TABLE					
Constraint	Field Name	Data Type	Description	Valid Values	
PK	Year_Record	Numeric(4)	Calendar year for the data	The four digits of the year the data represents.	
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.	
PK	County_Code	Numeric(3)	County FIPS code	Up to three digits for the Census county code.	
PK	F_System	Numeric(1)	Functional System	Report only for roads functionally classified as Local (7) and Minor Collector (rural only) (6). NHS roads on these systems should be included in this summary.	
				Code	*Description*
				6	Minor Collector (Rural only)
				7	Local
PK	Urban_Code	Numeric(5)	Urban Code	Up to five digits for the Census urban code. See Appendix I for a complete list of valid values. Code 99999 for rural sections and 99998 for small urban sections (not within the adjusted urbanized area and with an urban population of at least 5,000).	
PK	Ownership	Numeric(2)	Ownership Code	*Code*	*Description*
				1	State Highway Agency
				2	County Highway Agency
				3	Town or Township Highway Agency
				4	City or Municipal Highway Agency
				11	State Park, Forest, or Reservation Agency
				12	Local Park, Forest, or Reservation Agency
				21	Other State Agency
				25	Other Local Agency
				26	Private (other than Railroad)
				27	Railroad
				31	State Toll Authority
				32	Local Toll Authority
				40	Other Public Instrumentality (e.g., Airport, School, University)
				50	Indian Tribe Nation
				60	Other Federal Agency
				62	Bureau of Indian Affairs
				63	Bureau of Fish and Wildlife
				64	U.S. Forest Service
				66	National Park Service
				67	Tennessee Valley Authority
				68	Bureau of Land Management
				69	Bureau of Reclamation
				70	Corps of Engineers
				72	Air Force
				73	Navy/Marines
				74	Army
				80	Other
	RMC_L_System _Length	Decimal(8,3)	Rural minor collector and local roadways length within county	Total length to the nearest thousandth of a mile.	

Extent: All public roads functionally classified as Minor Collector (Rural) and Local. Any NHS routes or toll roads on these functional systems should be included.

Reporting cycle: Report annually; update as needed.

Table 3.15 NAAQS Summaries

Table 3.15 describes the dataset which contains system length and travel data for all roads functionally classified as minor collector in rural areas or local in any area summarized by EPA Non-Attainment or Maintenance Area, and the relative pollutant standard.

NAAQS SUMMARIES TABLE				
Constraint	Field Name	Data Type	Description	Valid Values
PK	Year_Record	Numeric(4)	Calendar year for the data	The four digits of the year the data represents.
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.
PK	Pollutant_Stnd	Text	Pollutant Standard	See Appendix K for a complete list of the applicable pollutant standards.
	RMC_L_System Length	Decimal(8,3)	Rural minor collector and local system length	Report total miles to the nearest mile.
	RMC_L_System Travel	Numeric(8)	Rural minor collector and local system daily travel	Report total daily vehicle-miles of travel as a whole number (round to the nearest 1,000 if preferred).

Extent: All public roads functionally classified as minor collector in rural areas or local in any area. Any NHS routes or toll roads on these functional systems should be included.

Reporting cycle: Review annually; update as needed.

Collection requirements: Travel and system length data for each pollutant standard within the applicable NAAQS area within the State.

References Catalog

The References Catalog identifies the reference data that will be maintained by FHWA or other Non-State DOT entities at some point in the future. This catalog identifies the Point References dataset, which contains data for grade-separated interchanges that are located on the Federal-aid system, excluding roads functionally classified as minor collector in rural areas or local in any area.

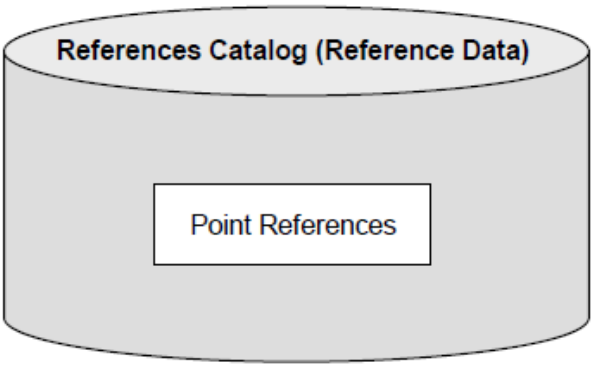


Table 3.16 Point References

Table 3.16 describes the dataset which contains data for grade-separated interchanges that are located on the Federal-aid system, excluding roads functionally classified as minor collector in rural areas or local in any area. Currently, this dataset only contains the location and type of grade-separated interchanges. This dataset will be populated by FHWA for the States that do not currently have these data.

POINT REFERENCES TABLE				
Constraint	Field Name	Data Type	Description	Valid Values
PK	Year_Record	Numeric(4)	Year for which the data apply	The four digits of the year the data represents.
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.
PK	Route_ID	VarChar(60)	Route identifier	Up to 60 alpha-numeric digits that identify the route. This ID must match a record in the Routes dataset.
PK	Route_Point	Decimal(8,3)	Route Milepoint	Enter a decimal value that falls between the beginning and ending MPs of the Route's section as referenced by the Route ID.
PK	Data_Item	Text	Attribute	Future use
	Value_Numeric	Numeric	Numeric value for data item	Must be numeric as specified under Data Items with their Value Numeric descriptions.
	Value_Text	Varchar(50)	Text value for data item	Text information as specified under the Data Items with their Value Text descriptions. This field is available for State use where data is not required for a particular Data Item. This field is limited to 50 characters.
	Value_Date	Date	Date value for data item	Date value as specified under the Data Items with their Value Date descriptions. This field is available for State use where data is not required for a particular Data Item.

Estimates Catalog

The dataset identified in this catalog stores information which describes the estimated values associated with the various pavement-related data items reported in the Sections dataset. The data identified in this catalog are used only for national-level analysis and are not used for reporting purposes. The data contained in the Estimates dataset represents the State's best estimate of current conditions or construction practices where measured data are not available for reporting purposes.

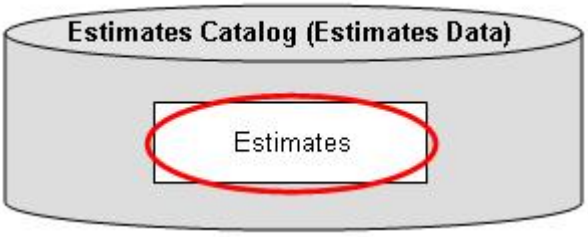


Table 3.17 Estimates

Table 3.17 describes the dataset which contains statewide estimates to be used as default inputs for FHWA's pavement deterioration models. Table 3.18 contains a list of the valid entries for the Estimate Type Field and their associated values.

ESTIMATES TABLE					
Constraint	Field Name	Data Type	Description	Valid Values	
PK	Year_Record	Numeric(4)	Calendar year for the data	The four digits of the year the data represents.	
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.	
PK	Estimate_Type*	Text	Estimates Type	A detailed list of the estimate types is provided in Table 3.18 below.	
PK	F_System	Numeric(1)	Functional System	Code	Description
				1	Interstate
				2	Principal Arterial – Other Freeways and Expressways
				3	Principal Arterial – Other
				4	Minor Arterial
				5	Major Collector
				6	Minor Collector
				7	Local
PK	Is_Urban	Text	Rural or Urban	Code	Description
				Y	Urban (Population of at least 5,000)
				N	Rural
PK	Is_State_Owned**	Text	On State/Off State System	Code	Description
				Y	On-State System
				N	Off-State System
	Value_Numeric	Decimal(5,1)	Numeric Value	Must be numeric as specified (in Table 3.18) under the Value Numeric descriptions.	

Extent: All Federal-aid highways

*Determine and code the predominant Estimate Type value when multiple Estimates Types apply.

**This field is intended to communicate to FHWA what each State considers to be their off-state system vs. on-state system.

Table 3.18 Estimate Types and Valid Values.

ESTIMATE TYPES AND VALUE NUMERIC			
Type	Description	Value Numeric	
Last_Overlay_Thickness	Typical design or construction last overlay thickness.	Last overlay thickness to the nearest 0.5 inch.	
Thickness_Rigid	Typical design or construction thickness of rigid pavement.	Rigid pavement thickness to the nearest 0.5 inch.	
Thickness_Flexible	Typical design or construction thickness of all AC (asphalt concrete) pavement layers.	Flexible pavement thickness to the nearest 0.5 inch.	
Base_Type	Base Type	*Code*	*Description*
		1	No base
		2	Aggregate
		3	Asphalt or cement stabilized
		5	Hot mix AC (Bituminous)
		6	Lean concrete
		7	Stabilized open-graded permeable
		8	Fractured PCC
Base_Thickness	Typical design or construction thickness	Base thickness to the nearest whole inch.	
Binder_Type	Binder Type	See following table below.	
Dowel_Bar	Presence of Dowel Bars	*Code*	*Description*
		1	No – Dowel Bars not typically used
		2	Yes – Dowel Bars are typically used
Joint_Spacing	Typical joint spacing	Joint spacing to the nearest whole foot.	

CODES FOR VISCOSITY GRADED BINDERS	
1	Less than AC–2.5
2	AC–2.5 to AC–4
3	AC–5 to AC–9
4	AC–10 to AC–19
5	AC–20 to AC–29
6	AC–30 to AC–39
7	AC–40 to AC–49
8	AC–50 or more

CODES FOR SUPER PAVE BINDERS										
		Low Temperature Grade								
		Less than –4	–4 to –9	–10 to –15	–16 to –21	–22 to –27	–28 to –33	–34 to –39	–40 to –45	–46 or more
High Temperature Grade	Less than 40	10	20	30	40	50	60	70	80	90
	40 to 45	11	21	31	41	51	61	71	81	91
	46 to 51	12	22	32	42	52	62	72	82	92
	52 to 57	13	23	33	43	53	63	73	83	93
	58 to 63	14	24	34	44	54	64	74	84	94
	63 to 69	15	25	35	45	55	65	75	85	95
	70 to 75	16	26	36	46	56	66	76	86	96
	76 to 81	17	27	37	47	57	67	77	87	97
	82 to 87	18	28	38	48	58	68	78	88	98
	88 or more	19	29	39	49	59	69	79	89	99

Metadata Catalog

This catalog consists of metadata, which is data that describes the other datasets and data items in the State's HPMS dataset. Metadata within HPMS are used to describe data collection procedures and post-processing that may impact the consistency or quality of the data. Metadata applies to an entire data item or group of data items, and not any single data item entry. Some Metadata may be published annually in the *Highway Statistics* publication and may be provided to data users as requested. FHWA will not use Metadata to modify or alter a State's HPMS data submittal.

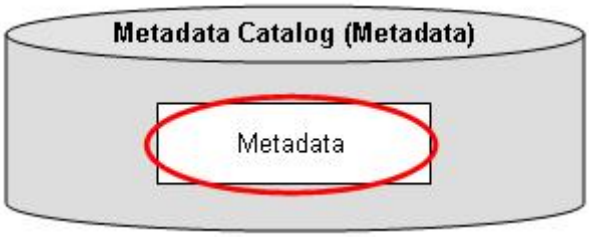


Table 3.19 Metadata

Table 3.19 describes the dataset which contains data that captures and explains variability in the collection and reporting of traffic and pavement data in HPMS. Table 3.20 lists the valid entries for the Metadata Type Field and their associated values.

METADATA TABLE					
Constraint	Field Name	Data Type	Description	Valid Values	
PK	Year_Record	Numeric(4)	Calendar year for the data	The four digits of the year the data represents.	
PK	State_Code	Numeric(2)	State FIPS code	Up to two digits for the FIPS code. See Appendix C for a complete list.	
PK	Metadata_Type*	Text	Metadata Type	A detailed list of the metadata types is provided in Table 3.20 below. Multiple metadata types are permitted per data item.	
PK	F_System	Numeric(1)	Functional System	*Code*	*Description*
				1	Interstate
				2	Principal Arterial - Other Freeways and Expressways
				3	Principal Arterial - Other
				4	Minor Arterial
				5	Major Collector
				6	Minor Collector
				7	Local
PK	Is_Urban	Text	Rural or Urban	*Code*	*Description*
				Y	Urban (population of at least 5,000)
				N	Rural
PK	Is_State_Owned**	Text	On State/Off State System	*Code*	*Description*
				Y	On-State System
				N	Off-State System
	Value_Numeric	Numeric(5)	Numeric Value	Must be numeric as specified (in Table 3.20) under the Value Numeric descriptions.	

Extent: All Federal-aid highways; optional for other sections.

*Determine and code the predominant Metadata Type value when multiple Metadata Types apply.

**This field is intended to communicate to FHWA what each State considers to be their off-state system vs. on-state system.

Table 3.20 Metadata Types and Valid Values.

METADATA TYPES AND VALUE NUMERIC			
Type	Description	Value Numeric	
AADT_Pct_Actual	Percent total section-level AADTs reported that are based on actual counts for the reported data year	Enter value to the nearest whole percent.	
AADT_24	Number of permanent and portable counter locations that were counted for a duration of 24 hours or more	Integer	
AADT_48	Number of permanent and portable counter locations that were counted for a duration of 48 hours or more	Integer	
AADT_Season	AADT Seasonal Adjustment	*Code*	*Description*
		1	AADT is not seasonally adjusted
		2	AADT is seasonally adjusted
		3	AADT is from counts taken throughout the year
AADT_Week	AADT Day-of-Week Adjustment	*Code*	*Description*
		1	AADT is not adjusted for day-of-week
		2	AADT is adjusted for day-of-week
		3	AADT is from counts taken throughout the week
AADT_Axle	AADT Axle Adjustment	*Code*	*Description*
		1	AADT is not adjusted for number of axles
		2	AADT is adjusted for number of axles
		3	AADT is from vehicle count data
AADT_Growth	AADT Growth Adjustment	*Code*	*Description*
		1	AADT is not adjusted for annual growth/change
		2	AADT is adjusted for annual growth/change
		3	AADT is from current year (i.e., data year) counts
Class_Pct_Actual	Percent of class AADTs reported that are based on actual counts for the reported data year or factored prior year class AADTs	Enter value to the nearest whole percent.	
Class_24	Number of permanent and portable classification count locations that were counted for a duration of 24 hours or more	Integer.	
Class_48	The number of permanent and portable classification count locations that were counted for a duration of 48 hours or more	Integer.	
Class_Season	Class Seasonal Adjustment	*Code*	*Description*
		1	No adjustment
		2	With adjustment
Class_Week	Class Weekly Adjustment	*Code*	*Description*
		1	No adjustment
		2	With adjustment
Class_Growth	Class Growth Adjustment	*Code*	*Description*
		1	No adjustment
		2	With adjustment

Travel_Source	Source of Travel Data	*Code*	*Description*
		1	State traffic database only
		2	State traffic database and local governments (MPO, Cities, and Counties)
		3	Other
Travel_Volume_Type	Type of volume counts used for reporting purposes	*Code*	*Description*
		1	Short-term counts only (>= 24 hrs in duration)
		2	Continuous permanent class counts only
		3	Both short term and continuous counts
Travel_Class_Type	Type of classification counts used for reporting purposes	*Code*	*Description*
		1	Short-term counts only (>= 24 hrs in duration)
		2	Continuous permanent class counts only
		3	Both short term and continuous counts
Travel_QA	Quality assurance program exists for any traffic data	*Code*	*Description*
		1	No existing traffic data quality assurance program
		2	State traffic data only
		3	State and Local traffic data
		4	Local traffic data only
IRI_Equip_Type	Type of equipment used predominately for measuring the international roughness index (IRI)	*Code*	*Description*
		1	Sonar
		2	Mix of sonar and laser devices
		3	Laser
		4	Scanning laser
		5	Other
IRI_Interval	IRI reporting interval (not to be confused with device sampling interval)	Reporting interval to the nearest foot.	
Rutting_Method	Method (Manual or Automated) used to collect most of the rutting data.	*Code*	*Description*
		1	Manual
		2	Automatic
Rutting_Equip_Type	Type of equipment used predominately for collection of rutting data.	*Code*	*Description*
		1	Sonar
		2	Mix of sonar and laser devices
		3	Laser
		4	Scanning laser
		5	Other/Manual
Rutting_Num_Sensors	Number of sensors for the equipment used predominately for collection of rutting data	*Code*	*Description*
		1	Three (3) sensors
		2	Five (5) sensors
		3	Greater than five (>5) sensors
		4	Scanning laser
		5	Other

Rutting_Interval	Rutting reporting interval (not to be confused with device sampling interval)	Reporting interval to the nearest foot.	
Faulting_Interval	Faulting reporting interval (not to be confused with device sampling interval)	Reporting interval to the nearest foot.	
Faulting_Method	Method (Manual or Automated) used to collect most of the faulting data.	*Code*	*Description*
		1	Manual
		2	Automatic
Faulting_Equipment_Type	Type of equipment used predominately for measuring the faulting data	*Code*	*Description*
		1	Manual
		2	Laser
		3	Scanning laser
		4	Other
Cracking_Pct_Equip	Type of equipment used predominately for measuring the percent of cracking (Cracking_Percent).	*Code*	*Description*
		1	Windshield survey
		2	Visual distress survey (side of road)
		3	Manually identify cracking from video
		4	Automated crack identification to detect cracking from video
		5	Combined manual and automatic crack identification from video
		6	Other
Cracking_Length_Equip	Type of equipment used predominately for measuring the length of cracking (Cracking_Length, Data Item 53, Table 3.9).	*Code*	*Description*
		1	Windshield survey
		2	Visual distress survey (side of road)
		3	Manually identify cracking from video
		4	Automated crack identification to detect cracking from video
		5	Combined manual and automatic crack identification from video
		6	Other
Cracking_Method	Protocol used to identify pavement distresses	*Code*	*Description*
		1	Long-Term Pavement Performance (LTPP)
		2	American Association of State Highway and Transportation Officials (AASHTO)
		3	Modified LTPP
		4	Modified AASHTO
		5	State developed protocol
		6	Other
Ramp_Termini_Desc	Ramp Termini	*Code*	*Description*
		1	Gore to Gore
		2	Taper to Taper
		3	Other
Ramp_Traf_Est_Method	Ramp Traffic Estimation Method	*Code*	*Description*
		1	Manual counts
		2	Portable counts

		3	Permanent count equipment
		4	ITS equipment
		5	Ramp metering equipment
		6	Ramp balancing
		7	Turning or ramp movement estimation software
		8	Estimation based on fixed percent of mainline volumes
		9	Other estimation method not described above

[1] Environmental Systems Research Institute, Inc. (ESRI), Shapefile Technical Description: an ESRI White Paper, July 1998

[2] Open Geospatial Consortium Inc, OpenGIS Implementation Specification for Geographic information – Simple feature access – Part 1:Common Architecture Version 1.1.0, Pg 28, Nov 2005

[3] Open Geospatial Consortium Inc, OpenGIS Implementation Specification for Geographic information – Simple feature access – Part 1:Common Architecture Version 1.1.0, Pg 29, Nov 2005

[4] http://www.opengeospatial.org/standards/gml

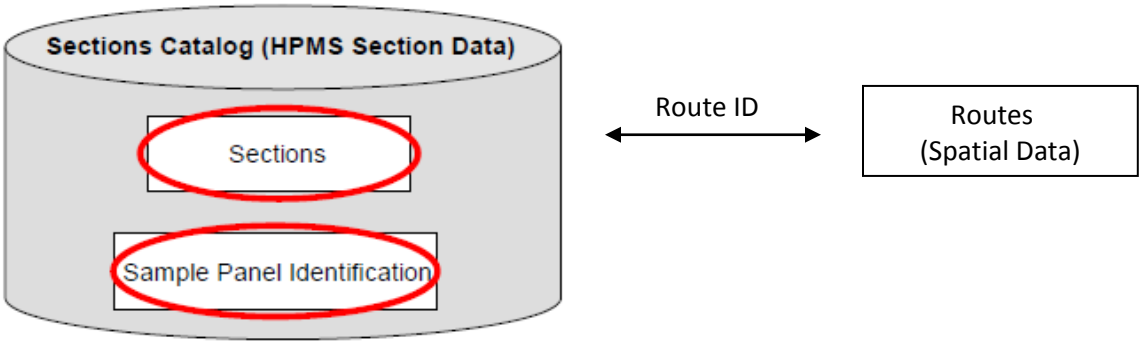
Chapter 4 DATA REQUIREMENTS AND SPECIFICATIONS

4.1 Overview

Chapter 3 provided a detailed description of the catalogs and datasets that comprise the HPMS data model. This chapter provides in-depth information on the data collection and reporting requirements for the Sections and Sample Panel Identification datasets, which the States are responsible for providing to FHWA. In addition, this chapter contains information on the datasets that are developed and maintained by FHWA, and the datasets that are gathered by FHWA from other sources.

Upon submittal to FHWA, the Sections and Sample Panel Identification datasets will be stored in the Sections Catalog. These datasets will then be linked to the respective State's Linear Referencing System (LRS) network for data management and analysis purposes, as shown in Figure 4.1 below. Furthermore, the data in the Sections catalog will be spatially linked to the Routes dataset (in the Shapes Catalog) via the Route ID field, which serves as the unique identifier that is embedded in each of these datasets (as discussed in Chapter 3).

Figure 4.1: Sections/Routes (LRS) Data Linkage



This chapter also specifies the fields of information that are to be reported for the Sections and Sample Panel Identification datasets. Also included in this chapter are the detailed requirements, as well as any applicable guidance for the various data items that are to be reported in the Sections dataset.

In addition to the data items that the States are responsible for collecting and reporting, there are also data items that FHWA is responsible for coding, as well as data items that are calculated by the HPMS software. Each of these types of data is also described in this chapter.

4.2 Sections Data Reporting Requirements

Data Fields Required for Section Reporting Purposes

The data fields listed in Table 4.1 are to be submitted as part of the Sections dataset which will be stored in the Sections Catalog (discussed in Chapter 3) within FHWA's system.

- **Field Number** is the number assigned to each data field for reference purposes.
- **Field Name** specifies the type of information that should be reported for each field. The Data Item field (Field No. 6) in Table 4.1 stores the name of the Data Item that is being reported. A complete list of these data items is shown in Table 4.2.

Table 4.1: HPMS Sections File Structure

	Field Number	Field Name
Section	1	Year_Record
	2	State_Code
	3	Route_ID
	4	Begin_Point
	5	End_Point
	6	Data_Item
	7	Section_Length
	8	*Value_Numeric*
	9	*Value_Text*
	10	*Value_Date*
	11	Comments (Optional)

Italicized fields are used to report values and additional information pertaining to the data item (in Field 6).

The next section describes the detailed specifications for the fields identified in Table 4.1, in terms of their Descriptions, Usage, Data Formats, Coding instructions, and Guidance (where applicable) for each Field.

Field 1: Year_Record

Description: The calendar year for which the data are being reported.

Use: For identifying the representative year of the data.

Data Type: Numeric

Coding: Enter the four digits for the calendar year that the data represents.

Guidance: The value that is coded must reflect the calendar year for which the data is being reported, not the year that the data is being submitted.

Field 2: State_Code

Description: The State Federal Information Processing Standard (FIPS) code.

Use: For identifying the State for which the data is being reported.

Data Type: Numeric

Coding: Enter up to two digits for the State FIPS code.

Guidance: See Appendix C for a complete list of FIPS codes.

Field 3: Route_ID

Description: The unique identifier for a given roadway (i.e., route).

Use: For identifying the specific route for which the data is being reported.

Data Type: Text

Coding: Enter an alphanumeric sequence consisting of no more than 60 characters.

Guidance: The Route ID is to be developed per the States' preference. However, the ID schema must be consistent with the Route ID schema that is contained in the State's LRS network attribute data.

Field 4: Begin_Point

Description: The point of origin for a given section of road.

Use: For identifying the beginning point of a section for spatial referencing purposes.

Data Type: Numeric

Coding: Enter a decimal value to the nearest thousandth of a mile.

Guidance: N/A

Field 5: End_Point

Description: The terminus point for a given section of road.

Use: For identifying the ending point of a section for spatial referencing purposes.

Data Type: Numeric

Coding: Enter a decimal value to the nearest thousandth of a mile.

Guidance: N/A

Field 6: Data_Item

Description: The attribute being reported for a given section of road.

Use: For specifying the particular attribute being reported for a given section of road.

Data Type: Text

Coding: Code the database-specific data item name for each data item listed in Section 4.4 of this chapter.

Guidance: Guidance for each data item is discussed in Section 4.4 of this chapter.

<u>CAUTION</u>: The States must use the database-specific data item names that are listed in Table 4.2. Failure to use the database-specific data item names as they are specified will cause the States' records to fail validation when the records are uploaded for HPMS submittal purposes.

Field 7: Section_Length

Description: The true length (i.e., measured length) for a given section of road.

Use: For analysis and comparison of various data items for apportionment, administrative, legislative, analytical, and national highway database purposes.

Data Type: Numeric

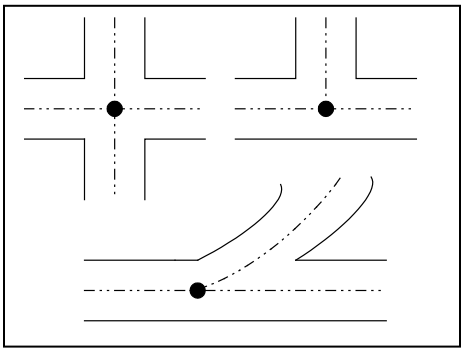
Coding: Code the length in decimal format to the nearest thousandth of a mile.

Guidance: Report either the inventory or LRS-based length for a given section of road, per the States' preference. This length should be consistent with the length that is reported in the State's Certified Public Road Mileage. For undivided facilities, the inventoried length should be measured along the centerline in the designated inventory direction (i.e., cardinal direction). For divided highways, the inventoried length should be measured in the designated inventory direction, on both the cardinal and non-cardinal sides of the roadway. Alternatively, this length can be calculated using Fields 4 and 5 (i.e., Ending Milepoint minus (-) Beginning Milepoint). Length cannot have a value of zero (0). If a length is not entered, FHWA will calculate a value for this field.

Report the length of the two roadways of a one-way couplet independently; do not average the length of the two roadways.

When measuring the length between at-grade intersections, use the center point of the intersecting roadways as the points of reference (i.e., origin, or terminus) for the section as shown in Figure 4.2.

Figure 4.2: At-Grade Intersection Reference Points



If the intersection is grade-separated, measure to the theoretical center-most point of the intersecting roadways.

When a route terminates at an interchange, such as a "T" interchange (as shown in Figure 4.3A), measure the length as the average of the directional connecting roadway segment's lengths to the first point of intersection with the perpendicular mainline route.

For ramps, the length should be measured either from gore to gore, or from taper to taper, and should be noted as such in the metadata for ramp reporting. Figures 4.3B, 4.3C, and 4.3D provide examples of begin and end taper points for grade-separated interchanges.

Figure 4.3A: Grade-Separated Interchange (Gore Points)

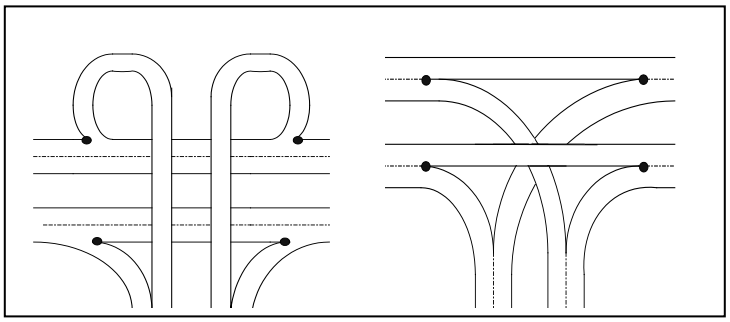


Figure 4.3B: Grade-Separated Interchange (Taper Points)

Source: Google Maps.

Figure 4.3C: Begin Taper Point

Source: Google Maps.

Figure 4.3D: End Taper Point

Source: Google Maps.

The begin taper point (Figure 4.3C) is the point at which the exit (deceleration) lane separates from the outermost lane of the mainline roadway, becoming a separate lane.

The end taper point (Figure 4.3D) is the point at which the entrance (acceleration) lane joins the outermost lane of the mainline roadway to become one lane.

Metadata: See Chapter 3 for a description of the metadata reporting requirements for ramps.

Field 8: Value_Numeric

Description: The numeric value that is associated with a particular data item.

Use: For identifying the corresponding numeric value for a particular data item, for a given section of road.

Data Type: Numeric

Coding: Must be coded in accordance with the individual data item descriptions discussed in Section 4.4 of this chapter.

Guidance: N/A

Field 9: Value_Text

Description: The text value that is associated with a particular data item.

Use: For identifying the corresponding text value for a particular data item, for a given section of road.

Data Type: Text

Coding: Must be coded in accordance with the individual data item descriptions discussed in Section 4.4 of this chapter. This field is available for State use where text data is not required for a particular data item. This field is limited to 50 characters.

Guidance: N/A

Field 10: Value_Date

Description: The date value that is associated with a particular data item.

Use: For identifying the corresponding date value for a particular data item, for a given section of road.

Data Type: Text

Coding: Must be coded in accordance with the individual data item descriptions discussed in Section 4.4 of this chapter. This field is available for State use where date data is not required for a particular data item.

Guidance: N/A

Field 11: Comments (Optional)

Description: Additional information for State use (formerly referred to as the "State Control Field").

Use: For storing supplemental information provided by the States which is used to manage their various databases.

Data Type: Text

Coding: This item can be coded as variable text up to 100 characters, in accordance with the State's needs.

Guidance: The information provided in this field **is not required** by FHWA.

Example records: The following example shows a potential arrangement of records for various data items (e.g., AADT, IRI, Through Lanes, etc.) for the State of Oregon, based on the file structure described in Table 4.1. This file is to be developed by the States and submitted to FHWA in a Character Separated Value (CSV) file format as shown below. This file should not contain any records that have either a zero (0) or null value for the fields that require an entry, for any given Data Item. The Value Text and Value Date fields can be used by the States to enter additional information, when data for these fields are not required for a particular data item (e.g., AADT). Furthermore, the Comment field is not required for FHWA purposes, but is available as an optional field for State-use. The States can either submit one aggregate CSV file containing all records for all of the required data items, or submit a series of individual CSV files. Upon submittal, this data will be stored in the Sections Catalog within FHWA's system.

<u>NOTE</u>: This file should not contain any records that have either a zero (0) or null value for the fields that require an entry (Value_Numeric, Value_Text, Value_Date), as specified in Section 4.4.

```
Year_Record|State_Code|Route_ID|Begin_Point|End_Point|Data_Item|Section_Length|Value_Numeric|Value_Text|Value_Date|Comments
2009|41|000100200S00|0|0.75|AADT|0.75|14800|Factored '06 AADT||
2009|41|000100200S00|0.75|5.32|AADT|4.57|14700||4/21/2009|
2009|41|000100200S00|0|0.75|IRI|0.75|118||3/2009|
2009|41|000100200S00|0.75|5.32|IRI|4.57|94|||
2009|41|000100200S00|5.32|5.69|IRI|0.37|66||4/2008|
2009|41|000100200S00|0|0.75|Through_Lanes|0.75|4|||
2009|41|000100200S00|0.75|5.32|Through_Lanes|4.57|4|||Widened in '08
```

4.3 Data Items to be Collected

Table 4.2 lists the data items that are to be collected by the States, which must be reported in the Sections dataset. The five types of data items that are to be reported are as follows: Inventory, Route, Traffic, Geometric, and Pavement data. In addition to the Data Item Type(s), Table 4.2 lists the Item Numbers for each Data Item, the specific name for each Data Item, and the Extent for which the Data Item is to be reported. Detailed information on coding instructions, extent requirements, and additional guidance for each Data Item is contained in Section 4.4.

The Table of Potential Samples (TOPS) (discussed in Section 6.2) is developed based on the spatial intersection of the following five data items: Functional System, Urban Code, Facility Type, Through Lanes, and AADT. Accordingly, the length of these data items are used as control totals for system extent. Each of these data items must be reported for the entire extent of all Federal-aid highways in a given State in order for that State's annual data submittal to be accepted by FHWA.

The HPMS is an inventory system that requires reported data to represent the condition and operation in both directions for all roadways. As a result, directional conflicts in coding may arise for specific data items under certain reporting conditions. The following provides some guidance on how these conflicts can be addressed.

Data items that involve widths, types, condition, etc., may differ in shape or dimension on either side of a roadway. To resolve this, one side of the facility should be designated for inventory purposes, and the applicable data items should be coded for the designated side of the roadway. This should be done for all roadways, regardless of whether or not the facility is divided or undivided with common or independent alignments. The "inventory direction" should be applied on a statewide basis (i.e., always South to North, East to West, or vice versa) and should never change once it has been designated.

Information reported for some data items such as AADT, Through Lanes, Median Width, etc., must reflect the entire facility (i.e., bi-directional information). Caution should be exercised when reporting Through Lane totals and AADT because these data are used for apportionment purposes.

As indicated in Chapter 5 on Pavement Guidance, IRI must be reported for the same inventory direction and lane all of the time. The "inventory direction" of a facility should be used as the side where IRI is measured and reported. IRI should not be reported or averaged for both sides of a roadway.

Table 4.2: Data Items

Data Item Type	Item Number	Database-Specific Data Item Name	Data Item Name	Extent	
Inventory	1	F_System	Functional System	FE + R	
	2	Urban_Code	Urban Code	FE + R	
	3	Facility_Type	Facility Type	FE + R	
	4	Structure_Type	Structure Type	FE**	
	5	Access_Control	Access Control	FE*	SP*
	6	Ownership	Ownership	FE	
	7	Through_Lanes	Through Lanes	FE + R	
	8	HOV_Type	HOV Operations Type	FE**	
	9	HOV_Lanes	HOV Lanes	FE**	
	10	Peak_Lanes	Peak Lanes		SP
	11	Counter_Peak_ Lanes	Counter Peak Lanes		SP
	12	Turn_Lanes_R	Right Turn Lanes		SP
	13	Turn_Lanes_L	Left Turn Lanes		SP
	14	Speed_Limit	Speed Limit		SP
	15	Toll_Charged	Toll Charged	FE**	
	16	Toll_Type	Toll Type	FE**	
Route	17	Route_Number	Route Number	FE*	
	18	Route_Signing	Route Signing	FE*	
	19	Route_Qualifier	Route Qualifier	FE*	
	20	Alternative_Route_Name	Alternative Route Name	FE	
Traffic	21	AADT	Annual Average Daily Traffic	FE + R	
	22	AADT_Single_Unit	Single Unit Truck and Bus AADT	FE*	SP*
	23	Pct_Peak_Single	Percent Peak Single-Unit Trucks and Buses		SP
	24	AADT_Combination	Combination Truck AADT	FE*	SP*
	25	Pct_Peak_Combination	Percent Peak Combination Trucks		SP
	26	K_Factor	K-factor		SP
	27	Dir_Factor	Directional Factor		SP
	28	Future_AADT	Future AADT		SP
	29	Signal_Type	Signal Type		SP
	30	Pct_Green_Time	Percent Green Time		SP
	31	Number_Signals	Number of Signalized		SP

Data Item Type	Item Number	Database-Specific Data Item Name	Data Item Name	Extent	
			Intersections		
	32	Stop_Signs	Number of Stop-Sign Controlled Intersections		SP
	33	At_Grade_Other	Number of Intersections, Type - Other		SP
Geometric	34	Lane_Width	Lane Width		SP
	35	Median_Type	Median Type		SP
	36	Median_Width	Median Width		SP
	37	Shoulder_Type	Shoulder Type		SP
	38	Shoulder_Width_R	Right Shoulder Width		SP
	39	Shoulder_Width_L	Left Shoulder Width		SP
	40	Peak_Parking	Peak Parking		SP
	41	Widening_Obstacle	Widening Obstacle		SP
	42	Widening_Potential	Widening Potential		SP
	43	Curves_A through Curves_F	Curve Classification		SP*
	44	Terrain_Type	Terrain Type		SP
	45	Grades_A through Grades_F	Grade Classification		SP*
	46	Pct_Pass_Sight	Percent Passing Sight Distance		SP
Pavement	47	IRI	International Roughness Index	FE*	SP*
	48	PSR	Present Serviceability Rating		SP*
	49	Surface_Type	Surface Type		SP
	50	Rutting	Rutting		SP
	51	Faulting	Faulting		SP
	52	Cracking_Percent	Cracking Percent		SP
	53	Cracking_Length	Cracking Length		SP
	54	Year_Last_Improv	Year of Last Improvement		SP
	55	Year_Last_Construction	Year of Last Construction		SP
	56	Last_Overlay_Thickness	Last Overlay Thickness		SP
	57	Thickness_Rigid	Thickness Rigid		SP
	58	Thickness_Flexible	Thickness Flexible		SP
	59	Base_Type	Base Type		SP
	60	Base_Thickness	Base Thickness		SP
	61	Climate_Zone**	Climate Zone**		SP

Data Item Type	Item Number	Database-Specific Data Item Name	Data Item Name	Extent	
	62	Soil_Type**	Soil Type**		SP
Inventory	63	County_Code	County Code	FE	
Special Networks	64	NHS	National Highway System	FE**	
	65	STRAHNET_Type	Strategic Highway Network	FE**	
	66	Truck	National Truck Network	FE**	
	67	Future_Facility	Future National Highway System	FE**	
Inventory	68	Maintenance_Operations	Maintenance & Operations	FE	
Traffic	69	Capacity	Capacity		SP

FE = Full Extent for all functional systems (including State and non-State roadways)
FE* = Full Extent for some functional systems, see Sec. 4.4 for more details
FE** = Full Extent wherever data item is applicable, (Sec. 4.4 for more details)
SP = All Sample Panel Sections (as defined by HPMS)
SP* = Some Sample Panel Sections, see Sec. 4.4 for more details
FE + R = Full Extent including ramps located within grade-separated interchanges
** = States have the option to override initial codes assigned by FHWA

The States must submit their section-level data for certain data items (Data Items 1-3, 7, and 21) as homogenous sections. For most other data items, this submittal format is optional. By definition, a homogenous section is a section that has the same value for a given data item over its entire extent. A homogenous section has a natural beginning and ending point where the value for a given data item changes beyond the limits of that section. This type of section may be longer or shorter than the sections identified in the Table of Potential Samples or "TOPS" (discussed in Section 6.2). The requirements for the reporting of these sections are identified by data item in Table 4.3.

If preferred, the States may structure and submit their non-homogenous section-level data in accordance with the limits of the TOPS sections (i.e. section limits must be equivalent to TOPS section limits). However, the States **must** submit their section-level data for Data Items 31-33, 43, and 45 in accordance with the limits of TOPS sections. If a State submits section-level data that matches the limits of the TOPS sections, then, they must apply one of the following calculation methods to ensure that the values reported provide the required representation of those sections:

1) No Calculation Required – Reported value must be consistent within the limits of the section.

2) Combination – Reported value must consist of a concatenation of multiple (text) values within the limits of the section.

3) Minimum Value – Reported value must be the lowest value in a range of values within the limits of the section.

4) Predominance – Reported value must be based on the most prevalent value within the limits of the section.

5) Weighted Averaging – Reported value must be based on an averaging of values within the limits of the section, weighted by the length of the sub-section for each value.

The calculation method to be applied depends on the particular data item being reported. Table 4.3 provides a summary of the data items and their applicable calculation method:

Table 4.3: Calculation Method by Data Item

Item Number	Data Item Name	Method
1	**Functional System ***	No Calculation Required
2	**Urban Code ***	No Calculation Required
3	**Facility Type ***	No Calculation Required
4	Structure Type	No Calculation Required
5	Access Control	Predominance
6	Ownership	Predominance
7	**Through Lanes ***	No Calculation Required
8	HOV Operations Type	Predominance
9	HOV Lanes ***	Predominance
10	Peak Lanes	Predominance
11	Counter-Peak Lanes	Predominance
12	Right Turn Lanes	Predominance
13	Left Turn Lanes	Predominance
14	Speed Limit	Predominance
15	Toll Charged	Predominance
16	Toll Type	Predominance
17	Route Number	Predominance
18	Route Signing	Predominance
19	Route Qualifier	Predominance
20	Alternative Route Name	Predominance
21	**AADT ***	No Calculation Required#
22	Single-Unit Truck and Bus AADT	Weighted Averaging
23	Percent Peak Single-Unit Trucks and Buses	Weighted Averaging
24	Combination Truck AADT	Weighted Averaging
25	Percent Peak Combination Trucks	Weighted Averaging
26	K-factor	Weighted Averaging
27	Directional Factor	Weighted Averaging
28	Future AADT	Weighted Averaging
29	Signal Type	Predominance
30	Percent Green Time	Weighted Averaging

Item Number	Data Item Name	Method
31	Number of Signalized Intersections **	No Calculation Required
32	Number of Stop Sign-Controlled Intersections **	No Calculation Required
33	Number of Intersections, Type – Other **	No Calculation Required
34	Lane Width	Predominance
35	Median Type	Predominance
36	Median Width	Predominance
37	Shoulder Type	Predominance
38	Right S	Predominance
39	Left Shoulder Width	Predominance
40	Peak Parking	Predominance
41	Widening Obstacle	Combination
42	Widening Potential	Minimum Value
43	Curve Classification **	No Calculation Required
44	Terrain Type	Predominance
45	Grade Classification **	No Calculation Required
46	Percent Passing Sight Distance	Minimum Value
47	International Roughness Index	Weighted Averaging
48	Present Serviceability Rating	Weighted Averaging
49	Surface Type	Predominance
50	Rutting	Weighted Averaging
51	Faulting	Weighted Averaging
52	Cracking Percent	Weighted Averaging
53	Cracking Length	Weighted Averaging
54	Year of Last Improvement	Predominance
55	Year of Last Construction	Predominance
56	Last Overlay Thickness	Weighted Averaging
57	Thickness Rigid	Weighted Averaging
58	Thickness Flexible	Weighted Averaging
59	Base Type	Predominance
60	Base Thickness	Weighted Averaging
61	Climate Zone	Predominance
62	Soil Type	Predominance
63	County Code	Predominance
64	National Highway System	No Calculation Required

Item Number	Data Item Name	Method
65	Strategic Highway Network	No Calculation Required
66	National Truck Network	No Calculation Required
67	Future National Highway System	No Calculation Required
68	Maintenance & Operations	Predominance
69	Capacity	Weighted Averaging

*Data items must be reported as homogenous sections (used to define the TOPS)
**Values for these data items must be reported for the defined limits of the TOPS
***Sections for this data item must be the same as for Data Item 8
#Weighted Averaging may be used if multiple traffic counts are combined to comprise a homogenous section

4.4 Data Item Requirements

NOTE: The following descriptions for each Data Item include an "English" name (in parenthesis) for clarification purposes. However, **the States must use the database-specific data item names shown in bold gray to populate Field 6 in their Sections datasets**.

Item 1: F_System (Functional System)

Description: The FHWA approved Functional Classification System.

Use: For analysis and mapping of information by functional system.

Extent: All Federal-aid highways including ramps located within grade-separated interchanges.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R		
Urban	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	

FE + R = Full Extent & Ramps SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the value that represents the FHWA approved functional system. These following codes are to be used for all rural and urban sections:

Code	Description
1	Interstate
2	Principal Arterial – Other Freeways and Expressways
3	Principal Arterial – Other
4	Minor Arterial
5	Major Collector
6	Minor Collector
7	Local

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: This Data Item must also be reported for all ramp sections contained within grade separated interchanges. If a section is defined as a ramp (i.e., Data Item 3 = Code '4'), then it must be coded the same as the highest order Functional System roadway that traverses the interchange.

Codes '6' and '7' must be reported for all National Highway System (NHS) sections.

Additional guidance on functional systems and the coding of this item can be found in Chapter 5.

Item 2: Urban_Code (Urban Code)

Description: The U.S. Census Urban Area Code.

Use: For the querying and analysis of data by the unique identification of a State's urbanized areas, and generically by small urban or rural areas.

Extent: All Federal-aid highways including ramps located within grade-separated interchanges.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R		
Urban	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	

FE + R = Full Extent & Ramps SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter up to five digits for the Census urban area code. Leading zeros are not required.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Code '99998' for small urban sections and '99999' for rural area sections. A small urban area is derived from Census Urban Clusters or Places that are not located within an urbanized area, with a population of at least 5,000.

Appendix I lists the U.S. Census Urban Area Codes that are currently in use. FHWA may issue interim guidance when Urban Codes change.

This Data Item must also be reported for all ramp sections contained within grade separated interchanges.

A Census Urbanized Area can be expanded for transportation purposes. This Adjusted Urbanized Area, once approved by FHWA, must be identified using the Census Urban Area Code for the Urbanized Area that it was based upon. Contiguous Urbanized Areas can be merged into one FHWA approved Urbanized Area. The combined area must be identified by the Urbanized Area code that was assigned to the largest (population) of the original Urbanized Areas that it was derived from.

Item 3: Facility_Type (Facility Type)

Description: The operational characteristic of the roadway.

Use: For determining public road mileage, for investment requirements modeling to calculate capacity and estimate roadway deficiencies and improvement needs, in the cost allocation pavement model, and in the national highway database.

Extent: All Federal-aid highways including ramps located within grade-separated interchanges.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R		
Urban	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	

FE + R = Full Extent & Ramps SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Use one of the following codes as applicable regardless of whether or not the section is on a structure. The definition for each code is as follows:

Code	Description	
1	One-Way Roadway	Roadway that operates with traffic moving in a single direction during non-peak period hours.
2	Two-Way Roadway	Roadway that operates with traffic moving in both directions during non-peak period hours.
3	Couplet	Non-inventory direction side of a "couplet." See definitions and guidance for "couplets" below.
4	Ramp	Non-mainline junction or connector facility contained within a grade-separated interchange.
5	Non Mainline	All non-mainline facilities excluding ramps.
6	Non Inventory Direction	Individual road/roads of a multi-road facility that is/are not used for determining the primary length for the facility.
7	Planned/Unbuilt	Planned roadway that has yet to be constructed.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: *General*

Use Codes '1' through '4' for sections that are located entirely on a structure (i.e., where Data Item 4 = Code '1,' '2,' or '3').

Public road mileage is based only on sections coded '1,' '2,' or '3.' This includes only those roads that are open to public travel regardless of the ownership or maintenance responsibilities. Ramps are not included in the public road mileage calculation.

Frontage roads and service roads that are public roads should be coded either as one-way (Code '1') or two-way (Code '2') roadways.

Use Code '7' to identify a new roadway section that has been approved per the State Transportation Improvement Plan (STIP), but has yet to be built.

Couplets

Characteristics of a couplet:

- Parallel roadways that have the same route designation (e.g., Route 1), but different street names (e.g., West Avenue, and East Avenue);
- Typically located in an urban area or a city/town;
- Usually connects to roadways with two-way traffic;
- Are typically separated by some physical or visual element other than a curb or barrier, such as buildings, landscaping, or terrain;
- Parallel roadways which complement each other in providing access at both termini; and
- Not designated as an Interstate

Ramps

Ramps may consist of directional connectors from either an Interstate to another Interstate, or from an Interstate to a different functional system. Moreover, ramps allow ingress and egress to grade separated highways. Ramps may consist of traditional ramps (i.e., gore to gore), acceleration and deceleration lanes, as well as collector-distributor lanes.

Ramps must be coded with the highest order functional system within the interchange that it functions. A mainline facility that terminates at the junction with another mainline facility is not a ramp and should be coded '1.'

Non-Mainlines

Non-mainline facilities include roads or lanes that provide access to and from sites that are adjacent to a roadway section such as bus terminals, park and ride lots, and rest areas. These may include: special bus lanes, limited access truck roads, ramps to truck weigh stations, or a turn-around.

Figure 4.4 shows an example of a street (E. Baltimore St.), for which traffic is only permitted to move in the eastbound direction. In this particular case, this Data Item should be assigned a code '1' for a given section (Section "X") along this stretch of road.

Figure 4.4: One-Way Roadway (Code '1') Example

Source: Bing Maps

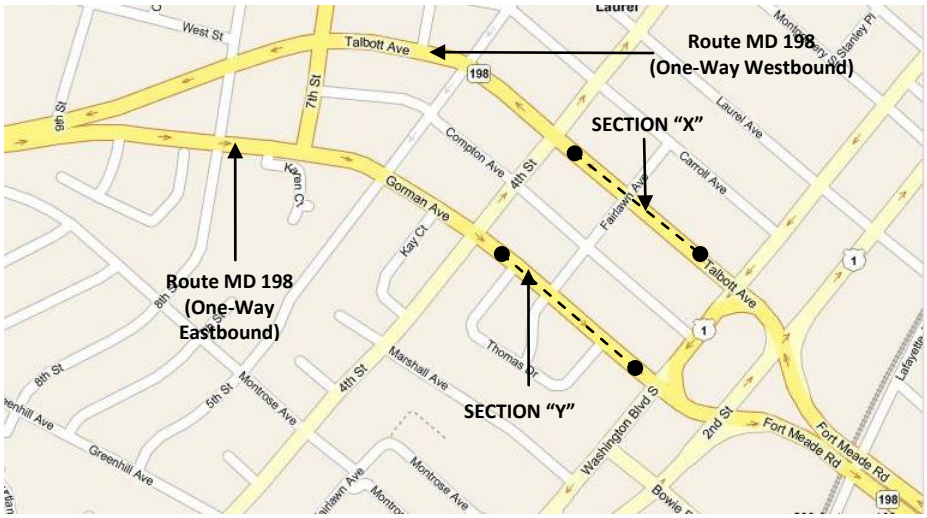
Figure 4.5 shows an example of a street (7th St. NW), for which traffic is permitted to move in both the north and southbound directions. In this particular case, this Data Item should be assigned a code '2' for a given section (Section "X") along this stretch of road.

Figure 4.5: Two-Way Roadway (Code '2') Example

Source: Bing Maps

Figure 4.6 shows an example of a street (MD 198), for which traffic moves in the east and westbound directions along a set of one-way pairs (i.e. parallel roadways). In this particular case, this Data Item should be assigned a code '2' for section "X", and a code '3' for section "Y", or vice-versa. Code '2' must be used to identify the roadway's cardinal direction.

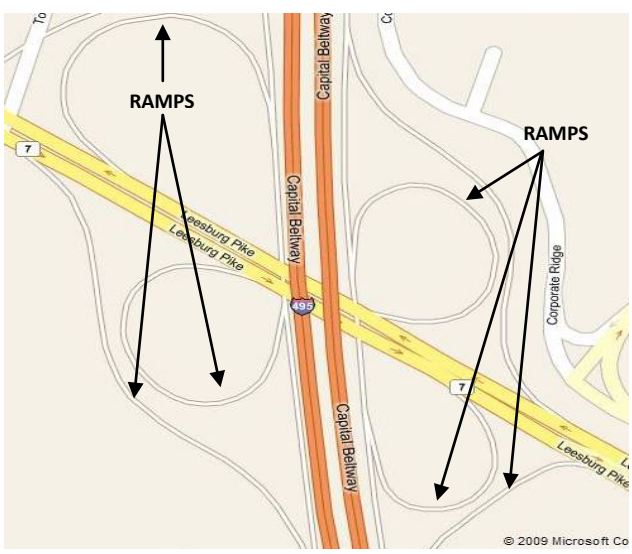
Figure 4.6: Couplet (Code '3') Example



Source: Bing Maps

Figure 4.7 shows an example of ramps contained within a grade-separated interchange located on a highway (Interstate 495). In this particular case, this Data Item should be assigned a code '4' for all applicable ramp sections (denoted as "Ramps" in the figure).

Figure 4.7: Ramp (Code '4') Example



Source: Bing Maps

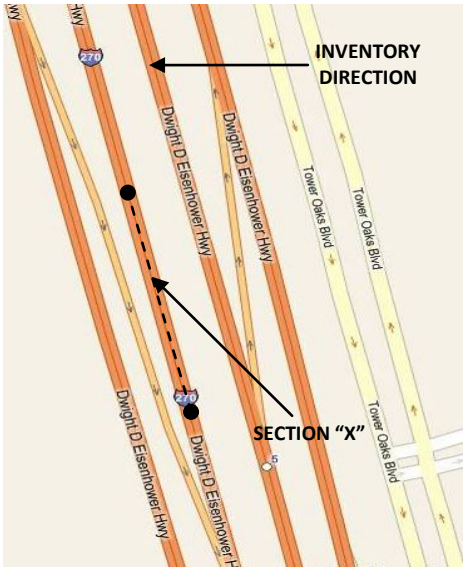
Figure 4.8 shows an example of a highway (Interstate 270), which consists of express and local lanes in both the north and southbound directions. In this particular case, this Data Item should be assigned a code '5' for Sections "X" and "Y" to indicate that they are non-mainline facilities.

Figure 4.8: Non-Mainline (Code '5') Example

Source: Bing Maps

Figure 4.9 shows an example of a highway (Interstate 270), for which an inventory direction is defined (northbound). In this particular case, this Data Item should be assigned a code '6' for Section "X", as the southbound side of the roadway would be defined as the non-inventory direction.

Figure 4.9: Non-Inventory Direction (Code '6') Example



Source: Bing Maps

Item 4: Structure_Type (Structure Type)

Description: Roadway section that is entirely on a bridge, tunnel or causeway.

Use: For analysis in the national highway database.

Extent: All Federal-aid highways.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	FE**	FE**	FE**	FE**	FE**	FE**		
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**	

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Use the following codes:

Code	Description
1	Entire section is a Bridge
2	Entire section is a Tunnel
3	Entire section is a Causeway

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Code this data item only when a bridge, tunnel, or causeway is present.

Bridges must meet a minimum length requirement of 20 feet (per the National Bridge Inventory (NBI) guidelines) in order to be deemed a "structure."

A tunnel is a roadway below the surface connecting to at-grade adjacent sections.

A causeway is a narrow, low-lying raised roadway, usually providing a passageway over some type of vehicular travel impediment (e.g. a river, swamp, earth dam, wetlands, etc.).

Figure 4.10: Bridge (Code '1') Example

Source: PennDOT

Figure 4.11: Tunnel (Code '2') Example

Source: PennDOT

Figure 4.12: Causeway (Code '3') Example

Source: PennDOT Video-log.

Item 5: Access_Control (Access Control)

Description: The degree of access control for a given section of road.

Use: For investment requirements modeling to calculate capacity and estimate type of design, in truck size and weight studies, and for national highway database purposes.

Extent: All principal arterials and Sample Panel sections; optional for other non-principal arterial sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	FE	FE	SP	SP		
Urban	FE	FE	FE	FE	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Use the following codes:

Code	Description	
1	Full Access Control	Preference given to through traffic movements by providing interchanges with selected public roads, and by prohibiting crossing at-grade and direct driveway connections (i.e., limited access to the facility).
2	Partial Access Control	Preference given to through traffic movement. In addition to interchanges, there may be some crossings at-grade with public roads, but, direct private driveway connections have been minimized through the use of frontage roads or other local access restrictions. Control of curb cuts is not access control.
3	No Access Control	No degree of access control exists (i.e., full access to the facility is permitted).

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Figure 4.13: Full Control (Code '1'); all access via grade-separated interchanges

Source: TxDOT, Transportation Planning and Programming Division.

Figure 4.14: Partial Control (Code '2'); access via grade-separated interchanges and direct access roadways

Source: TxDOT, Transportation Planning and Programming Division.

Figure 4.15 and 16: No Access Control (Code '3')

Figure 4.15

Figure 4.16

Source for Figures 4.15 and 4.16: FDOT RCI Field Handbook, Nov. 2008.

Item 6: Ownership (Ownership)

Description: The entity that has legal ownership of a roadway.

Use: For apportionment, administrative, legislative, analytical, and national highway database purposes, and in cost allocation studies.

Extent: All Federal-aid highways.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	FE	FE	FE	FE	FE	FE		
Urban	FE	FE	FE	FE	FE	FE	FE	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the level of government that best represents the highway owner irrespective of whether agreements exist for maintenance or other purposes. If more than one code applies, code the lowest numerical value using the following codes:

Code	Description	Code	Description
1	State Highway Agency	60	Other Federal Agency
2	County Highway Agency	62	Bureau of Indian Affairs
3	Town or Township Highway Agency	63	Bureau of Fish and Wildlife

Code	Description	Code	Description
4	City or Municipal Highway Agency	64	U.S. Forest Service
11	State Park, Forest, or Reservation Agency	66	National Park Service
12	Local Park, Forest or Reservation Agency	67	Tennessee Valley Authority
21	Other State Agency	68	Bureau of Land Management
25	Other Local Agency	69	Bureau of Reclamation
26	Private (other than Railroad)	70	Corps of Engineers
27	Railroad	72	Air Force
31	State Toll Road	73	Navy/Marines
32	Local Toll Authority	74	Army
40	Other Public Instrumentality (i.e., Airport)	80	Other
50	Indian Tribe Nation		

Value_Text: Optional. Enter secondary ownership information, if applicable.

Value_Date: No entry required. Available for State Use.

Guidance: "State" means owned by one of the 50 States, the District of Columbia, or the Commonwealth of Puerto Rico including quasi-official State commissions or organizations;

"County, local, municipal, town, or township" means owned by one of the officially recognized governments established under State authority;

"Federal" means owned by one of the branches of the U.S. Government or independent establishments, government corporations, quasi-official agencies, organizations, or instrumentalities;

"Other" means any other group not already described above or nongovernmental organizations with the authority to build, operate, or maintain toll or free highway facilities.

Only private roads that are open to public travel (e.g., toll bridges) are to be reported in HPMS.

In cases where ownership responsibilities are shared between multiple entities, this item should be coded based on the primary owner (i.e., the entity that has the larger degree of ownership), if applicable. Information on additional owners should be entered in Data Field 9 for this item.

Item 7: Through_Lanes (Through Lanes)

Description The number of lanes designated for through-traffic.

Use: For apportionment, administrative, legislative, analytical, and national highway database purposes.

Extent: All Federal-aid highways including ramps located within grade-separated interchanges.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R		
Urban	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	

FE = Full Extent & Ramps SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the predominant number of through lanes in both directions carrying through traffic in the off-peak period.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: This Data Item must also be reported for all ramp sections contained within grade separated interchanges.

Code the number of through lanes according to the striping, if present, on multilane facilities, or according to traffic use or State/local design guidelines if no striping or only centerline striping is present.

For one-way roadways, two-way roadways, and couplets, exclude all ramps and sections defined as auxiliary lanes, such as:

- Collector-distributor lanes;
- Weaving lanes;
- Frontage road lanes;
- Parking and turning lanes;
- Acceleration/deceleration lanes;
- Toll collection lanes;
- Truck climbing lanes; and
- Shoulders.

When coding the number of through lanes for ramps (i.e., where Data Item 3 = Code '4'), include the predominant number of (through) lanes on the ramp. Do not include turn lanes (exclusive or combined) at the termini unless they are continuous (turn) lanes over the entire length of the ramp.

Figure 4.17: A Roadway with Four Through-Lanes

Source: TxDOT, Transportation Planning and Programming Division.

Item 8: HOV_Type (High Occupancy Vehicle Operations Type)

Description: The type of HOV operations.

Use: For administrative, legislative, analytical, and national highway database purposes.

Extent: All sections where HOV operations exist. This should correspond with the information reported for Data Item 9 (HOV lanes).

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**		
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**	

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Use the following codes:

Code	Description	
1	Full-time HOV	Section has 24-hour exclusive HOV lanes (HOV use only; no other use permitted).
2	Part-time HOV	Normal through lanes used for exclusive HOV during specified time periods.
3	Part-time HOV	Shoulder/Parking lanes used for exclusive HOV during specified time periods.

Value_Text: No Entry Required. Available for State Use.

Value_Date: No Entry Required. Available for State Use.

Guidance: Code this data item only when HOV operations exist.

Code this Data Item for both directions to reflect existing HOV operations. If more than one type of HOV lane is present for the section, code the lesser of the two applicable HOV Type codes (e.g., if Codes '2' and '3' are applicable for a section, then the section should be coded as a Code '2').

Alternatively, if more than one type of HOV operation exists, the secondary HOV Type may be indicated in the Value_Text field.

This information may be indicated by either HOV signing or the presence of a large diamond-shaped marking (HOV symbol) on the pavement, or both.

Figure 4.18: HOV Signage

Source: FDOT RCI Field Handbook, Nov. 2008.

Item 9: HOV_Lanes (High Occupancy Vehicle Lanes)

Description: Maximum number of lanes in both directions designated for HOV operations.

Use: For administrative, legislative, analytical, and national highway database purposes.

Extent: All Sections where HOV lanes exist. This should correspond with the information reported for Data Item 8 (HOV Type).

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**		
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**	

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the number of HOV lanes in both directions.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Code this data item when Data Item 8 (HOV Type) is coded.

If more than one type of HOV operation exists on the section, code this data item with respect to all HOV lanes available, and indicate (in the Value_Text field) how many lanes apply to the HOV Type reported in Data Item 8.

Item 10: Peak_Lanes (Peak Lanes)

Description: The number of lanes in the peak direction of flow during the peak period.

Use: For investment requirements modeling to calculate capacity, and in congestion analyses, including estimates of delay. Also used in the Highway Capacity Manual (HCM)-based capacity calculation procedure.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the number of through lanes used during the peak period in the peak direction.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Include reversible lanes, parking lanes, or shoulders that are legally used for through-traffic for both non-HOV and HOV operation.

- For urban roads, code based on the peak direction of travel;
- For rural 2 or 3-lane roads, code both directions; and
- For rural roads with 4 or more lanes, code based on the peak direction of travel.

The peak period is represented by the period of the day when observed traffic volumes are the highest.

Figure 4.19: Peak Lanes Example (Peak Lanes = 3)

Source: Mike Kahn/Green Stock Media

Item 11: Counter_Peak_Lanes (Counter-Peak Lanes)

Description: The number of lanes in the counter-peak direction of flow during the peak period.

Use: For investment requirements modeling to calculate capacity, and in congestion analyses, including estimates of delay. It is used in the Highway Capacity Manual (HCM)-based capacity calculation procedure.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the number of through lanes used during the peak period (per Data Item 10) in the counter-peak direction of flow.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Include reversible lanes, parking lanes, or shoulders that are legally used for through-traffic for both non-HOV and HOV operation.

- For urban roads, code based on the counter-peak (i.e. opposite-peak) direction of travel;
- For rural 2 or 3-lane roads, do not code this data item

Visual inspection should be used as the principle method used to determine the number of peak lanes and counter-peak lanes.

The number of peak and counter-peak lanes should be greater than or equal to the total number of through lanes (i.e., Peak Lanes + Counter-Peak Lanes >= Through Lanes). The number of peak and counter-peak lanes can be greater than the number of through lanes if shoulders, parking lanes, or other peak-period-only lanes are used during the peak period.

The peak period is represented by the period of the day when observed traffic volumes are the highest.

Item 12: Turn_Lanes_R (Right Turn Lanes)

Description: The presence of right turn lanes at a typical intersection.

Use: For investment requirements modeling to calculate capacity and in congestion analyses, including estimates of delay.

Extent: All Sample Panel sections located in urban areas, optional for all other urban sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural								
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the code from the following table that best describes the peak-period turning lane operation in the inventory direction.

Code	Description
1	No intersection where a right turning movement is permitted exists on the section.
2	Turns permitted; multiple exclusive right turning lanes exist. Through movements are prohibited in these lanes. Multiple turning lanes allow for simultaneous turns from all turning lanes.
3	Turns permitted; a continuous exclusive right turning lane exists from intersection to intersection. Through movements are prohibited in this lane.
4	Turns permitted; a single exclusive right turning lane exists.
5	Turns permitted; no exclusive right turning lanes exist.
6	No right turns are permitted during the peak period.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Include turning lanes that are located at entrances to shopping centers, industrial parks, and other large traffic generating enterprises as well as public cross streets.

Where peak capacity for a section is governed by a particular intersection that is on the section, code the turning lane operation at that location (referred to as most controlling intersection); otherwise code for a typical intersection.

Through movements are prohibited in exclusive turn lanes.

Use codes '2' through '6' for turn lanes at a signalized or stop sign intersection that is critical to the flow of traffic; otherwise enter the code that best describes the peak-hour turning lane situation for typical intersections on the sample.

Code a continuous turning lane with painted turn bays as a continuous turning lane. Code a through lane that becomes an exclusive turning lane at an intersection as a shared (through/right turn) lane; however, if through and turning movements can be made from a lane at an intersection, it is not an exclusive turning lane.

Roundabouts (as shown in Figure 4.20) should be considered as an intersection where turns are permitted with no exclusive lanes. Use a Code '5' for this item since traffic can either turn or go through the roundabout from the same lane. However, if an exclusive turning lane exists (as indicated by pavement markings), use a Code '4'. Code if the roundabout controls the capacity of the entire HPMS section. If there is not a controlling intersection, then code for a typical intersection.

Figure 4.20: Roundabout Configuration Example

Source: SRA Consulting Group, Nov. 2008

This Data Item should be coded based on the same intersection that is used for identifying the percent green time for a given roadway section.

Painted islands (Figure 4.21) located in the center of a roadway should be considered a median, for the purpose of determining whether or not a turn lane exists.

Slip-ramp movements should not be considered for the purpose of determining turn lanes.

On-ramps and off-ramps which provide access to and from grade-separated, intersecting roadways are to be excluded from turn lane consideration.

Figure 4.21: Painted Island Example

Source: TxDOT, Transportation Planning and Programming Division.

Right Turn Lanes Coding Examples:

Figure 4.22: Multiple Turn Lanes (Code '2') Example

Turns permitted; multiple exclusive right turn lanes exist. Through movements are prohibited in these lanes. Multiple turn lanes allow for simultaneous turns from all turn lanes.

Source: FDOT RCI Field Handbook, Nov. 2008.

Figure 4.23: Continuous Turn Lane (Code '3') Example

Source: Minnesota Dept. of Transportation (MnDOT).

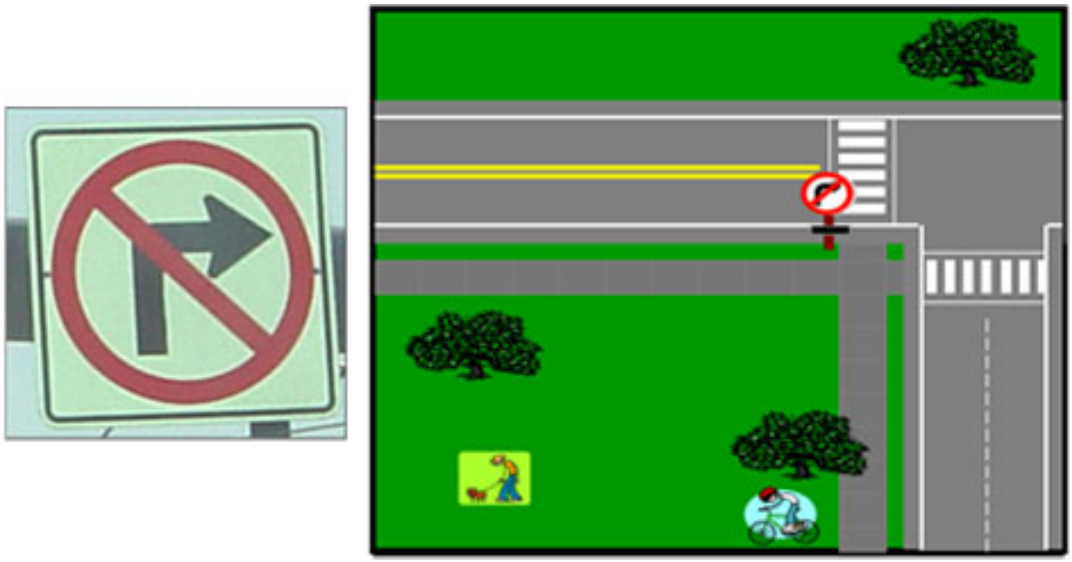
Figure 4.24: Single Turn Lane (Code '4') Example

Source: MoveTransport.com

Figure 4.25: No Exclusive Turn Lane (Code '5') Example

Source: FDOT RCI Field Handbook, Nov. 2008.

Figure 4.26 No Right Turn Permitted (Code '6') Example



Source: TxDOT, Transportation Planning and Programming Division.

Item 13: Turn_Lanes_ L (Left Turn Lanes)

Description: The presence of left turn lanes at a typical intersection.

Use: For investment requirements modeling to calculate capacity and in congestion analyses, including estimates of delay.

Extent: All Sample Panel sections located in urban areas, optional for all other urban sections beyond the limits of the Sample Panel.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural								
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = All sections SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the code from the following table that best describes the peak-period turning lane operation in the inventory direction.

Code	Description
1	No intersection where a left turning movement is permitted exists on the section.
2	Turns permitted; multiple exclusive left turning lanes exist. Through movements are prohibited in these lanes. Multiple turning lanes allow for simultaneous turns from all turning lanes.
3	Turns permitted; a continuous exclusive left turning lane exists from intersection to intersection. Through movements are prohibited in this lane.
4	Turns permitted; a single exclusive left turning lane exists.
5	Turns permitted; no exclusive left turning lanes exist.
6	No left turns are permitted during the peak period.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Where peak capacity for a section is governed by a particular intersection that is on the section, code the turning lane operation at that location (referred to as most controlling intersection); otherwise code for a typical intersection.

Include turning lanes that are located at entrances to shopping centers, industrial parks, and other large traffic generating enterprises as well as public cross streets.

Through movements are prohibited in exclusive turn lanes.

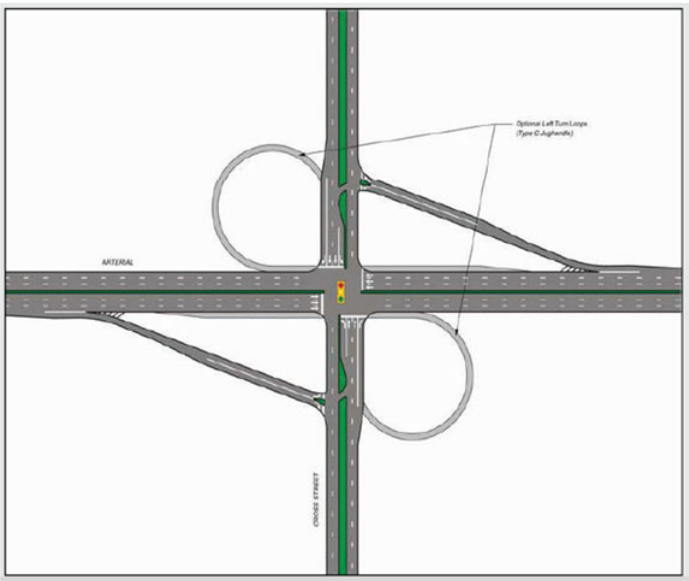
Use codes ‘2’ through ‘6’ for turn lanes at a signalized or stop sign intersection that is critical to the flow of traffic; otherwise enter the code that best describes the peak-hour turning lane situation for typical intersections on the sample.

Code a continuous turning lane with painted turn bays as a continuous turning lane. Code a through lane that becomes an exclusive turning lane at an intersection as a shared (through/left turn) lane; however, if through and turning movements can be made from a lane at an intersection, it is not an exclusive turning lane.

Roundabouts (as shown in Figure 4.20) should be considered as an intersection where turns are permitted with no exclusive lanes. Use a Code ‘5’ for this item since traffic can either turn or go through the roundabout from the same lane. Code if the roundabout controls the capacity of the entire HPMS section. If there is not a controlling intersection, then code for a typical intersection.

On-ramps and off-ramps which provide access to and from grade-separated, intersecting roadways are to be excluded from turn lane consideration.

Figure 4.27: Jug Handle Configuration Example



Source: SRA Consulting Group, Nov. 2008

Jug handle configurations (as shown in Figure 4.27), or lanes on either side of the roadway should be considered as an intersection with protected (exclusive) left turn lanes. Although a jug handle may be viewed as a right turn lane, it is intended for left turn movements, therefore it should not be coded as a right turn lane; instead use Code '6.'

This Data Item should be coded based on the same intersection that is used for identifying the percent green time for a given roadway section.

Painted islands located in the center of a roadway should be considered a median, for the purposes of determining whether or not a turn lane exists.

Permitted U-turn movements are not to be considered for the purpose of determining turn lanes.

Left Turn Lanes Coding Examples:

Figure 4.28: Multiple Turn Lanes (Code '2') Example

Turns permitted; multiple exclusive left turn lanes exist. Through movements are prohibited in these lanes. Multiple turn lanes allow for simultaneous turns from all turn lanes.

Source: FDOT RCI Field Handbook, Nov. 2008.

Figure 4.29: Multiple Turn Lanes (Code '2') Example

Source: Unavailable

Figure 4.30: Continuous Turn Lane (Code '3') Example

Source: Kentucky Transportation Cabinet

Example for Coding Turn Lanes and Through Lanes:

For an intersection that has a single left turn lane and no right turn lane with turns permitted in the peak period (as shown in Figure 4.31), use a code '4' for this Data Item, and a code '5' (turns permitted; no exclusive right turning lane exists) for Data Item 12 (Right Turn Lanes). Additionally, this intersection has four through-lanes (Data Item 7), and two peak-lanes (Data Item 10).

Figure 4.31: Exclusive Turn Lane (Code '4') Example

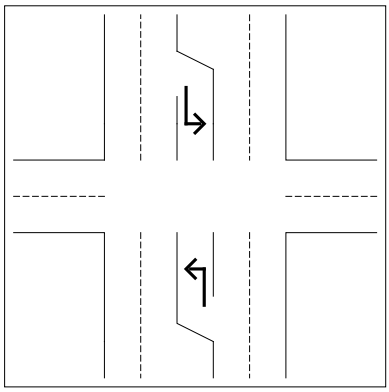


Figure 4.32: No Exclusive Left Turn Lane (Code '5') Example

Figure 4.33: No Left Turn Permitted (Code '6')

Item 14: Speed_Limit (Speed Limit)

Description: The posted speed limit.

Use: For investment requirements modeling to estimate running speed and for other analysis purposes, including delay estimation.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the daytime speed limit for automobiles posted or legally mandated on the greater part of the section. If there is no legally mandated maximum daytime speed limit for automobiles, code '999.'

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: If the speed limit changes within the limits of a section, the State must determine and report the predominant speed limit.

Item 15: Toll_Charged (Toll Charged)

Description: Identifies sections that are toll facilities regardless of whether or not a toll is charged.

Use: For administrative, legislative, analytical, and national highway database purposes.

Extent: All roadways that are toll facilities, whether public or privately-owned / operated.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**	FE**	FE**
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**	FE**

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Use the following codes:

Code	Description
1	Toll charged in one direction only.
2	Toll charged in both directions.
3	No toll charged

Value_Text: Assign the appropriate Toll ID. See Appendix D for the list of IDs.

Value_Date: No entry required. Available for State Use.

Guidance: Code this data item only when a toll facility is present.

Code each toll and non-toll portion of contiguous toll facilities as separate sections.

If tolls are charged in both directions, but only one direction at a given time, then use Code '1'.

Include High Occupancy Toll (HOT) lanes and other special toll lanes. Use Code '3' for subsections of a toll facility that do not have tolls.

Figure 4.34: Toll-Road Signage

Source: FDOT RCI Field Handbook, Nov. 2008.

Item 16: Toll_Type (Toll Type)

Description: Indicates the presence of special tolls (i.e., High Occupancy Toll (HOT) lane(s) or other managed lanes).

Use: For administrative, legislative, analytical, and national highway database purposes.

Extent: All roadways where special tolls exist.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**	FE**	FE**
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**	FE**

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Use the following codes:

Code	Description
1	This section has toll lanes but no special tolls (e.g., HOT lanes).
2	This section has HOT lanes.
3	This section has other special tolls.

Value_Text: Assign the appropriate Toll ID. See Appendix D for the list of IDs.

Value_Date: No entry required. Available for State Use.

Guidance: This may not be an HOV facility, but has special lanes identified where users would be subject to tolls.

High Occupancy Toll (HOT) lanes are HOV lanes where a fee is charged, sometimes based on occupancy of the vehicle or the type of vehicle. Vehicle types may include buses, vans, or other passenger vehicles.

Item 17: Route_Number (Route Number)

Description: The signed route number.

Use: Used along with route signing and route qualifier to track information by specific route.

Extent: All principal arterials, minor arterials, and the entire NHS.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	FE	FE	FE			
Urban	FE	FE	FE	FE	FE			

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the appropriate route number (leading zeros should not be used), e.g., Interstate 81 should be coded as '81'; Interstate 35W should be coded as '35'.

Value_Text: Enter the full route number, e.g., "35W" or "291A."

Value_Date: No entry required. Available for State Use.

Guidance: This should be the same route number that is identified for the route in Data Items 18 and 19 (Route Signing and Route Qualifier).

If two or more routes of the same functional system are signed along a roadway section (e.g., Interstate 64 and Interstate 81), code the lowest route number (i.e., Interstate 64).

If two or more routes of differing functional systems are signed along a roadway section (e.g., Interstate 83 and U.S. 32), code this Data Item in accordance with the highest functional system on the route (in this example, Interstate).

For the official Interstate route number, enter an alphanumeric value for the route in Data Field 9.

If Data Items 18 or 19 (Route Signing or Route Qualifier) are coded '10,' code a text descriptor (in Field 9) for this Data Item.

If the official route number contains an alphabetic character (e.g. "32A"), then code the numeric portion of this value in Field 8, and the entire value in Field 9.

Item 18: Route_Signing (Route Signing)

Description: The type of route signing.

Use: For tracking information by specific route; used in conjunction with Data Item 19 (Route Qualifier).

Extent: All principal arterials, minor arterials, and the entire NHS.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural	FE	FE	FE	FE	FE			
Urban	FE	FE	FE	FE	FE			

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the value that best represents the manner in which the roadway section is signed with route markers, using the following codes:

Code	Description	Code	Description
1	Not Signed	6	County
2	Interstate	7	Township
3	U.S.	8	Municipal
4	State	9	Parkway Marker or Forest Route Marker
5	Off-Interstate Business Marker	10	None of the Above

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: When a section is signed with two or more identifiers (e.g., Interstate 83 and U.S. 32), code the highest order identifier on the route (in this example, Interstate). Follow the hierarchy as ordered above.

Item 19: Route_Qualifier (Route Qualifier)

Description: The route signing descriptive qualifier.

Use: For tracking information by specific route; used in conjunction with Data Item 18 (Route Signing).

Extent: All principal arterials, minor arterials, and the entire NHS.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural	FE	FE	FE	FE	FE			
Urban	FE	FE	FE	FE	FE			

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the value which best represents the manner in which the roadway section is signed on the route marker described in Data Item 18 (Route Signing).

Code	Description	Code	Description
1	No qualifier or Not Signed	6	Loop
2	Alternate	7	Proposed
3	Business Route	8	Temporary
4	Bypass Business	9	Truck Route
5	Spur	10	None of the Above

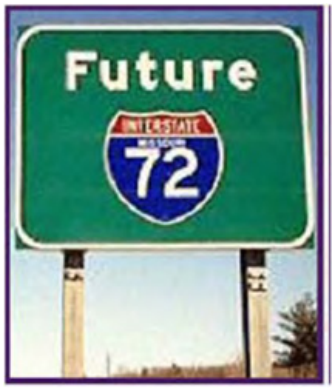
Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: If more than one code is applicable, use the lowest code.

Figure 4.35 Business Route (Code '3') Example

Source: FDOT RCI Field Handbook, Nov. 2008.

Figure 4.36 Proposed Route (Code '7') Example



Source: FDOT RCI Field Handbook, Nov. 2008.

Figure 4.37 Temporary Route (Code '8') Example

Source: FDOT RCI Field Handbook, Nov. 2008.

Item 20: Alternative_Route_Name (Alternative Route Name)

Description: A familiar, non-numeric designation for a route.

Use: For tracking information by specific route; used in conjunction with Data Items 18 and 19 (Route Signing and Route Qualifier).

Extent: Optional for principal arterial, minor arterial, and NHS sections where this situation exists.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	FE	FE	FE			
Urban	FE	FE	FE	FE	FE			

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: No entry required. Available for State Use.

Value_Text: Optional. Enter the alternative route name.

Value_Date: No entry required. Available for State Use.

Guidance: Examples for this Data item would be the "Pacific Coast Highway" (in California), and the "Garden State Parkway" (in New Jersey).

Item 21: AADT (Annual Average Daily Traffic)

Description: Annual Average Daily Traffic.

Use: For apportionment, administrative, legislative, analytical, and national highway database purposes.

Extent: All Federal-aid highways including ramps located within grade-separated interchanges.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R		
Urban	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	FE+R	

FE + R = Full Extent & Ramps SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter a value that represents the AADT for the current data year.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Metadata: See Chapter 3 for a description of the metadata reporting requirements for this Data Item.

Guidance: For two-way facilities, provide the bidirectional AADT; for one-way couplets, one-way roadways, and ramps, provide the directional AADT.

This Data Item must also be reported for all ramp sections contained within grade separated interchanges

All AADTs must reflect application of day of week, seasonal, and axle correction factors, as necessary; no other adjustment factors shall be used. Growth factors should be applied if the AADT is not derived from current year counts.

AADTs for the NHS, Interstate, Principal Arterials (OFE, OPA), and HPMS Sample Panel sections must be based on traffic counts taken on a minimum three-year cycle. AADTs for the non Principal Arterial System and non Sample Panel sections can be based on a minimum six-year counting cycle.

If average weekday, average weekly, or average monthly traffic is calculated or available, it must be adjusted to represent the annual average daily traffic (AADT). AADT is an average daily value that represents all days of the reporting year.

AADT guidance for ramps:

AADT values representing the current data year are required for ramps contained within grade separated interchanges on all Federal-aid highways. To the extent possible, the same procedures used to develop AADTs on HPMS sections should also be used to develop ramp AADT data. At a minimum, 48-hour ramp traffic counts should be taken on a six-year cycle, so at least one-sixth of the ramps should be counted every year.

Ramp AADT data may be available from freeway monitoring programs that continuously monitor travel on ramps and mainline facilities. Ramp balancing programs implemented by the States for ramp locations and on high volume roadways could be used to gather traffic data on ramps. States are encouraged to use adjustment factors that have been developed based either on entrance or exit travel patterns, or on the functional system of the ramp. The procedure should be applied consistently statewide.

Additional guidance on how this data is to be developed and reported is contained in Chapter 5.

Item 22: AADT_Single_Unit (Single-Unit Truck and Bus AADT)

Description: Annual Average Daily Traffic for single-unit trucks and buses.

Use: For investment requirements modeling to estimate pavement deterioration and operating speeds, in the cost allocation pavement model, the truck size and weight analysis process, freight analysis, and other scenario based analysis.

Extent: All NHS and Sample Panel sections; optional for all other non-NHS sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	SP	SP	SP	SP		
Urban	FE	FE	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the volume for all single-unit truck and bus activity over all days of the week and seasons of the year in terms of the annual average daily traffic.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Metadata: See Chapter 3 for a description of the AADT metadata reporting requirements related to this Data Item.

Guidance: This value should be representative of all single-unit truck and bus activity based on vehicle classification count data from both the State's and other agency's traffic monitoring programs over all days of the week and all seasons of the year. Actual vehicle classification counts should be adjusted to represent average conditions as recommended in the *Traffic Monitoring Guide (TMG)*. Single-unit trucks and buses are defined as vehicle classes 4 through 7 (buses through four-or-more axle, single-unit trucks).

AADT values shall be updated annually to represent current year data.

Section specific measured values are requested based on traffic counts taken on a minimum three-year cycle. If these data are not available, values derived from classification station data on the same route, or on a similar route with similar traffic characteristics in the same area can be used.

Specific guidance for the frequency and size of vehicle classification data collection programs, factor development, age of data, and other applications is contained in the *Traffic Monitoring Guide*.

Item 23: Pct_Peak_Single (Percent Peak Single-Unit Trucks and Buses)

Description: Peak hour single-unit truck and bus volume as a percentage of total AADT.

Use: For investment requirements modeling to calculate capacity and peak volumes.

Extent: All Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the peak hour single-unit truck and bus volume as a percentage of the applicable roadway section's AADT rounded to the nearest tenth of a percent (0.001%). This percent should not be rounded to the nearest whole percent or to zero percent if minimal vehicles exist.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Code this item based on vehicle classification data from traffic monitoring programs for vehicle classes 4 through 7 (as defined in the *Traffic Monitoring Guide*), based on traffic counts taken on a three-year cycle, at a minimum.

The Percent Peak Single-Unit Trucks and Buses value is calculated by dividing the number of single-unit trucks and buses during the hour with the highest total volume (i.e. the peak hour) by the AADT (i.e. the total daily traffic). Note that this data item is based on the truck traffic during the peak traffic hour and not the hour with the most truck traffic.

If actual measured values are not available, then an estimate shall be made based on the most readily available information. The most credible method would be to use other site specific measured values from sites located on the same route. Other methods may include: assigning site specific measured values to other samples that are located on similar facilities with similar traffic characteristics in the same geographic area and in the same volume group; or assigning measured values from samples in the same functional system and in the same area type (i.e., rural, small urban, urbanized).

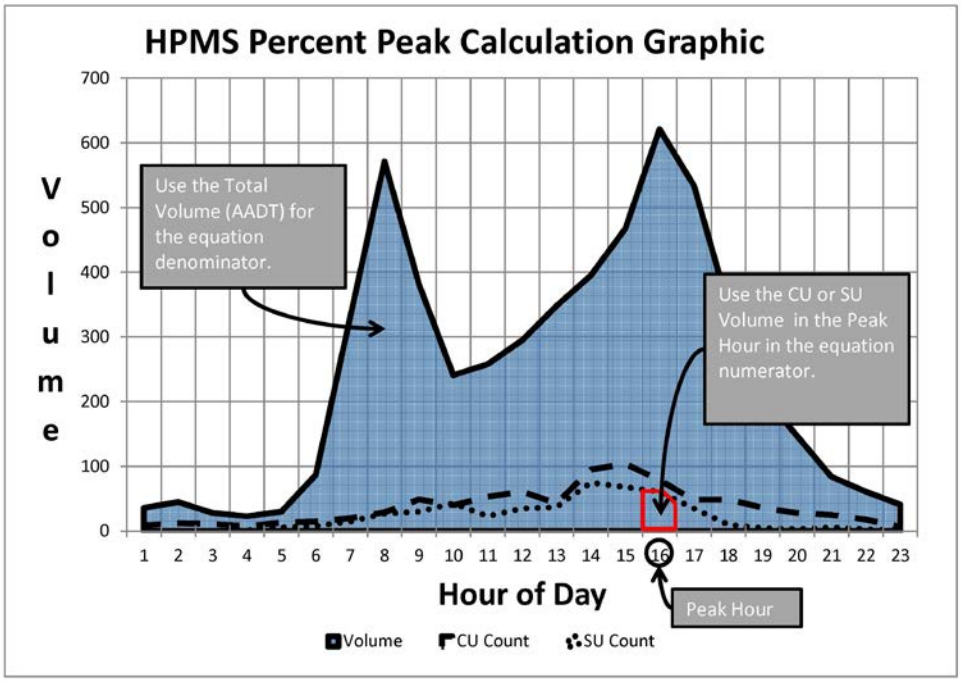
Statewide or functional system-wide values should not be used. Peak hour values may be different than daily averages which must be taken into consideration.

Supplemental methods and sources may be particularly useful in urban areas. These include turning movement studies, origin and destination studies, license plate surveys, design estimates and projections, and MPO data obtained for other purposes. Short term visual observation of truck travel can also be helpful when developing an estimate.

The hour used for calculation purposes should be the same time period that is used to calculate K-factor and D-factor. This information can be determined from continuous traffic monitoring data or from the time period with the highest hourly volume based on a short term traffic count.

Note that this data represents the truck traffic during the peak traffic hour and not the hour which has the peak truck traffic (see Figure 4.38).

Figure 4.38 Peak Hour Truck Traffic vs. AADT



Code this data item in accordance with the limits for which Data Item #22 is reported.

The following examples illustrate the % Peak Single-Unit (SU) Trucks calculation:

Example #1

AADT = 150,000 vehicles
SU AADT = 12,100 SU trucks (classes 4-7)
Peak hour SU Trucks = 1,550 SU trucks (classes 4-7)
% Peak SU Trucks = (Peak hour SU trucks/AADT)*100 =

(1,550 SU trucks/150,000)*100 = 1.0333%

**When reported in HPMS, this % Peak SU value would be reported as 1.0%.*

Example #2

AADT = 2,050 vehicles
SU AADT = 85 SU trucks (classes 4-7)

Peak hour SU Trucks = 8 SU trucks (classes 4-7)
% Peak SU Trucks = (Peak hour SU trucks/AADT)*100

(8 SU trucks/2,050)*100 = 0.39%

**When reported in HPMS, this % Peak SU value would be reported as 0.4%.*

Item 24: AADT_Combination (Combination Truck AADT)

Description: Annual Average Daily Traffic for Combination Trucks.

Use: For investment requirements modeling to estimate pavement deterioration and operating speeds, in the cost allocation pavement model, the truck size and weight analysis process, and freight analysis.

Extent: All NHS and Sample Panel sections; optional for all other non-NHS sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	SP	SP	SP	SP		
Urban	FE	FE	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the volume for combination-unit truck activity over all days of the week and seasons of the year in terms of the annual average daily traffic.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Metadata: See Chapter 3 for a description of the AADT metadata reporting requirements related to this Data Item.

Guidance: This value should be representative of all combination truck activity based on vehicle classification data from traffic monitoring programs over all days of the week and all seasons of the year. Actual vehicle classification counts should be adjusted to represent average conditions as recommended in the *Traffic Monitoring Guide (TMG).* Combination trucks are defined as vehicle classes 8 through 13 (four-or-less axle, single-trailer trucks through seven-or-more axle, multi-trailer trucks).

AADT values shall be updated annually to represent current year data.

Section specific measured values are requested based on traffic counts taken on a three-year cycle, at a minimum. If these data are not available, use values derived from classification station data on the same route or on a similar route with similar traffic characteristics in the same area.

Specific guidance for the frequency and size of vehicle classification data collection programs, factor development, age of data, and other applications is contained in the *Traffic Monitoring Guide.*

Item 25: Pct_Peak_Combination (Percent Peak Combination Trucks)

Description: Peak hour combination truck volume as a percentage of total AADT.

Use: For investment requirements modeling to calculate capacity and peak volumes.

Extent: All Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the peak hour combination truck volume as a percentage of the applicable roadway section's AADT rounded to the nearest tenth of a percent (0.001%). This percent should not be rounded to the nearest whole percent or to zero percent if minimal vehicles exist.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Code this item based on vehicle classification data from traffic monitoring programs for vehicle classes 8 through 13 (as defined in the TMG) based on traffic counts taken on a three year cycle, as a minimum. Code this data item in accordance with the limits for which Data Item #24 is reported.

The Percent Peak Combination Truck value is calculated by dividing the number of combination trucks during the hour with the highest total volume (i.e. the peak hour) by the AADT (i.e. the total daily traffic). Note that this data item is based on the truck traffic during the peak traffic hour and not the hour with the most truck traffic.

If actual measured values are not available, then an estimate shall be made based on the most readily available information. The most credible method would be to use other site specific measured values from sites located on the same route. Other methods may include: assigning site specific measured values to other samples that are located on similar facilities with similar traffic characteristics in the same geographic area and in the same volume group; or assigning measured values from samples in the same functional system and in the same area type (i.e., rural, small urban, urbanized).

Statewide or functional system-wide values should not be used. Peak hour values may be different than daily averages which must be taken into consideration.

Supplemental methods and sources may be particularly useful in urban areas. These include turning movement studies, origin and destination studies, license plate surveys, design estimates and projections, and MPO data obtained for other purposes. Short term visual observation of truck travel can also be helpful when developing an estimate.

The hour used for calculation purposes should be the same time period that is used to calculate K-factor and D-factor. This information can be determined from continuous traffic monitoring data or from the time period with the highest hourly volume based on a short term traffic count.

Note that this data represents the truck traffic during the peak traffic hour and not the hour which has the peak truck traffic (see Figure 4.38).

The following examples illustrate the % Peak Combination-Unit (CU) Trucks calculation:

Example #1

AADT = 15,000 vehicles
CU AADT = 2,800 CU trucks (classes 8-13)
Peak hour CU Trucks = 215 CU trucks (classes 8-13)
% Peak CU Trucks = (Peak hour CU Trucks/AADT)*100 =

(215 CU Trucks/15,000)*100 = 1.433%

**When reported in HPMS, this % Peak CU value would be reported as 1.4%.*

Example #2

AADT = 70,240 vehicles
CU AADT = 22,750 CU Trucks (classes 8-13)
Peak hour CU Trucks = 1,528 CU Trucks (classes 8-13)
% Peak CU Trucks = (Peak hour CU Trucks/AADT)*100

(1,528 CU Trucks/70,240)*100 = 2.175%

**When reported in HPMS, this % Peak CU value would be reported as 2.2%.*

Item 26: K_Factor (K-factor)

Description: The peak hour volume as a percentage of AADT.

Use: For investment requirements modeling to calculate capacity and estimate needed capacity improvements, in the cost allocation pavement model, and for other analysis purposes, including delay estimation.

Extent: All Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the K-factor to the nearest percent.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: The K-factor is the peak hour volume as a percentage of the annual average daily traffic. Section specific values should be provided. Statewide or functional system-wide values should not be used. The K-Factor normally ranges from 7 to 18 percent. Values less than 7 percent indicate that there is no significant peak hour and that volumes are the same for every hour of the day which is an unusual condition.

The *Highway Capacity Manual* provides some guidance on how to collect and calculate this data in rural and urban locations if sufficient traffic data is not available. For rural areas, the four highest consecutive fifteen (15) minute traffic volume counts can be used to estimate the peak hour. For urban areas, either the a.m. or p.m. weekday peak period traffic volume counts can be used to estimate the peak hour.

The best source of this data is from continuous traffic monitoring sites. If continuous data is not available, then short term traffic count data can be used to determine the peak hour and the peak hour volume. If this data is not available, use values derived from continuous count station data on the same route or on a similar route with similar traffic characteristics in the same area.

When utilizing traffic count data gathered from continuous traffic monitoring sites, the 30th highest hourly volume for a given year (typically used) is to be used for the purposes of calculating K-factor. Conversely, the peak hour volume is used for this calculation when utilizing data gathered from short term traffic monitoring sites.

Other sources of this data may include the use of project level information for the section, turning movement and classification count data to estimate peak hour volume, regression analysis of computed K-factors at ATR stations, continuous site data grouped by urbanized areas to estimate urbanized area K-factors, and continuous site data grouped by number of lanes for high volume routes.

The hour used to calculate K-factor should also be used to calculate percent trucks and D-factor.

Code this data item in accordance with the limits for which Data Item #21 is reported.

Item 27: Dir_Factor (Directional Factor)

Description: The percent of peak hour volume flowing in the peak direction.

Use: For investment requirements modeling to calculate capacity and estimate needed capacity improvements, in congestion, delay, and other analyses, and in the cost allocation pavement model.

Extent: All Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the percentage of the peak hour volume flowing in the peak direction. Code '100' for one-way facilities.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Section-specific values based on an actual count should be provided. If this information is unavailable, use values derived from continuous count station data on the same route or on a similar route with similar traffic characteristics in the same area. Statewide or functional system-wide values should not be used.

For two-way facilities, the directional factor normally ranges from 50 to 70 percent.

When utilizing traffic count data gathered from continuous traffic monitoring sites, the 30th highest hourly volume for a given year (typically used) is to be used for the purposes of calculating D-factor. Conversely, the peak hour volume is used for this calculation when utilizing data gathered from short term traffic monitoring sites.

The hour used to calculate D-factor should also be used to calculate percent trucks and K-factor.

Code this data item in accordance with the limits for which Data Item #21 is reported.

Item 28: Future_AADT (Future AADT)

Description: Forecasted AADT.

Use: For investment requirements modeling to estimate deficiencies and future improvement needs, in the cost allocation pavement model and in other analytical studies.

Extent: All Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the forecasted two-way AADT (one-way where applicable).

Value_Text: No entry required. Available for State Use.

Value_Date: Four-digit year for which the Future AADT has been forecasted.

Guidance: This should be a 20-year forecast AADT, which may cover a period of 18 to 25 year periods from the data year of the submittal, and must be updated if less than 18 years.

Future AADT should come from a technically supportable State procedure, Metropolitan Planning Organizations (MPOs) or other local sources. HPMS forecasts for urbanized areas should be consistent with those developed by the MPO at the functional system and urbanized area level.

This data may be available from travel demand models, State and local planning activities, socioeconomic forecasts, trends in motor vehicle and motor fuel data, projections of existing travel trends, and other types of statistical analyses.

Code this data item in accordance with the limits for which Data Item #21 is reported.

Item 29: Signal_Type (Signal Type)

Description: The predominant type of signal system on a sample section.

Use: For the investment requirements modeling process to calculate capacity and estimate delay.

Extent: All Sample Panel sections located in urban areas; optional for all other urban sections beyond the limits of the Sample Panel and rural Sample Panel sections.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP*	SP*	SP*	SP*	SP*	SP*		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections SP* = Sample Panel Sections (optional)

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the code that best describes the predominant type of signal system for the direction of travel (in the inventory direction). Signal information may be coded for rural sections on an optional basis.

Code	Description
1	Uncoordinated Fixed Time (may include pre-programmed changes for peak or other time periods).
2	Uncoordinated Traffic Actuated.
3	Coordinated Progressive (coordinated signals through several intersections).
4	Coordinated Real-time Adaptive

5	No signal systems exist.

Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: It is difficult to determine coordinated signals from field observations, therefore the best source of such data may be traffic engineering departments or traffic signal timing plans. However, if such information cannot be obtained, field inspection and/or observation may be necessary.

Code '4' – Coordinated Real-Time Traffic Adaptive is difficult to determine from field reviews and may require discussion with local traffic engineering personnel. It is good practice to always contact the agencies responsible for the signals in question to obtain information on the type of signal and green time when available.

Examples of Types of Signals:

Figure 4.39: Uncoordinated Fixed Time (Code '1') Example

Generally found in rural areas, and in some cases small urban areas; typically not in close proximity to other traffic signals.

Figure 4.40: Uncoordinated Traffic Actuated (Code '2') Example

These signals are typically identified by the presence of in-pavement loops or other detectors (intrusive or non-intrusive) on the approach to the intersection in one or more lanes.

Figure 4.41: Coordinated Progressive (Code '3') Example

These signals usually occur in high-traffic urban or urbanized areas, in close proximity to other signals (as shown in Figure 4.41), and are usually timed or coordinated with adjoining signals. This type of signal allows for a more constant free flow of traffic.

Item 30: Pct_Green_Time (Percent Green Time)

Description: The percent of green time allocated for through-traffic at intersections.

Use: For investment requirements modeling to calculate capacity and in congestion analyses.

Extent: All Sample Panel sections located in urban areas; optional for all other urban sections beyond the limits of the Sample Panel and rural Sample Panel sections.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP*	SP*	SP*	SP*	SP*	SP*		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections SP* = Sample Panel Sections (optional)

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the percent green time in effect during the peak period (max peak period preferred) for through traffic at signalized intersections, for the inventoried direction of travel.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: **Example – Procedure for Calculating Percent Green Time:**

The timing of signals should occur during either the AM or PM peak period (i.e., 7-9 AM or 4-6 PM). Using a stopwatch, the entire signal cycle (green, amber, red) should be timed (in seconds), followed by the timing of the green cycle (in seconds). Then, divide the green cycle time by the entire signal time to find the percent green time. If the signal has a green arrow for turning movements, do not include the green arrow time in the timing of the green cycle. Use the average of at least three field-timing checks to determine a "typical" green time for traffic-actuated or demand responsive traffic signals.

Additional Guidance:

Code this Data Item for all sections where right and left turn data (Data Items 12 and 13) are coded.

For uncoordinated traffic actuated signals only, data can be collected when monitoring green time. Consider the surrounding environment and determine if the inventory direction of the signal would actually carry the peak flow for the intersection. Based on this approach, the value received may be an estimate depending upon the operation of the traffic signal during the peak hour. Furthermore, if the traffic signal is fully actuated, or the approach of interest is actuated, estimate the percent of green time based on the maximum green time available for that phase of operation versus the maximum cycle length. This would provide the "worst case" scenario since the volume on the actuated approach typically varies cycle by cycle.

Where peak capacity for a section is governed by a particular intersection that is on the section, this Data Item should be coded based on the percent green time at that location; otherwise code this Data Item for the predominate intersection.

For traffic actuated traffic signals, use the results of a field check of several (three complete cycles) peak period light cycles to determine a "typical" green time. Ignore separate green-arrow time for turning movements.

Item 31: Number_Signals (Number of Signalized Intersections)

Description: A count of the signalized at-grade intersections.

Use: For investment requirements modeling to calculate capacity and estimate delay.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the number of signalized at-grade intersections, controlling traffic in the inventory direction.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: A signal which cycles through red, yellow (amber), and green for all or a portion of the day should be counted as a signal.

Access points to large traffic generators (e.g., shopping centers, malls, large work sites, office parks, apartment complexes, etc.) should be counted as intersections if the access point is controlled by a traffic signal.

Special treatment is required when a Sample Panel section begins and/or ends with a traffic control device (i.e., Data Items 31, 32, and 33). This is accomplished by doing the following as illustrated in Figure 4.45:

- Choose a statewide direction for inventory purposes (e.g., South to North, West to East, etc.);
- Choose a statewide rule to either always count the beginning at-grade intersection only or the ending at-grade intersection only, but never both.

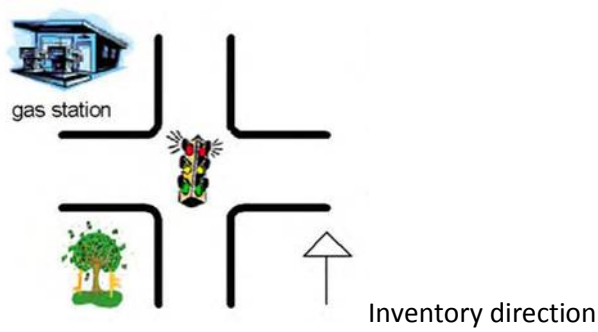
For divided roadways, continuous cross streets are to be counted as a single intersection. If the cross street is not continuous and is separated by at least 50 feet, then it should be counted as two intersections.

Roundabouts (see Figure 4.20) should be coded under Data Item 33 (At-Grade/Other) intersections.

The sum of Data Items 31, 32, and 33 should be equal to the total number of intersections on the section.

Figure 4.42 Signal Inventory

Count the signals controlling the route being inventoried. Each signal must cycle through red, yellow, and green.



Source: FDOT RCI Field Handbook, Nov. 2008.

Item 32: Stop_Signs (Number of Stop-Sign Controlled Intersections)

Description: A count of the at-grade intersections with stop signs.

Use: For investment requirements modeling to calculate capacity and estimate delay.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the number of at-grade intersections, with a stop sign, controlling traffic in the inventory direction.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: A continuously operating (i.e. all day), flashing red signal should be counted as a stop sign.

Stop signs on intersecting roads should not be included in the total count.

Access points to large traffic generators (e.g., shopping centers, malls, large work sites, office parks, apartment complexes, etc.) should be counted as intersections if the access point is controlled by a stop sign.

Special treatment is required when a Sample Panel section begins and/or ends with a traffic control device (i.e., Data Items 31, 32, and 33). This is accomplished by doing the following as illustrated in Figure 4.45:

- Choose a statewide direction for inventory purposes (e.g., South to North, West to East, etc).
- Choose a statewide rule to either always count the beginning at-grade intersection only or the ending at-grade intersection only, but never both.

For divided roadways, continuous cross streets are to be counted as a single intersection. If the cross street is not continuous and is separated by at least 50 feet, then it should be counted as two intersections.

Roundabouts (see Figure 4.20) should be coded under Data Item 33 (At-Grade/Other) intersections.

The sum of Data Items 31, 32, and 33 should be equal to the total number of intersections on the section.

Figure 4.43 Stop Sign Controlled Intersection

Source: MnDOT, Dec. 2012.

Item 33: At_Grade_Other (Number of Intersections, Type – Other)

Description: A count of the intersections without stop sign or signal controls.

Use: For investment requirements modeling to calculate capacity and estimate delay.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:	
Value_Numeric:	Enter the number of at-grade intersections in the inventory direction where traffic is not controlled by either a signal or a stop sign; is controlled by other types of signage; or some other device.
Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: A continuously operating (i.e. all day), flashing yellow signal should be considered as an "at-grade/other" type of control.

Access points to large traffic generators (e.g., shopping centers, malls, large work sites, office parks, apartment complexes, etc.) should be included in the evaluation for this Data Item.

Special treatment is required when a Sample Panel section begins and/or ends with a traffic control device (i.e., Data Items 31, 32, and 33). This is accomplished by doing the following as illustrated in Figure 4.45:

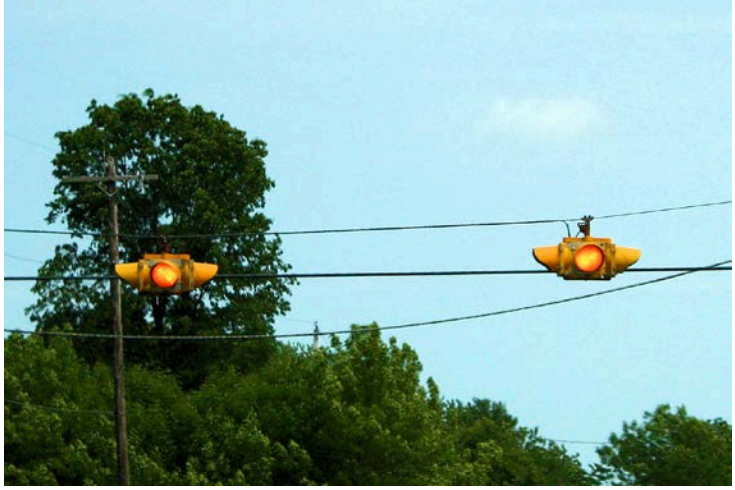
- Choose a statewide direction for inventory purposes (e.g., South to North, West to East, etc.);
- Choose a statewide rule to either always count the beginning curb only or the ending curb only, but never both.

For divided roadways, continuous cross streets are to be counted as a single intersection. If the cross street is not continuous and is separated by at least 50 feet, then it should be counted as two intersections.

Roundabouts (see Figure 4.20) should be coded under this Data Item.

The sum of Data Items 31, 32, and 33 should be equal to the total number of intersections on the section.

Figure 4.44 At-Grade Other Example

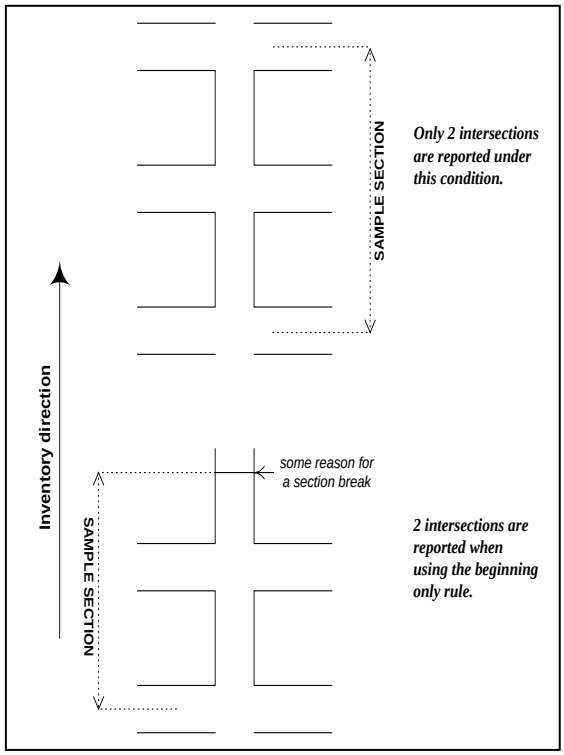


Source: Puckett Pages

An Example of the Beginning or Ending Intersection Rule:

In the upper portion of Figure 4.45, the intersection count is the same, '2', when using either the beginning only or ending only rule. In the lower portion of Figure 4.45, when using the beginning only rule, the count is '2'; when using the ending only rule the count is '1'.

Figure 4.45: Intersection Count Example



Item 34: Lane_Width (Lane Width)

Description: The measure of existing lane width.

Use: For investment requirements modeling to calculate capacity, estimate needed improvements, and compute a safety index, for cost allocation pavement models.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:	
Value_Numeric:	Enter the predominant through-lane width to the nearest whole foot.
Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: Lane width should be coded according to where the pavement/shoulder surface changes, or to the pavement lane striping (if the shoulder and pavement surface are the same).

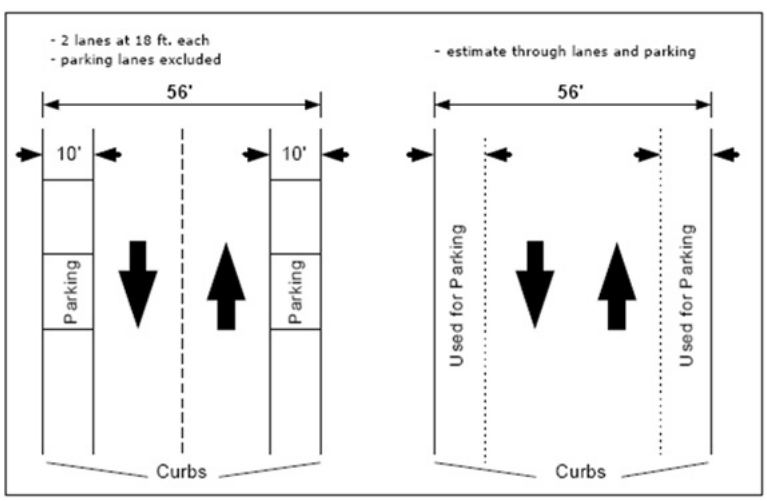
Where there is no delineation between the through-traffic lane and the shoulder or parking lane, or where there is no centerline, estimate a reasonable split between the actual width used by traffic and the shoulder or parking lane based on State/local design guides.

When striping is placed inside the edge of the pavement (within approximately one foot) to keep traffic from breaking the pavement edge, ignore the striping and measure from the pavement edge to the center of a single centerline stripe. Or, if double centerline striping exists, measure to the center of the two stripes.

If more than one lane exists, measure all lanes in the inventory direction and use the average value to the nearest foot. If lane widths vary over the extent of the sample section, use the predominant width(s) for measuring and reporting purposes.

In Figure 4.46, the number of through lanes is 2; deducting 10 feet for parking on each side, which is either striped or from design practices, would leave width for two 18 foot lanes.

Figure 4.46: An Example for Measuring Lane Width



Item 35: Median_Type (Median Type)

Description: The type of median.

Use: For investment requirements modeling to calculate capacity and estimate type of design and for national highway data base purposes.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the type of median using the following codes (Codes '5' through '7' are optional and should be used if the data is available.):

Code	Description	
1	None	No median or unprotected area less than 4 feet wide.
2	Unprotected	Median exists with a width of 4 feet or more.
3	Curbed	Barrier or mountable curbs with a minimum height of 4 inches.
4	Positive Barrier- unspecified	Prevents vehicles from crossing median.
5*	Positive Barrier – flexible	Considerable deflection upon impact.
6*	Positive Barrier – semi-rigid	Some deflection upon impact.
7*	Positive Barrier – rigid	No deflection upon impact.

These definitions are summarized from AASHTO *Policy on Geometric Design of Highways and Streets* 2004.
* Codes 5, 6, and 7 are optional.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Median: The portion of a divided highway separating the traveled way for traffic in opposing directions. The principal functions of a median are to:

- Minimize interference of opposing traffic;
- Provide a recovery area for out-of-control vehicles;
- Provide a stopping area in case of emergencies;
- Provide open or green space;
- Minimize headlight glare from opposing vehicles;
- Provide width for future lanes;
- Provide space for speed-change lanes and storage areas for left- and U-turn vehicles; and
- Restrict left turns except where median openings are provided.

A positive barrier normally consists of a guardrail or concrete barrier, but could consist of thick, impenetrable vegetation.

Turning lanes or bays are not considered medians unless the turning lanes/bays are cut into an existing median at intersections, site entrances (e.g., a shopping center), etc; a continuous turning lane is not a median.

Figure 4.47: An Example of Median Type = 2, Unprotected

Source: TxDOT, Transportation Planning and Programming Division.

Item 36: Median_Width (Median Width)

Description: The existing median width.

Use: For investment requirements modeling to calculate capacity and estimate type of design and for national highway data base purposes.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the predominant median width including left shoulders, if any, measured between the inside edges of the left-most through lanes in both directions, to the nearest foot.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Enter '99' where the median width is 100 feet or greater.

The edge of through lane is determined by paint stripping, difference in pavement/shoulder construction material, or according to traffic use. If the median is raised or a ditch, do not add the contour as part of the median width measure.

For measurement purposes, ignore turning bays cut into the median.

Figure 4.48: An Example for Measuring Median Width

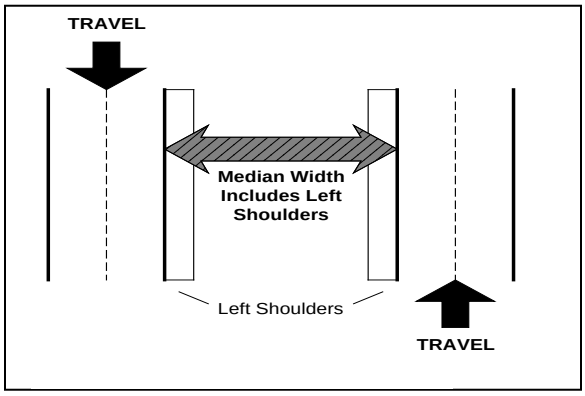


Figure 4.49: Median Width Measurement

Source: FDOT RCI Field Handbook, Nov. 2008.

Item 37: Shoulder_Type (Shoulder Type)

Description: The type of shoulder.

Use: For investment requirements modeling to estimate needed improvements.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

Functional System		**1**	**2**	**3**	**4**	**5**	**6**	**7**
	NHS	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the code for the type of shoulder on the section.

Code	Description
1	None
2	Surfaced shoulder exists – bituminous concrete (AC)
3	Surfaced shoulder exists – Portland Cement Concrete surface (PCC)
4	Stabilized shoulder exists (stabilized gravel or other granular material with or without admixture)
5	Combination shoulder exists (shoulder width has two or more surface types; e.g., part of the shoulder width is surfaced and a part of the width is earth)
6	Earth shoulder exists
7	Barrier curb exists; no shoulder in front of curb

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: If the shoulder type varies over the extent of the section, code the predominant type. If left and right shoulder types differ on a divided facility, code the right shoulder type as the predominant type.

If there is a shoulder in front of a barrier curb, code this Data Item and Data Item 38 (Shoulder Width); do not code the area behind a barrier curb as a shoulder.

Disregard mountable curbs for HPMS reporting purposes. If there is a shoulder either in front of or behind a mountable curb, code this Data Item and Data Item 38 (Shoulder Width).

If a bike lane abuts the through lane, there cannot be a shoulder unless it is used as a combined shoulder/bike lane (sometimes indicated by signage or symbols on the pavement). If a bike lane or parking is completely separated from the roadway, it should not be considered.

If the section has parking abutting the through lane, there cannot be a shoulder. If there is parking on one side of a divided roadway and a shoulder or a curb on the other side, code this Data Item, Data Item 38 (Shoulder Width), and Data Item 40 (Peak Parking) accordingly. A shoulder cannot exist between a traffic lane and a parking lane.

Shoulder Type Examples:

Figure 4.50: Bituminous (Code '2')

Figure 4.51: Stabilized (Code '4')

Figure 4.52: Combination (Code '5')

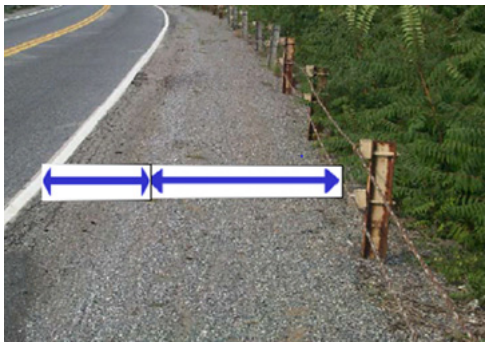


Figure 4.53: Earth (Code '6')

Item 38: Shoulder_Width_R (Right Shoulder Width)

Description: The existing right shoulder width.

Use: For investment requirements modeling to calculate capacity and estimate needed improvements.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the width of the right shoulder to the nearest whole foot.

Value_Text: No entry required. Available for State Use.

Value_Date:	No entry required. Available for State Use.

Guidance: Do not include parking or bicycle lanes in the shoulder width as further illustrated in Figures 4.57-4.59.

Code the predominant width where it changes back and forth along a roadway section.

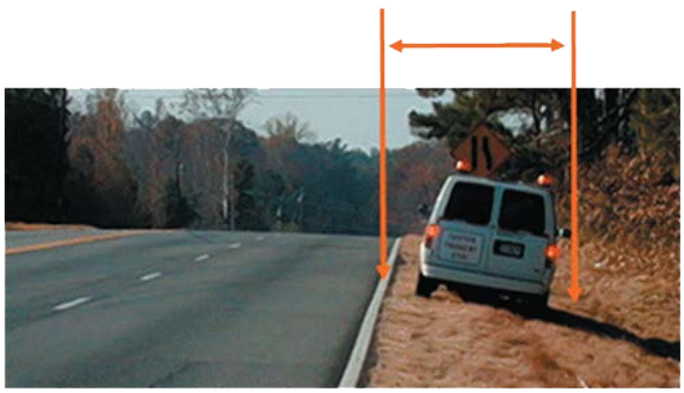
Ensure that the total width of combination shoulders is reported.

Include rumble strips and gutter pans in shoulder width.

This width should be measured from the outer edge of the right-most through lane to the outer edge of the shoulder.

Examples of Measuring Shoulder Width:

Figure 4.54: Earth Shoulder Measurement



Earth Shoulder: Measure from the white stripe to the break point of the shoulder.

Figure 4.55: Bituminous Shoulder Measurement

Bituminous Shoulder: Measure from the white stripe to the edge of the paved area.

Figure 4.56: Measuring Shoulders with Guardrails

Guardrail Present on Shoulder: Measure from the edge of through lane to the face of the guardrail.

Figure 4.57: Measuring Shoulders with Parking/Bike Lanes

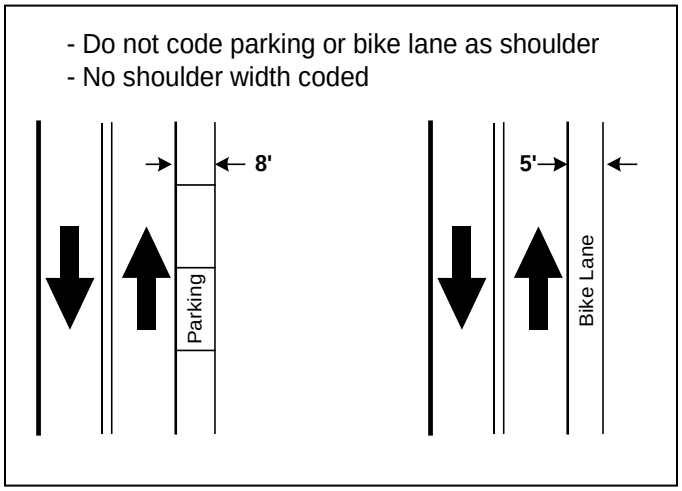


Figure 4.58: Measuring Shoulders with Parking and Bike Lanes

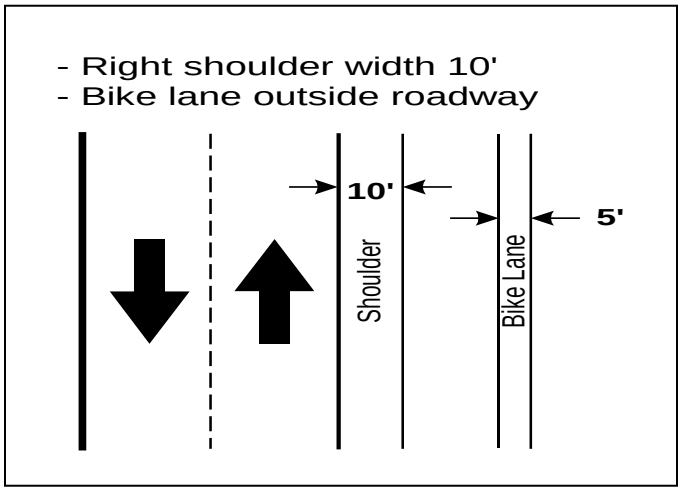
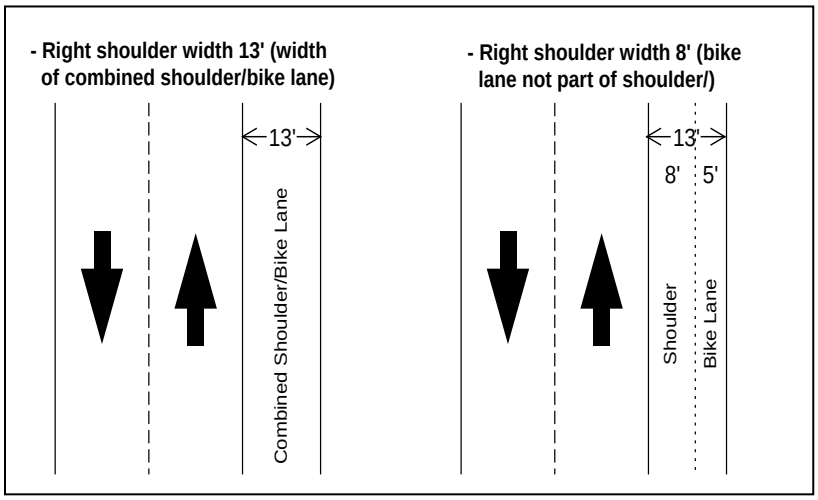


Figure 4.59: Measuring Shoulders with Combined Parking/Bike Lanes



Item 39: Shoulder_Width_L (Left Shoulder Width)

Description: The existing left shoulder width.

Use: For investment requirements modeling to calculate capacity and estimate needed improvements.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the width of the left (median) shoulder to the nearest whole foot. Left shoulders should only be coded for divided highway sections.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Do not include parking or bicycle lanes in the shoulder width measurement.

Code the predominant width where it changes back and forth along a roadway section.

Ensure that the total width of combination shoulders is reported.

Include rumble strips and gutter pans in shoulder width.

This width should be measured from the outer edge of the left-most through lane to the left-most edge of the inside shoulder.

Item 40: Peak_Parking (Peak Parking)

Description: Specific information about the presence of parking during the peak period.

Use: For investment requirements modeling to calculate capacity.

Extent: All Sample Panel sections located in urban areas, optional for all other urban sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural								
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the code that best reflects the type of peak parking that exists using the following codes:

Code	Description
1	Parking allowed on one side.
2	Parking allowed on both sides.
3	No parking allowed or none available.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Code this Data Item to reflect the permitted use, even if the section is not formally signed or striped for parking.

If parking is observed beyond the shoulder or the pavement-edge where there is no shoulder, use code '3.'

If parking lanes are legally used for through-traffic or turning lanes during the peak period, code the appropriate in-use condition.

Interstates and Freeways are usually assigned a code '3.'

Figure 4.60: Parking on One Side (Code '1') Example

Source: FDOT RCI Field Handbook, Nov. 2008.

Figure 4.61: Parking on Both Sides (Code '2') Example

Source: FDOT RCI Field Handbook, Nov. 2008.

Figure 4.62: No parking allowed (Code '3') Example

Source: TxDOT, Transportation Planning and Programming Division

Item 41: Widening_Obstacle (Widening Obstacle)

Description: Obstacles that prevent widening of the existing roadway for additional through lanes.

Use: For administrative, legislative, analytical, and national highway database purposes.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: No entry required. Available for State Use.

Value_Text: Code all conditions that apply in either direction on either side of the section and leave blank for unreported data using the following codes:

Code	Definition	Description
X	No obstacles	No obstacles to widening.
A	Dense development	Refers to the density and size of buildings to be acquired, the number of people that would need to be relocated, and the number of businesses that would need to be acquired. (Realizing dense development may be higher in urban areas; this should not be used as on obstacle for all urban areas and should be evaluated relative to the conditions in the area where the section is located).
B	Major transportation facilities	Includes major rail lines, canals, airports, major natural gas and oil pipe lines whose location relative to the roadway section would limit expansion of the existing roadway.
C	Other public facilities	Includes hospitals, museums, libraries, major public office buildings, schools, and universities.
D	Terrain restrictions	Relates to geographic features that would make it very difficult to add lanes, requiring significant excavation, fill, or tunneling. This applies to both horizontal and vertical terrain restrictions.
E	Historic and archaeological sites	Includes such things as historic buildings, historic land, large monuments, cemeteries, and known archaeological sites.
F	Environmentally sensitive areas	Includes such areas as scenic landmarks, wetlands, bodies of water, areas inhabited or used by protected species. Scenic routes and byways are included in the category and are those national and State routes that have been identified and listed as official designations.
G	Parkland	Includes National, State, and local parks.

Value_Date: No entry required. Available for State Use.

Guidance: Enter any combination of the codes (e.g. if there are Historic and Dense development obstacles, code “EA” or “AE” for this Data Item). There is no requirement for the ordering of the codes; a code should not be used more than once in a sequence of codes (e.g. “AEA”).

Code “X” cannot be used with other codes (e.g. “XE”)

This item provides for the coding of obstacles which may prevent or limit the ability to widen the roadway surface within approximately 100 feet of the outer edge of the through lanes that are present in either direction of the section.

Figure 4.63: Cemetery (Code "E") Obstacle Example

Source: PennDOT.

Figure 4.64: Major Rail Line (Code "B") Obstacle Example

Source: TxDOT, Transportation Planning and Programming Division.

Item 42: Widening_Potential (Widening Potential)

Description: The number of through lanes that could be potentially added.

Use: For investment requirements modeling to estimate needed capacity improvements

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the number of lanes (0-9) for which it is feasible to widen the existing road, in both directions. Code a '9,' if it is possible to add nine or more lanes.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Code this item based on how feasible it is to widen the existing road based on the presence of obstacles as identified in Data Item 41 (Widening Obstacles), and the proximity of the obstacle to the roadway. Consider medians, areas already within the existing right-of-way, and areas outside existing right- of- way to be available for widening.

Do not consider restrictions due to current right-of-way width, or projected traffic.

Narrowing lanes via restriping, resulting in an additional lane on a multilane facility does not constitute widening feasibility.

The cost of adding capacity to sections or corridors with limited widening feasibility is assumed to be significantly more costly than other more routine capacity improvements.

Figure 4.65: Widening Potential of 9 lanes (Max)

Source: PennDOT.

Figure 4.66: No Widening Potential

Source: PennDOT.

Item 43: Curves_A through Curves_F (Curve Classification)

Description: Curve classification data.

Use: For investment requirements modeling to calculate horizontal alignment adequacy and estimate running speed and operating costs.

Extent: All paved principal arterial and rural minor arterial Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural		SP	SP	SP	SP			
Urban		SP	SP	SP				

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the total length of the segments that apply to each individual curve class, using the degree of curvature ranges listed in the table below. Each Sample Panel section will need to be subdivided to report the extent of each applicable curve class.

Curve Classification	Degrees
A	Under 3.5 degrees
B	3.5 – 5.4 degrees
C	5.5 – 8.4 degrees
D	8.5 – 13.9 degrees
E	14.0 – 27.9 degrees
F	28 degrees or more

Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: This information may be available from construction plans, GIS databases, and contracts for other data collection activities such as International Roughness Index (IRI) or pavement data, and video log.

The primary goal is to populate curve data for each paved sample on the applicable functional system. There are 6 classes of curvature (i.e., Curve Class A through Curve Class F). The beginning and ending points will remain constant for each of the data items; however the values for these data items will reflect the length of that particular curve class. Furthermore, the sum of the values for each of the 6 curve class Data Items must be equal to the total length of the entire sample.

Each curve and tangent segment is coded as a separate curve; segments are summed by curve class to obtain the total length in each class. Report the sum of the class lengths for each of the six curve classes (in units of miles); the sum of all curve lengths must equal the Sample Panel section length.

Example:

Milepoint	0.00	1.75	3.00	3.75	4.57	5.69
	A	B	C	E	C	
Curve Length		1.75	1.25	0.75	0.82	1.12

This example depicts a Sample Panel section for which the HPMS software would expect 4 records reported in the Sections dataset as depicted below:

2009|45|SCXXX|0|5.69|CURVES_A|5.69|1.75|||

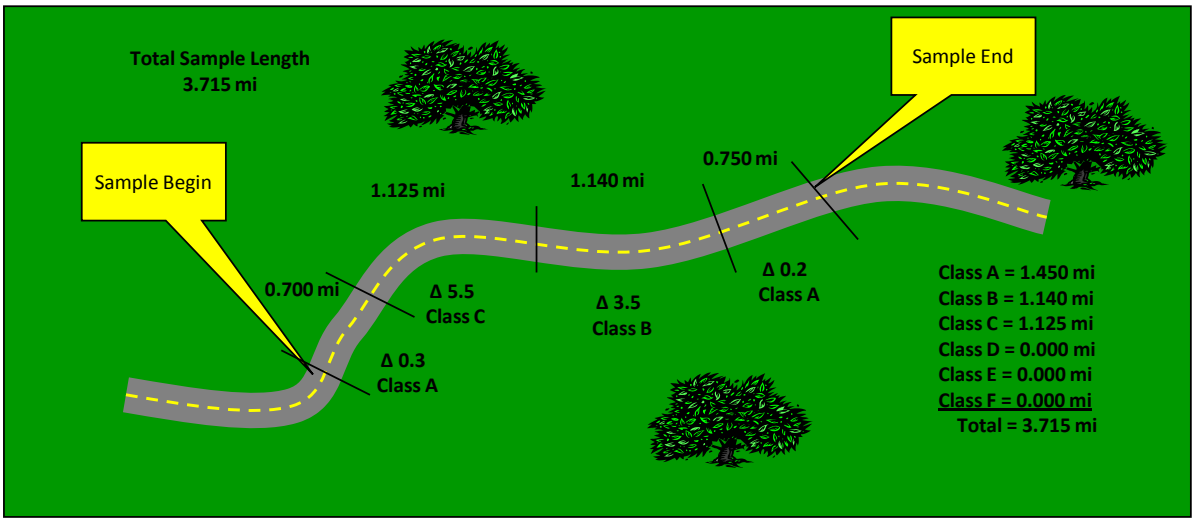
2009|45|SCXXX|0|5.69|CURVES_B|5.69|1.25|||

2009|45|SCXXX|0| 5.69|CURVES_C|5.69|1.87|||

2009|45|SCXXX|0| 5.69|CURVES_E|5.69|0.82|||

Since no data exists for curve classes D and F in this example, there would not be a record reported for either class. Moreover, the value for Curve Class C is calculated by adding the values for both Curve Class C parts together. The beginning and ending points are consistent throughout all records within the sample. The sum of all of the Curve Class lengths must equal the total length of the Sample Panel section.

Figure 4.67 Curve Classification Example



Source: TxDOT, Transportation Planning and Programming Division

Item 44: Terrain_Type (Terrain Type)

Description: The type of terrain.

Use: For investment requirements modeling to calculate capacity and estimate needed capacity improvements and in the truck size and weight analysis process.

Extent: All Sample Panel sections located in rural areas, optional for all other rural sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural		SP	SP	SP	SP	SP		
Urban								

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the code that best describes the terrain according to the following table:

Code	Description
1	**Level:** Any combination of grades and horizontal or vertical alignment that permits heavy vehicles to maintain the same speed as passenger cars; this generally includes short grades of no more than 2 percent.
2	**Rolling:** Any combination of grades and horizontal or vertical alignment that causes heavy vehicles to reduce their speeds substantially below those of passenger cars but that does not cause heavy vehicles to operate at crawl speeds for any significant length of time.
3	**Mountainous:** Any combination of grades and horizontal or vertical alignment that causes heavy vehicles to operate at extremely low speeds for significant distances or at frequent intervals.

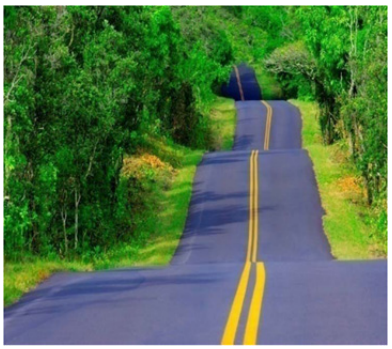
Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: When coding this Data Item, consider the terrain of an extended length of the roadway upon which the sample is located rather than the grade on the specific Sample Panel section by itself. The extended roadway section may be several miles long and contain a number of upgrades, downgrades, and level sections. For long samples, such as rural freeway samples extending between interchanges, the extended roadway section and the Sample Panel section may be the same.

Figure 4.68 Level Terrain (Code '1') Example

Source: PennDOT.

Figure 4.69 Rolling Terrain (Code '2') Example



Source: PennDOT.

Figure 4.70 Mountainous Terrain (Code '3') Example

Source: PennDOT.

Item 45: Grades_A through Grades_F (Grade Classification)

Description: Grade classification data.

Use: For investment requirements modeling to calculate vertical alignment adequacy and estimate running speed and operating costs and in the truck size and weight analysis process.

Extent: All paved interstate, other freeway and expressway, other principal arterial, and rural minor arterial Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural		SP	SP	SP	SP			
Urban		SP	SP	SP				

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the total length of the segments that apply to each individual grade class, using the percent grade ranges listed in the table below. Each sample will need to be subdivided to report the extent of each applicable grade class.

Grade Classification	Percent Grade
A	0.0 – 0.4
B	0.5 – 2.4
C	2.5 – 4.4
D	4.5 – 6.4
E	6.5 – 8.4
F	8.5 or greater

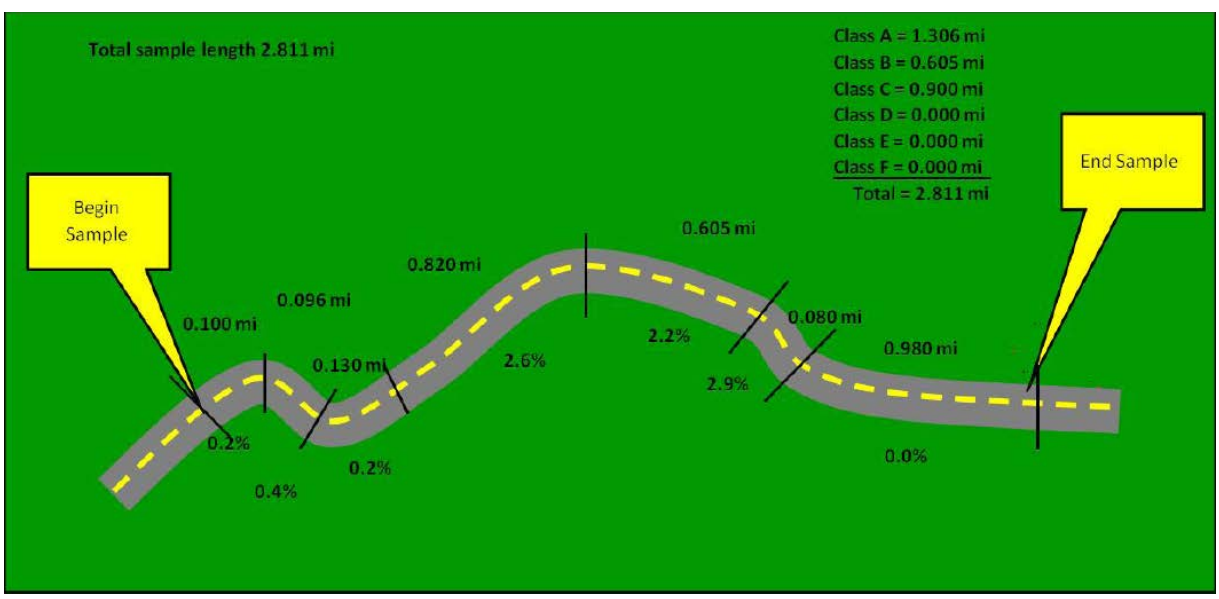
Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: This information may be available from construction plans, GIS databases, and contracts for other data collection activities.

Each grade and flat segment is to be coded as a separate segment; segments are typically measured between vertical points of intersection (VPI) and summed by grade class to obtain the total length in each class. The sum of all of the Grade Class lengths must equal the total length of the Sample Panel section.

Figure 4.71 Grade Classification Example



Source: TxDOT, Transportation Planning and Programming Division.

Item 46: Pct_Pass_Sight (Percent Passing Sight Distance)

Description: The percent of a Sample Panel section meeting the sight distance requirement for passing.

Use: For investment requirements modeling to calculate capacity and estimate running speed and for truck size and weight analysis purposes.

Extent: All rural, paved two-lane Sample Panel sections; optional for all other rural sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban								

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the percent of the section length that is striped for passing.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: When there is a discernable directional difference, code for the more restrictive direction.

Item 47: IRI (International Roughness Index)

Description: A statistic used to estimate the amount of roughness in a measured longitudinal profile. The IRI is computed from a single longitudinal profile using a quarter-car simulation as described in the report "On the Calculation of IRI from Longitudinal Road Profile" (Sayers, M.W., Transportation Research Board 1501, Transportation Research Board, Washington, DC 1995).

Use: For investment requirements modeling to estimate pavement deterioration, section deficiencies, and necessary improvements, in cost allocation studies, in pavement condition trends, and for other analysis purposes including NHS performance.

Extent: All NHS and principal arterial sections, and rural minor arterial Sample Panel sections; optional for urban minor arterial, major collector, and minor collector Sample Panel sections and rural major collector Sample Panel sections.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	FE	FE	SP	SP*		
Urban	FE	FE	FE	FE	SP*	SP*	SP*	

FE = Full Extent SP = Sample Panel Sections SP* = Sample Panel Sections (optional)

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code IRI to the nearest inch per mile.

Value_Text: No entry required. Available for State Use.

Value_Date: Report the month and year for which the IRI data reported was collected. A default date may be used for new pavement surface. If the month is unknown, use a default month.

Guidance: IRI should be measured on an annual cycle for the NHS and on the 2-year maximum cycle for all other required sections. Existing IRI values should continue to be reported until they are replaced by new measured values.

Structures and railroad grade crossings are to be included in the measurement of surface roughness.

IRI should be consistently measured and reported for the same direction and lane, which typically is the outermost (right) lane. The practice of measuring the "worst" lane is discouraged in cases where the outermost (right) lane is not measured.

For purposes of national-level data consistency, IRI sections reported in HPMS should not exceed 0.10 mile in length. It is understood and acceptable that sections less than 0.10 mile be reported in HPMS which can result from short collection sections, route termini, and intersections, etc.

The average of the right and left quarter-car IRI should be reported as Mean Roughness Index (MRI) for this data item. This is not to be confused with the half-car IRI, which is computed by averaging the profile data for the left and right wheel paths, and then applying the quarter-car simulation to the average data.

Default values or values obtained by other means or conversions that are not directly obtained from measured road profiles are not to be used. However, when a pavement improvement is made on an applicable section, a temporary value for the improved section reflecting a reasonable average value for new pavement may be provided until replaced by a measured value. States are encouraged to use data from State or local pavement management systems when they are available, are current, and when they meet HPMS reporting requirements.

If a measured IRI value is reported for a section, a PSR value for that section is not required. A Sample Panel section must have either PSR or IRI reported.

FHWA has adopted AASHTO Standard R 43-07 as the preferred method of providing IRI data for the HPMS. Additional guidelines, including R 43-07, are found in the Pavement Data Guidance contained in Chapter 5.

Metadata: See Chapter 3 for a description of the metadata reporting requirements for this Data Item.

Item 48: PSR (Present Serviceability Rating)

Description: Present Serviceability Rating (PSR) for pavement condition.

Use: For investment requirements modeling to estimate pavement deterioration, section deficiencies, and needed improvements, in cost allocation studies, in pavement condition trends, and for other analysis purposes including NHS performance.

Extent: All urban minor arterial, major collector, and minor collector Sample Panel sections and rural major collector Sample Panel sections where IRI is not reported; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural						SP		
Urban					SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code a PSR or equivalent to the nearest tenth.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: PSR is not required if IRI is reported for a section. **A Sample Panel section must have either PSR or IRI reported.**

If sufficiency ratings of pavement condition are available, they may be used after a correlation between the sufficiency rating scale and the PSR scale or other rating factors has been developed.

If there are no current PSR, PSI, or sufficiency ratings that can be adapted, the section can be rated using values in the following Table 4.4. Estimates to the nearest tenth within the applicable range should be made (e.g., 2.3 as opposed to 2.323). Where different lanes have different pavement condition ratings, code PSR consistent with IRI data collection practices.

Table 4.4: Present Serviceability Rating

PSR	Description
4.0 – 5.0	Only new (or nearly new) superior pavements are likely to be smooth enough and distress free (sufficiently free of cracks and patches) to qualify for this category. Most pavements constructed or resurfaced during the data year would normally be rated in this category.
3.0 – 4.0	Pavements in this category, although not quite as smooth as those described above, give a first class ride and exhibit few, if any, visible signs of surface deterioration. Flexible pavements may be beginning to show evidence of rutting and fine random cracks. Rigid pavements may be beginning to show evidence of slight surface deterioration, such as minor cracks and spalling.
2.0 – 3.0	The riding qualities of pavements in this category are noticeably inferior to those of new pavements, and may be barely tolerable for high-speed traffic. Surface defects of flexible pavements may include rutting, map cracking, and extensive patching. Rigid pavements in this group may have a few joint failures, faulting and/or cracking, and some pumping.

PSR	Description
1.0 – 2.0	Pavements in this category have deteriorated to such an Extent that they affect the speed of free-flow traffic. Flexible pavement may have large potholes and deep cracks. Distress includes raveling, cracking, rutting and occurs over 50 percent of the surface. Rigid pavement distress includes joint spalling, patching, cracking, scaling, and may include pumping and faulting.
0.1 – 1.0	Pavements in this category are in an extremely deteriorated condition. The facility is passable only at reduced speeds, and with considerable ride discomfort. Large potholes and deep cracks exist. Distress occurs over 75 percent or more of the surface.

Item 49: Surface_Type (Surface Type)

Description: Surface type on a given section.

Use: For investment requirements modeling to estimate pavement deterioration and loading history, for the cost allocation pavement model, and for the national highway database.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the following code which best represents the type of surface:

Code	Description
1	Unpaved
2	Bituminous
3	JPCP – Jointed Plain Concrete Pavement
4	JRCP – Jointed Reinforced Concrete Pavement
5	CRCP – Continuously Reinforced Concrete Pavement
6	Asphalt-Concrete (AC) Overlay over Existing AC Pavement
7	AC Overlay over Existing Jointed Concrete Pavement
8	AC (Bituminous Overlay over Existing CRCP)
9	Unbonded Jointed Concrete Overlay on PCC Pavement
10	Bonded PCC Overlay on PCC Pavement
11	Other (includes “whitetopping”)

Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: For codes '7' through '9', if the existing PCC pavement is fractured (rubblized or crack-and-seated) prior to overlaying, treat the broken PCC as a base and select the surface type that best describes the new surface. For example, AC (Bituminous) surface placed over rubblized PCC is code '2' with fractured PCC as the base type.

Table 4.5: Data Item Requirements by Surface Type

Code	IRI	PSR	Rutting	Faulting	Cracking Percent	Cracking Length	Thickness Rigid	Thickness Flexible
1								
2	in/mi	0.1-5.0	0.1”		Fatigue % area	Transverse ft/mi		0.5”
3	in/mi	0.1-5.0		0.1”	% cracked slabs		0.5”	
4	in/mi	0.1-5.0		0.1”	% cracked slabs		0.5”	
5	in/mi	0.1-5.0			Punchout/ long./patch % area		0.5”	
6	in/mi	0.1-5.0	0.1”		Fatigue % area	Transverse/ reflective ft/mi		0.5”
7	in/mi	0.1-5.0	0.1”		Fatigue % area	Transverse/ reflective ft/mi	0.5”	0.5”
8	in/mi	0.1-5.0	0.1”		Fatigue % area	Transverse ft/mi	0.5”	0.5”
9	in/mi	0.1-5.0		0.1”	% cracked slabs		0.5”	
10	in/mi	0.1-5.0		0.1”	% cracked slabs/ punchout % area		0.5”	
11	in/mi	0.1-5.0						

Item 50: Rutting (Rutting)

Description: Average depth of rutting.

Use: For pavement modeling purposes.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code to the nearest 0.1 inch. Reporting should be consistent with IRI inventory direction and lane.

Value_Text: No entry required. Available for State Use.

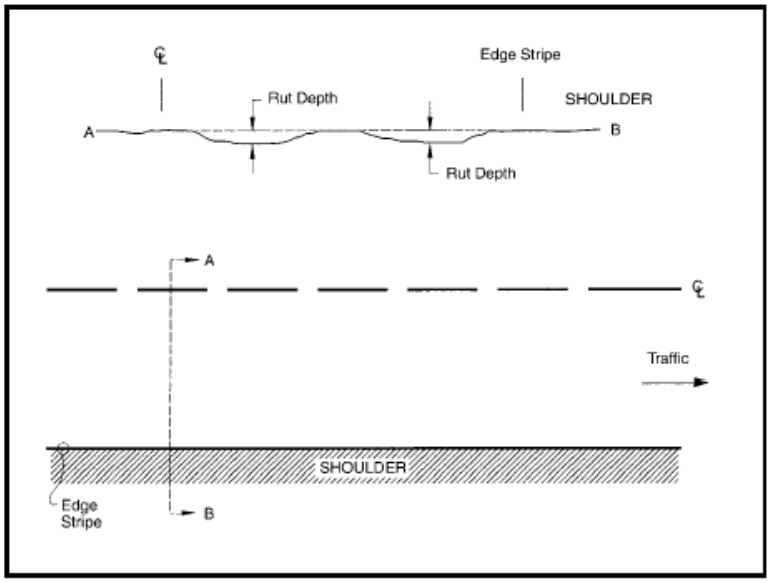
Value_Date: No entry required. Available for State Use.

Guidance: This data is to be collected on a two year cycle.

A rut is defined as a longitudinal surface depression in the wheel path and it may have associated transverse displacement.

Rutting is to be reported for all AC surface types as identified in Table 4.5.

Figure 4.72 Rutting



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.73 Rutting Example

Source: TxDOT, Construction Division.

Report the average of both wheel paths. Average all values, but the results for each wheel path are reported separately in the AASHTO method (i.e., 2 numbers are reported, the average rut depth for both wheel paths).

AASHTO R 48-10 (and the associated PP 69-10 and PP 70-10 as applicable) specifications or the LTPP protocol are to be followed for the collection of these data. Reporting should be consistent with IRI inventory direction and lane.

Metadata: See Chapter 3 for a description of the metadata reporting requirements for this Data Item.

Item 51: Faulting (Faulting)

Description: The average vertical displacement (difference in elevation) between adjacent jointed concrete panels in the direction of travel.

Use: For pavement modeling purposes.

Extent: All Sample Panel sections, optional for all other sections beyond the limits of the Sample Panel.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Report the average/mean faulting to the nearest 0.1 inch. Reporting should be consistent with IRI inventory direction and lane.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

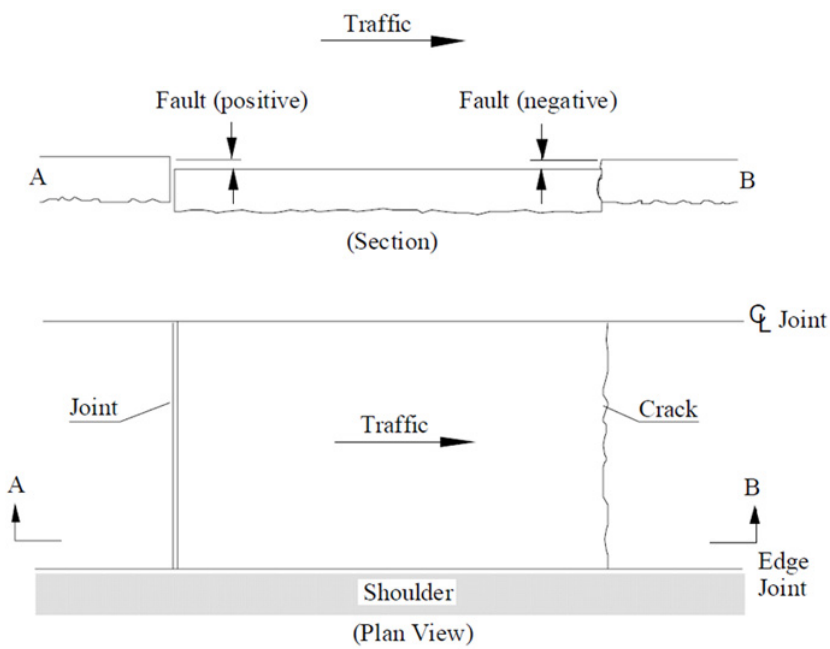
Guidance: This data is to be collected on a two year cycle.

Every joint should be measured in the right wheel-path over a section and the average reported.

AASHTO R36-04 specifications or the LTPP protocol are to be followed for the collection of these data.

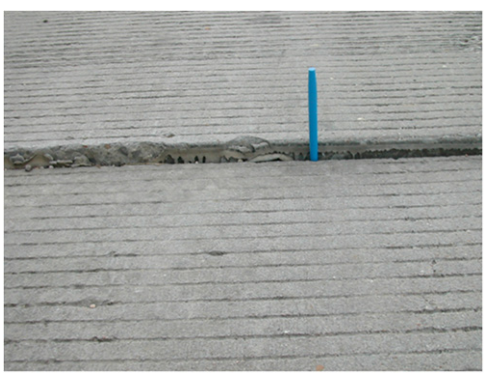
Faulting is to be reported for Surface Type codes ‘3’, ‘4’, ‘9’, and ‘10’ as identified in Table 4.5.

Figure 4.74: Faulting



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.75: Faulting Example



Source: TxDOT, Construction Division.

Metadata: See Chapter 3 for a description of the metadata reporting requirements for this Data Item.

Item 52: Cracking_Percent (Cracking Percent)

Description: Estimate of percent area with fatigue type cracking for all severity levels for AC pavements (in wheel path) and percent of slabs with cracking for PCC (jointed and continuous) pavements.

Use: For pavement modeling purposes.

Extent: Required for all AC, PCC, and composite paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Report the percent of total AC section area and percent of PCC slabs (jointed and continuous) cracked to the nearest 5% at a minimum.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Reporting should be consistent with IRI inventory direction and lane.

This data is to be collected on a two year cycle.

All severity levels of associated cracking should be considered and reported.

This should be reported as the percent of actual pavement with fatigue cracking. The LTPP protocol says to include fatigue cracking and longitudinal cracking in the wheel path that has associated random cracking (any cracks in the wheel path that have a quantifiable area). For jointed PCC sections, exclude corner breaks, D-cracking, and Alkali Silica Reactivity (ASR) cracking that may occur on a slab.

This should be the best estimate of the area with fatigue cracking and it is not expected that each portion of fatigue cracking in a section will actually be measured.

Examples of Procedures to Estimate Cracking Percent

If this data is not readily available or part of States' pavement management systems, then they may want to estimate it using a procedure that can be used repeatedly. One method could be to review and measure some sections based on three severity levels (Low, Medium, High) by counting the number of cracks per mile, multiply by the pavement width, and divide by the total area (63,360 for a mile section 12 feet wide) to get a percent. These three percentage values can then be assigned to all sections based on severity level for HPMS reporting.

For AC pavements an estimate of the total area of fatigue cracking for the Sample Panel section should be reported. As an example, if the Sample Panel section is a single lane, 12 foot in width, 1 mile in length; total area = 63,360 sq. ft.

The fatigue cracking in the sample is 500 foot in length and 2 foot in width in each wheel path:

500 ft. * 2 ft * 2 wheelpaths = 2,000 sq. ft.

2,000 sq. ft. / 63,360 sq. ft. = 3.2 percent area of fatigue cracking which can be reported as 5 percent

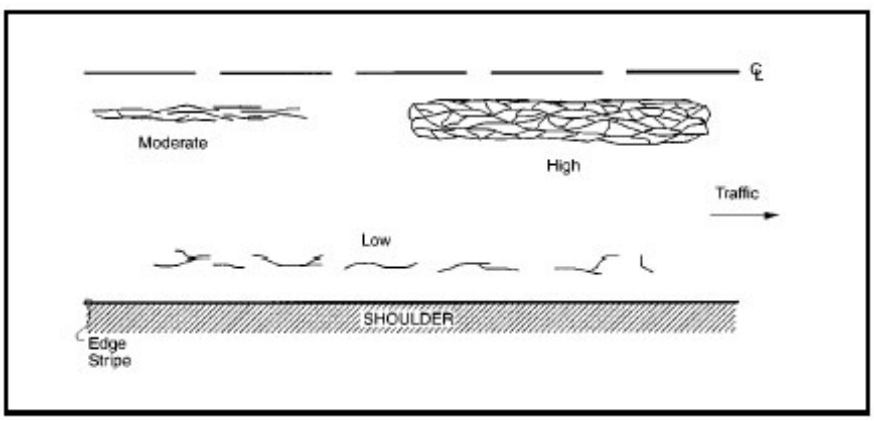
For JPCP and JRCP slab cracking, the key factor to be captured is whether or not a slab is cracked. So, if a slab contains a fatigue crack (which may extend as little as 2 to 3 ft from an edge), that slab should be counted as a cracked slab. In determining the percent of slabs cracked, a slab with multiple cracks should still be counted as one cracked slab. If the joint spacing is variable, the number of slabs may be estimated by dividing the section length by the average joint spacing.

As an example, if 4 slabs of 10 having some fatigue cracking, you would report 40% slab cracking. This is not a percent of Sample Panel section length or wheel path measurement.

For CRCP pavements, the area should be reported for which punch-outs, longitudinal cracking, and/or patching occurs in the section (at any severity level).

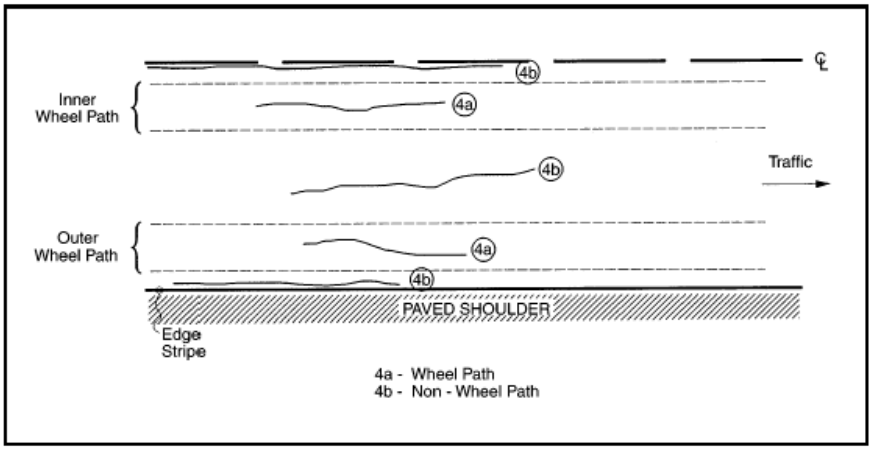
AASHTO R 55-10 (and associated PP 67-10 and PP 68-10 as applicable) or the LTPP distress identification manual should be followed as a guide for use in reporting cracks at any and all severity levels (sealed and unsealed). Reporting should be consistent with IRI inventory direction and lane.

Figure 4.76: AC Fatigue Type Cracking



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.77: AC Longitudinal Cracking (Inside and Outside of Wheel path)



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.78: AC Moderate Severity Longitudinal Cracking (Wheel path)

Source: LTPP Distress and Identification Manual, June 2003

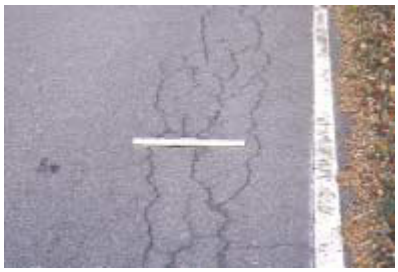
Figure 4.79: AC Chicken Wire/Alligator Fatigue Type Cracking in Wheel path

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.80: AC Low Severity Fatigue Type Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.81: AC Moderate Severity Fatigue Type Cracking

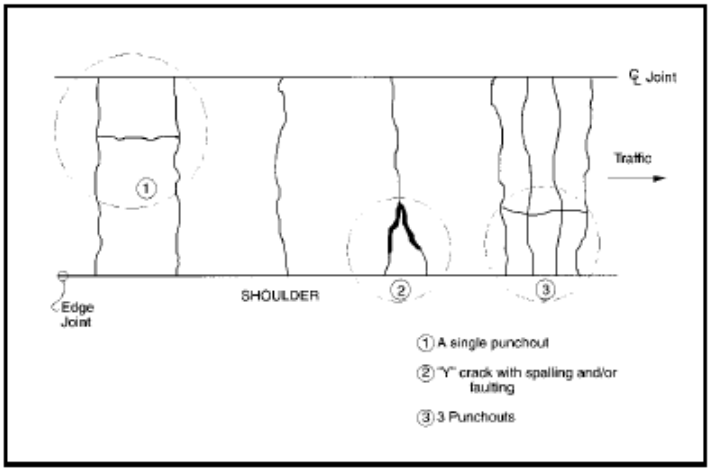


Source: LTPP Distress and Identification Manual, June 2003

Figure 4.82: AC High Severity Fatigue Type Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.83: CRCP Fatigue Type Cracking (Punchouts)

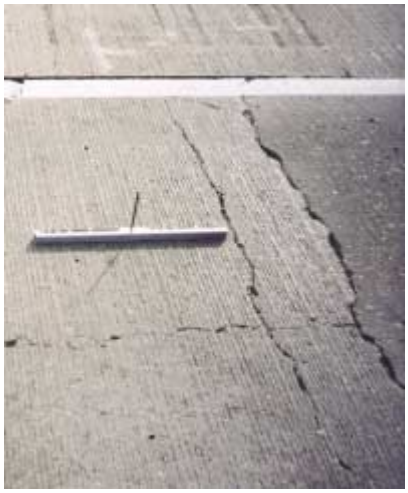


Source: LTPP Distress and Identification Manual, June 2003

Figure 4.84: Low Severity CRCP Punchout Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.85: Moderate Severity CRCP Punchout Cracking

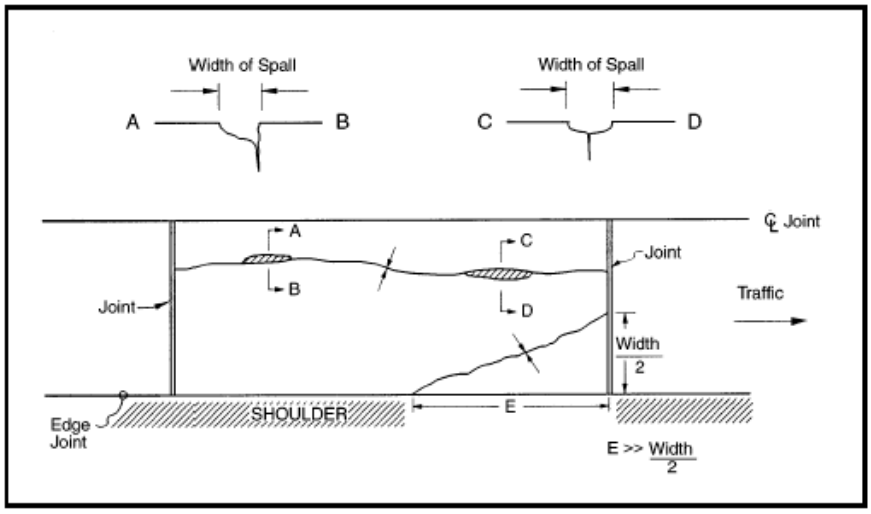


Source: LTPP Distress and Identification Manual, June 2003

Figure 4.86: High Severity CRCP Punchout Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.87: JCP Longitudinal Cracking



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.88: JCP Low Severity Longitudinal Cracking

Source: LTPP Distress and Identification Manual, June 2003

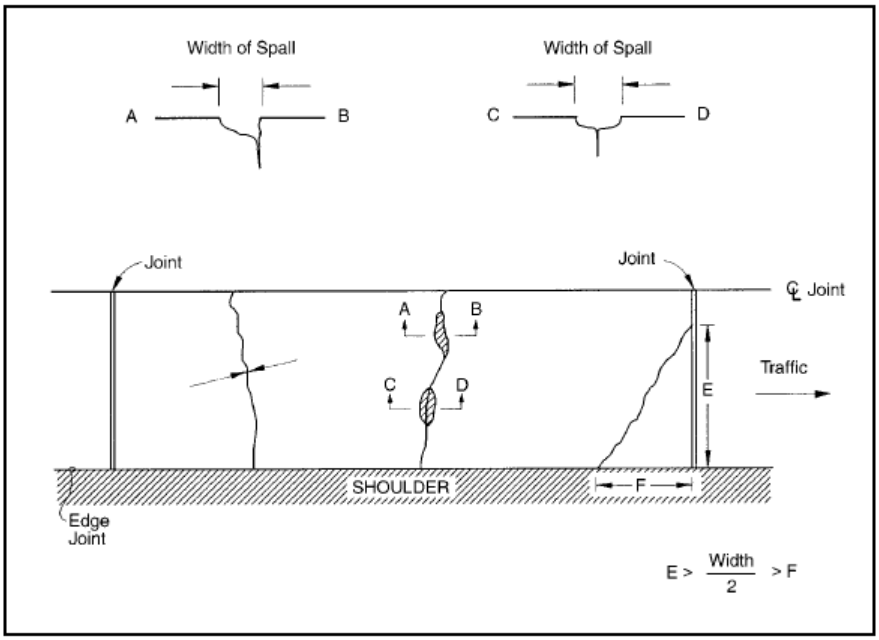
Figure 4.89: JCP Moderate Severity Longitudinal Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.90: JCP High Severity Longitudinal Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.91: JCP Transverse Cracking



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.92: JCP Moderate Severity Transverse Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.93: JCP High Severity Transverse Cracking

Source: LTPP Distress and Identification Manual, June 2003

Metadata: See Chapter 3 for a description of the metadata reporting requirements for this Data Item.

Item 53: Cracking_Length (Cracking Length)

Description: Estimate of relative length in feet per mile (ft/mi) of transverse cracking for AC pavements and reflection transverse cracking for composite pavements where AC is the top surface layer.

Use: For pavement modeling purposes.

Extent: Required for all AC (transverse cracking), and composite (transverse reflection cracking) paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the length of transverse cracking in feet per mile (ft/mi). The ft/mi section of AC transverse and transverse reflection cracking for composite pavements to the nearest foot is to be coded. Reporting should be consistent with IRI inventory direction and lane.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: This data is to be collected on a two year cycle.

This is a summation of the lengths of all of the transverse cracks in each mile section. Transverse cracking is a length per mile value; fatigue cracking is an area. This should be the best estimate of the length with transverse cracking and it is not expected that each portion of transverse cracking in a section will actually be measured. Note that transverse reflection cracks may occur in composite, AC surfaced sections over transverse joints as well as over transverse cracks—either case should be considered and reported for this data item.

A crack should be at least 6 feet long to be counted.

AASHTO R 55-10 (and associated PP 67-10 and PP 68-10 as applicable) or the LTPP distress identification manual should be followed as a guide for use in reporting cracks at any and all severity levels (sealed and unsealed). Reporting should be consistent with IRI inventory direction and lane.

Examples of Procedures to Estimate Cracking Length

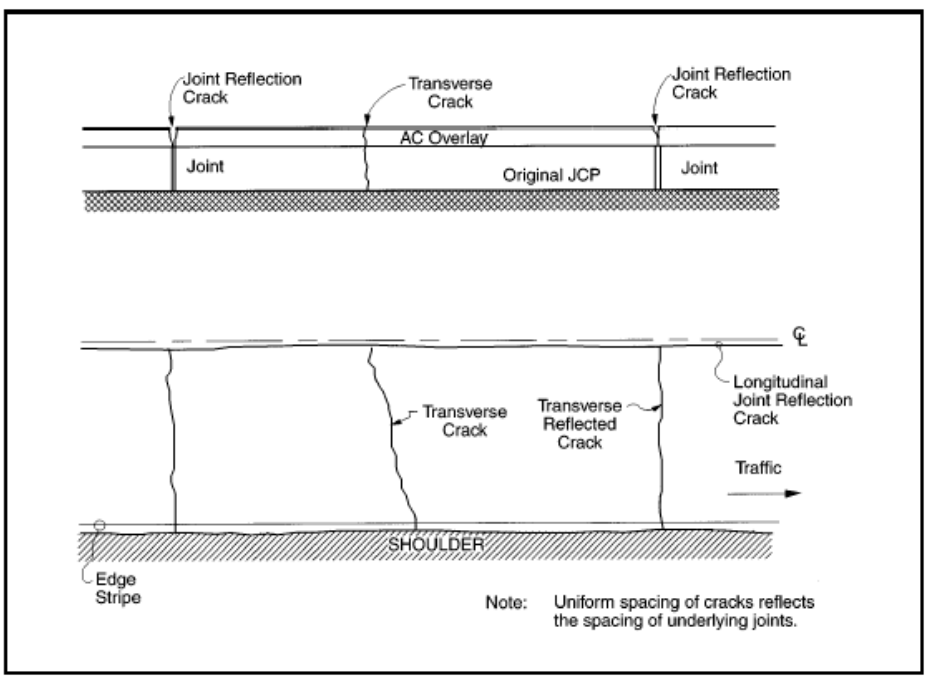
Consider only the primary cracking and not smaller transverse cracking that may occur adjacent to main transverse crack when estimating the length of transverse cracking in a segment. To convert to length per mile, using an example of 500 ft of transverse cracking in a 2,000 foot section converts to 1,300 feet of transverse cracking.

[(5,280/2,000)*500 ft = approximately 2.6 (rounded) * 500 ft = approximately 1,300 ft.]

Rounding in feet is acceptable.

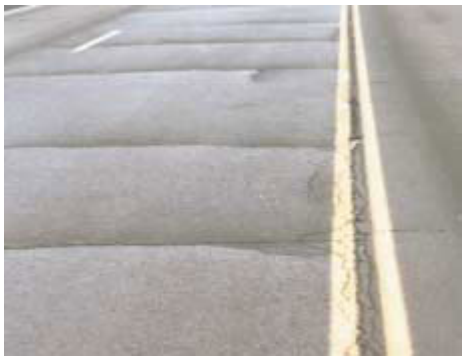
AASHTO PP44-01 or the LTPP distress identification manual should be used in identifying and reporting cracks at any and all severity levels. Reporting should be consistent with IRI inventory direction and lane.

Figure 4.94: AC/Composite Cracking Length



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.95: High Severity AC/Composite Reflection Cracking



Source: LTPP Distress and Identification Manual, June 2003

Figure 4.96: Low Severity AC Transverse Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.97: Moderate Severity AC Transverse Cracking

Source: LTPP Distress and Identification Manual, June 2003

Figure 4.98: High Severity AC Transverse Cracking

Source: LTPP Distress and Identification Manual, June 2003

Metadata: See Chapter 3 for a description of the metadata reporting requirements for this Data Item.

Item 54: Year_Last_Improv (Year of Last Improvement)

Description: The year in which the roadway surface was last improved.

Use: For the cost allocation pavement model.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: No entry required. Available for State Use.

Value_Text: No entry required. Available for State Use.

Value_Date: Enter the 4-digit year (in format YYYY) when the last surface improvement was completed.

Guidance: Reporting should be consistent with IRI inventory direction and lane.

0.5 inch or more of compacted pavement material must be put in place for it to be considered a surface improvement.

Completion date is the actual date the construction ended or the date when the project was opened to traffic.

Retain the coded improvement year until another improvement affecting the surface is completed.

Figure 4.99: Resurfaced Roadway

Source: FDOT RCI Field Handbook, Nov. 2008.

Item 55: Year_Last_Construction (Year of Last Construction)

Description: The year in which the roadway was constructed or reconstructed.

Use: For pavement modeling purposes.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: No entry required. Available for State Use.

Value_Text: No entry required. Available for State Use.

Value_Date: Enter the 4-digit year (in format YYYY) when the roadway was last constructed or reconstructed.

Guidance: Reporting should be consistent with IRI inventory direction and lane.

Reconstruction is the replacement of the existing pavement structure with an equivalent or increased structure. Although recycled materials may be used in the new pavement structure, reconstruction usually requires the complete removal and replacement of at least the old pavement surface, and often also the base.

If a new pavement surface were placed without first removing the old pavement surface, the resulting pavement should be considered an overlay (surface improvement, not construction), even if the existing pavement was rubblized prior to placing the new pavement surface.

Item 56: Last_Overlay_Thickness (Last Overlay Thickness)

Description: Thickness of the most recent pavement overlay.

Use: For pavement modeling purposes.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the actual measured value to the nearest 0.5 inch.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Reporting should be consistent with IRI inventory direction and lane.

Values can also be obtained from construction plans for use in the Table.

An overlay is more than 0.5 inch.

Item 57: Thickness_Rigid (Thickness Rigid)

Description: Thickness of rigid pavement.

Use: For investment requirements modeling to estimate pavement deterioration and loading history and in the cost allocation pavement model.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the actual measured value to the nearest 0.5 inch.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: The thickness should reflect the last improvement on the section. When an improvement is made, consider all new or redesigned base and pavement materials when determining the appropriate value.

Reporting should be consistent with IRI inventory direction and lane.

Values can also be obtained from construction plans for use in the Table.

Definitions: Refer to the table of codes in Data Item 49 (Surface Type)

- Codes ‘3,’ ‘4,’ ‘5,’ ‘9,’ and ‘10’ are rigid pavements.
- Codes ‘2’ and ‘6’ are flexible pavements.
- Codes ‘7’ and ‘8’ are composite pavements.

For code '9' (Unbonded Jointed Concrete Overlay on PCC Pavement), only the unbounded overlay should be considered and reported for this data item. For code '10' (Bonded PCC Overlay on PCC Pavement), both bonded overlay and underlying rigid pavement surface layer should be considered and reported for this data item.

Item 58: Thickness_Flexible (Thickness Flexible)

Description: Thickness of the flexible pavement.

Use: For investment requirements modeling to estimate pavement deterioration and loading history and in the cost allocation pavement model.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the actual measured value to the nearest 0.5 inch.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: Reporting should be consistent with IRI inventory direction and lane.

Values can also be obtained from construction plans for use in the Table.

Report total thickness of all AC (asphalt) pavement layer(s); if PCC has been overlaid on AC ("white topped") composite, report the AC layer thickness under it; if AC has been overlaid on PCC, report the AC layer thickness on top.

Definitions: Refer to the table of codes in Data Item 49 (Surface Type).

- Codes '3','4', '5', '9', and '10' are rigid pavements.
- Codes '2' and '6' are flexible pavements.
- Codes '7' and '8' are composite pavements.

Item 59: Base_Type (Base Type)

Description: The base pavement type.

Use: For pavement modeling purposes.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Supply the appropriate code using the following codes:

Code	Description	Definitions
1	No Base	Surface layer is placed directly on subgrade without a subbase
2	Aggregate	Non-stabilized granular, consisting of either crushed stone, gravel, recycled asphalt or concrete
3	Asphalt or Cement Stabilized	Aggregate base treated with either asphalt or Portland cement
5	Hot Mix AC (Bituminous)	Either a new hot-mix asphalt (HMA) layer placed as the base layer or the HMA surface of an old flexible pavement
6	Lean Concrete	A Portland cement concrete mixture made with relatively low cement content (typically about 3 sacks/yd)
7	Stabilized Open-graded Permeable	Open-graded aggregate treated with either asphalt or Portland cement for stability
8	Fractured PCC	Rubblized or crack-and-seated PCC pavement

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: For rigid pavements the base is all layers between subgrade and bottom of concrete surface. For flexible pavements the base is all layers between subgrade and bottom of asphalt concrete layer.

If you have several types of base, use the code that best describes the layer immediately below the surface layer.

Reporting should be consistent with IRI inventory direction and lane.

Item 60: Base_Thickness (Base Thickness)

Description: The thickness of the base pavement.

Use: For pavement modeling purposes.

Extent: All paved Sample Panel sections; optional for all other sections beyond limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the actual measured value to the nearest inch.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: For rigid pavements the base is all layers between subgrade and bottom of concrete surface. For flexible pavements the base is all layers between subgrade and bottom of asphalt concrete layer. If there are several types of base, report the total thickness of all base layers

Reporting should be consistent with IRI inventory direction and lane.

Values can also be obtained from construction plans for use in the Table.

Item 61: Climate_Zone (Climate Zone)

Description: Climate zone as defined by the 4 LTPP climate zone descriptions.

Use: For cost allocation pavement model purposes.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

Functional System	NHS	1 Int	2 OFE	3 OPA	4 MiA	5 MaC	6 MiC	7 Local
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the applicable Long Term Pavement Performance (LTPP) climate zone code:

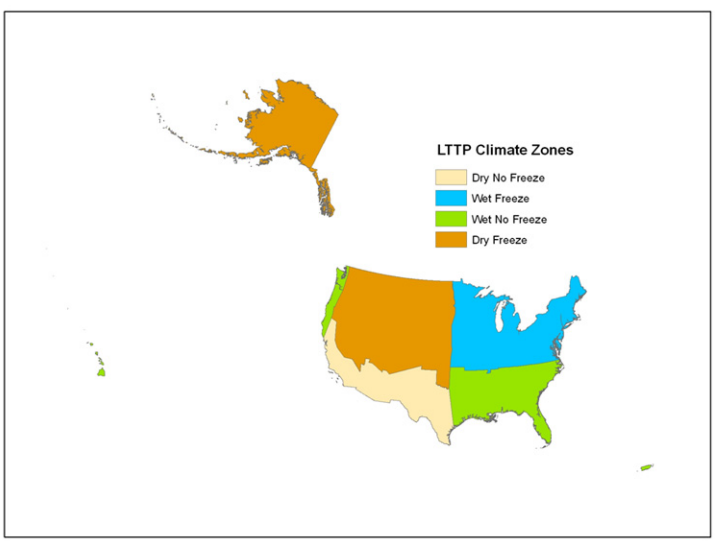
Code	Description
1	Wet-Freeze
2	Wet-Non-freeze
3	Dry-Freeze
4	Dry-Non-freeze

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: This data item will be populated by FHWA using the map shown in Figure 4.100, if the States do not provide this information.

Figure 4.100: LTPP Climate Zone Map



Item 62: Soil_Type (Soil Type)

Description: Soil type as defined by AASHTO soil classes.

Use: For pavement modeling purposes.

Extent: All paved Sample Panel sections; optional for all other sections beyond the limits of the Sample Panel.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: *Enter the applicable AASHTO soil class code:

Code	Description
1	Granular (35% or less passing the 0.075 mm sieve) (AASHTO Soil Class A0 through A-3)
2	Fine (Silt-Clay) Materials (>35% passing the 0.075 mm sieve) (AASHTO Soil Class A-4 through A-7)

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: This data item will be populated by FHWA if the States do not provide this information.

Item 63: County_Code (County Code)

Description: The County Federal Information Processing Standard (FIPS) code.

Use: For identifying the County for which the data is being reported.

Extent: All Federal-aid highways.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	FE	FE	FE	FE		
Urban	FE	FE	FE	FE	FE	FE	FE	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Enter the three-digit County FIPS code.

Value_Text: No entry required. Available for State Use.

Value_Date: No entry required. Available for State Use.

Guidance: The official (three-digit) codes are defined in the National Institute of Standards and Technology (NIST) FIPS Publication 6-4.

See Appendix J for codes to be used for Alaska, District of Columbia (DC), and Puerto Rico.

Item 64: NHS (National Highway System)

Description: Roadway section that is a component of the National Highway System (NHS).

Use: For analysis and mapping of NHS information.

Extent: All roadways that are designated NHS routes (as of December 31st of the applicable data year), excluding ramps.

	1	2	3	4	5	6	7
Functional System	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**	FE**
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Data Item Value: Code the value that represents the type of NHS facility as follows:

Code	Description
1	Non Connector NHS
2	Major Airport
3	Major Port Facility
4	Major Amtrak Station
5	Major Rail/Truck Terminal
6	Major Inter City Bus Terminal
7	Major Public Transportation or Multi-Modal Passenger Terminal
8	Major Pipeline Terminal
9	Major Ferry Terminal

Data Item Text:	No entry required. Available for State Use.
Data Item Date:	Optional. The Month and Year that the NHS section was officially approved.

Guidance: Code this data item for roadway segments that reside on an official NHS route.

The States must provide their NHS data to FHWA as part of their annual submittal until directed otherwise by the FHWA Office of Highway Policy Information. Ultimately, the Office of Highway Policy Information will maintain this data item based on official requests for changes to the NHS per the FHWA Office of Planning.

Provided that FHWA assumes the role of maintaining these datasets in the future, the States will be responsible for submitting additions, deletions, and changes to these networks to FHWA for approval, as directed by the procedures outlined in the appropriate sections of Title 23 CFR, U.S.C., and FHWA regulations. Once approved, the appropriate sections of the network(s) will be coded by FHWA with the approval date, at which time the change will become official. These datasets will be available to the States throughout the year for reference or to download, and will be provided to each State at the end of the calendar year, which will serve as the official network for that calendar year.

Item 65: STRAHNET_Type (Strategic Highway Network)

Description: Roadway section that is a component of the Strategic Highway Network (STRAHNET).

Use: For analysis and mapping of STRAHNET information.

Extent: All roadways that are designated STRAHNET routes.

	1	2	3	4	5	6	7
Functional System	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**	FE**
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:	
Data Item Value:	Code the value that represents the type of STRAHNET facility as follows:

Code	Description
1	Regular STRAHNET
2	Connector

Data Item Text:	Military Base Name (if one exists).
Data Item Date:	Optional. The Month and Year that the STRAHNET section was officially approved.

Guidance: Code this data item for roadway segments that reside on an official STRAHNET route.

The States must provide their STRAHNET data to FHWA as part of their annual submittal until directed otherwise by the FHWA Office of Highway Policy Information. Ultimately, the Office of Highway Policy Information will maintain this data item based on official requests for changes to the STRAHNET per the FHWA Office of Planning.

Provided that FHWA assumes the role of maintaining these datasets in the future, the States will be responsible for submitting additions, deletions, and changes to these networks to FHWA for approval, as directed by the procedures outlined in the appropriate sections of Title 23 CFR, U.S.C., and FHWA regulations. Once approved, the appropriate sections of the network(s) will be coded by FHWA with the approval date, at which time the change will become official. These datasets will be available to the States throughout the year for reference or to download, and will be provided to each State at the end of the calendar year, which will serve as the official network for that calendar year.

Item 66: Truck (National Truck Network)

Description: Roadway section that is a component of the National Truck Network (NN) as defined by 23 CFR 658.

Use: For analysis and mapping of NN information.

Extent: All roadways that are designated NN routes.

	1	2	3	4	5	6	7
Functional System	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**	FE**
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Data Item Value: Code the value that represents the type of truck facility as follows:

Code	Description
1	Section is on the National Network (NN)
2	Other State-designated truck route (optional)

Data Item Text: No entry required. Available for State Use.

Data Item Date: Optional. The Month and Year that the National Truck Network section was officially approved.

Guidance: Code this data item for roadway segments that reside on an official National Network route.

The States must provide their NN data to FHWA as part of their annual submittal until directed otherwise by the FHWA Office of Highway Policy Information. Ultimately, the Office of Highway

Policy Information will maintain this data item based on official requests for changes to the NN per the FHWA Office of Planning.

Provided that FHWA assumes the role of maintaining these datasets in the future, the States will be responsible for submitting additions, deletions, and changes to these networks to FHWA for approval, as directed by the procedures outlined in the appropriate sections of Title 23 CFR, U.S.C., and FHWA regulations. Once approved, the appropriate sections of the network(s) will be coded by FHWA with the approval date, at which time the change will become official. These datasets will be available to the States throughout the year for reference or to download, and will be provided to each State at the end of the calendar year, which will serve as the official network for that calendar year.

Item 67: Future_Facility (Future National Highway System)

Description: Roadway section that is a component of the pending National Highway System (NHS), including intermodal connectors.

Use: For analysis and mapping of future NHS information.

Extent: All roadways that are designated future NHS routes.

	1	2	3	4	5	6	7
Functional System	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE**	FE**	FE**	FE**	FE**	FE**	FE**
Urban	FE**	FE**	FE**	FE**	FE**	FE**	FE**

FE** = Full Extent wherever data item is applicable SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Data Item Value: Code as follows future NHS facilities as follows:

Code	Description
1	Un-built NHS section

Data Item Text: No entry required. Available for State Use.

Data Item Date: Optional. The Month and Year that the Future NHS section was officially approved.

Guidance: Code this data item for roadway segments that may ultimately reside (i.e. awaiting FHWA approval) on an official NHS route.

The States must provide their future NHS data to FHWA as part of their annual submittal until directed otherwise by the FHWA Office of Highway Policy Information. Ultimately, the Office of Highway Policy Information will maintain this data item based on official requests for changes to the future NHS per the FHWA Office of Planning.

Provided that FHWA assumes the role of maintaining these datasets in the future, the States will be responsible for submitting additions, deletions, and changes to these networks to FHWA for approval, as directed by the procedures outlined in the appropriate sections of Title 23 CFR,

U.S.C., and FHWA regulations. Once approved, the appropriate sections of the network(s) will be coded by FHWA with the approval date, at which time the change will become official. These datasets will be available to the States throughout the year for reference or to download, and will be provided to each State at the end of the calendar year, which will serve as the official network for that calendar year.

Item 68: Maintenance_Operations (Maintenance and Operations)

Description: The legal entity that maintains and operates a roadway.

Use: For administrative, legislative, analytical, and national highway database purposes.

Extent: All Federal-aid highways that are toll facilities; optional for all other sections.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural	FE	FE	FE	FE	FE	FE		
Urban	FE	FE	FE	FE	FE	FE	FE	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:

Value_Numeric: Code the level of government that best represents who maintains and operates the highway irrespective of ownership or agreements for other purposes. If more than one code applies, use the lowest numerical value from the following:

Code	Description	Code	Description
1	State Highway Agency	60	Other Federal Agency
2	County Highway Agency	62	Bureau of Indian Affairs
3	Town or Township Highway Agency	63	Bureau of Fish and Wildlife
4	City or Municipal Highway Agency	64	U.S. Forest Service
11	State Park, Forest, or Reservation Agency	66	National Park Service
12	Local Park, Forest or Reservation Agency	67	Tennessee Valley Authority
21	Other State Agency	68	Bureau of Land Management
25	Other Local Agency	69	Bureau of Reclamation
26	Private (other than Railroad)	70	Corps of Engineers
27	Railroad	72	Air Force
31	State Toll Authority	73	Navy/Marines
32	Local Toll Authority	74	Army

Code	Description	Code	Description
40	Other Public Instrumentality (i.e., Airport)	80	Other
50	Indian Tribe Nation		

Value_Text:	Optional. Enter secondary operator information, if applicable.
Value_Date:	No entry required. Available for State Use.

Guidance: The term "maintenance and operations" covers the preservation and performance of the highway, including surface, shoulders, roadsides, structures, and such traffic-control devices as are necessary for safe and efficient utilization of the highway.

"State" maintained means one of the 50 States, the District of Columbia, or the Commonwealth of Puerto Rico including quasi-official State commissions or organizations;

"County, local, municipal, town, or township" means maintained by one of the officially recognized governments established under State authority;

"Federal" means maintained by one of the branches of the U.S. Government or independent establishments, government corporations, quasi-official agencies, organizations, or instrumentalities;

"Other" means any other group not already described above or nongovernmental organization that maintains the highway.

In cases where maintenance and operations responsibilities are shared between multiple entities, this item should be coded based on the entity that has the larger degree of responsibility for maintenance and operations. Information on additional entities should be entered in Data Field 9 (*Value_Text*) for this item.

Item 69: Capacity (Capacity)

Description: The capacity of the roadway as estimated by the State or local agency.

Use: For investment requirements modeling to calculate capacity, the cost allocation pavement model, and congestion, delay and other analyses.

Extent: All Sample Panel sections.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding Requirements for Fields 8, 9, and 10:	
Data Item Value:	Enter the estimated capacity for a given roadway
Value_Text:	No entry required. Available for State Use.
Value_Date:	No entry required. Available for State Use.

Guidance: The capacity of a roadway facility is the maximum reasonable hourly rate at which vehicles can be expected to transverse a point or a uniform section of lane or roadway during a given time period under prevailing roadway, traffic, and control conditions. Reasonable expectancy is that the stated capacity can be achieved repeatedly. The *Highway Capacity Manual* provides procedures, formulas, graphics, and tables in assessing roadway capacity.

This item should be estimated based on procedures consistent with the *Highway Capacity Manual* (HCM).

All urban and rural capacity for freeways and other multilane facilities is for the peak direction. If a rural facility has 2 or 3 lanes with one-way operation, it is considered to be a multilane facility for determining capacity. The capacity for rural facilities with 2 or 3 lanes and two-way operation is for both directions.

4.5 Sample Panel Identification Data Reporting Requirements

This section describes the data fields required for reporting the location of the Sample Panel Sections within the State's Table of Potential Samples (T.O.P.S.). Detailed Information on the sampling procedures associated with the T.O.P.S. is contained in Chapter 6.

Fields Required for Sample Panel Identification Reporting Purposes

The fields of information listed in Table 4.6 are to be submitted as part of the Sample Panel Identification dataset which will be stored in the Sections Catalog (discussed in Chapter 3) within FHWA's system.

- **Field Number** is the number assigned to each data field for reference purposes.
- **Field Name** specifies the type of information that should be reported for each field.

Table 4.6: HPMS Sample Panel Identification File Structure

	Field Number	Field Name
Sample Panel Section	1	Year_Record
	2	State_Code
	3	Route_ID
	4	Begin_Point
	5	End_Point
	6	Section_Length
	7	Sample_ID
	8	Comments (Optional)

The next section describes the detailed specifications for the fields identified in Table 4.6, in terms of their Descriptions, Usage, Data Formats, Coding instructions, and Guidance (where applicable) for each Field.

Field 1: Year_Record

Description: The calendar year for which the data is applicable.

Use: For identifying the representative year of the data.

Data Type: Numeric

Coding: Enter the four digits for the calendar year that the data represents.

Guidance: N/A

Field 2: State_Code

Description: The State Federal Information Processing Standard (FIPS) code.

Use: For identifying the State for which the data is being reported.

Data Type: Numeric

Coding: Enter up to two digits for the State FIPS code. See Appendix C for a complete list of FIPS codes.

Guidance: N/A

Field 3: Route_ID

Description: The unique identifier for a given roadway (i.e., route).

Use: For identifying the specific route for which the data is being reported.

Data Type: Text

Coding: Enter an alphanumeric sequence consisting of no more than 60 characters.

Guidance: The Route ID is to be developed per the States' preference. However, this ID must be consistent with the Route ID schema that is contained in the State's LRS network attribute data.

Field 4: Begin_Point

Description: The point of origin for a given section of road.

Use: For identifying the beginning point of a section for spatial referencing purposes.

Data Type: Numeric

Coding: Enter a decimal value to the nearest thousandth of a mile.

Guidance: N/A

Field 5: End_Point

Description: The terminus point for a given section of road.

Use: For identifying the ending point of a section for spatial referencing purposes.

Data Type: Numeric

Coding: Enter a decimal value to the nearest thousandth of a mile.

Guidance: N/A

Field 6: Section_Length

Description: The true length (i.e., measured length) for a given section of road.

Use: For analysis and comparison of various data items for apportionment, administrative, legislative, analytical, and national highway database purposes.

Data Type: Numeric

Coding: Code the length in decimal format to the nearest thousandth of a mile.

Guidance: Refer to guidance provided in Section 4.2 for Data Field No. 7 in the Sections dataset.

Field 7: Sample_ID

Description: A unique identifier for the section.

Use: For identifying a section that is within the defined limits of the Sample Panel.

Data Type: Text

Coding: Enter an alphanumeric sequence consisting of no more than 12 characters.

Guidance: N/A

Field 11: Comments (Optional)

Description: Additional information for State use (formerly referred to as the "State Control Field").

Use: For storing supplemental information provided by the States which is used to manage their various databases.

Data Type: Text

Coding: This item can be coded as variable text up to 100 characters, in accordance with the State's needs.

Guidance: The information provided in this field **is not required** by FHWA.

4.6 FHWA-Coded Items

Within the scope of the Sections data in HPMS, there are data items that either are currently coded by FHWA, or will be at some point in the future. For reference purposes, Table 4.7 lists these items. FHWA will assign default codes to the items shown with a single asterisk (*) if the States do not provide this information. In addition, the items shown with a double asterisk (**) will be coded by FHWA (at some point in the future) based on updates that are provided by the States to FHWA's Office of Planning. Only FHWA-approved updates will be used to code Data Items 64-67.

Table 4.7 FHWA Coded Items

	Item Number	Data Item
FHWA Coded Items	61	Climate Zone*
	62	Soil Type*
	64	National Highway System (NHS)**
	65	STRAHNET**
	66	National Truck Network**
	67	Future Facility**

The next section provides the detailed specifications for the data items identified in Table 4.7.

Item61: Climate Zone

Description: Climate zone as defined by the 4 LTPP climate zone descriptions.

Use: For the cost allocation pavement model.

Coding: This will be coded according to the four FHWA Long Term Pavement Performance (LTPP) climate zone descriptions as follows:

Code	Description
1	Wet-Freeze
2	Wet-Non Freeze
3	Dry-Freeze
4	Dry-Non Freeze

Item 62: Soil Type

Description: Soil type as defined by AASHTO soil classes.

Use: For pavement modeling purposes.

Coding: This will be coded AASHTO soil class data.

Item 64: NHS

Description: The FHWA-approved NHS, including intermodal connectors, and the year it was approved (optional).

Use: For establishing the official National Highway System.

Coding: This item will be coded for all sections that either are located on the NHS or function as NHS connectors to -intermodal facilities, using one of the following codes:

Code	Description	
1	Not NHS Connector	A designated NHS Route
2	NHS Connector to	Airport
3		Port Facility
4		Amtrak Station
5		Rail/Truck Terminal
6		Inter City Bus Terminal
7		Public Transportation or Multimodal Passenger Terminal
8		Pipeline Terminal
9		Ferry Terminal

Item 65: STRAHNET

Description: The Strategic Highway Network (used for Department of Defense purposes).

Use: For identifying the STRAHNET system.

Coding: This item will be coded using the following codes:

Code	Description
1	Regular STRAHNET
2	Connector

Item 66: National Truck Network

Description: Highway sections that comprise the National Truck Network as defined by 23 CFR 658, Appendix A.

Use: For freight modeling and analysis.

Coding: This item will be coded using the following codes:

Code	Description
1	Section is on the National Truck Network
2	Other State designated truck routes

Item 67: Future Facility

Description: The pending (planned/un-built) NHS, including intermodal connectors.

Use: For identifying the National Highway System.

Coding: This item will be coded using the following code:

Code	Description
1	This is an un-built NHS section

4.7 Software-Calculated Items

In addition to the items that will be coded by FHWA, there is a limited group of data items that will be calculated by the HPMS software once the data has been submitted. These items and the extent for which they will be calculated are listed in Table 4.8 below.

Table 4.8: Software Calculated Items

	Data Item	Extent	
Software Calculated Items	Volume Group	FE	
	Expansion Factor		SP
	Horizontal Alignment Adequacy		SP*
	Vertical Alignment Adequacy		SP*
	Weighted Design Speed		SP
	Computed Capacity		SP
	Volume/Service Flow Ratio		SP
SP = All Sample Panel Sections (as defined by HPMS) SP* = Some Sample Panel Sections, see Data Item details			

The next section provides the detailed specifications for the data items identified in Table 4.8.

Item Name: Volume Group

Description: A value that is associated with a defined range of values, used to classify an AADT value.

Use: For apportionment, administrative, legislative, analytical, and national highway database purposes.

Extent: All Federal-aid highways.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	FE	FE	FE	FE	FE	FE		
Urban	FE	FE	FE	FE	FE	FE	FE	

FE = Full Extent SP = Sample Panel Sections

Coding: This item will be coded based on the reported AADT, using the following codes:

Code	Description
1	Under 500
2	500 – 1,999
3	2,000 – 4,999
4	5,000 – 9,999
5	10,000 – 19,999

Code	Description
6	20,000 – 34,999
7	35,000 – 54,999
8	55,000 – 84,999
9	85,000 – 124,999
10	125,000 – 174,999
11	175,000 – 249,999
12	250,000 and more

Item Name: Expansion Factor

Description: The ratio of the total length in a volume group to the total sampled volume group length.

Use: For expanding sampled data to represent the Full Extent from which the sample is drawn.

Extent: All Sample Panel sections.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding: This item will be calculated and coded using the volume group information in Data Item 1 (Volume Group).

Calculation:

$$\text{Expansion Factor} = \frac{\text{Total length in the Volume Group}}{\text{Sampled length in the Volume Group}}$$

If the expansion factor for a volume group exceeds 100.000, select additional Sample Panel sections from the Full Extent volume group until the expansion factor is reduced to a maximum of 100.000. If there are fewer than three samples in a volume group (minimum requirement) and additional sections are available, select additional samples from the Full Extent volume group.

Chapter 6 contains a description of the standard sample selection and maintenance scheme.

Item Name: Horizontal Alignment Adequacy

Description: The adequacy of horizontal alignment when curve data are not reported.

Use: For investment requirements modeling to estimate horizontal alignment deficiencies and for the truck size and weight analyses.

Extent: All rural paved Sample Panel sections, unless Data Item 43 (Curves) is coded for the section.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural		SP	SP	SP	SP			
Urban								

FE=Full Extent SP = Sample Panel Sections

Coding: This item will be calculated and coded using the following codes:

Code	Description
0	Curve data are reported or this item is not required for the section.
1	All curves meet appropriate design standards for the type of roadway.
2	Some curves are below appropriate design standards but all curves can be safely and comfortably negotiated at the prevailing speed limit on the section. The speed limit was not established by the design speed of curves.
3	Infrequent curves with design speeds less than the prevailing speed limit on the section. Infrequent curves may have reduced speed limits for safety purposes.
4	Several curves uncomfortable or unsafe when traveled at the prevailing speed limit on the section or the speed limit on the section is severely restricted due to the design speed of curves.

Item Name: Vertical Alignment Adequacy

Description: The adequacy of vertical alignment when grade data are not reported.

Use: For investment requirements modeling to estimate vertical alignment deficiencies.

Extent: All rural paved Sample Panel sections unless Data Item 45 (Grades) is coded.

Functional System		1	2	3	4	5	6	7
	NHS	Int	OFE	OPA	MiA	MaC	MiC	Local
Rural		SP	SP	SP	SP			
Urban								

FE = Full Extent SP = Sample Panel Sections

Coding: This item will be calculated and coded using the following codes:

Code	Description	
0	Grade data are reported or not required	
1	All meet design standards	All grades (rate and length) and vertical curves meet minimum design standards appropriate for the terrain.

Code	Description	
2	Some meet design standards	Some grades (rate and length) and vertical curves are below appropriate design standards for new construction; all grades and vertical curves provide sufficient sight distance for safe travel and do not substantially affect the speed of trucks.
3	Infrequent grades	Infrequent grades and vertical curves that impair sight distance or affect the speed of trucks (when truck climbing lanes are not provided).
4	Frequent grades	Frequent grades and vertical curves that impair sight distance or severely affect the speed of trucks; truck climbing lanes are not provided.

Item Name: Weighted Design Speed

Description: The design speed weighted by the length of individual horizontal curves and tangents on a section.

Use: For investment requirements modeling to calculate capacity and estimate needed capacity improvements.

Extent: All Sample Panel sections.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding: When curve data are not provided, a default value based upon functional system and facility type will be used, as shown in the following table:

	Functional System Code											
	Rural						Urban					
Roadway Type	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
Multilane Divided	70	70	70	70	65		70	70	70	60	55	55
Multilane Undivided	70	70	70	70	60		70	70	70	55	45	45
2/3 Lane	70	70	70	65	60		70	65	65	55	45	45

Item Name: Computed Capacity

Description: The capacity of the roadway as estimated by the HPMS software provided that the State has not reported this information.

Use: For investment requirements modeling to calculate capacity, the cost allocation pavement model, and congestion, delay, and other analyses.

Extent: Sample Panel sections for which capacity data has not been reported by the State.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding: The capacity of a roadway facility is the maximum reasonable hourly rate at which vehicles can be expected to transverse a point or a uniform section of lane or roadway during a given time period under prevailing roadway, traffic, and control conditions. Reasonable expectancy is that the stated capacity can be achieved repeatedly. The *Highway Capacity Manual* provides procedures, formulas, graphics, and tables in assessing roadway capacity.

This item will be computed and coded based on procedures used in the HPMS software which are consistent with the *Highway Capacity Manual* (HCM).

All urban and rural capacity for freeways and other multilane facilities is for the peak direction (ensuring capacity from reversible lanes is included). If a rural facility has 2 or 3 lanes with one-way operation, it is considered to be a multilane facility for determining capacity. The capacity for rural facilities with 2 or 3 lanes and two-way operation is for both directions.

The Computed Capacity is only for sample sections which lack State-provided Capacity (Data Item 69) in order to ensure complete data. State-provided capacities are superior estimates because the State has access to more detailed information than is available through HPMS.

Item Name: Volume/Service Flow Ratio (V/SF)

Description: A computed value reflecting peak hour congestion.

Use: For investment requirements modeling to estimate needed capacity improvements, in the national highway database, and for congestion, delay, and other data analyses.

Extent: All Sample Panel sections.

		1	2	3	4	5	6	7
Functional System	**NHS**	**Int**	**OFE**	**OPA**	**MiA**	**MaC**	**MiC**	**Local**
Rural	SP	SP	SP	SP	SP	SP		
Urban	SP	SP	SP	SP	SP	SP	SP	

FE = Full Extent SP = Sample Panel Sections

Coding: States are not able to override this value, but are encouraged to verify data items that affect this calculation.

If the volume to service ratio is 1.40 or higher, the measurement and coding of items that affect peak capacity should be inspected.

Items that affect capacity (listed from most to least critical) are:

1. AADT
2. K-factor
3. D-factor
4. Peak Lanes
5. Through Lanes (primarily for rural 2 and 3-lane roads)
6. Median Type
7. Median Width (< or >= 4 ft.)
8. Percent Green Time

Less significant items that affect capacity are:

1. Lane Width
2. Shoulder Width (< or >= 6 ft.)
3. Peak Percent Combination Trucks
4. Peak Percent Single-Unit Trucks
5. Left-Turn Lanes
6. Right-Turn Lanes
7. Peak Parking

Chapter 5 GUIDANCE ON SPECIAL TOPICS

5.1 Overview

The purpose of this chapter is to provide additional guidance on the reporting of Functional System, Traffic, and Pavement data. This information is a supplement to the data item requirements discussed in Chapter 4.

5.2 Functional Classification System Descriptions and Groupings

FHWA focuses scarce national resources on the most important roads and highways in the Nation. This practice has been in existence on a national level since the 1960s and guidance documents have been issued several times. The FHWA's most recent comprehensive Functional Classification Guidance Document was published in 1989 and can be found at www.fhwa.dot.gov/planning/fctoc.htm. This document should be used by the State Departments of Transportation as a conceptual reference in updating and maintaining their respective Functional Classification (FC) Systems.

Functional classification is the process by which streets and highways are grouped into classes, or systems, according to several factors that contribute to the overall importance of a given roadway to a region or area. All streets and highways are grouped into one of seven classes, depending on the character of the roadway and the degree of land access that they allow. The seven functional classes are represented by a one-digit code:

Code	Description
1	Interstate
2	Principal Arterial – Other Freeways and Expressways
3	Principal Arterial – Other
4	Minor Arterial
5	Major Collector
6	Minor Collector
7	Local

This is a change from the past two-digit code. One code will be used to represent a similar type of road whether it is located in an Urban or Rural Area. Updated guidance concerning the Functional Classification of Highways was issued by FHWA in October 2008 and updated Functional Classifications Guidelines is forthcoming. The process of functional classification is essentially the same as before.

The U.S. Census based Urban Area (UA) Boundaries are an important part of the FC system. Traditionally new Urban Area Boundaries have been released two years after the initial decennial census as a byproduct of that effort. Since these boundaries are developed through automated methods they are often coarse, irregular and generally don't encompass transportation facilitates in an effective way. While a State may choose unadjusted original census boundaries as part of the overall FC program, it is advisable to adjust these polygons to efficiently encompass the overall highway network.

The Functional Classification Codes and the Urban Area Boundary codes will both be needed whether a given highway is located in or out of an Urban Area. Spatial Analysis can be used by the States to relate the FC code to the Urban Area code or by other effective means.

The functional classification for all sections is coded in Data Item 1 (Functional System). Data Item 2 contains the Urban Code. Referencing these two codes together allows for the designation of 14 rural/urban functional systems.

Note: All of FHWA is adopting this revised functional class code schema as an enterprise standard. For example, the *Traffic Monitoring Guide (TMG)* is including the one-digit code for functional class and a one-letter code for area type to designate roads as 'rural' or 'urban'. Other USDOT systems are converting to this new standard as well.

5.3 Traffic Monitoring Procedures

Introduction

Traffic monitoring data are a key component of the HPMS. They are some of the most analyzed and used data elements and must be of high quality to accurately represent conditions in all States. Traffic data are used for a variety of work program objectives which include the following:

- Apportionment of Federal-aid Highway funds;
- Analysis and presentation of data for the *Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance* report to Congress;
- Clean Air Act travel data requirements for non-attainment areas;
- FHWA performance measures such as vehicle crash rates, pavement condition, and congestion;
- Analysis of vehicle types for freight movements; and
- Analysis and development of legislation.

Traffic monitoring data are also key inputs for the development and maintenance of the HPMS data set. Traffic data drive the HPMS sample stratification and selection process by assigning roadway sections into volume groups and for statistical analysis to develop the sample panel as further discussed in Chapter 6. The validity of the entire HPMS sample panel and the development of the sample expansion procedure depends on the proper maintenance of a comprehensive traffic monitoring program.

A State traffic monitoring program that is developed following the guidance contained in the *Traffic Monitoring Guide* (TMG) will provide data that meets the needs of HPMS. The *AASHTO Guidelines for Traffic Data Programs (AASHTO Guide)* provides another reference for developing and maintaining a State Traffic Data Program. Since HPMS is a key driver for State's traffic monitoring programs, States should use a combination of guidance from the TMG, *HPMS Field Manual*, and other sources such as the *AASHTO Guide* to develop their traffic program.

The traffic data reported in HPMS must be the same data the State uses for their own purposes as contained in their traffic monitoring system. Using the same data provides assurance that it was collected and processed following the State's traffic monitoring program and not processed independently for HPMS. If the same data are used, then products from the HPMS data submittal are approximately the same as the State's traffic data products such as VMT. In summary, the specific travel data needs for HPMS can be accommodated with minor adjustments and implementation of good practices as presented in the TMG and in the *AASHTO Traffic Data Guidelines*.

This section provides specific guidance for traffic monitoring procedures to meet the HPMS requirements and builds on the recommendations provided in the TMG. It is important to recognize that this *Field Manual* refers to traffic data in several sections: Sections 3.3, 4.3, etc. Stakeholders involved in collecting, analyzing and reporting on traffic data for HPMS should refer to this section as well as the other references to traffic monitoring throughout the *Field Manual*.

This section is presented in three parts:

(1) General, high level requirements for the traffic monitoring program,

(2) Volume Group Assignments for HPMS, and

(3) More detailed traffic monitoring program guidelines.

State Traffic Monitoring Data Program

General Requirements

State maintenance of a comprehensive traffic monitoring data program to provide quality, timely, and complete traffic volume and vehicle classification data is important for meeting HPMS requirements. This section describes the fundamental macro-level requirements of a State Traffic Data Program for HPMS. Specific guidance is contained in the TMG and readers are encouraged to refer to the TMG for more detail.

While traffic data are collected at points on the highway system, HPMS is oriented toward highway sections. So an initial step is for the State to segment their highways into sections with consistent traffic. As highways evolve and traffic patterns change, these traffic monitoring sections may need to be revised. An advantage of the new HPMS data model is that States may submit section-level data for these traffic monitoring sections without having to match any sections in HPMS.

Count Cycles and Coverage

A State should have minimum count cycles and coverage as follows:

Minimum 3-year count cycle – The State's traffic monitoring program shall cover all NHS, Interstate, Principal Arterial, and HPMS sample sections on a three-year cycle or better; at least one-third should be counted each year. The remaining two-thirds counts must be estimated based on a documented process in accordance with the TMG and the *Field Manual*. The State shall cover all roads on these systems, not just State-owned roads, so data provided by MPOs, cities, or counties should be included in the count cycle.

Minimum 6-year count cycle – The State shall also have a traffic count program on a six-year cycle or better for all sections that are neither samples nor NHS but are on the minor arterials and collectors (except for rural minor collectors). Traffic data for ramps, as defined in Chapter 4, are also to be collected on a six-year cycle or better.

All traffic data for HPMS shall be based on a minimum of 48 hours of monitoring for volume and vehicle classification, which is referred to as short term monitoring. If a State has a duration of monitoring that is less than 48 hours, they must be able to demonstrate no loss in quality of data based on documented statistical analysis provided to FHWA.

The program should provide for a sufficient number of automatic traffic recorder (ATR) volume and automatic vehicle classification (AVC) stations to permit factoring of short term counts for estimates of annual average daily traffic (AADT). If there are insufficient ATRs for statistical accuracy in a factor group, use of statewide factors is encouraged. Day of week, seasonal, axle correction, weekday and weekend, and annual (growth) adjustment factors are the only factors to be used as necessary to keep all AADTs current to the year for which they are being reported.

The HPMS traffic data needs should be conveyed to the traffic monitoring office within the State in a timely manner that allow enough time to develop and schedule the State's comprehensive traffic monitoring program. Areas of the State selected for counting in a program year should be selected on a random basis. Highways with high variability should be counted more often than those with low variability, and highways with high traffic volume should be counted more extensively than those with low volume. To make the most of available resources, an area traffic count plan may consider using cluster count techniques whereby several counts are taken in the same general area. Counts scheduled and obtained under other programs may be incorporated into the count plan to avoid duplication of monitoring sites.

Sources of Data

Automatic traffic recorders provide continuous monitoring of existing traffic conditions around the State. Travel on freeways, expressways and other multilane facilities can be monitored by route. Travel can also be monitored by area through statewide, or MPO freeway management or travel surveillance programs, which are often referred to as Intelligent Transportation System (ITS) deployments. Other highway functional systems, both State and off-State, can be monitored by geographic area, such as by county or highway district. Traffic information in a comprehensive count program should be compiled from all available sources -- State, MPO, ITS, city, and county.

Coordination and cooperation with local governments to implement a comprehensive count program is highly desirable; however, the State ultimately maintains responsibility for ensuring that these data meet minimum collection and quality requirements. To meet these responsibilities, the State should have a comprehensive quality assurance program that includes data collection, the conversion of traffic counts into current year AADT values, routine equipment testing provisions, and routine traffic count calibration procedures.

The following list of standards from ASTM International provides detailed guidance on traffic monitoring techniques and technologies:

E17.52 Traffic Monitoring Committee

- E 1318-09 Standard Specification for Highway Weigh-in-Motion (WIM) Systems with User Requirements and Test Methods
- E 1957-04 Standard Practice for Using Pneumatic Tubing for Roadway Traffic Counters and Classifiers
- E 2300-09 Standard Specification for Highway Traffic Monitoring Devices
- E 2415-05 Standard Practice for Installing Piezoelectric Highway Traffic Sensors
- E 2467-05 Standard Practice for Developing Axle Count Adjustment Factors
- E 2532-09 Standard Test Methods for Evaluating Performance of Highway Traffic Monitoring Devices
- E 2561-07a Standard Practice for the Installation of Inductive Loop Detectors
- E 2259-03a Standard Guide for Archiving and Retrieving ITS-Generated Data
- E 2665-08 Standard Specification for Archiving ITS-Generated Traffic Monitoring Data
- E2667-09 Standard Practice for Intersection Turning Movement Traffic Data
- E2759-10 Standard Practice for Highway Traffic Monitoring Truth-in-Data

AADT Calculation

The development of section AADT estimates from traffic monitoring data using continuous or short term volume, vehicle classification, or truck weight data must include the use of adjustment factors if the data does not cover all months. The AADT estimates reported to the HPMS for all sections not counted during the current year must be updated to current year AADT estimates by use of annual (growth) adjustment factors.

The rounding of AADTs is acceptable for HPMS following the scheme recommended by the *AASHTO Guide* but is not encouraged unless it is common practice for the State to round all traffic data in their traffic monitoring database and the practice is applied to all traffic data consistently. This applies to the reporting of volume and vehicle classification data. Rounding should be performed after all adjustments to the raw count have been made and should not be performed when calculating percent single unit and combination trucks. Low volume counts must not be rounded to report zero as a volume or as a percent since this will not accurately represent the presence of minimal volumes and will also show no change in trends. Zeros should only be reported when the actual count is zero.

Volume Group Assignments

The State's comprehensive traffic count program should be used to develop traffic volume group assignments for all road sections in a program that adequately monitors both high and low volume roads, including those off the State system. To facilitate this process, count station locations should be selected to represent expected AADT volume group breakpoints for the volume ranges of all required samples. This may require locating count stations at one per several miles in rural areas and more closely in urban areas. If there are homogeneous traffic sections as determined by prior counts or engineering judgment, more than one section may be represented by a single traffic count station as long as traffic does not vary more than 10%. Selection of count locations should be based on previous count experience on the section or adjacent sections, recent land use developments, and the existence of uncounted sections along the route.

Traffic Monitoring Program Elements

A detailed discussion of recommended procedures for developing, collecting, and processing travel monitoring data is contained in the *Traffic Monitoring Guide* (TMG). However, a general discussion of some elements of a typical traffic monitoring program and their applicability to the HPMS follows.

Count Cycle

A minimum of one-third of all NHS, Interstate, Other Freeways and Expressways, Other Principal Arterials, and HPMS sample sections shall be counted each year; all other monitoring should be on a minimum six-year cycle. The sections to be counted should be randomly selected from each sample stratum (volume group), with minor adjustments as necessary for strata with numbers of sections not divisible by three or having less than three samples. A single count may be used for several sections between adjacent interchanges on controlled access facilities.

Continuous Counts

Automatic Traffic Recorders (ATRs) are used to provide continuous traffic count coverage for every day of the year at a limited number of locations using automated procedures. ATR data are also used to develop seasonal, day-of-week, axle correction, weekday and weekend, and annual (growth) adjustment factors which are then

used to factor short term counts to an AADT. Analytical procedures to determine the appropriate level of effort and to develop the needed traffic estimates are described in the TMG.

Continuous count data are essential for converting short term counts to AADT. The State's documentation of its continuous count program should identify the number of continuous counters on the rural and urban portions of the PAS/NHS system and the rest of the highway network. The process used to develop adjustment factors and their application should be thoroughly documented as well. Whenever possible, the State should have at least one continuous counter on each major PAS/NHS highway route. At a minimum, each continuous counter should have at least one full day of data for each day of the week for each month provided the State has an adequate automatic edit process based on the historic trend.

Short Term Counts

Short term counts cover lesser time periods than continuous ATRs, 48-hour counts (two full 24-hour days) are required for all HPMS Full Extent and sample data including those off the State highway system. Where axle correction factors are needed to adjust raw counts, they should be derived from facility-specific vehicle classification data obtained on the same route or on a similar route with similar traffic in the same area. Factors that purport to account for suspected machine error in high traffic volume situations shall not be applied to traffic counts used for HPMS purposes, including volume group assignment. In high volume situations and on controlled access facilities, it may be more appropriate to use continuous or short term ramp counts in conjunction with strategic mainline monitoring than to use short term counts on all mainline locations (see "ramp balancing" in the TMG for details).

Ramp Counts

Traffic counts are required on all Federal-aid highways including ramps associated with grade-separated interchanges. Ramp counts are important because many bottlenecks occur at major interchanges around the country and large amounts of Federal funds are expended to address these congestion issues. A minimum of one count every six years is required for ramps.

The same procedures used to develop AADTs on all HPMS sections should be used to develop ramp AADTs. It is important that this volume data be an AADT for comparison to other AADTs and for reasonable trend analysis. States are encouraged to use adjustment factors developed based on either entrance or exit travel patterns or on the functional class of the ramp and to use this procedure consistently statewide. For example, the factors used for the mainline road with subordinate flow may be appropriate for use on the ramp. In other cases, the factors from intersecting roads connected to the ramp may be more appropriate for use. Good judgment and experience should be applied regarding factor use. As a minimum, 48-hour ramp counts should be adjusted with axle correction factors as needed.

Ramp counts should be available from freeway monitoring programs that continuously monitor travel on ramps and mainline facilities. Ramp balancing programs implemented by States on ramp locations and on high volume roadways could also be used to provide AADTs. In the case where no ramp counts are available, a State may use traffic matrix estimation. The State's traffic modeling office may compute ramp traffic estimates as part of their modeling process.

Vehicle Classification

Data reported in the HPMS should reflect the use of automatic vehicle classification equipment to accurately report truck data, vehicle classification summaries, and develop seasonal and day of week vehicle class

adjustment factors. Summary vehicle classification data reporting requirements are outlined in Chapter 3. Percent trucks data in Items 23 and 25 and truck AADTs in Items 22 and 24 are reported for each HPMS sample section as discussed in Chapter 4. Vehicle classification information is also reported in the summary travel data as discussed in Chapter 2.

The State's vehicle classification program shall include:

Data representative of all functional systems, both on and off the State system.

Monitoring sessions for at least 48 hours to account for the changes in vehicle mix from day to day. Data for less than 24 continuous hours is not acceptable. At locations where vehicle class is not consistent throughout the week, such as on weekends, counts longer than 48 hours may be necessary to determine appropriate days to counts and to accurately represent average vehicle class data.

Monitoring frequency shall be at a minimum, over a three-year cycle with one-third of the counts per year for the NHS, all PAS, and HPMS sample sections. All other locations should be monitored on no longer than a six-year cycle.

Data reported in HPMS shall represent data for the reporting year. Prior year classification counts shall be adjusted with annual adjustment factors to represent current year data and to accurately develop percent trucks and truck travel trends.

Monitoring activities should include all lanes in both directions.

The Axle Class Algorithm used should be consistent among different equipment and vendors, and should be checked annually to ensure that it is working properly for all vehicle types.

Axle correction factors are to be developed based on data that represents all seasons of the year. They should be applied to all counts that are based on axle sensors. The factor groups could be the same as for other adjustment factors or can be for each functional class and are to be updated each year based on that year's vehicle classification data.

Vehicle classification programs shall be set up following the guidance in the TMG for monitoring homogenous section with one monitoring location. The limits of a homogenous traffic section for one vehicle class may differ from the limits of a different vehicle class.

Vehicle classification data used to report truck AADTs for HPMS shall be adjusted to represent average conditions for the entire year following the recommendations in the TMG. Adjustments to vehicle classification data should be based on factors developed using data from a permanent continuous vehicle classification monitoring program established following the guidance in the TMG. As States fully develop and implement vehicle classification programs to provide sufficient and accurate data to develop adjustment factors this should be an integral component of a comprehensive traffic monitoring program. States that do not have a complete program are still required to adjust raw count data using interim procedures they have developed. These interim procedures could focus on using data from traffic volume programs to develop adjustment factors if considered reasonable to represent truck travel patterns until more specific vehicle classification data becomes available.

The goal of developing a comprehensive vehicle classification program to provide truck AADTs based on truck characteristics is of utmost importance since various studies have concluded that truck travel oftentimes varies considerably from total traffic patterns and has different trends statewide and by functional class. All other vehicle types are also important and should receive the attention they deserve. Motorcycles in particular are a small percent of travel but have significant safety issues that require attention for estimating their travel exposure.

Vehicle Miles of Travel (VMT)

Estimates of Daily Vehicle Miles of Travel (DVMT) are developed by direct computation for all Federal-aid Highway functional systems. This is generated by the HPMS software which multiplies the section AADT by the section length and sums the result to the HPMS aggregation level desired (functional system, total rural, etc.). A comprehensive traffic monitoring program, good traffic volume procedures and practices, a well-distributed HPMS sample, and appropriate AADT estimation techniques will result in highly reliable DVMT estimates.

Specific HPMS requirements for reporting VMT are found in Section 3.3 of this manual. Examples of good state practices for estimating VMT on non-Federal-aid highways are:

- Current traffic growth rate on collectors or higher systems;
- Limited sample of short term traffic counts;
- Combination of sample and estimated counts; and
- Area-wide average daily traffic based on documented methods.

One method which is not recommended is to use the residual of the statewide total VMT minus the highway system VMT because this obscures all other traffic data collected. Another discouraged method is the use of fixed percent of traffic growth (e.g. zero or one percent).

The monthly Traffic Volume Trends report is published by the FHWA based on a sample of traffic data from ATRs in the States. Annual VMT growth rates by functional system derived from these reports are used to validate HPMS traffic data. The goal is that all traffic information published by the FHWA and the States is valid and consistent.

5.4 Pavement Data Guidance

Roughness

In order to provide a measure of pavement surface condition that has nationwide consistency and comparability and is as realistic and practical as possible, a uniform, calibrated roughness measurement for paved roadways is required by the HPMS.

R-43 defines roughness as follows: *roughness*—according to ASTM E 867, "the deviation of a surface from a true planar surface with characteristic dimensions that affect vehicle dynamics and ride quality." After a detailed study of various methodologies and road profiling statistics, the International Roughness Index (IRI) was chosen as the HPMS standard reference roughness index. The summary numeric (HPMS data reporting unit) is the IRI in inches/mile. The primary advantages of the IRI are:

1. It is a time-stable, reproducible, mathematical processing of the known profile;
2. It is broadly representative of the effects of roughness on vehicle response and user's perception over the range of wavelengths of interest, and is thus relevant to the definition of roughness;
3. It is a zero-origin scale consistent with the roughness definition;
4. It is compatible with profile measuring equipment available in the U.S. market;
5. It is independent of section length and amenable to simple averaging; and
6. It is consistent with established international standards and able to be related to other roughness measures.

HPMS Roughness Measurement Procedure

The reference method for obtaining IRI data for the HPMS can be found in the AASHTO Standard Practice for Determination of International Roughness Index for Quantifying Roughness of Pavements, AASHTO R 43-07. This Standard Practice calls for the use of a longitudinal profile measured in accordance with ASTM E 950 as a basis for estimating IRI. Roughness is reported for HPMS in IRI units of in/mi.

Roughness data should be reported in IRI units for all sections in accordance with Data Item 47 International Roughness Index (IRI) and IRI Date. IRI should be measured on an annual cycle for the NHS and on a 2-year maximum cycle for all other required sections. Existing IRI values should continue to be reported until they are replaced by new measured values. The lower functional systems (minor arterial in urban areas and collector in any area) have been placed in the "optional" category since there are situations where it may not be possible to obtain meaningful roughness measurements with profiling equipment. Major obstacles may include:

Speed restrictions	Traffic congestion
Short section lengths	Pavement treatments
Numerous traffic signals	Intersection treatments

However, some of these obstacles can be overcome by collecting roughness data during non-peak hours or at night, where speed, traffic, and safety are less of a problem. There are situations where it also may not be possible to obtain meaningful roughness measurements on some Urban Other Principal Arterial sections. In these cases, a value of "0" may be reported.

For purposes of national-level data consistency, IRI sections reported in HPMS should not exceed 0.10 mile in length. It is understood and acceptable that sections less than 0.10 mile be reported in HPMS which can result from short collection sections, route termini, and intersections, etc.

All equipment must be operated within manufacturer's specifications and quality assurance guidelines outlined in AASHTO R 43-07 must be followed. Each State should document and retain records of its quality assurance procedures. FHWA field offices should monitor adherence to these procedures as part of roughness data process reviews.

Additional Recommendations for Collection of Roughness Data

The following field survey guidelines are recommended for State use in addition to the AASHTO Standard Practice:

Where roughness data are collected in both directions, the State should use the "inventory direction" selected in accordance with the discussion in this chapter for reporting IRI data and should use this same direction for all future HPMS reporting.

For multilane facilities, roughness data for the outside (right) lane should be reported. However, if this is not practical, whichever lane is measured should be used for all future HPMS reporting.

Roughness data collection should be performed when the pavement is in stable condition. Data should not be collected during winter (frost/freeze or freeze/thaw) or wet base conditions. Data collection should be performed during good weather conditions when wind conditions will not affect equipment stability and on dry pavement. All equipment manufacturers' recommended procedures should be observed. Good general practice rules include:

Temperature: Between 40 and 100 F;

Wind: Data collection should not be performed when wind conditions affect the stability of the equipment/vehicle; and

Surface: Data collection should preferably be performed when the roadway surface is dry.

Data should only be collected at the speeds that correspond to the manufacturer's recommended speed range. Constant speeds should be maintained for all measurements within specified ranges.

The impacts of bridge approaches and railroad crossings (or other localized discontinuities) are to be included in the roughness measurement for the roadway.

Roughness measurements should be taken over the entire length of an HPMS roadway section. However, in order to achieve equipment and speed stability, a minimum run-in length, consistent with the manufacturer's specification, may be required prior to the beginning of the measurement area. If this minimum cannot be met prior to the start of the Sample Panel section, a shorter portion of the HPMS section may be measured, but that same portion should always be measured in future roughness data collection activities. Short HPMS sections also may be included in slightly longer roughness test sections for measurement and reporting purposes. However, the same longer sections should always be measured in future data collections.

Rutting

Rutting is defined as a longitudinal depression in the wheelpath(s) of a paved surface measured between the width limits of the lane. (Note that there may also be associated transverse displacements). For HPMS reporting purposes, it is recommended that AASHTO Standard Practice R 48-10 along with the LTPP Distress

Identification Manual be followed as a guide to reporting rutting in flexible (AC) pavement types. These include composite pavements where AC pavement types are the surface layer. Also for HPMS reporting, the average rut depth to the nearest tenth of an inch (0.1") should be reported for the section.

Faulting

Faulting is defined for HPMS purposes as the absolute value of the difference in elevation across a joint in a jointed concrete (PCC) paved surface. It is recommended that AASHTO Standard Practice R 36-04 along with the LTPP *Distress Identification Manual* be followed as a guide to reporting faulting in jointed, rigid (PCC) pavement types. These include un-bonded jointed concrete overlays on PCC pavement and bonded PCC overlay of jointed PCC. For HPMS purposes, report the average joint faulting value for the section to the nearest tenth on an inch (0.1"). Faulting that occurs in other areas of the paved section away from the joint should be ignored for HPMS.

Cracking Length

Cracking Length is defined for HPMS purposes as the total length in ft/mi on a paved asphalt concrete (AC) section for transverse or reflective type cracks. It is recommended that AASHTO Provisional Protocol PP 67-10 and the LTPP *Distress Identification Manual* be followed as a guide to reporting these types of cracks. Transverse and reflective cracks are generally perpendicular to the pavement centerline and all severity levels should be considered for reporting in HPMS. Both automated and manual surveys for the collection and reporting of these data in HPMS are acceptable. Reflective cracks can be present in composite, asphalt surfaced pavements when it overlays a jointed rigid (PCC) pavement and is manifested on the surface similar to transverse cracks but appear over the underlying joints. Both types of cracks should be reported in HPMS for AC surfaced paved sections, whether composite or not.

Cracking Percent

Cracking Percent is defined for HPMS purposes as the percent area to the nearest 5 percent (at a minimum) for fatigue type cracking in AC and percent cracked slabs to the nearest 5 percent (at a minimum) for jointed PCC and CRCP surfaced paved sections. All severity levels should be considered for HPMS reporting. Both automated and manual surveys for the collection and reporting of these data in HPMS are acceptable. Fatigue type cracks generally occur in areas of the paved surface subjected to repeated traffic loadings. It is recommended that AASHTO Provisional Protocol PP 67-10 and the LTPP *Distress Identification Manual* be followed as a guide to reporting these types of cracks.

Pavement Data Collection Coordination with Other Activities

One of the goals of HPMS is to avoid duplicate data collection efforts. States are encouraged to coordinate roughness measurement activities, where possible, such that the same equipment, verification sites, and measurements are used for multiple purposes. Therefore, HPMS activities should be coordinated with other State activities such as the Strategic Highway Research Program (SHRP)/Long Term Pavement Performance (LTPP) and the State Pavement Management Systems (PMS).

The LTPP activities monitor pavement performance and use in detail for approximately 1,500 pavement sections nationwide as part of SHRP. The pavement and traffic monitoring data collected on LTPP sections should be used for the HPMS Full Extent or Sample Panel sections where possible. In addition, efforts should be made to utilize the LTPP established sections/profiles as multiple-use verification sections in each State.

Many State and some local transportation agencies have operational or are developing a PMS to guide program development, improve life-cycle costs, and help select the most effective pavement improvement strategies. The HPMS pavement data reporting should make full use of existing PMS data and collection activities. Data collected by others (cities, counties, MPO's, etc.) should be subjected to the same AASHTO quality assurance guidelines before incorporation into the HPMS.

References

Additional guidance and information on the collection of various pavement data items can be found in the following standards, specifications, and documented procedures:

IRI

AASHTO Standard R 43-07 (Quantifying Roughness of Pavements)

ASTM Standard E 950 (Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference)

NCHRP 20-24(37B) Comparative Performance Measurement: Pavement Smoothness

Sayers, M.W., On the Calculation of International Roughness Index from Longitudinal Road Profile, Transportation Research Record 1501, Transportation Research Board, Washington, DC, 1995.

ASTM Standard E1926 Standard Practice for Computing International Roughness Index of Roads from Longitudinal Profile Measurements

AASHTO MP 11-08 (2008) (Inertial Profiler)

Rutting

AASHTO R 48-10 (Determining Rut Depth in Pavements) specifications and the LTPP Distress Identification Manual

AASHTO PP 69-10 (Determining Pavement Deformation Parameters and Cross-Slope from Collected Transverse Profiles)

AASHTO PP 70-10 (Collecting the Transverse Pavement Profile)

Faulting

AASHTO R 36-04 (Evaluating Faulting of Concrete Pavements) specifications and the LTPP Distress Identification Manual

Cracking Percent

AASHTO R 55-10 (Quantifying Cracks in Asphalt Pavement Surface) specifications and the LTPP Distress Identification Manual

AASHTO PP 67-10 (Quantifying Cracks in Asphalt Pavement Surfaces from Collected Images Utilizing Automated Methods)

AASHTO PP 68-10 (Collecting Images of Pavement Surfaces for Distress Detection)

Cracking Length

AASHTO R 55-10 (Quantifying Cracks in Asphalt Pavement Surface) specifications and the LTPP Distress Identification Manual

AASHTO PP 67-10 (Quantifying Cracks in Asphalt Pavement Surfaces from Collected Images Utilizing Automated Methods)

AASHTO PP 68-10 (Collecting Images of Pavement Surfaces for Distress Detection)

Profilers/Profiles

AASHTO M 328-08 Standard Equipment Specification for Inertial Profiler (for construction quality control)

AASHTO R 57-07 Operating Inertial Profilers and Evaluating Pavement Profiles (for construction quality control)

AASHTO MP 11-08 (2008) (Inertial Profiler)

The above references can be accessed at the following web site locations:

http://www.astm.org/Standards/E950.htm?A

https://bookstore.transportation.org/

http://www.tfhrc.gov/pavement/ltpp/reports/03031/index.htm

Chapter 6 SAMPLING

6.1 Overview

The purpose of this chapter is to address the selection and maintenance of the HPMS Sample Panel, and to explain how the geospatial component of the HPMS data model supports these processes. The data reported in HPMS for sampled roadway sections are a source of the condition, use, and operational information pertaining to the nation's roadways. For analysis purposes, Sample Panel data are expanded to represent the Full Extent of roadways in the HPMS. This data is ultimately used for monitoring trends and impacts in performance data over time, and for analyses in support of national budgeting for highway improvements through the *Conditions and Performance (C&P)* report to Congress. Therefore, the selection and maintenance of adequate, up-to-date HPMS samples is a high priority, annual requirement.

This chapter also discusses the AADT and Volume Group Ranges and their impact on the sample selection process, and the sample size estimation procedures and methods used to determine sample adequacy. Chapters 3 and 4 described the HPMS Data Model, and the specific requirements for the Full Extent and Sample Panel data. The following section describes the Table of Potential Samples (TOPS) (see Appendix B, Glossary), and explains how it is to be used for sample selection purposes.

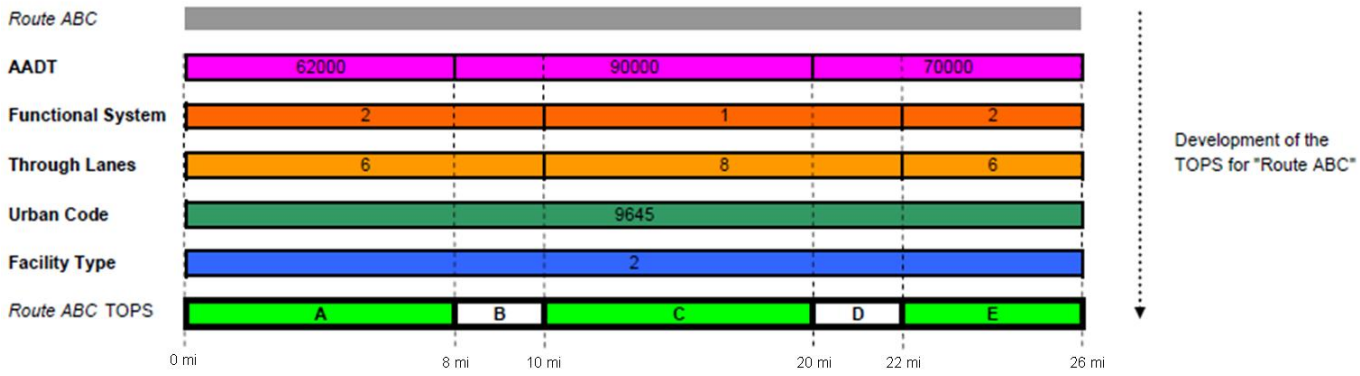
6.2 Sampling Framework

Statistically speaking, a *universe* is a population from which a sample is taken. A population can be any set of *sampling units*, such as objects that can be observed or people who can be surveyed. A *sampling frame* is a list of all of the sampling units in a universe. The universe for HPMS is all public roads. A sampling unit in HPMS is a particular kind of highway section and the Table of Potential Samples (TOPS) is the sampling frame. An HPMS sample panel is a selection of sections from the TOPS stratified by a defined set of traffic volume groups. Stratification is done to improve the precision of the estimates without significantly increasing the sample size.

The TOPS includes all Federal-aid highways, which are highways on the National Highway System (NHS) and all other public roads not classified as local roads or rural minor collectors. Some data items in HPMS are reported for all Federal-aid highways; these are called Full Extent data items. However, road sections used for Full Extent data items do not need to align with the TOPS. It is important to note that once the sample panel is chosen, then the State must provide data for every sampled data item in the sample panel.

The TOPS is developed based on the geospatial intersection of five key data items (AADT, Functional System, Urban Code, Through Lanes, and Facility Type) where their respective values are homogenous (i.e. unchanged) for defined extents along a given route. Please note that roadway segments which have been designated as "couplets" (i.e. where Facility Type = '3') are eligible for sampling purposes. Figure 6.1 shows the development of TOPS sections for a given route ("Route ABC") based on the aforementioned homogenous data items. Once the TOPS has been established, samples are selected at random from the TOPS (e.g. Sections A, B, and C in Figure 6.1).

Figure 6.1 TOPS Development Process



The following list uses the terms "extent" and "coverage" to illustrate the difference between Full Extent and Sample Panel data as it pertains to each of the listed data elements. The term "extent" describes the types of roadways for which the data item is collected or can be expanded from a sample. The term "coverage" describes the highway sections for which the data item must be reported. The minimum coverage for each data item is Full Extent, Sample Panel, or Partial Extent:

Data Element	Extent	Coverage
AADT	Federal-aid highways and ramps	Full Extent
Access Control	All principal arterials and sample sections	Partial Extent
Ownership	Federal-aid highways	Full Extent
Route Signing	Federal-aid highways except urban collectors	Full Extent
Peak Lanes	Federal-aid highways	Sample Panel
Terrain Type	Rural Federal-aid highways	Sample Panel
Type Signal	Urban Federal-aid highways	Sample Panel

So essentially, there are three types of data items: (1) those with coverage for the Full Extent of the Federal-aid highways (with possible additions and exceptions), (2) those with coverage only on the HPMS Sample Panel (with possible exceptions), and (3) those with coverage for the Full Extent of some highway systems and elsewhere on the Sample Panel. For short, they are referred to as **Full Extent, Sample Panel,** and **Partial Extent** data items.

An HPMS section record represents a single data item and its corresponding value for a "section" of road. However, with few exceptions, it is not necessary that the section record have the same begin and end points matching a section in the TOPS, provided that the required coverage is accounted for. The section records that are reported for the following data items must have begin and end points that align with the limits of a TOPS section: Data Items 31-33, 43 and 45 (Number of Signals, Number of Stop Signs, Number of At-Grade-Other Intersections, Curves, and Grades).

Upon upload of the States' Section data, the HPMS software will subsequently generate the TOPS. The TOPS will then be used for sample selection purposes and to validate the Sample Panel attributes. Also, a TOPS that is

generated based on the data submitted in one year may be used in the next year for sampling purposes, except where there is a change in the limits for one or more of the required homogenous data items.

6.3 AADT Volume Group Ranges and Precision Levels

Since travel patterns within a State are dynamic and tend to vary by area type (e.g. rural, small urban, and urbanized areas), the HPMS sample selection process also changes to accommodate this fluctuation in travel patterns.

HPMS uses 12 volume groups for stratification purposes. The stratification process used for AADT data produces estimates of greater accuracy for the sample data items, when a smaller number of samples at the functional system (summation) level.

The AADT volume groups for rural, small urban, and urbanized areas, are the same for all sampled functional systems. The sampled functional systems include: Interstates, Other Freeways and Expressways, Other Principal Arterials, Minor Arterials, Major Collectors, and Urban Minor Collectors. The volume group ranges to be used for stratification purposes are listed in Table 6.1.

Table 6.1 Volume Group/AADT Ranges

Volume Group	AADT Ranges
1	Under 500
2	500 to 1,999
3	2,000 to 4,999
4	5,000 to 9,999
5	10,000 to 19,999
6	20,000 to 34,999
7	35,000 to 54,999
8	55,000 to 84,999
9	85,000 to 124,999
10	125,000 to 174,999
11	175,000 to 249,999
12	250,000 and more

There is a direct correlation between functional system and a *precision level* as shown in Table 6.2.

The term precision level is defined as “the degree of accuracy resulting from the use of a statistical sample”. For example, if a sample is designed at the 90-10 confidence interval and precision rate, the resultant sample estimate will be within ±10 percent of the true value, 90 percent of the time.

There are precision levels defined, for the purposes of HPMS, which apply to each Functional System listed in Table 6.2. A statistical formula is used to determine the estimated required number of samples needed to meet the target precision level, within each volume group for a given Functional System. This formula is discussed in Section 6.4.

The size of the HPMS sample is based on three components: (1) the variability (i.e. coefficient of variance) of AADT within a volume group, (2) the functional system confidence interval and precision level, and (3) the number of TOPS sections in a volume group, available for sampling.

Sample size requirements by functional system will vary from State to State according to the total number of TOPS sections, the number of predetermined volume groups, the validity of the State's AADT data, and the desired precision level. The HPMS sample size requirements are more stringent for the principal arterial systems, where a higher level of precision is needed due to their national significance.

Typically, the State-wide summation of individual urbanized functional system data element estimates will result in an overall precision level of at least 80-10 (or 70-15 for States having three or more urbanized areas with population < 200,000).

Higher precision is necessary to obtain comparable urban and rural precision levels, on a State-wide basis, and to obtain precision levels that can adequately accommodate desired levels of accuracy for estimates of proportionate values as well as average and aggregate values. That is, although the HPMS sample is designed to measure AADT, the same samples are used to estimate the proportionate values for other types of data such as pavement condition. The level of accuracy for estimated proportions is closely related to sample size. Therefore, precision levels have been set high enough to produce reasonable proportionate estimates at the functional system level. It is important to remember that the absence of Sample Panel data, where it is required to be reported, will degrade the sample precision.

The required precision levels are listed in Table 6.2.

Table 6.2 Precision Levels

	Interstate	Other Freeways and Expressways	Other Principal Arterial	Minor Arterial	Major Collector	Minor Collector
RURAL	90-5	90-5	90-5	90-10	80-10	–
SMALL URBAN	90-5	90-5	90-5	90-10	80-10	80-10
URBANIZED < 200,000 population	80-10	80-10	80-10	80-10 or 70-15*	80-10 or 70-15*	80-10 or 70-15*
URBANIZED ≥ 200,000 population	90-10	90-10	90-10	90-10	80-10	80-10

*These precision levels will be applied if a State has three or more urbanized areas with a population < 200,000.

6.4 Sample Size Estimation Procedures

This section describes how the sample size estimates for each stratum, with a desired confidence level, can be derived using an estimation formula and/or the HPMS software. The formula and each of its input variables are described below.

Sample Size Estimation formula:

$$n = \frac{\left(\frac{Z^2C^2}{d^2}\right)}{1+\left(\frac{1}{N}\right)\left(\left(\frac{Z^2C^2}{d^2}\right)-1\right)}$$

Where:

n = Required sample size

Z = Value of the standard normal statistic for an alpha confidence level (two-sided):

Table 6.3 Confidence Level

Confidence Level	Value of Z	Z Squared
90 Percent	1.645	2.706
80 Percent	1.282	1.644
70 Percent	1.040	1.082

C = AADT coefficient of variation from a State's AADT data

d = Desired precision rate (from Table 6.2)

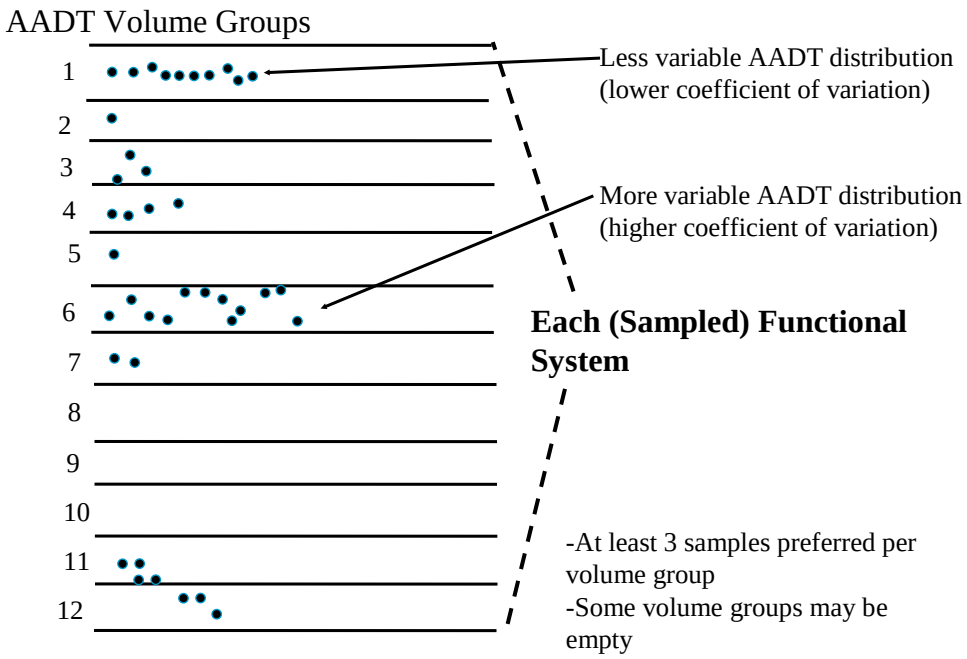
N = TOPS or population stratum size (number TOPS sections available for sampling in a volume group)

For example, the sample size for a stratum with a desired precision rate of +/–5 percent and a 90 percent confidence level, an AADT coefficient of variation of 0.40, and 300 available TOPS sections for sampling, is estimated by:

$$n = \frac{\left(\frac{(1.645)^2(0.4)^2}{(0.05)^2}\right)}{1+\left(\frac{1}{300}\right)\left(\left(\frac{(1.645)^2(0.4)^2}{(0.05)^2}\right)-1\right)} = \frac{173.18}{1+\left(\frac{172.18}{300}\right)} = 110 \text{ required samples}$$

Figure 6.2 illustrates the potential degrees of variability of AADT data by volume group with respect to each sampled functional system. Each dot represents an AADT record in the Sample Panel. In this example, less variation in the AADT distribution for samples (as shown in volume group 1) produces a lower coefficient of variation, while more variation in the AADT distribution (as shown in volume group 6) produces a higher coefficient of variation. Note that empty volume groups may exist across functional systems, (e.g. volume groups 8, 9, and 10). However, if three samples or fewer exist in a given volume group, then all three must be used for sampling purposes (minimum requirement).

Figure 6.2 AADT Volume Groups



The critical point in this process is the value designation of *C,* the AADT coefficient of variation. The procedures presented in this discussion require an estimation of AADT coefficients of variation based on the latest State data. This approach ensures that the results are up to date, based on the latest information, and are tailored to the specific State.

Estimates of the AADT coefficients of variation for a particular State can be derived from its existing HPMS data using standard statistical software packages. Note, the coefficients of variation will be generated via the HPMS software, which uses a State's Full Extent data as inputs to standard statistical procedures, and produces reports that enable the State to analyze and review the HPMS Sample Panel.

The HPMS software is also capable of identifying the location potential sample sections using a GIS-based spatial analysis procedure. The TOPS will be created via the software, which will then be made available to the States (via the HPMS software) for sample selection purposes. Furthermore, the software uses the TOPS to calculate and determine the number of samples required in each volume group. There are a number of advantages to leveraging the GIS component of the data model for sampling purposes, which are explained in more detail in the next section on Sample Adequacy and Maintenance.

6.5 Sample Adequacy and Maintenance

Each HPMS section should be relatively homogeneous as to geometrics, traffic volume, cross-section, and condition, and should be long enough to constitute a logical section for National-level analysis purposes.

In general:

- The length for a rural section should range from 0.3 to 10.0 miles.
- The length for a section that is an urban access controlled facility typically should not exceed 5.0 miles.
- The length for all other urban sections should range from 0.1 to 3.0 miles.

These suggested lengths are intended to normalize the sample data at a national level. Shorter sections may be warranted where there are breaks in homogenous roadway elements. Conversely, longer sections reduce the number of TOPS sections and result in a somewhat smaller number of initial samples. However, longer sections may need to be split in later years in order to maintain sample homogeneity, which will increase the number of sampling units within the Sample Panel and may result in an increase in the required number of samples.

It is important to precisely document the exact location of each sampled section to assure that yearly and cyclical updates, field reviews, traffic counts, etc., are performed on the appropriate roadway sections.

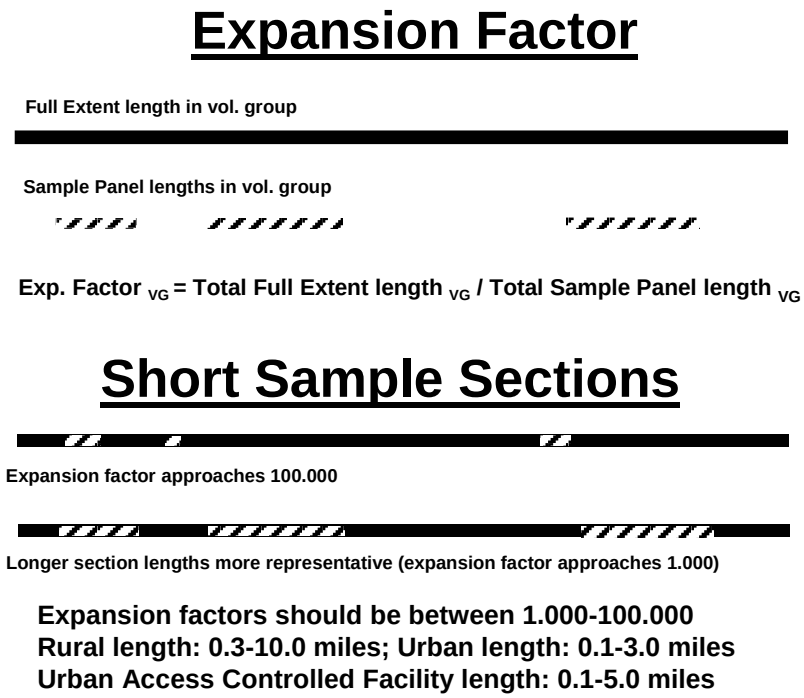
Sample adequacy and maintenance is a process that should be integrated as part of the routine data management activities of the State throughout the year. Once the State has uploaded HPMS data, the HPMS software will produce the TOPS and this information will be available to the States (as discussed in Section 6.2). The States will need to then review their sample framework to determine the necessary adjustments and add new sample sections as needed, prior to the next HPMS submittal cycle. Some of the guidelines recommended by FHWA for the States to adhere to include the following:

- Provide a 5-10 percent sample surplus per volume group, if possible.
- Add/delete samples as needed using a random process.
- Provide their sample deletion plan to FHWA for the review of any significant deletions.
- Check for un-sampled, under-sampled, and over-sampled volume groups.
- Ensure a minimum of 3 samples per volume group; sample all if there are < 3 samples in a volume group.
- Maintain a maximum expansion factor of 100.000 (see explanation below).

The purpose of the HPMS Sample Panel is to provide an expandable base for rural, small urban and urbanized area data in each State, stratified by functional system and traffic volume group. An expansion factor is calculated for each volume stratum within each functional system. This is accomplished by dividing the total miles in the stratum by the miles included in that stratum's sample. States are encouraged to not exceed a maximum expansion factor of 100.000; otherwise, it is possible that the TOPS would be too sparse for adequate representation. States must avoid having no sample in a traffic volume group with mileage in the State, because that traffic volume group cannot be expanded and the mileage is missing.

Figure 6.3 illustrates the Expansion Factor calculation, using the Full Extent and Sample Panel lengths, and the effect of excessively short Sample Panel lengths.

Figure 6.3 Expansion Factor



Expansion factors should be between 1.000-100.000
Rural length: 0.3-10.0 miles; Urban length: 0.1-3.0 miles
Urban Access Controlled Facility length: 0.1-5.0 miles

As shown in the top part of Figure 6.3, the total Full Extent length in each stratum is a known value based on the AADT volume group identifier. Expansion factors are calculated by the HPMS software for each sample section. The expansion factor allows sample data to be expanded to represent entire functional systems for rural, small urban and urbanized areas. The lower part of the figure illustrates that if there is a prevalence of short Sample Panel sections in a given volume group, the net effect is an expansion factor that will approach or exceed 100.000. Note that a prevalence of longer Sample Panel sections in a volume group will thus have the effect of lowering the expansion factor towards or equaling 1.000.

Sampling Rural and Small Urban Areas

Both rural and small urban area data are to be sampled on a statewide basis, and stratified only by functional system and volume group. The volume group for each roadway section in the sampling frame will be identified in the HPMS software, according to Table 6.1. The number of sections to be included in the sample is determined using the calculation procedure described in Section 6.4. A minimum of three sample sections is required for each volume group. If less than three TOPS sections exist in a volume group; it is recommended that they all be sampled, which will result in an expansion factor of 1.000. Sections should be selected randomly within each volume group for a given functional system, until the required number of samples is reached.

Sampling Individual Urbanized Areas

Urbanized area data are sampled on an individual area basis stratified by functional system and volume group. Each State must individually sample urbanized areas regardless of population size. The volume group for each roadway section and the required precision levels in the sampling frame must be identified according to Table 6.1 and Table 6.2, respectively, before sample selection can begin.

The number of sections to be included in the sample is determined using the calculation procedure described in Section 6.4. As with rural and small urban areas, sections should be selected randomly within each volume group for a given functional system, until the required number of samples is reached.

Each State must sample its portion of a multi-State urbanized area individually; an individual sampling approach must be applied to all parts of multi-State urbanized areas if expanded estimates are needed for the entire urbanized area.

Sample Maintenance

An HPMS sample adequacy review should be performed annually as part of a State's sample maintenance activities. The review should be completed shortly after the annual submittal of the HPMS dataset to address any potential deficiencies, prior to the next annual submittal. This permits the data provider to assess the adequacy of the sample framework (i.e. TOPS), which allows enough time for changes to be made in preparation for the next reporting cycle. Timing of the State's HPMS data processing is an important issue since sampling is dependent to a certain degree upon up-to-date traffic and functional classification data. There should be a number of considerations when reviewing HPMS sample adequacy. These considerations should include not only the assessment of the number of samples per volume group, but also a check for potential sample biases.

When conducting a sampling review, the State should also check for biases that may have been inadvertently introduced into the sample. As a result, sample bias may have been introduced in areas such as samples on State versus non-State-owned roads, sub-area biases by highway district, county, or non-random selection of adjacent roadway sections as new samples. Some of these biases may be disclosed by comparing the number of miles sampled. For example, the percent of State-owned miles sampled could be compared with the percent of non-State-owned miles sampled. Others may require a more detailed examination of the sample and its distribution. For instance, are samples clustered in groups on the same facility? A periodic review of the sample provides an opportunity to identify if any of these problems exist. As further changes are made to the HPMS sample, any biased sample selection procedures should be eliminated to improve sample randomness.

Need for Sample Panel Adjustments

There are any numbers of occurrences that may result in a need to reconsider the suitability of the existing Sample Panel. Some of the more common reasons for considering Sample Panel adjustments include:

- The decennial census of population is likely to require changes in the HPMS sample frame. The sampling basis may need to change because the numbers of small urban areas and individual urbanized areas may change, and/or the FHWA approved, adjusted Census urban boundaries of existing urban areas may be altered.

- The addition of new areas and the expansion of current urban boundaries are likely to require the functional reclassification of roadways within the new boundaries. This will in turn likely require transferring Sample Panel sections from one area's Sample Panel to another and randomly selecting additional samples to satisfy urban area requirements. Also, the loss of samples caused by movement from rural to small urban or from rural or small urban to urbanized areas may cause a deficiency in the rural or small urban area Sample Panels.

- Changes in the existing functional system length and HPMS Sample Panels are likely to result from functional reclassification, non-Census-related changes in urban boundaries, or the addition of newly constructed roadways.

- Migration of sections among and between volume groups may also result in a need to change HPMS Sample Panels. Each volume group contained within in a functional system is a separate sampling framework. Typically, there should be only minor changes in Sample Panel section and Full Extent length assignments to specific volume groups as a result of traffic increases or decreases within a period of three years. Full Extent AADT information for each roadway section must be kept up-to-date, so that the correct volume group reassignments can be made.

A thorough sample adequacy review, conducted annually, provides an opportunity to update the HPMS Sample Panels when necessary to meet the changed conditions reflected above.

Making Sample Panel Adjustments

Sample Panel adjustments should be made as necessary upon completion of a sample adequacy review. Use of an annual cycle will minimize the burden of completing this task. The following general procedures should be considered when adjusting Sample Panels:

- Check roadway sections that have moved from rural areas into new or expanded urban/urbanized areas or out of condensed urban areas into rural areas. Use appropriate sampling criteria and good engineering judgment to determine the extent of change warranted.
- Transfer rural, urban, or urbanized sample sections that have moved from one area type to another.

When small urban or urbanized areas decrease in size, changes to small urban or rural Sample Panels will occur. Therefore, Sample Panel sections affected by such changes should be assigned correctly in the new panel.

Advantages of Using Geospatial Data for Sample Selection Purposes

Geospatial data can be used as reference information for the purpose of making adjustments to the Sample Panel. States can overlay existing rural and urban geospatial boundary data on the routes spatial data to identify potential sample sections located in a given area. The States will then have the option to code rural/ urban area information for their section data based on the boundary data. However, the States will need to ensure that this data is accurate before using it for coding purposes. Alternatively, the States can manually code this information for their section data.

The ability of the HPMS software to generate the TOPS should reduce the amount of time that the States are required to spend selecting new samples. Additionally, the software calculates the number of samples needed in each volume group, using the formula defined in Section 6.4.

The following provides an outline of the steps involved in the preparation of the Sample Panel:

1 - States will check each of the following data items to ensure that they are properly coded in the Sections dataset for FHWA sample adequacy analysis purposes:

Functional System

Urban Code

Facility Type

Through Lanes

AADT

2 - States will use the TOPS (HPMS software generated) for review and analysis, and the selection of new samples.

3 - The HPMS software will calculate the Volume Groups and will determine the number of samples required in each volume group, using the formula discussed in Section 6.4.

4 - Additional calculations will be performed by the HPMS software and reports will be generated for review by the States.

Selecting Additional Samples

The selection of additional sample sections for a given volume group is straightforward for most Sample Panel updates. The TOPS is generated by the HPMS software. Therefore, the number of existing sample sections can be compared to the required number of samples as determined from the Sample Size Estimation formula, and additional samples can be selected as needed. Again, maintaining accurate AADTs requires the States and other data providers to maintain comprehensive, high quality traffic count programs (see Chapter 5).

Sample Permanence

Sample sections transferred to other geographic areas become part of the Sample Panel for those areas. Samples may be dropped in cases where a roadway is truly abandoned and not relocated, where sample sections are reclassified to a minor collector (rural) or local functional systems, or where sample sections are dropped from use as a result of a sample reduction plan. When samples are deleted, the State must submit a list specifying the ID numbers for those samples, the reasons for the deletions, and the locations for where the deletions will occur. Significant deletions of samples should be approved by FHWA prior to actual deletion of the samples.

Deleting Samples

The Sample Panel has been in existence for some time, therefore the addition of samples and the re-assignment Sample Panel sections from one volume group to another are likely to have caused over-sampling in some volume groups. Significant over-sampling is not encouraged because of cost and efficiency impacts. Sample reductions should be considered a normal component of sample maintenance. Before proceeding with a sample reduction exercise, the State should prepare a sample reduction plan and provide it to the FHWA for evaluation. A sample reduction plan should take into account the following:

1 - All sampling criteria must be met. Sample size requirements are calculated using the Sample Size Estimation Procedures described in Section 6.4, and must be maintained for each standard sample functional system.

2 - AADT data must be updated annually to ensure the correct volume group assignment.

3 - Individual volume group reductions resulting in less than three sample sections in any volume group should not be considered. A minimum of three samples per volume group must be maintained.

4 - Random deletion of the samples within each over-sampled volume group is required. As noted above, it is recommended that a surplus of 5 to 10 percent of samples be maintained to absorb future AADT changes, etc.

5 - Trends of Sample Panel section migration among volume groups should be examined. Volume groups that continually lose samples may warrant retaining a few excess samples.

6 - An expansion factor maximum of 100.000 should be observed.

7 - A State using the HPMS database for other purposes may want to keep an over-sampled Sample Panel intact or consider using higher precision levels.

8 - The sample reduction process may require more effort than the apparent resulting benefit of maintaining fewer samples. However, a periodic review and adjustment of the sample is needed to maintain the overall viability of the HPMS sample program.

9 - A sample reduction should be considered as part of the annual sample review process.

Eliminating Excessively Short and Long Sample Sections

As part of sample maintenance activities, sample sections should be analyzed to see if they are excessively short in length. Short samples not meeting minimum length recommendations should be lengthened into longer sample sections if they have similar roadway characteristics and the following key data items are homogenous: Urban Code, Functional System, Facility Type, AADT, and Through Lanes. While it is assumed that the TOPS as generated by the HPMS software will produce candidate sample sections based on these items, it is still possible that the resulting lengths may not meet the minimum recommended. In these cases, the AADT should be examined from the perspective of the source data to see if it can be re-calculated based on an extended sample section length that meets length recommendations while maintaining the homogeneity of the other data items. A reduction in an excessive number of short samples may save the State financial and personnel resources, and will ultimately improve sample representation.

For sample sections that are excessively longer than the recommended sample section length, effort should be made to reduce the length of the sample sections by considering subdividing the HPMS software-generated TOPS section(s) in question into one or more sections, based on a homogenous data item that meets the recommended length. In this way, the software-generated TOPS section may be subdivided based on AADT as long as the resulting subdivided section meets the recommended length. However, if no data item changes in value over the excessively long section, there is no need to subdivide the section for HPMS purposes. For example, if a 20 mile rural section is selected from the software-generated TOPS, the section should be subdivided into 2 or more (each not to be less than the minimum length or exceed the maximum) sections based on a non-homogenously-required data item, such as pavement type, if possible.

Updating Expansion Factors

When updating Sample Panels, any change in sample length and/or the length of the sampling frame requires an update of the expansion factors related to affected volume groups. Expansion factors should be recalculated before the annual HPMS submittal to ensure that all changes to AADT data, whatever the cause, have been properly accommodated. Expansion factor recalculation is one of the final data preparation steps when using the HPMS software.

A Tabular Summary

Table 6.4 provides an overview of conditions which generally require making changes to HPMS Sample Panels. The table lists the changes triggered either directly or indirectly by Bureau of Census actions, and by changes unrelated to Census actions. It should be noted that the impact of the Census' actions may be minor in nature due to the simplification of the urban/rural area boundary coding process. Furthermore, the table outlines the "Causes" for potential Sample Panel change and the "Recommendations" for how to address the change.

Table 6.4 Sample Panel Change Cause/Recommendation

CAUSE	RECOMMENDATION
CENSUS-RELATED	
New Small Urban Areas (Rural to Small Urban)	Adjust all rural sample section records within the new area to urban requirements. Verify statewide rural and small urban area Sample and Full Extent bases and select additional samples as necessary.
New Urbanized Areas (Small Urban and/or Rural to Urbanized)	Adjust all rural and small urban area Sample Panel section records within the new area to urbanized area requirements. Procedures for drawing new standard samples for individual panels are discussed above. Verify all Sample Panel and Full Extent bases and select additional samples as necessary.
Expansion of the Adjusted Boundaries of Small Urban or Urbanized Areas (Rural to Small Urban and Rural and/or Small Urban to Urbanized)	Adjust all affected rural sample section records to urban requirements. Verify all affected Sample Panel and Full Extent bases and select additional samples as necessary.
Functional System Reclassification-Any Area	Reassign reclassified sections (TOPS and Sample Panel) to appropriate areas and volume groups. Sample new sections as necessary to maintain required volume group precision levels.
Losses in Urban Population	No action until Census area designation changes.
Major Revision of Boundaries Based on New Census	Redraw Sample Panel and include old samples, if possible.
Changes or Additions to Maintenance Area(s).	Updates to the samples are made based on the procedures outlined in this chapter.
NON-CENSUS-RELATED	
New Length by Functional System	Verify Sample Panel and Full Extent base; sample new sections, if necessary.
Functional System Reclassification in Any Area	In addition to the movement of sections because of reclassification, there may be a need for possible volume group changes for TOPS and/or Sample Panel sections, precision level changes, and additional samples.
AADT Reassignment of Sections	Reassign sample sections but no further action is needed if changes are minor. If changes are major, verify volume group Sample Panel and Full Extent bases for all affected volume groups and add samples, if necessary.
Expansion Factor	Recalculate expansion factor values for sample section records in the affected group.

Chapter 7 SOFTWARE WORKFLOW & SUBMITTAL PROCESS

7.1 Overview

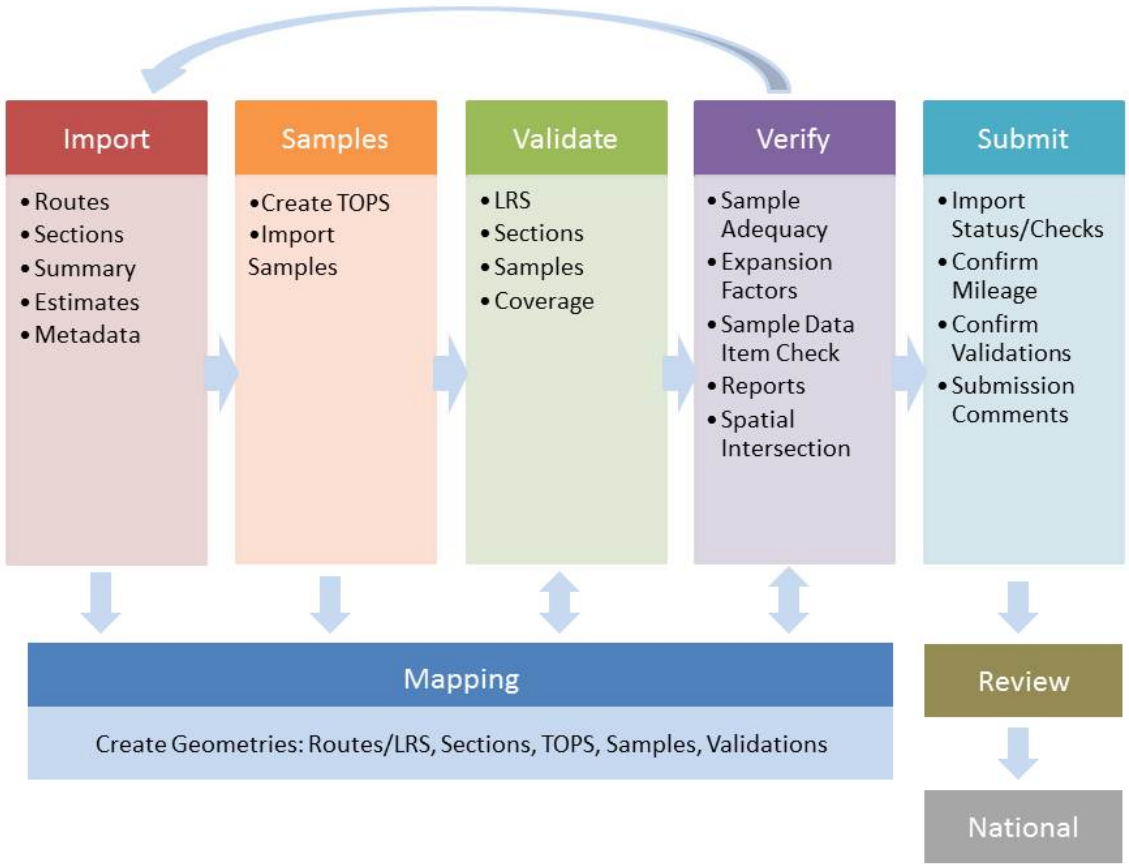
This chapter provides a macro-level overview of the HPMS software-related workflow that is associated with the preparation of the HPMS annual submittal. In addition, this chapter provides some basic examples of the types of validation checks that will be performed on the data by the HPMS software upon submittal. Finally, this chapter provides information on what the States should expect in terms of feedback, once their submittal has been validated and accepted by FHWA. For additional instructions regarding the use of the HPMS software, please consult the *HPMS Software Guide* which can be accessed via the FHWA HPMS Community of Practice (COP) website.

7.2 Submittal Process

In general, the HPMS submittal process is applicable for all States. However, certain components of the submittal preparation may vary from State to State. For example, a State may or may not include the use of data from external sources such as Metropolitan Planning Organizations (MPOs). Therefore, each State establishes its own procedures for developing their HPMS submittal files. Ultimately, these procedures must result in the submittal of various types of roadway condition and performance attribute data in a Character-Separated Value (CSV) file format. This must include data for all Federal-aid and National Highway System (NHS) routes, excluding those that are functionally classified as minor collector in rural areas or local in any area. Once the CSV file has been created, it must then be submitted via the HPMS software web application. States are required to obtain a User Profile Access Control System (UPACS) Login ID and Password in order to access the HPMS software (via UPACS). States should contact their respective FHWA Division Office to request access or contact the FHWA Office of Highway Policy Information UPACS Representative at 202-366-0175.

The submittal process involves a series of sequential steps, which includes a validation of the attribute data (i.e. Sections data) and LRS network data, which occurs during the initial upload phase of the submittal process. The data is then further validated, for quality assurance/quality control purposes, after the data has been uploaded. A series of reports identifying all of the records in each file that failed validation will then be generated by the HPMS software and provided to the States via the HPMS software web application to be used for the purpose of resolving the remaining issues.

Figure 7.1 Software Workflow Diagram



The steps associated with the annual HPMS submittal (listed in no particular sequence) are discussed below:

1) Load **Routes** Data (ESRI shapefile, ESRI geodatabase, or Intergraph GeoMedia Access Warehouse)

   i. This step involves the loading of the LRS network (i.e. the Routes Dataset) using the Import Module in the HPMS software web application. The States have the option of submitting either a single LRS network dataset containing all of the routes in their respective network, or multiple datasets containing selected routes in their respective network. However, the States must provide a single range of measures (milepoints) for each individual route. This information will be used to generate mileage totals for the purpose of validating the Certified Mileage totals reported by the States.

   ii. Once the routes are loaded, a series of validation checks will be performed to ensure that the measures associated with the routes are logical. The system will only allow the routes that pass the validation checks to be submitted. The system will then generate a report listing all of the routes that will require attention before the system will allow them to be submitted. Upon re-loading of the revised routes, the software will confirm whether or not the routes pass validation and can ultimately be submitted.

2) Load **Sections** Data (CSV files)

   i. This step involves the loading of the Sections data (i.e. roadway attributes), using the Import Module in the HPMS software web application. The States have the option of submitting either a single CSV file containing their Sections data in its entirety, or multiple CSV files containing

certain data items within the scope of their Sections data. The following data items reported in the Sections data will be used to generate the Table of Potential Samples (T.O.P.S) as discussed in Chapter 6:

- Functional System
- Annual Average Daily Traffic (AADT)
- Facility Type
- Through Lanes
- Urban Code

ii. Once the CSV file(s) are loaded, a series of validation cross checks will be performed to ensure that the values/codes provided for the key attributes (i.e. data items) are logical. All of the validation cross checks must be addressed before the Sections data can ultimately be submitted.

3) Load Non-Sections Data (CSV files)
   a) Enter **Summary** data using the Import Module in the HPMS software web application.
   b) Enter **Estimates** data using the Import Module in the HPMS software web application.
   c) Enter **Metadata** using the Import Module in the HPMS software web application.
4) Load **Sample Panel Identification Data** (CSV file)
5) Validate LRS, Sections, and Sample Data
6) Verify Sample Data Components
7) Submit the Data

7.3 Software Validations

The HPMS software web application will perform a series of validation checks on the States' Sections and LRS network (i.e. the Routes dataset) during the initial phase of the submittal process. Validation reports will be generated during this process, which will provide the States with a summary of the records and routes in the respective datasets that do not pass the validation checks. The States must then address the erroneous records and/or routes within their respective database(s) and re-submit them either individually, or as a batch re-submittal via the HPMS software web application.

The validation process checks records in the Sections dataset for various data items to ensure that the values/codes entered for those items are correctly formatted. The validation process also ensures that all required values/codes have been reported for those data items, and that the values/codes reported are logical in-terms of how they relate to other key data items. A list of the validation checks are contained within the *HPMS Software Guide*.

Additionally, the validation process will check each route in the LRS network to ensure that: (1) measures are present over the entire extent of each route, (2) measures are consistently increasing over the entire extent of the route (i.e. origin to terminus), and (3) measures fall within the range of values defined by the route's minimum and maximum measures. Other validation checks performed on the LRS network data are identified in the *HPMS Software Guide*.

7.4 Post-Submittal Expectations

Once the States' HPMS submittal has been accepted, FHWA will conduct a review of the submittal file for Quality Assurance/Quality Control (QA/QC) purposes. FHWA will then develop a summary of the anomalies that are discovered during the review process which will need to be addressed by the States either in the near-term, or in the next annual submittal. This information will then be communicated to the States via official FHWA correspondence which will specify any actions that must be taken pertaining to the current submittal and prior to the next submittal. The States must then prepare an official response to FHWA's correspondence and forward it to FHWA for the official record.

Appendix A. Acronyms

AADT	Annual Average Daily Traffic
AADTT	Annual Average Daily Truck Traffic
AASHTO	American Association of State Highway Transportation Officials
AC	Asphalt-Concrete
ASTM	American Society of Testing and Materials
ATR	Automated Traffic Recorder
AVC	Automatic Vehicle Classification
CAA	Clean Air Act
CFR	Code of Federal Regulations
Col	Collector
COP	Community of Practice
CRCP	Continuously Reinforced Concrete Pavement
CSV	Comma Separated Value
DOT	Department of Transportation
DVMT	Daily Vehicle-Miles of Travel
EPA	Environmental Protection Agency
FC	Functional Classification
FE	Full Extent
FE + R	Full Extent including Ramps
FHWA	Federal Highway Administration
FIPS	Federal Information Processing Standards
GIS	Geographic Information System
GML	Geography Markup Language
HERS	Highway Economic Requirements System
HCM	Highway Capacity Manual

HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HPMS	Highway Performance Monitoring System
Int	Interstate
IRI	International Roughness Index
ITS	Intelligent Transportation Systems
JPCP	Jointed Plain Concrete Pavement
JRCP	Jointed Reinforced Concrete Pavement
Loc	Local
LRS	Linear Referencing System
LTPP	Long Term Pavement Performance
MA	Minor Arterial
MaC	Major Collector
MiC	Minor Collector
MPO	Metropolitan Planning Organization
MRI	Mean Roughness Index
NAAQS	National Ambient Air Quality Standards
NBI	National Bridge Inventory
NHS	National Highway System
NN	National Freight Network
OFE	Other Freeways and Expressways
OGC	Open Geospatial Consortium
OPA	Other Principal Arterial
PAS	Principal Arterial System
PCC	Portland Concrete Cement
PK	Primary Key
PMS	Pavement Management System

PSR	Present Serviceability Rating
SHA	State Highway Agency/Administration
SHRP	Strategic Highway Research Program
SP	Sample Panel
STRAHNET	Strategic Highway Network
TEA-21	Transportation Equity Act for the 21st Century
TMG	Traffic Monitoring Guide
TOPS	Table of Potential Samples
UK	Unique Key
U.S.C.	United States Code
VMT	Vehicle Miles of Travel
VPI	Vertical Point of Intersection
WBT	Well Known Binary
WDS	Weighted Design Speed
WIM	Weigh-in-Motion
WKT	Well Known Text

Appendix B. Glossary

Adjusted Census Urban Boundary – Designated boundaries of a Census urban place or urbanized area as adjusted by responsible State and local officials in cooperation with each other, subject to the approval by FHWA (23 U.S.C. 101). Urban and rural data in HPMS must be reported in accordance with FWHA-approved adjusted boundaries.

Aggregation Business Rule – Describes how the national HPMS database and software will aggregate data as the sample view is created. Typical rules include: weighted average, predominance, proportional, or summation.

Certification of Public Road Mileage – An annual document furnished by each State to FHWA certifying the total public road length in the State as of December 31st. This document is to be signed by the Governor of the State or by his/her designee and provided to FHWA by June 1st of the year following (23 CFR 460). For additional clarification, this glossary also contains the definition of a "public road".

Collection Cycle – The period for which the data are collected; typically annually or every 2 or 3 years. This is in contrast to the HPMS reporting cycle which is annual for all data.

Comment File – A text file that accompanies the HPMS data submittal to FHWA. It explains data issues, problems, deficiencies, unusual conditions, and any significant changes from the previous HPMS submittal. It should be provided as an electronic file attached to the HPMS submittal.

Divided Highway – A multi-lane facility with a curbed or positive barrier median, or a median that is at least 4 feet in width.

English Units – The term "English" refers to the United States legislative interpretation of U.S. customary units as defined in a document prepared by the National Institute of Standards and Technology (NIST), U.S. Department of Commerce, Special Publication 330. Commonly used English units in HPMS are miles, feet, and inches.

Extent – Spatial coverage for which the data are to be reported: functional system, NHS, Sample, paved etc.

Federal-aid highways – All NHS routes and other roads functionally classified as Interstate, Other Freeways & Expressways, Other Principal Arterials, Minor Arterials, Major Collectors, and Urban Minor Collectors.

Full Extent – A population comprised of all sections of a functional system of public roads, which serves as a statistical universe for HPMS sampling and census data collection

Full Extent Data – Data that are collected in a census of a whole population, which for HPMS means data collected on all sections of a functional system of public roads.

Functional Systems – Functional systems result from the grouping of highways by the character of service they provide. The functional systems designated by the States in accordance with 23 CFR 470 are used in the HPMS. Guidance criteria and procedures are provided in the FHWA publication *Highway Functional Classification: Concepts, Criteria, and Procedures*, http://www.fhwa.dot.gov/planning/fctoc.htm.~~March 1989, as amended. In addition, interim guidance has been issued by FHWA, October 2008.~~

Geographic Information System (GIS) – A system for the management, display, and analysis of spatial information.

Geospatial Data – The HPMS geospatial data provide a linear referencing system for the full extent and sample panel data on selected highway functional systems. The represented functional systems include Interstate, Other Freeways & Expressways, Other Principal Arterials, Minor Arterials, Major Collectors, Urban Minor Collectors, and all National Highway System (NHS) routes and connectors. This permits the national HPMS database to be utilized and maintained in a GIS environment.

Highway – The term highway includes roads, streets, and parkways and all their appurtenances (23 U.S.C. 101).

Linear Referencing System (LRS) – A set of procedures for determining and retaining a record of specific points along a highway. Typical methods used are milepoint, milepost, reference point, and link-node.

Metadata – Describes how data are collected or converted for reporting; explains variations in data that do not warrant the establishment of a collection requirement (e.g., type of equipment used, sampling frequency etc.)

National Ambient Air Quality Standards (NAAQS) Non-attainment Area – Any geographic region of the United States which has been designated under Section 107 of the Clean Air Act (CAA) for any pollutant for which a national ambient air quality standard exists. The national HPMS database is used for travel tracking for air quality assurance purposes in non-attainment and maintenance areas as required by EPA under the 1990 Clean Air Amendments Act (Section 187) and the Transportation Conformity Rule, 40 CFR parts 51 and 93. More specifically, these data are used primarily for establishing regional transportation-related emissions for transportation conformity purposes. Estimated travel based on these data is used for calibration and validation of base-year network travel models when required for non-attainment or maintenance areas.

National Highway System (NHS) – The National Highway System is a network of nationally significant highways approved by Congress in the National Highway System Designation Act of 1995. It includes the Interstate System and over 117,000 miles of other roads and connectors to major intermodal terminals. All NHS routes and connectors must be identified in the HPMS.

National Network – These are the routes designated for use by dimensioned commercial vehicles under the Surface Transportation Assistance Act (STAA) of 1982 as identified in 23 CFR 658, Appendix A. Nationally designated truck routes include the Interstate System (a few sections are exempted by Federal law in Minnesota, Virginia, and District of Columbia); non-Interstate routes specifically listed in 23 CFR, Appendix A, as amended, and the other non-Interstate existing Federal-aid Primary (FAP) routes as defined prior to June 1, 1991, that STAA-dimensioned commercial vehicles may legally operate on.

- Some States have allowed STAA-dimensioned commercial vehicles to operate on other State routes. These and other non-national truck network roads used between the STAA national network and terminals and facilities for food, fuel, repairs, and rest under the reasonable access rule are not nationally designated truck routes. These routes are not to be included.

PK – Primary Key – Used to indicate which fields of data within a table are to be used for establishing relationships with other tables in a database environment.

Public Road – A public road is any road or street owned and maintained by a public authority and open to public travel. [23 U.S.C. 101(a)] Under this definition, a ferryboat route is not a public road.

- The term “maintenance” means the preservation of the entire highway, including surfaces, shoulders, roadsides, structures, and such traffic-control devices as are necessary for safe and efficient utilization of the highway. [23 U.S.C. 101(a)]

- To be open to public travel, a road section must be available, except during scheduled periods, extreme weather, or emergency conditions, passable by four-wheel standard passenger cars, and open to the general public for use without restrictive gates, prohibitive signs, or regulation other than restrictions based on size, weight, or class of registration. Toll plazas of public toll roads are not considered restrictive gates. [23 CFR 460.2(c)]
- A public authority is defined as a Federal, State, county, town or township, Indian tribe, municipal or other local government, or instrumentality with authority to finance, build, operate, or maintain toll or toll-free facilities. [23 U.S.C. 101(a)]

Roadway – The portion of a highway intended for vehicular use.

Rural Areas – All areas of a State outside of the FHWA-approved adjusted Census boundaries of small urban and urbanized areas.

Sample Panel – A collection of designated roadway sections within a system of public roads that is stable over time and is used to estimate attributes for the entire system.

Small Urban Areas – Small urban areas are defined by Census as places that have an urban population of 5,000 to 49,999 (except in the case of cities in Maine and New Hampshire) outside of urbanized areas. As a minimum, a small urban area includes any place containing an urban population of at least 5,000 as designated by Census. Designated boundaries of an urban place (or urban cluster) can be adjusted by responsible State officials subject to approval by FHWA (23 U.S.C. 101). Urban and rural data in HPMS must be reported in accordance with FHWA-approved adjusted boundaries. Area revisions as needed are expected to be submitted especially shortly after the latest Decennial (or special) Census information becomes available.

State (Codes) – The term "State" refers to any one of the 50 States, the District of Columbia, or the Commonwealth of Puerto Rico. The Federal Information Processing Standard Codes for States (FIPS PUB 5-2) are included in Appendix C.

Strategic Highway Network (STRAHNET) – The STRAHNET includes highways which are important to the United States strategic defense policy and which provide defense access, continuity, and emergency capabilities for the movement of personnel, materials, and equipment in both peacetime and war time.

Summary Data – These data consist of annual summary reports for certain data not included in the HPMS full extent and sample panel data set for the rural minor collector and local functional systems. These additional data are derived from State and local sources such as statewide highway databases, management systems, Intelligent Transportation Systems (ITS) and traffic monitoring systems, and data made available from local governments and MPOs.

Table of Potential Samples – A collection of roadway sections spanning the public road network that provides the sampling frame for selection of the Sample Panel.

Urban Areas – All urban places (or clusters) of 5,000 or more population and Urbanized areas. These are the small urban and urbanized areas within the State.

Urbanized Areas and Codes – Areas with a population of 50,000 or more, as designated by the Census. An FHWA-approved adjusted urbanized area includes the Census urbanized area plus transportation centers, shopping centers, major places of employment, satellite communities, and other major trip generators near the edge of the urbanized area, including those expected to be in place in the near future. Urbanized area codes are

included in Chapter 4. For multi-State urbanized areas, each State must report HPMS information for the portion of the FHWA-approved adjusted urbanized area within its State boundary. Area revisions as needed should be submitted especially shortly after the latest Decennial (or special) Census information becomes available. New codes for new or modified areas will be issued based on Census changes.

U.S. Territories – The U.S. Territories include American Samoa, Guam, the Commonwealth of the Northern Marianas, and the Virgin Islands of the United States. The Federal Information Processing Standard Codes (FIPS PUB 5-2) are included in Appendix C.

Appendix C. Table of Federal Information Processing Standard (FIPS) Codes for States (FIPS PUB 5-2)

FIPS PUB 5-2, Federal Information Processing Standard Publication, 1987 May 28, U.S. Department of Commerce, National Bureau of Standards.

Code	Description	Code	Description
1	Alabama	32	Nevada
2	Alaska	33	New Hampshire
4	Arizona	34	New Jersey
5	Arkansas	35	New Mexico
6	California	36	New York
8	Colorado	37	North Carolina
9	Connecticut	38	North Dakota
10	Delaware	39	Ohio
11	District of Columbia	40	Oklahoma
12	Florida	41	Oregon
13	Georgia	42	Pennsylvania
15	Hawaii	44	Rhode Island
16	Idaho	45	South Carolina
17	Illinois	46	South Dakota
18	Indiana	47	Tennessee
19	Iowa	48	Texas
20	Kansas	49	Utah
21	Kentucky	50	Vermont
22	Louisiana	51	Virginia
23	Maine	53	Washington
24	Maryland	54	West Virginia
25	Massachusetts	55	Wisconsin
26	Michigan	56	Wyoming
27	Minnesota	60	American Samoa
28	Mississippi	66	Guam
29	Missouri	69	Northern Mariana Islands
30	Montana	72	Puerto Rico
31	Nebraska	78	Virgin Islands of the U.S.

Appendix D. Toll-ID Table

This table will be updated by FHWA as additional facilities are added.

State FIPS	HPMS Toll ID	Name of Toll Facility
1	1	Alabama River Parkway Bridge
1	2	Black Warrior Parkway Bridge
1	3	Emerald Mountain Expressway Bridge
1	4	Foley Beach Express
2	5	Whittier Tunnel
6	8	San Francisco-Oakland Bay Bridge
6	9	Carquinez Bridge (2 Bridges)
6	10	Martinez-Benicia Bridge
6	11	Richmond-San Rafael Bridge
6	12	Antioch (John A. Nedjedly) Bridge
6	13	San Mateo-Hayward Bridge
6	14	Dumbarton Bridge
6	15	Golden Gate Bridge
6	16	I-15 Value Pricing Project
6	17	Seventeen Mile Drive
6	18	Route 91 Express Lanes
6	19	Eastern Trans. Corridor (Routes 261, 241, & 133)
6	20	Foothill Trans. Corridor (Route 241)
6	21	San Joaquin Hills Trans. Corridor (Route 73)
6	22	SR-7
6	23	SR-125S (San Diego County)
8	24	I-25 HOV/Tolled Express Lanes
8	25	Northwest Parkway
8	26	E-470
10	27	Delaware Memorial Bridge
10	28	John F. Kennedy Memorial Highway (Delaware Turnpike I-95)
10	29	SR-1
12	30	Sunshine Skyway Bridge (I-275)
12	31	Card Sound Bridge
12	32	Mid-Bay Bridge
12	33	Pinellas Bayway System Bridge
12	34	Pensacola Beach Bridge (Bob Sykes Bridge)
12	35	Treasure Island Causeway
12	36	Broad Causeway
12	37	Rickenbacker Causeway (SR-913)
12	38	Venetian Causeway
12	39	Clearwater Pass; Sand Key Bridge
12	40	Sanibel Causeway
12	41	Cape Coral Bridge

State FIPS	HPMS Toll ID	Name of Toll Facility
12	42	Midpoint Memorial Bridge
12	43	Garcon Point Bridge
12	44	Alligator Alley (Everglades Parkway I-75)
12	45	East-West (Dolphin) Expressway
12	46	Florida Turnpike - Mainline
12	47	Bee Line East (Central Florida Expressway)
12	48	Bee Line Expressway
12	49	Bee Line West
12	50	Homestead Extension of Florida Turnpike (HEFT)
12	51	South Dade (Don Shula) Expressway
12	52	Lee Roy Selmon Crosstown Expressway
12	53	Holland East-West Expressway
12	54	Sawgrass Expressway (SR 869)
12	55	Miami Airport Expressway
12	56	Veterans Expressway (SR 589)
12	57	Seminole Expressway
12	58	Central Florida Greenway (SR-417)
12	59	Western Beltway Part C
12	60	Osceola Parkway
12	61	Southern Connector Extension
12	62	Gratigny Parkway
12	63	Suncoast Parkway (SR 589)
12	64	Polk Parkway (SR 570)
12	65	Southwest 10th St. Sawgrass Extension
13	66	F. J. Torras Causeway
13	67	Georgia 400 Extension
17	68	New Harmony Bridge
17	69	Wabash Memorial Bridge
17	70	Frank E. Bauer Bridge
17	71	Fort Madison Bridge
17	72	Ronald Reagan Memorial Tollway
17	73	North-South Tollway
17	74	Northwest Tollway
17	75	Chicago Skyway (I-90)
17	76	Tri-State Tollway
17	77	East-West Tollway (SR-56 Connector)
18	68	New Harmony Bridge
18	69	Wabash Memorial Bridge
18	78	Indiana East-West Toll Road
19	70	Frank E. Bauer Bridge
19	71	Fort Madison Bridge
19	79	St. Francisville Bridge
19	80	Bellevue Bridge
19	81	Decatur Bridge

State FIPS	HPMS Toll ID	Name of Toll Facility
19	82	Plattsmouth Bridge
20	83	Kansas Turnpike
21	84	Audubon Parkway
21	85	Daniel Boone Parkway
21	86	William H. Natcher Parkway
21	286	Nolan Toll Bridge
22	87	Lake Pontchartrain Causeway
22	88	Greater New Orleans Mississippi River Bridge
22	89	Avery Island
23	90	Maine Turnpike
24	91	Harry W. Nice Memorial Bridge
24	92	Baltimore Harbor Tunnel (2 Tubes)
24	93	Fort McHenry Tunnel (4 Tubes)
24	94	Millard Tydings Bridge
24	95	Hatem Bridge
24	96	William Preston Lane, Jr. Bridge
24	97	Francis Scott Key Bridge
24	98	I-95 John F. Kennedy Memorial Highway - Express Toll Lanes (ETL)
24	99	Intercounty Connector (ICC)
25	100	Ted Williams Tunnel
25	101	Callahan & Sumner Tunnels
25	102	Maurice J. Tobin Bridge
25	103	Massachusetts Turnpike
26	104	Mackinac Bridge
26	105	Sault Ste. Marie Bridge
26	106	Blue Water Bridge
26	107	New Blue Water Bridge
26	108	Grosse Isle Bridge
26	109	Ambassador Bridge
26	110	Detroit-Windsor Tunnel
27	111	12th/15th Avenue, N Bridge
27	112	International Falls Bridge
27	113	MNPass
29	79	St. Francisville Bridge
29	114	Lake Bridge
31	80	Bellevue Bridge
31	81	Decatur Bridge
31	82	Plattsmouth Bridge
32	115	Valley of Fire Road
33	116	Cheshire Bridge
33	117	New Hampshire Turnpike
33	118	F.E. Everett Turnpike
33	119	Henry Bourque Highway (Route 3)
33	120	Spaulding Turnpike

State FIPS	HPMS Toll ID	Name of Toll Facility
33	121	Mt. Washington Summit Road
34	27	Delaware Memorial Bridge
34	122	George Washington Bridge
34	123	Goethals Bridge
34	124	Holland Tunnel (2 Tubes)
34	125	Bayonne Bridge
34	126	Outerbridge Crossing Bridge
34	127	Lincoln Tunnel (3 Tubes)
34	128	I-78 Toll Bridge
34	129	Delaware Water Gap Bridge
34	130	Ben Franklin Bridge
34	131	Walt Whitman Bridge
34	132	New Jersey and Pennsylvania Turnpike Bridge
34	133	Dingman's Ferry Bridge
34	134	Tacony-Palmyra Bridge
34	135	Burlington-Bristol Bridge
34	136	Trenton-Morrisville Bridge
34	137	Easton-Phillipsburg Bridge
34	138	Portland-Columbia Bridge
34	139	Milford-Montague Bridge
34	140	New Hope-Lambertville Bridge
34	141	Betsy Ross Bridge
34	142	Commodore John Barry Bridge
34	143	Margate Bridge
34	144	Beesleys Point Bridge
34	145	Townsends Inlet Bridge
34	146	Grassy Sound Bridge
34	147	Middle Thorofare Bridge
34	148	Corson’s Inlet Bridge
34	149	New Jersey Turnpike (Main Line)
34	150	Newark Bay Extension
34	151	Pennsylvania Turnpike Extension
34	152	New Jersey Turnpike (Mainline)
34	153	New Jersey 495
34	154	Garden State Parkway
34	155	Atlantic City Expressway
34	156	Ocean City-Longport Bridge
36	122	George Washington Bridge
36	123	Goethals Bridge
36	124	Holland Tunnel (2 Tubes)
36	125	Bayonne Bridge
36	126	Outerbridge Crossing Bridge
36	127	Lincoln Tunnel (3 Tubes)
36	157	South Grand Island Bridge

State FIPS	HPMS Toll ID	Name of Toll Facility
36	158	North Grand Island Bridge
36	159	Tappan Zee Bridge
36	160	Newburgh-Beacon Bridge (I-84)
36	161	Triborough Bridge
36	162	Bronx-Whitestone Bridge
36	163	Throgs Neck Bridge
36	164	Verrazano-Narrows Bridge
36	165	Queens Midtown Tunnel (2 Tubes)
36	166	Brooklyn Battery Tunnel
36	167	Thousand Islands Bridge
36	168	Lewston-Queenston Bridge
36	169	Castleton-on-Hudson Bridge
36	170	Kingston-Rhinecliff Bridge
36	171	Rip Van Winkle Bridge
36	172	Mid-Hudson Bridge
36	173	Bear Mountain Bridge
36	174	Atlantic Beach Bridge
36	175	Henry Hudson Bridge
36	176	Marine Parkway-Gil Hodges Memorial Bridge
36	177	Cross Bay Veterans Memorial Bridge
36	178	Peace Bridge
36	179	Ogdensburg-Prescott Bridge
36	180	Rainbow Bridge
36	181	Whirlpool Rapids Bridge
36	182	Seaway International Bridge (Cornwall-Massena)
36	183	Gov. Thomas E. Dewey Thruway (Main Line)
36	184	Berkshire Section
36	185	Niagara Section
36	186	New England Section
36	187	Gov. Thomas E. Dewey Thruway Berkshire Section
36	188	Gov. Thomas E. Dewey Thruway Gardenstate Parkway Connection
36	189	Whiteface Mountain Vet. Memorial Highway
36	190	Prospect Mountain Vet. Memorial Highway
37	191	Currituck Bridge
37	192	Northern Wake Expressway
37	193	Triangle Parkway
37	194	Western Wake Expressway
38	111	12th/15th Avenue, N Bridge
39	195	Newell-East Liverpool Bridge
39	196	Ohio Turnpike
39	287	Parkersburg Memorial Bridge
40	197	Turner Turnpike
40	198	Will Rogers Turnpike
40	199	H.E. Bailey Turnpike

State FIPS	HPMS Toll ID	Name of Toll Facility
40	200	Indian Nation Turnpike
40	201	Muskogee Turnpike
40	202	Cimarron Turnpike
40	203	John Kilpatrick Turnpike
40	204	Creek Turnpike
40	205	Chickasaw Turnpike
40	206	Cherokee Turnpike
41	207	Bridge of the Gods
41	284	Hood River Bridge
42	128	I-78 Toll Bridge
42	129	Delaware Water Gap Bridge
42	130	Ben Franklin Bridge
42	131	Walt Whitman Bridge
42	132	New Jersey and Pennsylvania Turnpike Bridge
42	133	Dingman's Ferry Bridge
42	134	Tacony-Palmyra Bridge
42	135	Burlington-Bristol Bridge
42	136	Trenton-Morrisville Bridge
42	137	Easton-Phillipsburg Bridge
42	138	Portland-Columbia Bridge
42	139	Milford-Montague Bridge
42	140	New Hope-Lambertville Bridge
42	141	Betsy Ross Bridge
42	142	Commodore John Barry Bridge
42	208	Pennsylvania Turnpike
42	209	Pennsylvania Turnpike Eastern Extension
42	210	Pennsylvania Turnpike Northeastern Extension
42	211	Pennsylvania Turnpike Western Extension
42	212	Pennsylvania Turnpike Delaware River Extension
42	213	Mosey Wood Toll Road
42	214	Greensburg Bypass
42	215	Beaver Valley Expressway
42	216	Monvalley Expressway
42	217	Mon-Fayette Expressway
44	218	Newport Bridge
45	219	Southern Connector
45	221	Cross Island Parkway (U.S. 278)
48	222	Addison Airport Toll Tunnel
48	223	Mountain Creek Lake Bridge
48	224	Sam Houston Ship Channel Bridge
48	225	San Luis-Vacek Pass Bridge
48	226	Gateway Bridge
48	227	B & M Bridge
48	228	Free Trade Bridge

State FIPS	HPMS Toll ID	Name of Toll Facility
48	229	Veterans International Bridge
48	230	B & P Bridge
48	231	Pharr-Reynosa Bridge
48	232	McAllen-Hidalgo-Reynosa Bridge
48	233	Rio Grande City-Camargo Bridge
48	234	Roma-Ciudad Miguel Aleman Bridge
48	235	Juarez-Lincoln Bridge
48	236	Laredo International Bridge (Convent St.)
48	237	World Trade Bridge
48	238	Laredo-Columbia Solidarity Bridge
48	239	Eagle Pass Bridge # 1
48	240	Eagle Pass Bridge # 2
48	241	Del Rio-Ciudad Acuna International Bridge
48	242	Presidio Bridge
48	243	Ysleta-Zaragosa Bridge
48	244	Good Neighbor Bridge (Stanton St.)
48	245	Paso Del Norte Bridge (Santa Fe St.)
48	246	Katy I-10 QuickRide and U.S. 290
48	247	Dallas North Tollway
48	248	Sam Houston Tollway - East
48	249	Sam Houston Tollway - West
48	250	Sam Houston Tollway - SW Belt
48	251	Sam Houston Tollway - SE Belt
48	252	Hardy Toll Road
48	253	Westpark Tollway
48	254	President George Bush Turnpike
48	255	Camino Colombia
48	256	U.S. 183-A
48	257	Fort Bend Parkway Extension
48	258	SH 45
48	259	SH 45 SE
48	260	SH 130
48	261	Loop 49
48	262	SH 121
48	263	Loop 1
48	264	Central Texas Turnpike
48	265	U.S. 281
48	266	Harris County Beltway 8
49	267	I-15 Express Lanes (Salt Lake City)
49	268	Adams Avenue Parkway
50	116	Cheshire Bridge
50	269	Equinox Sky Line Drive
50	270	Mt. Mansfield Toll Road
50	271	Burke Mountain Toll Road

State FIPS	HPMS Toll ID	Name of Toll Facility
51	91	Harry W. Nice Memorial Bridge
51	272	Boulevard Bridge
51	273	Jordan Bridge
51	274	Chesapeake Bay Bridge-Tunnel
51	275	George P. Coleman Bridge (U.S. 17)
51	276	Powhite Parkway Extension (Route 76)
51	277	Downtown Expressway (Route 195)
51	278	Downtown Expressway (Route 146)
51	279	Dulles Toll Road
51	280	Dulles Greenway
51	281	Route 168
51	282	Pocahontas Parkway (Route 895)
51	283	Battlefield Boulevard (SR-168)
53	207	Bridge of the Gods
53	284	Hood River Bridge
53	285	Tacoma Narrows Bridge
54	195	Newell-East Liverpool Bridge
54	217	Mon-Fayette Expressway
54	286	Nolan Toll Bridge
54	287	Parkersburg Memorial Bridge
54	288	West Virginia Turnpike (I-77)
72	289	Teodoro Moscoso Bridge
72	290	Luis A. Ferre Expressway (PR-52)
72	291	De Diego Expressway (PR-22)
72	292	PR-53 Expressway: José Celso Barbosa
72	293	PR-53 Expressway: José Dávila Mosanto
72	294	Rafael Martínez Nadal Expressway (PR-20)
72	295	Expreso Rio Hondo (PR-5)
72	296	Roberto Sánchez Vilella Expressway (PR-66)

Appendix F. Metric-to-English Soft Conversion Procedures

The HPMS software requires the States' data to be submitted in English units. States that maintain their data in metric units are required to apply a soft conversion factor to their data for HPMS submittal purposes. A soft conversion is a computation which involves the application of a conversion factor to an initial value for the purpose of producing a converted value. The converted value must then be rounded in accordance with the requirements for the specific data field or data item, as applicable.

Table F-1 provides a list of factors to be used when performing a Metric-to-English soft conversion:

Table F.1 Metric-to-English Conversion Factors

Conversion Type	Conversion Factor
Kilometers to Miles	1 / 1.609344
Meters to Feet	1 / 0.3048
Meters per Kilometer to Inches per Mile	63.36
Millimeters to Inches	1 / 25.4
km/h to MPH	1 / 1.609344

The following shows an example of how this procedure would be applied for the purpose of converting units of meters to feet:

3.9624 meters * (1 feet / 0.3048 meters) = 13 feet

Appendix G. Sample View Export and Calculations

A Sample View will be created by the HPMS software to be exported as a Character Separated Value (CSV) file. The format of this file is identified below.

The Calculation Method for each data item's value falls into several categories generally based on the format of the data. These rules are applied when a Sample Panel section's limits are occupied by several sections, for the purpose of determining a single value for a particular data item. These calculation methods are as follows:

1. **No Calculation –** Value will be consistent with the value reported for a given section.
2. **Combination –** Calculated value will be based on a concatenation of multiple (text) values that fall within the limits of the section.
3. **Minimum Value –** Calculated value will be based on the lowest value in a range of values that fall within the limits of the section.
4. **Predominance –** Calculated value will be based on the most prevalent value that falls within the limits of the section.
5. **Weighted Averaging –** Calculated value will be based on an averaging of values that fall within the limits of the section, weighted by the length of the section.

The following table includes the name of the Data Item, the format of the value for each item, and the particular calculation method that is used for the Data Item.

Field Name	Format	Calculation Method
Year_Record	Date: YYYY	No Calculation
State_Code	Numeric(2,0)	No Calculation
Route_ID	Character(60)	No Calculation
Begin_Point	Numeric(6,3)	No Calculation
End_Point	Numeric(6,3)	No Calculation
Section_Length	Numeric(6,3)	End_Point – Begin_Point (where State reported value is 0)
F_System	Codes: 1-7	No Calculation
Urban_Code	Codes: 1-99999	No Calculation
Facility_Type	Codes: 1-6	No Calculation
Structure_Type	Codes: 1-3	No Calculation
Access_Control	Codes: 1-3	Predominance
Ownership	Codes: 1-80	Predominance
Through_Lanes	Numeric(2,0)	No Calculation
HOV_Type	Codes: 1-3	Predominance
HOV_Lanes	Numeric(2,0)	Predominance
Peak_Lanes	Numeric(2,0)	Predominance
Counter_Peak_Lanes	Numeric(2,0)	Predominance

Field Name	Format	Calculation Method
Turn_Lanes_R	Codes 1-6	Predominance
Turn_Lanes_L	Codes 1-6	Predominance
Speed_Limit	Numeric(2,0)	Predominance
Toll_Charged	Codes: 1-2	Predominance
Toll_Type	Codes: 1-3	Predominance
Route_Number	Character(8)	Predominance
Route_Signing	Codes: 1-10	Predominance
Route_Qualifier	Codes: 1-10	Predominance
AADT	Numeric(6,0)	No Calculation
AADT_Single_Unit	Numeric(6,0)	Weighted Averaging
Pct_Peak_Single	Numeric(2,0)	Weighted Averaging
AADT_Combination	Numeric(6,0)	Weighted Averaging
Pct_Peak_Combination	Numeric(2,0)	Weighted Averaging
K_Factor	Numeric(2,0)	Weighted Averaging
Dir_Factor	Numeric(2,0)	Weighted Averaging
Future_AADT	Numeric(6,0)	No Calculation
Future_AADT_Year	Date: YYYY	No Calculation
Signal_Type	Codes 1-5	Predominance
Pct_Green_Time	Numeric(2,0)	Weighted Averaging
Number_Signals	Numeric(2,0)	No Calculation
Stop_Signs	Numeric(2,0)	No Calculation
At_Grade_Other	Numeric(2,0)	No Calculation
Lane_Width	Numeric(2,0)	Predominance
Median_Type	Codes: 1-7	Predominance
Median_Width	Numeric(2,0)	Predominance
Shoulder_Type	Codes: 1-7	Predominance
Shoulder_Width_R	Numeric(2,0)	Predominance
Shoulder_Width_L	Numeric(2,0)	Predominance
Peak_Parking	Codes: 1-3	Predominance
Widening_Obstacle	Codes: X,A-G	Combination
Widening_Potential	Numeric(1,0)	Minimum Value
Curves_A	Numeric(6,3)	No Calculation
Curves_B	Numeric(6,3)	No Calculation
Curves_C	Numeric(6,3)	No Calculation
Curves_D	Numeric(6,3)	No Calculation
Curves_E	Numeric(6,3)	No Calculation
Curves_F	Numeric(6,3)	No Calculation
Terrain_Type	Codes: 1-3	Predominance
Grades_A	Numeric(6,3)	No Calculation
Grades_B	Numeric(6,3)	No Calculation

Field Name	Format	Calculation Method
Grades_C	Numeric(6,3)	No Calculation
Grades_D	Numeric(6,3)	No Calculation
Grades_E	Numeric(6,3)	No Calculation
Grades_F	Numeric(6,3)	No Calculation
Pct_Pass_Sight	Numeric(3,0)	Minimum Value
IRI	Numeric(3,0)	Weighted Averaging
PSR	Numeric(3,1)	Weighted Averaging
Surface_Type	Codes: 1-11	Predominance
Rutting	Numeric(3,1)	Weighted Averaging
Faulting	Numeric(3,1)	Weighted Averaging
Cracking_Percent	Numeric(3,1)	Weighted Averaging
Cracking_Length	Numeric(6,1)	Weighted Averaging
Year_Last_Improv	Date: YYYY	Predominance
Year_Last_Construction	Date: YYYY	Predominance
Last_Overlay_Thickness	Numeric(3,1)	Weighted Averaging
Thickness_Rigid	Numeric(3,1)	Weighted Averaging
Thickness_Flexible	Numeric(3,1)	Weighted Averaging
Base_Type	Codes: 1-8	Predominance
Base_Thickness	Numeric(2,0)	Weighted Averaging
Climate_Zone	Codes: 1-4	Predominance
Soil_Type	Codes: 1-2	Predominance
County_Code	Numeric(5,0)	Predominance
NHS	Codes: 1-9	No Calculation
Future_Facility	Code: 1	No Calculation
STRAHNET_Type	Codes: 1-2	No Calculation
Truck	Codes: 1-2	No Calculation
Maintenance_Operations	Codes: 1-80	Predominance
Capacity	Numeric(6,0)	Weighted Averaging
VSF	Numeric(3,1)	Capacity Calculation*
Computed Capacity	Numeric(6,0)	Capacity Calculation*
Design_Speed	Numeric(2,0)	Design Speed Calculation*
Vertical_Alignment	Codes: 0-4	Vertical Alignment Calculation*
Horizontal_Alignment	Codes: 0-4	Horizontal Alignment Calculation*
Volume_Group	Codes 1-12	No Calculation
Expansion_Factor	Numeric(3,2)	Sample Adequacy Calculation

*Values may be overridden by the States if found to not be representative of actual value.

Appendix H. HPMS Crosswalk Table

N/A = Not Applicable

Item No.	Item Name	HPMS 2000 Codes	HPMS 2010+ Codes
1	F_System (Formerly Item #17)	RURAL 1=Principal Arterial-Interstate. 2=Principal Arterial-Other. 6=Minor Arterial. 7=Major Collector. 8=Minor Collector. 9=Local. URBAN 11=Principal Arterial-Interstate. 12=Principal Arterial-Other. Freeways & Expressways. 14=Principal Arterial-Other. 16=Minor Arterial. 17=Collector. 19=Local.	1=Interstate. 2=Principal Arterial-Other Freeways & Expressways. 3=Principal Arterial-Other. 4=Minor Arterial. 5=Major Collector. 6=Minor Collector. 7=Local.
2	Urban_Code (Formerly Item #13 and #15)	1=Rural (pop. < 5K). 2=Small Urban (pop. 5K to 50K). 3=Small Urbanized (pop. 50K to 200K). 4=Large Urbanized (pop. > 200 K).	99999=Rural. 99998=Small Urban. *Use Census Urban Area Codes for Small and Large Urbanized areas.
3	Facility_Type (Formerly Item #27)	1=One-Way Roadway. 2=Two-Way Roadway. 3=One-Way Structure. 4=Two-Way Structure.	1= One-Way Roadway. 2=Two-Way Roadway. 3=Couplet. 4=Ramp. 5=Non-Mainline. 6=Non-Inventory Direction.
4	Structure_Type	N/A	1=Entire section is a Bridge. 2=Entire section is a Tunnel. 3=Entire section is a Causeway.
5	Access_Control (Formerly Item #55)	1=Full Access Control. 2=Partial Access Control. 3=No Access Control.	NO CHANGE
6	Ownership (Formerly Item #25)	1=State Hwy Agency. 2=County Hwy Agency. 3=Town or Township Hwy Agency. 4=Municipal Hwy Agency. 5=Other State Agency. 6=Other Local Agency. 7=Federal Agency. 8=Other.	1=State Hwy Agency. 2=County Hwy Agency. 3=Town or Township Hwy Agency. 4=City or Municipal Hwy Agency. 11=State Park, Forest, or Reservation Agency. 12=Local Park, Forest, or Reservation Agency. 21=Other State Agency. 25=Other Local Agency. 26=Private (other than Railroad). 27=Railroad. 31=State Toll Authority. 32=Local Toll Authority. 40=Other Public Instrumentality (e.g., Airport,

Item No.	Item Name	HPMS 2000 Codes	HPMS 2010+ Codes
			School, University). 50=Indian Tribe Nation. 60=Other Federal Agency. 62=Bureau of Indian Affairs. 63=Bureau of Fish and Wildlife. 64=U.S. Forest Service. 66=National Park Service. 67=Tennessee Valley Authority. 68=Bureau of Land Management. 69=Bureau of Reclamation. 70=Corps of Engineers. 72=Air Force. 73=Navy/Marines. 74=Army. 80=Other.
7	Through_Lanes (Formerly Item #34)	Coded/Entered Value	NO CHANGE
8	HOV_Type (Formerly Item #37)	0=Section does not have HOV lanes. 1=Section has exclusive HOV lanes. 2=Normal through lanes(s) used for exclusive HOV in specified time periods. 3=Shoulder/parking lanes(s) used for exclusive HOV in specified time periods.	1=Full-time: Section has 24-hr. exclusive HOV lanes (HOV use only; no other use permitted). 2=Part-time: Normal through lanes used for exclusive HOV during specified time periods. 3=Part-time: Shoulder/Parking lanes used for exclusive HOV during specified time periods.
9	HOV_Lanes	N/A	Coded/Entered Value
10	Peak_Lanes (Formerly Item #87)	Coded/Entered Value	NO CHANGE
11	Counter_Peak_Lanes	N/A	Coded/Entered Value
12	Turn_Lanes_R (Formerly Item #89)	0=Not applicable, this is a rural section or no intersections exist on this section. 1=Turns permitted; multiple exclusive right turning lanes exist. Through movements are prohibited in these lanes. Multiple turning lanes allow for simultaneous turns from all turning lanes. 2=Turns permitted; a continuous exclusive right turning lane exists from intersection to intersection. Through movements are prohibited in this lane. 3=Turns permitted; a single exclusive right turning lane exists. 4=Turns permitted; no exclusive right turning lanes exist. 5=No right turns are permitted during the peak period.	1=No intersections exist on the section. 2=Turns permitted; multiple exclusive right turning lanes exist. Through movements are prohibited in these lanes. Multiple turning lanes allow for simultaneous turns from all turning lanes. 3=Turns permitted; a continuous exclusive right turning lane exists from intersection to intersection. Through movements are prohibited in this lane. 4=Turns permitted; a single exclusive right turning lane exists. 5=Turns permitted; no exclusive right turning lanes exist. 6=No right turns are permitted during the peak period.
13	Turn_Lanes_L (Formerly Item #88)	Same as Turn_Lanes_R	Same as Turn_Lanes_R
14	Speed_Limit (Formerly Item #80)	Coded/Entered Value	NO CHANGE
15	Toll_Charged	N/A	1=Toll charged in one direction only. 2=Toll charged in both directions. 3=No toll charged

Item No.	Item Name	HPMS 2000 Codes	HPMS 2010+ Codes
16	Toll_Type (Formerly Item #29)	1=Section is non-toll. 2=Section is toll.	1=This section has toll lanes but no HOT lanes. 2=This section has HOT lanes.
17	Route_Number (Formerly Item #24)	Coded/Entered Value (Text)	NO CHANGE
18	Route_Signing (Formerly Item #22)	0=Not Signed. 1=Interstate. 2=U.S.. 3=State. 4=Off-Interstate Business Marker. 5=County. 6=Township. 7=Municipal. 8=Parkway Marker or Forest Route Marker. 9=None of the Above.	1=Not Signed. 2=Interstate. 3=U.S. 4=State. 5=Off-Interstate Business Marker. 6=County. 7=Township. 8=Municipal. 9=Parkway Marker or Forest Route Marker. 10=None of the Above.
19	Route_Qualifier (Formerly Item #23)	0=No Qualifier or Not Signed. 1=Alternate. 2=Business Route. 3=Bypass. 4=Spur. 5=Loop. 6=Proposed. 7=Temporary. 8=Truck Route. 9=None of the Above.	1=No Qualifier or Not Signed. 2=Alternate. 3=Business Route. 4=Bypass. 5=Spur. 6=Loop. 7=Proposed. 8=Temporary. 9=Truck Route. 10=None of the Above.
20	Alternative_Route_Name	N/A	Coded/Entered Value
21	AADT (Formerly Item #33)	Coded/Entered Value	NO CHANGE
22	AADT_Single_Unit (Formerly Item #82)	Coded/Entered Value (Percent)	Coded/Entered Value (AADT)
23	Pct_Peak_Single	Coded/Entered Value	Coded/Entered Value (Nearest 0.1 %)
24	AADT_Combination (Formerly Item #84)	Coded/Entered Value (Percent)	Coded/Entered Value (AADT)
25	Pct_Peak_Combination	Coded/Entered Value	Coded/Entered Value (Nearest 0.1 %)
26	K_Factor (Formerly Item #85)	Coded/Entered Value	NO CHANGE
27	Dir_Factor (Formerly Item #86)	Coded/Entered Value	NO CHANGE
28	Future_AADT (Formerly Item #97 & 98)	Coded/Entered Value	NO CHANGE
29	Signal_Type (Formerly Item #90)	0=Not applicable; this is a rural section. 1=Uncontrolled Fixed Time. 2=Uncoordinated Traffic Actuated. 3=Coordinated Progressive. 4=No signal systems exist.	1=Uncoordinated Fixed Time. 2=Uncoordinated Traffic Actuated. 3=Coordinated Progressive. 4=Coordinated Real-time Adaptive. 5=No signal systems exist.
30	Pct_Green_Time (Formerly Item #91)	Coded/Entered Value	NO CHANGE

Item No.	Item Name	HPMS 2000 Codes	HPMS 2010+ Codes
31	Number_Signals (Formerly Item #92)	Coded/Entered Value	NO CHANGE
32	Stop_Signs (Formerly Item #93)	Coded/Entered Value	NO CHANGE
33	At_Grade_Other (Formerly Item #94)	Coded/Entered Value	NO CHANGE
34	Lane_Width (Formerly Item #54)	Coded/Entered Value	NO CHANGE
35	Median_Type (Formerly Item #56)	1=Curbed. 2=Positive barrier-unspecified. 3=Unprotected. 4=None.	1=None. 2=Unprotected. 3=Curbed. 4=Positive barrier-unspecified. *5=Positive barrier-flexible. *6=Positive barrier-semi-rigid. *7=Positive barrier – rigid. *Codes 5, 6, and 7 are optional.
36	Median_Width (Formerly Item #57)	Coded/Entered Value	NO CHANGE
37	Shoulder_Type (Formerly Item #58)	1=None. 2=Surfaced shoulder exists (bituminous concrete or Portland cement concrete surface). 3=Stabilized shoulder exists- (stabilized gravel or other granular material with or without admixture). 4=Combination shoulder exists – (shoulder width has two or more surface types; e.g., part of the shoulder width is surfaced and a part of the width is earth). 5=Earth shoulder exists. 6=Barrier curb exists; no shoulder in front of curb.	1=None. 2=Surfaced shoulder exists – bituminous concrete (AC). 3=Surfaced shoulder exists – Portland Cement Concrete surface (PCC). 4=Stabilized shoulder exists – (stabilized gravel or other granular material with or without admixture) 5=Combination shoulder exists (shoulder width has two or more surface types; e.g., part of the shoulder width is surfaced and a part of the width is earth). 6=Earth shoulder exists. 7=Barrier curb exists; no shoulder in front of curb.
38	Shoulder_Width_R (Formerly Item #59)	Coded/Entered Value	NO CHANGE
39	Shoulder_Width_L (Formerly Item #60)	Coded/Entered Value	NO CHANGE
40	Peak_Parking (Formerly Item #61)	0=Not Applicable-Rural. 1=Parking allowed on one side. 2=Parking allowed on both sides. 3=No parking allowed or none available.	1=Parking allowed on one side. 2=Parking allowed on both sides. 3=No parking allowed or none available.
41	Widening_Obstacle	N/A	X=No obstacles. A=Dense development. B=Major transportation facilities. C=Other public facilities D=Terrain restrictions. E=Historic and archeological sites. F=Environmentally sensitive areas. G=Parkland.
42	Widening_Potential	N/A	Coded/Entered Value

Item No.	Item Name	HPMS 2000 Codes	HPMS 2010+ Codes
43	Curves (Curves_A through Curves_F) (Formerly Item #63-#68)	Coded/Entered Value	NO CHANGE
44	Terrain_Type (Formerly Item #70)	0=Not Applicable-Urban 1=Level 2=Rolling 3=Mountainous	1=Level 2=Rolling 3=Mountainous
45	Grades (Grades_A through Grades_F) (Formerly Item #72-#77)	Coded/Entered Value	NO CHANGE
46	Pct_Pass_Sight (Formerly Item #78)	Coded/Entered Value	NO CHANGE
47	IRI (Formerly Item #35)	Coded/Entered Value	NO CHANGE
48	PSR (Formerly Item #36)	Coded/Entered Value	NO CHANGE
49	Surface_Type (Formerly Item #50)	1=Unpaved. 2=Low Type Bituminous. 3=Intermediate Type Bituminous. 4=High Type Bituminous. 5=High Type Rigid. 6=High Type Composite.	1=Unpaved. 2=Bituminous. 3=JPCP-Jointed Plain Concrete Pavement. 4=JRCP-Jointed Reinforced Concrete Pavement. 5=CRCP-Continuously Reinforced Concrete Pavement. 6=Asphalt-Concrete (AC) Overlay over Existing AC Pavement. 7=AC Overlay over Existing Jointed Concrete Pavement. 8=AC (Bitum. Overlay over Existing CRCP). 9=Unbonded Jointed Concrete Overlay on PCC Pavements. 10=Bonded PCC Overlays on PCC Pavements. 11=Other.
50	Rutting	N/A	Coded/Entered Value
51	Faulting	N/A	Coded/Entered Value
52	Cracking_Percent	N/A	Coded/Entered Value (Percent)
53	Cracking_Length	N/A	Coded/Entered Value
54	Year_Last_Improv (Formerly Item #53)	Coded/Entered Value (Date)	NO CHANGE
55	Year_Last_Construction	N/A	Coded/Entered Value (Date)
56	Last_Overlay_Thickness	N/A	Coded/Entered Value
57	Thickness_Rigid (Formerly Item #51)	Coded/Entered Value	NO CHANGE
58	Thickness_Flexible (Formerly Item #51)	Coded/Entered Value	NO CHANGE

Item No.	Item Name	HPMS 2000 Codes	HPMS 2010+ Codes
59	Base_Type	N/A	1=No base. 2=Aggregate. 3=Asphalt or cement stabilized. 4=Asphalt or cement stabilized with granular subbase. 5=Hot mix AC (Bituminous). 6=Lean concrete. 7=Stabilized open-graded permeable. 8=Fractured PCC.
60	Base_Thickness	N/A	Coded/Entered Value
61	Climate_Zone (Formerly Item #52)	1=Wet; Freeze. 2=Wet; Freeze-Thaw. 3=Wet; No Freeze. 4=Intermediate; Freeze. 5=Intermediate; Freeze-Thaw. 6=Intermediate; No Freeze. 7=Dry; Freeze. 8=Dry; Freeze-Thaw. 9=Dry; No Freeze.	Will be coded by FHWA; States will have override capability: 1=Wet-Freeze. 2=Wet-Non Freeze. 3=Dry-Freeze. 4=Dry-Non Freeze.
62	Soil_Type	N/A	Will be coded by FHWA; States will have override capability: 1=Granular (35% or less passing the 0.075 mm sieve). 2=Fine (Silt-Clay) Materials (>35% passing the 0.075 mm sieve).
63	County_Code	Coded / Entered Value	NO CHANGE
64	NHS (Formerly Item #19)	0 = This section is not on the NHS 1 = This section is on the NHS but is not an NHS intermodal connector 2 = Major Airport 3 = Major Port Facility 4 = Major Amtrak Station 5 = Major Rail/Truck Terminal 6 = Major Inner City Bus Terminal 7 = Major Public Transportation or Multi-Modal Passenger Terminal 8 = Major Pipeline Terminal 9 = Major Ferry Terminal	1 = Non-connector NHS 2 = Major Airport 3 = Major Port Facility 4 = Major Amtrak Station 5 = Major Rail/Truck Terminal 6 = Major Inner City Bus Terminal 7 = Major Public Transportation or Multi-Modal Passenger Terminal 8 = Major Pipeline Terminal 9 = Major Ferry Terminal
65	STRAHNET_Type (Formerly Item #26)	0 = Section is not on STRAHNET or is a STRAHNET connector 1 = Section is on STRAHNET or is a STRAHNET connector	1 = Regular STRAHNET 2 – Connector
66	Truck (Formerly Item #28)	1 = Not on a designated truck route 2 = Designated truck route under Federal authority in 23 CFR 658.	1 = Section is on the National Network (NN) 2 = Other state-designated truck route (optional)
67	Future_Facility (Formerly Item #20)	0 = This roadway section is not on the NHS. 1 = This roadway section is on the NHS and is open to public travel. 2 = This roadway section is on the NHS but is not	1 = Unbuilt NHS section

Item No.	Item Name	HPMS 2000 Codes	HPMS 2010+ Codes
		yet built.	
68	Maintenance_Operations	N/A	1=State Hwy Agency. 2=County Hwy Agency. 3=Town or Township Hwy Agency. 4=City or Municipal Hwy Agency. 11=State Park, Forest, or Reservation Agency. 12=Local Park, Forest, or Reservation Agency. 21=Other State Agency. 25=Other Local Agency. 26=Private (other than Railroad). 27=Railroad. 31=State Toll Authority. 32=Local Toll Authority. 40=Other Public Instrumentality (e.g., Airport, School, University). 50=Indian Tribe Nation. 60=Other Federal Agency. 62=Bureau of Indian Affairs. 63=Bureau of Fish and Wildlife. 64=U.S. Forest Service. 66=National Park Service. 67=Tennessee Valley Authority. 68=Bureau of Land Management. 69=Bureau of Reclamation. 70=Corps of Engineers. 72=Air Force. 73=Navy/Marines. 74=Army. 80=Other.
69	Capacity	N/A	Coded/Entered Value

Appendix I. Urbanized Area Codes

State Name	Urban Area Name	Urban Code	PART	Population
Alabama	Anniston--Oxford, AL	02629		79,796
Alabama	Auburn, AL	04033		74,741
Alabama	Birmingham, AL	07786		749,495
Alabama	Columbus, GA--AL	19099	P	61,264
Alabama	Daphne--Fairhope, AL	22285		57,383
Alabama	Decatur, AL	22690		70,436
Alabama	Dothan, AL	24472		68,781
Alabama	Florence, AL	29953		77,074
Alabama	Gadsden, AL	32113		64,172
Alabama	Huntsville, AL	40780		286,692
Alabama	Mobile, AL	57925		326,183
Alabama	Montgomery, AL	58600		263,907
Alabama	Pensacola, FL--AL	68482	P	6,266
Alabama	Tuscaloosa, AL	89110		139,114
Alaska	Anchorage, AK	02305		251,243
Alaska	Fairbanks, AK	28549		64,513
Arizona	Avondale--Goodyear, AZ	04549		197,041
Arizona	Casa Grande, AZ	14401		51,331
Arizona	Flagstaff, AZ	29818		71,957
Arizona	Lake Havasu City, AZ	46747		53,427
Arizona	Phoenix--Mesa, AZ	69184		3,629,114
Arizona	Prescott Valley--Prescott, AZ	72112		84,744
Arizona	Sierra Vista, AZ	81901		52,745
Arizona	Tucson, AZ	88732		843,168
Arizona	Yuma, AZ--CA	98020	P	134,256
Arkansas	Conway, AR	19801		65,277
Arkansas	Fayetteville--Springdale--Rogers, AR--MO	29494	P	295,081
Arkansas	Fort Smith, AR--OK	30925	P	120,714
Arkansas	Hot Springs, AR	40213		55,121
Arkansas	Jonesboro, AR	43345		65,419
Arkansas	Little Rock, AR	50392		431,388
Arkansas	Memphis, TN--MS--AR	56116	P	40,270
Arkansas	Pine Bluff, AR	69454		53,495
Arkansas	Texarkana--Texarkana, TX--AR	87193	P	26,072
California	Antioch, CA	02683		277,634
California	Arroyo Grande--Grover Beach, CA	03196		52,000
California	Bakersfield, CA	04681		523,994

State Name	Urban Area Name	Urban Code	PART	Population
California	Camarillo, CA	12754		71,772
California	Chico, CA	16318		98,176
California	Concord, CA	19504		615,968
California	Davis, CA	22420		72,794
California	Delano, CA	22987		54,372
California	El Centro--Calexico, CA	26416		107,672
California	El Paso de Robles (Paso Robles)--Atascadero, CA	27261		65,088
California	Fairfield, CA	28657		133,683
California	Fresno, CA	31843		654,628
California	Gilroy--Morgan Hill, CA	33328		98,413
California	Hanford, CA	36703		87,941
California	Hemet, CA	38215		163,379
California	Indio--Cathedral City, CA	41347		345,580
California	Lancaster--Palmdale, CA	47611		341,219
California	Livermore, CA	50527		81,624
California	Lodi, CA	50851		68,738
California	Lompoc, CA	51040		51,509
California	Los Angeles--Long Beach--Anaheim, CA	51445		12,150,996
California	Madera, CA	52984		78,413
California	Manteca, CA	54145		83,578
California	Merced, CA	56251		136,969
California	Mission Viejo--Lake Forest--San Clemente, CA	57709		583,681
California	Modesto, CA	58006		358,172
California	Murrieta--Temecula--Menifee, CA	60799		441,546
California	Napa, CA	61057		83,913
California	Oxnard, CA	66673		367,260
California	Petaluma, CA	68887		64,078
California	Porterville, CA	71074		70,272
California	Redding, CA	73774		117,731
California	Reno, NV--CA	74179	P	9
California	Riverside--San Bernardino, CA	75340		1,932,666
California	Sacramento, CA	77068		1,723,634
California	Salinas, CA	78310		184,809
California	San Diego, CA	78661		2,956,746
California	San Francisco--Oakland, CA	78904		3,281,212
California	San Jose, CA	79039		1,664,496
California	San Luis Obispo, CA	79147		59,219
California	Santa Barbara, CA	79282		195,861
California	Santa Clarita, CA	79309		258,653
California	Santa Cruz, CA	79336		163,703

State Name	Urban Area Name	Urban Code	PART	Population
California	Santa Maria, CA	79417		130,447
California	Santa Rosa, CA	79498		308,231
California	Seaside--Monterey, CA	80362		114,237
California	Simi Valley, CA	82144		125,206
California	Stockton, CA	85087		370,583
California	Thousand Oaks, CA	87490		214,811
California	Tracy, CA	88273		87,569
California	Turlock, CA	89083		99,904
California	Vacaville, CA	89866		93,141
California	Vallejo, CA	90028		165,074
California	Victorville--Hesperia, CA	90541		328,454
California	Visalia, CA	90946		219,454
California	Watsonville, CA	92890		73,534
California	Woodland, CA	96994		55,513
California	Yuba City, CA	97939		116,719
California	Yuma, AZ--CA	98020	P	1,011
Colorado	Boulder, CO	09298		114,591
Colorado	Colorado Springs, CO	18856		559,409
Colorado	Denver--Aurora, CO	23527		2,374,203
Colorado	Fort Collins, CO	30628		264,465
Colorado	Grand Junction, CO	34273		128,124
Colorado	Greeley, CO	34786		117,825
Colorado	Lafayette--Louisville--Erie, CO	46126		79,407
Colorado	Longmont, CO	51175		90,897
Colorado	Pueblo, CO	72613		136,550
Connecticut	Bridgeport--Stamford, CT--NY	10162	P	877,630
Connecticut	Danbury, CT--NY	22096	P	161,323
Connecticut	Hartford, CT	37243		924,859
Connecticut	New Haven, CT	62407		562,839
Connecticut	New York--Newark, NY--NJ--CT	63217	P	114
Connecticut	Norwich--New London, CT--RI	64135	P	188,041
Connecticut	Springfield, MA--CT	83926	P	89,711
Connecticut	Waterbury, CT	92485		194,535
Connecticut	Worcester, MA--CT	97291	P	32,928
Delaware	Dover, DE	24580		110,769
Delaware	Philadelphia, PA--NJ--DE--MD	69076	P	481,625
Delaware	Salisbury, MD--DE	78364	P	24,588
District of Columbia	Washington, DC--VA--MD	92242	P	601,723
Florida	Bonita Springs, FL	08974		310,298

State Name	Urban Area Name	Urban Code	PART	Population
Florida	Cape Coral, FL	13510		530,290
Florida	Deltona, FL	23311		182,169
Florida	Fort Walton Beach--Navarre--Wright, FL	31060		191,917
Florida	Gainesville, FL	32167		187,781
Florida	Homosassa Springs--Beverly Hills--Citrus Springs, FL	39758		80,962
Florida	Jacksonville, FL	42346		1,065,219
Florida	Kissimmee, FL	45451		314,071
Florida	Lady Lake--The Villages, FL	45937		112,991
Florida	Lakeland, FL	46828		262,596
Florida	Leesburg--Eustis--Tavares, FL	48799		131,337
Florida	Miami, FL	56602		5,502,379
Florida	North Port--Port Charlotte, FL	63838		169,541
Florida	Ocala, FL	64567		156,909
Florida	Orlando, FL	65863		1,510,516
Florida	Palm Bay--Melbourne, FL	67105		452,791
Florida	Palm Coast--Daytona Beach--Port Orange, FL	67134		349,064
Florida	Panama City, FL	67294		143,280
Florida	Pensacola, FL--AL	68482	P	333,801
Florida	Port St. Lucie, FL	71479		376,047
Florida	Sarasota--Bradenton, FL	79606		643,260
Florida	Sebastian--Vero Beach South--Florida Ridge, FL	80400		149,422
Florida	Sebring--Avon Park, FL	80416		61,625
Florida	Spring Hill, FL	84024		148,220
Florida	St. Augustine, FL	77230		69,173
Florida	Tallahassee, FL	86464		240,223
Florida	Tampa--St. Petersburg, FL	86599		2,441,770
Florida	Titusville, FL	87787		54,386
Florida	Winter Haven, FL	96697		201,289
Florida	Zephyrhills, FL	98182		66,609
Georgia	Albany, GA	00901		95,779
Georgia	Athens-Clarke County, GA	03763		128,754
Georgia	Atlanta, GA	03817		4,515,419
Georgia	Augusta-Richmond County, GA--SC	04222	P	283,283
Georgia	Brunswick, GA	11026		51,024
Georgia	Cartersville, GA	14185		52,477
Georgia	Chattanooga, TN--GA	15832	P	78,364
Georgia	Columbus, GA--AL	19099	P	192,338
Georgia	Dalton, GA	22069		85,239
Georgia	Gainesville, GA	32194		130,846
Georgia	Hinesville, GA	39133		51,456

State Name	Urban Area Name	Urban Code	PART	Population
Georgia	Macon, GA	52822		137,570
Georgia	Rome, GA	76204		60,851
Georgia	Savannah, GA	79768		260,677
Georgia	Valdosta, GA	89974		77,085
Georgia	Warner Robins, GA	91783		133,109
Hawaii	Kahului, HI	43615		55,934
Hawaii	Kailua (Honolulu County)--Kaneohe, HI	43669		113,682
Hawaii	Urban Honolulu, HI	89770		802,459
Idaho	Boise City, ID	08785		349,684
Idaho	Coeur d'Alene, ID	18451		98,378
Idaho	Idaho Falls, ID	40996		90,733
Idaho	Lewiston, ID--WA	49312	P	31,740
Idaho	Nampa, ID	60976		151,499
Idaho	Pocatello, ID	70426		69,809
Illinois	Alton, IL--MO	01765	P	83,811
Illinois	Beloit, WI--IL	06760	P	18,712
Illinois	Bloomington--Normal, IL	08407		132,600
Illinois	Cape Girardeau, MO--IL	13537	P	309
Illinois	Carbondale, IL	13591		67,821
Illinois	Champaign, IL	15211		145,361
Illinois	Chicago, IL--IN	16264	P	8,018,716
Illinois	Danville, IL	22204		50,996
Illinois	Davenport, IA--IL	22366	P	137,150
Illinois	Decatur, IL	22717		93,863
Illinois	DeKalb, IL	22960		68,545
Illinois	Dubuque, IA--IL	24823	P	3,051
Illinois	Kankakee, IL	43885		81,926
Illinois	Kenosha, WI--IL	44506	P	4
Illinois	Peoria, IL	68509		266,921
Illinois	Rockford, IL	75718		296,863
Illinois	Round Lake Beach--McHenry--Grayslake, IL--WI	76474	P	259,811
Illinois	Springfield, IL	83899		161,316
Illinois	St. Louis, MO--IL	77770	P	372,895
Indiana	Anderson, IN	02386		88,133
Indiana	Bloomington, IN	08380		108,657
Indiana	Chicago, IL--IN	16264	P	589,492
Indiana	Cincinnati, OH--KY--IN	16885	P	10,225
Indiana	Columbus, IN	19126		54,933
Indiana	Elkhart, IN--MI	26794	P	142,692
Indiana	Evansville, IN--KY	28333	P	200,768

State Name	Urban Area Name	Urban Code	PART	Population
Indiana	Fort Wayne, IN	31087		313,492
Indiana	Indianapolis, IN	41212		1,487,483
Indiana	Kokomo, IN	45694		62,182
Indiana	Lafayette, IN	46018		147,725
Indiana	Louisville/Jefferson County, KY--IN	51755	P	140,180
Indiana	Michigan City--La Porte, IN--MI	56656	P	65,430
Indiana	Muncie, IN	60625		90,580
Indiana	South Bend, IN--MI	83116	P	241,870
Indiana	Terre Haute, IN	87139		92,742
Iowa	Ames, IA	02062		60,438
Iowa	Cedar Rapids, IA	14752		177,844
Iowa	Davenport, IA--IL	22366	P	142,901
Iowa	Des Moines, IA	23743		450,070
Iowa	Dubuque, IA--IL	24823	P	64,767
Iowa	Iowa City, IA	41590		106,621
Iowa	Omaha, NE--IA	65269	P	68,546
Iowa	Sioux City, IA--NE--SD	82225	P	84,359
Iowa	Waterloo, IA	92593		113,418
Kansas	Kansas City, MO--KS	43912	P	663,508
Kansas	Lawrence, KS	48232		88,053
Kansas	Manhattan, KS	53848		54,622
Kansas	St. Joseph, MO--KS	77743	P	2,368
Kansas	Topeka, KS	88084		150,003
Kansas	Wichita, KS	95077		472,870
Kentucky	Bowling Green, KY	09379		78,306
Kentucky	Cincinnati, OH--KY--IN	16885	P	328,060
Kentucky	Clarksville, TN--KY	17317	P	20,346
Kentucky	Elizabethtown--Radcliff, KY	26750		73,467
Kentucky	Evansville, IN--KY	28333	P	28,583
Kentucky	Huntington, WV--KY--OH	40753	P	56,594
Kentucky	Lexington-Fayette, KY	49582		290,263
Kentucky	Louisville/Jefferson County, KY--IN	51755	P	832,366
Kentucky	Owensboro, KY	66484		70,543
Louisiana	Alexandria, LA	01279		82,804
Louisiana	Baton Rouge, LA	05680		594,309
Louisiana	Hammond, LA	36514		67,629
Louisiana	Houma, LA	40375		144,875
Louisiana	Lafayette, LA	46045		252,720
Louisiana	Lake Charles, LA	46531		143,440
Louisiana	Mandeville--Covington, LA	53794		88,925

State Name	Urban Area Name	Urban Code	PART	Population
Louisiana	Monroe, LA	58330		116,533
Louisiana	New Orleans, LA	62677		899,703
Louisiana	Shreveport, LA	81739		298,317
Louisiana	Slidell, LA	82468		91,151
Maine	Bangor, ME	04951		61,210
Maine	Dover--Rochester, NH--ME	24607	P	7,825
Maine	Lewiston, ME	49339		59,397
Maine	Portland, ME	71263		203,914
Maine	Portsmouth, NH--ME	71506	P	15,791
Maryland	Aberdeen--Bel Air South--Bel Air North, MD	00199		213,751
Maryland	Baltimore, MD	04843		2,203,663
Maryland	Cumberland, MD--WV--PA	21745	P	49,619
Maryland	Frederick, MD	31519		141,576
Maryland	Hagerstown, MD--WV--PA	36190	P	101,406
Maryland	Lexington Park--California--Chesapeake Ranch Estates, MD	49594		58,875
Maryland	Philadelphia, PA--NJ--DE--MD	69076	P	48,690
Maryland	Salisbury, MD--DE	78364	P	73,493
Maryland	Waldorf, MD	91261		109,919
Maryland	Washington, DC--VA--MD	92242	P	1,749,163
Maryland	Westminster--Eldersburg, MD	94294		72,714
Massachusetts	Barnstable Town, MA	05167		246,695
Massachusetts	Boston, MA--NH--RI	09271	P	4,087,709
Massachusetts	Leominster--Fitchburg, MA	49096		116,960
Massachusetts	Nashua, NH--MA	61165	P	7,318
Massachusetts	New Bedford, MA	61786		149,443
Massachusetts	Pittsfield, MA	69778		59,124
Massachusetts	Providence, RI--MA	72505	P	260,276
Massachusetts	Springfield, MA--CT	83926	P	531,589
Massachusetts	Worcester, MA--CT	97291	P	453,586
Michigan	Ann Arbor, MI	02602		306,022
Michigan	Battle Creek, MI	05707		78,393
Michigan	Bay City, MI	05869		70,585
Michigan	Benton Harbor--St. Joseph--Fair Plain, MI	07138		61,022
Michigan	Detroit, MI	23824		3,734,090
Michigan	Elkhart, IN--MI	26794	P	900
Michigan	Flint, MI	29872		356,218
Michigan	Grand Rapids, MI	34300		569,935
Michigan	Holland, MI	39430		99,941
Michigan	Jackson, MI	42157		90,057
Michigan	Kalamazoo, MI	43723		209,703

State Name	Urban Area Name	Urban Code	PART	Population
Michigan	Lansing, MI	47719		313,532
Michigan	Michigan City--La Porte, IN--MI	56656	P	595
Michigan	Midland, MI	56980		59,014
Michigan	Monroe, MI	58357		51,240
Michigan	Muskegon, MI	60841		161,280
Michigan	Port Huron, MI	71155		87,106
Michigan	Saginaw, MI	77149		126,265
Michigan	South Bend, IN--MI	83116	P	36,295
Michigan	South Lyon--Howell, MI	83332		119,509
Michigan	Toledo, OH--MI	87868	P	28,461
Minnesota	Duluth, MN--WI	24850	P	93,333
Minnesota	Fargo, ND--MN	29089	P	42,527
Minnesota	Grand Forks, ND--MN	34219	P	8,318
Minnesota	La Crosse, WI--MN	45910	P	5,358
Minnesota	Mankato, MN	53983		57,584
Minnesota	Minneapolis--St. Paul, MN--WI	57628	P	2,650,614
Minnesota	Rochester, MN	75637		107,677
Minnesota	St. Cloud, MN	77338		110,621
Mississippi	Gulfport, MS	35920		208,948
Mississippi	Hattiesburg, MS	37594		80,358
Mississippi	Jackson, MS	42211		351,478
Mississippi	Memphis, TN--MS--AR	56116	P	128,310
Mississippi	Pascagoula, MS	67807		50,428
Missouri	Alton, IL--MO	01765	P	79
Missouri	Cape Girardeau, MO--IL	13537	P	52,591
Missouri	Columbia, MO	18937		124,748
Missouri	Fayetteville--Springdale--Rogers, AR--MO	29494	P	2
Missouri	Jefferson City, MO	42967		58,533
Missouri	Joplin, MO	43399		82,775
Missouri	Kansas City, MO--KS	43912	P	855,909
Missouri	Lee's Summit, MO	48826		85,081
Missouri	Springfield, MO	83953		273,724
Missouri	St. Joseph, MO--KS	77743	P	78,808
Missouri	St. Louis, MO--IL	77770	P	1,777,811
Montana	Billings, MT	07705		114,773
Montana	Great Falls, MT	34759		65,207
Montana	Missoula, MT	57736		82,157
Nebraska	Grand Island, NE	34246		50,440
Nebraska	Lincoln, NE	49933		258,719
Nebraska	Omaha, NE--IA	65269	P	656,462

State Name	Urban Area Name	Urban Code	PART	Population
Nebraska	Sioux City, IA--NE--SD	82225	P	16,576
Nevada	Carson City, NV	14158		58,079
Nevada	Las Vegas--Henderson, NV	47995		1,886,011
Nevada	Reno, NV--CA	74179	P	392,132
New Hampshire	Boston, MA--NH--RI	09271	P	93,038
New Hampshire	Dover--Rochester, NH--ME	24607	P	80,262
New Hampshire	Manchester, NH	53740		158,377
New Hampshire	Nashua, NH--MA	61165	P	219,082
New Hampshire	Portsmouth, NH--ME	71506	P	72,409
New Jersey	Allentown, PA--NJ	01495	P	32,443
New Jersey	Atlantic City, NJ	03898		248,402
New Jersey	East Stroudsburg, PA--NJ	25849	P	249
New Jersey	New York--Newark, NY--NJ--CT	63217	P	6,159,466
New Jersey	Philadelphia, PA--NJ--DE--MD	69076	P	1,150,865
New Jersey	Poughkeepsie--Newburgh, NY--NJ	71803	P	11,228
New Jersey	Trenton, NJ	88462		296,668
New Jersey	Twin Rivers--Hightstown, NJ	89263		64,037
New Jersey	Villas, NJ	90658		51,291
New Jersey	Vineland, NJ	90730		95,259
New Mexico	Albuquerque, NM	01171		741,318
New Mexico	El Paso, TX--NM	27253	P	30,712
New Mexico	Farmington, NM	29278		53,049
New Mexico	Las Cruces, NM	47935		128,600
New Mexico	Los Lunas, NM	51499		63,758
New Mexico	Santa Fe, NM	79363		89,284
New York	Albany--Schenectady, NY	00970		594,962
New York	Binghamton, NY--PA	07732	P	155,662
New York	Bridgeport--Stamford, CT--NY	10162	P	45,681
New York	Buffalo, NY	11350		935,906
New York	Danbury, CT--NY	22096	P	6,813
New York	Elmira, NY	27118		67,983
New York	Glens Falls, NY	33598		65,443
New York	Ithaca, NY	41914		53,661
New York	Kingston, NY	45262		57,442
New York	Middletown, NY	56899		58,381
New York	New York--Newark, NY--NJ--CT	63217	P	12,191,715
New York	Poughkeepsie--Newburgh, NY--NJ	71803	P	412,338
New York	Rochester, NY	75664		720,572
New York	Saratoga Springs, NY	79633		64,100
New York	Syracuse, NY	86302		412,317

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New York	Utica, NY	89785		117,328
New York	Watertown, NY	92674		57,840
North Carolina	Asheville, NC	03358		280,648
North Carolina	Burlington, NC	11728		119,911
North Carolina	Charlotte, NC--SC	15670	P	1,180,484
North Carolina	Concord, NC	19558		214,881
North Carolina	Danville, VA – NC**	22258	P	49,344
North Carolina	Durham, NC	25228		347,602
North Carolina	Fayetteville, NC	29440		310,282
North Carolina	Gastonia, NC--SC	32653	P	169,333
North Carolina	Goldsboro, NC	33814		61,054
North Carolina	Greensboro, NC	35164		311,810
North Carolina	Greenville, NC	35380		117,798
North Carolina	Hickory, NC	38647		212,195
North Carolina	High Point, NC	38809		166,485
North Carolina	Jacksonville, NC	42400		105,419
North Carolina	Myrtle Beach--Socastee, SC--NC	60895	P	20,279
North Carolina	New Bern, NC	61840		50,503
North Carolina	Raleigh, NC	73261		884,891
North Carolina	Rocky Mount, NC	75988		68,243
North Carolina	Wilmington, NC	95833		219,957
North Carolina	Winston-Salem, NC	96670		391,024
North Dakota	Bismarck, ND	07921		81,955
North Dakota	Fargo, ND--MN	29089	P	134,149
North Dakota	Grand Forks, ND--MN	34219	P	52,952
Ohio	Akron, OH	00766		569,499
Ohio	Canton, OH	13375		279,245
Ohio	Cincinnati, OH--KY--IN	16885	P	1,286,542
Ohio	Cleveland, OH	17668		1,780,673
Ohio	Columbus, OH	19234		1,368,035
Ohio	Dayton, OH	22528		724,091
Ohio	Huntington, WV--KY--OH	40753	P	33,775
Ohio	Lima, OH	49852		72,852
Ohio	Lorain--Elyria, OH	51364		180,956
Ohio	Mansfield, OH	54091		75,250
Ohio	Middletown, OH	56926		97,503
Ohio	Newark, OH	61705		76,068
Ohio	Parkersburg, WV--OH	67672	P	7,586
Ohio	Sandusky, OH**	78769		48,990
Ohio	Springfield, OH	83980		85,256

State Name	Urban Area Name	Urban Code	PART	Population
Ohio	Toledo, OH--MI	87868	P	479,182
Ohio	Weirton--Steubenville, WV--OH--PA	93592	P	39,918
Ohio	Wheeling, WV--OH	94726	P	30,182
Ohio	Youngstown, OH--PA	97831	P	348,073
Oklahoma	Fort Smith, AR--OK	30925	P	2,233
Oklahoma	Lawton, OK	48394		94,457
Oklahoma	Norman, OK	63433		103,898
Oklahoma	Oklahoma City, OK	65080		861,505
Oklahoma	Tulsa, OK	88948		655,479
Oregon	Albany, OR	00955		56,997
Oregon	Bend, OR	06868		83,794
Oregon	Corvallis, OR	20422		62,433
Oregon	Eugene, OR	28117		247,421
Oregon	Grants Pass, OR	34516		50,520
Oregon	Longview, WA--OR	51283	P	2,354
Oregon	Medford, OR	55981		154,081
Oregon	Portland, OR--WA	71317	P	1,490,336
Oregon	Salem, OR	78229		236,632
Oregon	Walla Walla, WA--OR	91405	P	8,825
Pennsylvania	Allentown, PA--NJ	01495	P	632,208
Pennsylvania	Altoona, PA	01792		79,930
Pennsylvania	Binghamton, NY--PA	07732	P	2,422
Pennsylvania	Bloomsburg--Berwick, PA	08434		53,618
Pennsylvania	Chambersburg, PA	15184		50,887
Pennsylvania	Cumberland, MD--WV--PA	21745	P	31
Pennsylvania	East Stroudsburg, PA--NJ	25849	P	54,067
Pennsylvania	Erie, PA	27766		196,611
Pennsylvania	Hagerstown, MD--WV--PA	36190	P	9,503
Pennsylvania	Hanover, PA	36784		66,301
Pennsylvania	Harrisburg, PA	37081		444,474
Pennsylvania	Hazleton, PA	37945		56,827
Pennsylvania	Johnstown, PA	43291		69,014
Pennsylvania	Lancaster, PA	47530		402,004
Pennsylvania	Lebanon, PA	48664		77,086
Pennsylvania	Monessen--California, PA	58168		66,086
Pennsylvania	Philadelphia, PA--NJ--DE--MD	69076	P	3,760,387
Pennsylvania	Pittsburgh, PA	69697		1,733,853
Pennsylvania	Pottstown, PA	71749		107,682
Pennsylvania	Reading, PA	73693		266,254
Pennsylvania	Scranton, PA	80227		381,502

State Name	Urban Area Name	Urban Code	PART	Population
Pennsylvania	State College, PA	84493		87,454
Pennsylvania	Uniontown--Connellsville, PA	89650		51,370
Pennsylvania	Weirton--Steubenville, WV--OH--PA	93592	P	302
Pennsylvania	Williamsport, PA	95455		56,142
Pennsylvania	York, PA	97750		232,045
Pennsylvania	Youngstown, OH--PA	97831	P	39,477
Rhode Island	Boston, MA--NH--RI	09271	P	272
Rhode Island	Norwich--New London, CT--RI	64135	P	21,149
Rhode Island	Providence, RI--MA	72505	P	930,680
South Carolina	Anderson, SC	02413		75,702
South Carolina	Augusta-Richmond County, GA--SC	04222	P	103,504
South Carolina	Charleston--North Charleston, SC	15508		548,404
South Carolina	Charlotte, NC--SC	15670	P	68,958
South Carolina	Columbia, SC	18964		549,777
South Carolina	Florence, SC	30061		89,557
South Carolina	Gastonia, NC--SC	32653	P	162
South Carolina	Greenville, SC	35461		400,492
South Carolina	Hilton Head Island, SC	39079		68,998
South Carolina	Mauldin--Simpsonville, SC	55603		120,577
South Carolina	Myrtle Beach--Socastee, SC--NC	60895	P	195,025
South Carolina	Rock Hill, SC	75745		104,996
South Carolina	Spartanburg, SC	83548		180,786
South Carolina	Sumter, SC	85708		73,107
South Dakota	Rapid City, SD	73396		81,251
South Dakota	Sioux City, IA--NE--SD	82225	P	5,559
South Dakota	Sioux Falls, SD	82252		156,777
Tennessee	Bristol--Bristol, TN--VA	10351	P	36,130
Tennessee	Chattanooga, TN--GA	15832	P	302,748
Tennessee	Clarksville, TN--KY	17317	P	138,309
Tennessee	Cleveland, TN	17722		66,777
Tennessee	Jackson, TN	42265		71,880
Tennessee	Johnson City, TN	43210		120,415
Tennessee	Kingsport, TN--VA	45235	P	102,428
Tennessee	Knoxville, TN	45640		558,696
Tennessee	Memphis, TN--MS--AR	56116	P	891,481
Tennessee	Morristown, TN	59410		59,036
Tennessee	Murfreesboro, TN	60733		133,228
Tennessee	Nashville-Davidson, TN	61273		969,587
Texas	Abilene, TX	00280		110,421
Texas	Amarillo, TX	01927		196,651

State Name	Urban Area Name	Urban Code	PART	Population
Texas	Austin, TX	04384		1,362,416
Texas	Beaumont, TX	06058		147,922
Texas	Brownsville, TX	10972		217,585
Texas	College Station--Bryan, TX	18748		171,345
Texas	Conroe--The Woodlands, TX	19755		239,938
Texas	Corpus Christi, TX	20287		320,069
Texas	Dallas--Fort Worth--Arlington, TX	22042		5,121,892
Texas	Denton--Lewisville, TX	23500		366,174
Texas	El Paso, TX--NM	27253	P	772,374
Texas	Galveston, Texas**	32491		44,022
Texas	Harlingen, TX	36892		135,663
Texas	Houston, TX	40429		4,944,332
Texas	Killeen, TX	44992		217,630
Texas	Lake Jackson--Angleton, TX	46801		74,830
Texas	Laredo, TX	47854		235,730
Texas	Longview, TX	51256		98,884
Texas	Lubbock, TX	51877		237,356
Texas	McAllen, TX	52390		728,825
Texas	McKinney, TX	52687		170,030
Texas	Midland, TX	57007		117,807
Texas	Odessa, TX	64864		126,405
Texas	Port Arthur, TX	70993		153,150
Texas	San Angelo, TX	78553		92,984
Texas	San Antonio, TX	78580		1,758,210
Texas	San Marcos, TX	79201		52,826
Texas	Sherman, TX	81631		61,900
Texas	Temple, TX	87058		90,390
Texas	Texarkana--Texarkana, TX--AR	87193	P	52,090
Texas	Texas City, TX	87220		106,383
Texas	Tyler, TX	89326		130,247
Texas	Victoria, TX	90514		63,683
Texas	Waco, TX	91027		172,378
Texas	Wichita Falls, TX	95104		99,437
Utah	Logan, UT	50959		94,983
Utah	Ogden--Layton, UT	64945		546,026
Utah	Provo--Orem, UT	72559		482,819
Utah	Salt Lake City--West Valley City, UT	78499		1,021,243
Utah	St. George, UT	77446		98,370
Vermont	Burlington, VT	11755		108,740
Virginia	Blacksburg, VA	08002		88,542

State Name	Urban Area Name	Urban Code	PART	Population
Virginia	Bristol--Bristol, TN--VA	10351	P	33,371
Virginia	Charlottesville, VA	15724		92,359
Virginia	Danville, VA – NC**	22258	P	49,344
Virginia	Fredericksburg, VA	31600		141,238
Virginia	Harrisonburg, VA	37162		66,784
Virginia	Kingsport, TN--VA	45235	P	4,143
Virginia	Lynchburg, VA	52201		116,636
Virginia	Richmond, VA	74746		953,556
Virginia	Roanoke, VA	75421		210,111
Virginia	Staunton--Waynesboro, VA	84630		56,611
Virginia	Virginia Beach, VA	90892		1,439,666
Virginia	Washington, DC--VA--MD	92242	P	2,235,884
Virginia	Williamsburg, VA	95411		75,689
Virginia	Winchester, VA	96103		69,449
Washington	Bellingham, WA	06652		114,473
Washington	Bremerton, WA	09946		198,979
Washington	Kennewick--Pasco, WA	44479		210,975
Washington	Lewiston, ID--WA	49312	P	20,184
Washington	Longview, WA--OR	51283	P	61,598
Washington	Marysville, WA	55333		145,140
Washington	Mount Vernon, WA	60490		62,966
Washington	Olympia--Lacey, WA	65242		176,617
Washington	Portland, OR--WA	71317	P	359,562
Washington	Seattle, WA	80389		3,059,393
Washington	Spokane, WA	83764		387,847
Washington	Walla Walla, WA--OR	91405	P	46,980
Washington	Wenatchee, WA	93862		67,227
Washington	Yakima, WA	97507		129,534
West Virginia	Beckley, WV	06139		64,022
West Virginia	Charleston, WV	15481		153,199
West Virginia	Cumberland, MD--WV--PA	21745	P	2,249
West Virginia	Hagerstown, MD--WV--PA	36190	P	71,787
West Virginia	Huntington, WV--KY--OH	40753	P	112,268
West Virginia	Morgantown, WV	59275		70,350
West Virginia	Parkersburg, WV--OH	67672	P	59,643
West Virginia	Weirton--Steubenville, WV--OH--PA	93592	P	30,669
West Virginia	Wheeling, WV--OH	94726	P	51,067
Wisconsin	Appleton, WI	02764		216,154
Wisconsin	Beloit, WI--IL	06760	P	45,123
Wisconsin	Duluth, MN--WI	24850	P	27,045

State Name	Urban Area Name	Urban Code	PART	Population
Wisconsin	Eau Claire, WI	26038		102,852
Wisconsin	Fond du Lac, WI	30223		54,901
Wisconsin	Green Bay, WI	34813		206,520
Wisconsin	Janesville, WI	42562		69,658
Wisconsin	Kenosha, WI--IL	44506	P	124,060
Wisconsin	La Crosse, WI--MN	45910	P	95,510
Wisconsin	Madison, WI	53200		401,661
Wisconsin	Milwaukee, WI	57466		1,376,476
Wisconsin	Minneapolis--St. Paul, MN--WI	57628	P	276
Wisconsin	Oshkosh, WI	66160		74,495
Wisconsin	Racine, WI	73153		133,700
Wisconsin	Round Lake Beach--McHenry--Grayslake, IL--WI	76474	P	30,562
Wisconsin	Sheboygan, WI	81118		71,313
Wisconsin	Wausau, WI	93025		74,632
Wisconsin	West Bend, WI	93916		68,444
Wyoming	Casper, WY	14482		64,548
Wyoming	Cheyenne, WY	16237		73,588
Guam	Hag†¤a, GU	36163		
Northern Mariana Islands	Saipan, MP	78040		
Puerto Rico	Aguadilla--Isabela--San Sebastián, PR	00631		306,196
Puerto Rico	Arecibo, PR	03034		139,171
Puerto Rico	Fajardo, PR	28981		85,225
Puerto Rico	Florida--Imbéry--Barceloneta, PR	30115		71,747
Puerto Rico	Guayama, PR	35866		80,155
Puerto Rico	Juana Díaz, PR	43453		80,928
Puerto Rico	Mayagüez, PR	55738		109,572
Puerto Rico	Ponce, PR	70642		149,539
Puerto Rico	San Germán--Cabo Rojo--Sabana Grande, PR	78985		118,199
Puerto Rico	San Juan, PR	79093		2,148,346
Puerto Rico	Yauco, PR	97561		90,899
*	Rural	99999		< 5,000
*	Small Urban	99998		5,000 - 49,000

* These codes are to be utilized by all States wherever these area types exist

**The following 2000 Census Year Urban Areas are now classified as Urban Clusters (UC's):

- Danville, VA-NC: Pop. 49,344
- Sandusky, OH: Pop. 48,990
- Galveston, TX: Pop. 44,022

NOTE: The "PART" field is used to identify urban areas that are located in multiple States.

Appendix J. County Code Reference Tables (AK, DC, and PR)

Alaska

Borough Name	County Code
Non Borough Area	000
Juneau City and Borough	001
Bristol Bay	002
Ketchikan Gateway	003
Anchorage Municipality	004
Sitka City and Borough	005
Kenai Peninsula	006
Kodiak Island	007
Matanuska Susitna	008
Fairbanks North Star	009
Haines	010
North Slope Borough	011
Northwest Arctic Borough	012
Aleutians East Borough	013
Denali Borough	014
Lake and Peninsula Borough	015
Yakutat City and Borough	016

District of Columbia

County Name	County Code
Northwest	001
Northeast	002
Southeast	003
Southwest	004
Boundary	005

Puerto Rico

Highway District	Municipio Name	County Code
San Juan	Bayamon	001
	Canovanas	
	Carolina	
	Catano	
	Guaynabo	
	Loiza	
	San Juan	
	Trujillo Alto	
Arecibo	Arecibo	002
	Barceloneta	
	Ciales	
	Corozal	
	Dorado	
	Florida	
	Manati	
	Morovis	
	Naranjito	
	Toa Alta	
	Toa Baja	
	Utuado	
	Vega Alta	
	Vega Baja	
Aguadilla	Aguada	003
	Aguadilla	
	Camuy	
	Hatillo	
	Isabela	
	Lares	
	Moca	
	Quebradillas	
	Rincon	
	San Sebastian	
Mayaguez	Anasco	004
	Cabo Rojo	
	Guanica	
	Hormigueros	
	Lajas	
	Las Marias	
	Maricao	
	Mayaguez	
	Sabana Grande	
	San German	
	Yauco	

Highway District	Municipio Name	County Code
Ponce	Adjuntas	005
	Coamo	
	Guayanilla	
	Jayuya	
	Juana Diaz	
	Orocovis	
	Penuelas	
	Ponce	
	Santa Isabel	
	Villalba	
Guayama	Aguas Buenas	006
	Aibonito	
	Arroyo	
	Barranquitas	
	Cayey	
	Cidra	
	Comerio	
	Guayama	
	Patillas	
	Salinas	
Humucao	Caguas	007
	Ceiba	
	Culebra	
	Fajardo	
	Gurabo	
	Humacao	
	Juncos	
	Las Piedras	
	Luquillo	
	Maunabo	
	Humacao	
	Rio Grande	
	San Lorenzo	
	Vieques	
	Yabucoa	

Appendix K. NAAQS Pollutant Standards

State	Area Name	Pollutant Standard
Alabama	Birmingham, AL	Ozone_8-hr.1997.Birmingham
Alabama	Birmingham, AL	PM-2.5.1997.Birmingham
Alabama	Birmingham, AL	PM-2.5.2006.Birmingham
Alaska	Fairbanks, AK	PM-2.5.2006.Fairbanks
Arizona	Nogales, AZ	PM-2.5.2006.Nogales
Arizona	Phoenix-Mesa, AZ	Ozone_8-hr.1997.Phoenix
Arkansas	Memphis, TN-AR	Ozone_8-hr.1997.Memphis
California	Amador and Calaveras Cos., CA: (Central Moun	Ozone_8-hr.1997.Amador_and_Calaveras_Cos
California	Chico, CA	Ozone_8-hr.1997.Chico
California	Chico, CA	PM-2.5.2006.Chico
California	Imperial Co, CA	PM-2.5.2006.Imperial_Co
California	Imperial Co., CA	Ozone_8-hr.1997.Imperial_Co
California	Kern County (Eastern Kern), CA	Ozone_8-hr.1997.East_Kern
California	Los Angeles, CA	PM-2.5.2006.LA-South_Coast
California	Los Angeles-San Bernardino Cos. (W Mojave De	Ozone_8-hr.1997.LA-Desert
California	Los Angeles-South Coast Air Basin, CA	Ozone_8-hr.1997.LA-South_Coast
California	Los Angeles-South Coast Air Basin, CA	PM-2.5.1997.LA-South_Coast
California	Mariposa and Tuolumne Cos., CA: (Southern Mo	Ozone_8-hr.1997.Mariposa_and_Tuolumne_Cos
California	Nevada County (Western part), CA	Ozone_8-hr.1997.Nevada_Co
California	Riverside Co. (Coachella Valley), CA	Ozone_8-hr.1997.Coachella_Valley
California	Sacramento Metro, CA	Ozone_8-hr.1997.Sacramento
California	Sacramento, CA	PM-2.5.2006.Sacramento
California	San Diego, CA	Ozone_8-hr.1997.San_Diego
California	San Francisco Bay Area, CA	Ozone_8-hr.1997.San_Francisco
California	San Francisco Bay Area, CA	PM-2.5.2006.San_Francisco
California	San Joaquin Valley, CA	Ozone_8-hr.1997.San_Joaquin_Valley
California	San Joaquin Valley, CA	PM-2.5.1997.San_Joaquin_Valley
California	San Joaquin Valley, CA	PM-2.5.2006.San_Joaquin_Valley
California	Sutter County (Sutter Buttes), CA	Ozone_8-hr.1997.Sutter_Buttes
California	Ventura County, CA	Ozone_8-hr.1997.Ventura_Co
California	Yuba City-Marysville, CA	PM-2.5.2006.Yuba_City
Colorado	Denver-Boulder-Greeley-Ft.Collins-Love., CO	Ozone_8-hr.1997.Denver
Connecticut	Greater Connecticut, CT	Ozone_8-hr.1997.Connecticut
Connecticut	New York, NY-NJ-CT	PM-2.5.2006.New_York

State	Area Name	Pollutant Standard
Connecticut	New York-N. New Jersey-Long Island, NY-NJ-CT	Ozone_8-hr.1997.New_York
Connecticut	New York-N. New Jersey-Long Island, NY-NJ-CT	PM-2.5.1997.New_York
Delaware	Philadelphia-Wilmington-Atlantic Ci, PA-NJ-M	Ozone_8-hr.1997.Philadelphia
Delaware	Philadelphia-Wilmington, PA-NJ-DE	PM-2.5.1997.Philadelphia
Delaware	Philadelphia-Wilmington, PA-NJ-DE	PM-2.5.2006.Philadelphia
District of Columbia	Washington, DC-MD-VA	Ozone_8-hr.1997.Washington
District of Columbia	Washington, DC-MD-VA	PM-2.5.1997.Washington
Georgia	Atlanta, GA	Ozone_8-hr.1997.Atlanta
Georgia	Atlanta, GA	PM-2.5.1997.Atlanta
Georgia	Chattanooga, TN-GA	Ozone_8-hr.1997.Chattanooga
Georgia	Chattanooga, TN-GA	PM-2.5.1997.Chattanooga
Georgia	Macon, GA	Ozone_8-hr.1997.Macon
Georgia	Macon, GA	PM-2.5.1997.Macon
Georgia	Murray Co. (Chattahoochee Nat Forest), GA	Ozone_8-hr.1997.Murray_Co
Georgia	Rome, GA	PM-2.5.1997.Rome
Idaho	Logan, UT-ID	PM-2.5.2006.Logan
Illinois	Chicago-Gary-Lake County, IL-IN	Ozone_8-hr.1997.Chicago
Illinois	Chicago-Gary-Lake County, IL-IN	PM-2.5.1997.Chicago
Illinois	St. Louis, MO-IL	Ozone_8-hr.1997.St_Louis
Illinois	St. Louis, MO-IL	PM-2.5.1997.St_Louis
Indiana	Chicago-Gary-Lake County, IL-IN	Ozone_8-hr.1997.Chicago
Indiana	Chicago-Gary-Lake County, IL-IN	PM-2.5.1997.Chicago
Indiana	Cincinnati-Hamilton, OH-KY-IN	Ozone_8-hr.1997.Cincinnati
Indiana	Cincinnati-Hamilton, OH-KY-IN	PM-2.5.1997.Cincinnati
Indiana	Evansville, IN	Ozone_8-hr.1997.Evansville
Indiana	Evansville, IN	PM-2.5.1997.Evansville
Indiana	Fort Wayne, IN	Ozone_8-hr.1997.Fort_Wayne
Indiana	Greene Co., IN	Ozone_8-hr.1997.Greene_Co_IN
Indiana	Indianapolis, IN	Ozone_8-hr.1997.Indianapolis
Indiana	Indianapolis, IN	PM-2.5.1997.Indianapolis
Indiana	Jackson Co., IN	Ozone_8-hr.1997.Jackson_Co
Indiana	La Porte Co., IN	Ozone_8-hr.1997.La_Porte_Co
Indiana	Louisville, KY-IN	Ozone_8-hr.1997.Louisville
Indiana	Louisville, KY-IN	PM-2.5.1997.Louisville
Indiana	Muncie, IN	Ozone_8-hr.1997.Muncie
Indiana	South Bend-Elkhart, IN	Ozone_8-hr.1997.South_Bend
Indiana	Terre Haute, IN	Ozone_8-hr.1997.Terre_Haute
Kentucky	Cincinnati-Hamilton, OH-KY-IN	Ozone_8-hr.1997.Cincinnati
Kentucky	Cincinnati-Hamilton, OH-KY-IN	PM-2.5.1997.Cincinnati

State	Area Name	Pollutant Standard
Kentucky	Clarkesville-Hopkinsville, TN-KY	Ozone_8-hr.1997.Clarksville
Kentucky	Huntington-Ashland, WV-KY	Ozone_8-hr.1997.Huntington
Kentucky	Huntington-Ashland, WV-KY-OH	PM-2.5.1997.Huntington
Kentucky	Louisville, KY-IN	Ozone_8-hr.1997.Louisville
Kentucky	Louisville, KY-IN	PM-2.5.1997.Louisville
Louisiana	Baton Rouge, LA	Ozone_8-hr.1997.Baton_Rouge
Maine	Hancock, Knox, Lincoln and Waldo Cos., ME	Ozone_8-hr.1997.Central_Maine_Coast
Maine	Portland, ME	Ozone_8-hr.1997.Portland_ME
Maryland	Baltimore, MD	Ozone_8-hr.1997.Baltimore
Maryland	Baltimore, MD	PM-2.5.1997.Baltimore
Maryland	Kent and Queen Anne's Cos., MD	Ozone_8-hr.1997.Kent_and_Queen_Annes_Cos
Maryland	Martinsburg, WV-Hagerstown, MD	PM-2.5.1997.Hagerstown
Maryland	Philadelphia-Wilmington-Atlantic Ci, PA-NJ-M	Ozone_8-hr.1997.Philadelphia
Maryland	Washington, DC-MD-VA	Ozone_8-hr.1997.Washington
Maryland	Washington, DC-MD-VA	PM-2.5.1997.Washington
Massachusetts	Boston-Lawrence-Worcester (E. Mass), MA	Ozone_8-hr.1997.Boston_MA
Massachusetts	Boston-Manchester-Portsmouth (SE), NH	Ozone_8-hr.1997.Boston_NH
Massachusetts	Springfield (W. Mass), MA	Ozone_8-hr.1997.Springfield
Michigan	Allegan Co., MI	Ozone_8-hr.1997.Allegan_Co
Michigan	Benton Harbor, MI	Ozone_8-hr.1997.Benton_Harbor
Michigan	Benzie Co., MI	Ozone_8-hr.1997.Benzie_Co
Michigan	Cass County, MI	Ozone_8-hr.1997.Cass_Co
Michigan	Detroit-Ann Arbor, MI	Ozone_8-hr.1997.Detroit
Michigan	Detroit-Ann Arbor, MI	PM-2.5.1997.Detroit
Michigan	Detroit-Ann Arbor, MI	PM-2.5.2006.Detroit
Michigan	Flint, MI	Ozone_8-hr.1997.Flint
Michigan	Grand Rapids, MI	Ozone_8-hr.1997.Grand_Rapids
Michigan	Huron Co., MI	Ozone_8-hr.1997.Huron_Co
Michigan	Kalamazoo-Battle Creek, MI	Ozone_8-hr.1997.Kalamazoo
Michigan	Lansing-East Lansing, MI	Ozone_8-hr.1997.Lansing
Michigan	Mason Co, MI	Ozone_8-hr.1997.Mason_Co
Michigan	Muskegon, MI	Ozone_8-hr.1997.Muskegon
Missouri	St. Louis, MO-IL	Ozone_8-hr.1997.St_Louis
Missouri	St. Louis, MO-IL	PM-2.5.1997.St_Louis
Montana	Libby, MT	PM-2.5.1997.Libby
Nevada	Las Vegas, NV	Ozone_8-hr.1997.Las_Vegas
New Hampshire	Boston-Manchester-Portsmouth (SE), NH	Ozone_8-hr.1997.Boston_NH
New Jersey	New York, NY-NJ-CT	PM-2.5.2006.New_York
New Jersey	New York-N. New Jersey-Long Island, NY-NJ-CT	Ozone_8-hr.1997.New_York

State	Area Name	Pollutant Standard
New Jersey	New York-N. New Jersey-Long Island, NY-NJ-CT	PM-2.5.1997.New_York
New Jersey	Philadelphia-Wilmington, PA-NJ-DE	PM-2.5.1997.Philadelphia
New Jersey	Philadelphia-Wilmington, PA-NJ-DE	PM-2.5.2006.Philadelphia
New Jersey	Philadelphia-Wilmington-Atlantic Ci, PA-NJ-M	Ozone_8-hr.1997.Philadelphia
New York	Albany-Schenectady-Troy, NY	Ozone_8-hr.1997.Albany
New York	Buffalo-Niagara Falls, NY	Ozone_8-hr.1997.Buffalo
New York	Essex County (Whiteface Mtn.), NY	Ozone_8-hr.1997.Whiteface_Mountain
New York	Jamestown, NY	Ozone_8-hr.1997.Jamestown
New York	Jefferson County, NY	Ozone_8-hr.1997.Jefferson_Co
New York	New York, NY-NJ-CT	PM-2.5.2006.New_York
New York	New York-N. New Jersey-Long Island, NY-NJ-CT	Ozone_8-hr.1997.New_York
New York	New York-N. New Jersey-Long Island, NY-NJ-CT	PM-2.5.1997.New_York
New York	Poughkeepsie, NY	Ozone_8-hr.1997.Poughkeepsie
New York	Rochester, NY	Ozone_8-hr.1997.Rochester
North Carolina	Charlotte-Gastonia-Rock Hill, NC-SC	Ozone_8-hr.1997.Charlotte
North Carolina	Greensboro-Winston-Salem-High Point, NC	PM-2.5.1997.Greensboro
North Carolina	Haywood and Swain Cos. (Great Smoky NP), NC	Ozone_8-hr.1997.Haywood_and_Swain_Cos
North Carolina	Hickory-Morganton-Lenoir, NC	PM-2.5.1997.Hickory
North Carolina	Raleigh-Durham-Chapel Hill, NC	Ozone_8-hr.1997.Raleigh
North Carolina	Rocky Mount, NC	Ozone_8-hr.1997.Rocky_Mount
Ohio	Canton-Massillon, OH	Ozone_8-hr.1997.Canton
Ohio	Canton-Massillon, OH	PM-2.5.1997.Canton
Ohio	Canton-Massillon, OH	PM-2.5.2006.Canton
Ohio	Cincinnati-Hamilton, OH-KY-IN	Ozone_8-hr.1997.Cincinnati
Ohio	Cincinnati-Hamilton, OH-KY-IN	PM-2.5.1997.Cincinnati
Ohio	Cleveland-Akron-Lorain, OH	Ozone_8-hr.1997.Cleveland
Ohio	Cleveland-Akron-Lorain, OH	PM-2.5.1997.Cleveland
Ohio	Cleveland-Akron-Lorain, OH	PM-2.5.2006.Cleveland
Ohio	Columbus, OH	Ozone_8-hr.1997.Columbus
Ohio	Columbus, OH	PM-2.5.1997.Columbus
Ohio	Dayton-Springfield, OH	Ozone_8-hr.1997.Dayton
Ohio	Dayton-Springfield, OH	PM-2.5.1997.Dayton
Ohio	Huntington-Ashland, WV-KY-OH	PM-2.5.1997.Huntington
Ohio	Lima, OH	Ozone_8-hr.1997.Lima
Ohio	Parkersburg-Marietta, WV-OH	Ozone_8-hr.1997.Parkersburg
Ohio	Parkersburg-Marietta, WV-OH	PM-2.5.1997.Parkersburg
Ohio	Steubenville-Weirton, OH-WV	Ozone_8-hr.1997.Weirton
Ohio	Steubenville-Weirton, OH-WV	PM-2.5.1997.Weirton
Ohio	Steubenville-Weirton, OH-WV	PM-2.5.2006.Weirton

State	Area Name	Pollutant Standard
Ohio	Toledo, OH	Ozone_8-hr.1997.Toledo
Ohio	Wheeling, WV-OH	Ozone_8-hr.1997.Wheeling
Ohio	Wheeling, WV-OH	PM-2.5.1997.Wheeling
Ohio	Youngstown-Warren-Sharon, PA-OH	Ozone_8-hr.1997.Youngstown
Oregon	Klamath Falls, OR	PM-2.5.2006.Klamath_Falls
Oregon	Oakridge, OR	PM-2.5.2006.Oakridge
Pennsylvania	Allentown, PA	PM-2.5.2006.Allentown
Pennsylvania	Allentown-Bethlehem-Easton, PA	Ozone_8-hr.1997.Allentown
Pennsylvania	Altoona, PA	Ozone_8-hr.1997.Altoona
Pennsylvania	Clearfield & Indiana Cos., PA	Ozone_8-hr.1997.Clearfield_and_Indiana_Cos
Pennsylvania	Erie, PA	Ozone_8-hr.1997.Erie
Pennsylvania	Franklin Co., PA	Ozone_8-hr.1997.Franklin_Co
Pennsylvania	Greene Co., PA	Ozone_8-hr.1997.Greene_Co_PA
Pennsylvania	Harrisburg-Lebanon-Carlisle, PA	Ozone_8-hr.1997.Harrisburg
Pennsylvania	Harrisburg-Lebanon-Carlisle, PA	PM-2.5.1997.Harrisburg
Pennsylvania	Harrisburg-Lebanon-Carlisle-York, PA	PM-2.5.2006.Harrisburg
Pennsylvania	Johnstown, PA	Ozone_8-hr.1997.Johnstown
Pennsylvania	Johnstown, PA	PM-2.5.1997.Johnstown
Pennsylvania	Johnstown, PA	PM-2.5.2006.Johnstown
Pennsylvania	Lancaster, PA	Ozone_8-hr.1997.Lancaster
Pennsylvania	Lancaster, PA	PM-2.5.1997.Lancaster
Pennsylvania	Lancaster, PA	PM-2.5.2006.Lancaster
Pennsylvania	Philadelphia-Wilmington, PA-NJ-DE	PM-2.5.1997.Philadelphia
Pennsylvania	Philadelphia-Wilmington, PA-NJ-DE	PM-2.5.2006.Philadelphia
Pennsylvania	Philadelphia-Wilmington-Atlantic Ci, PA-NJ-M	Ozone_8-hr.1997.Philadelphia
Pennsylvania	Pittsburgh-Beaver Valley, PA	Ozone_8-hr.1997.Pittsburgh
Pennsylvania	Pittsburgh-Beaver Valley, PA	PM-2.5.1997.Pittsburgh
Pennsylvania	Pittsburgh-Beaver Valley, PA	PM-2.5.2006.Pittsburgh
Pennsylvania	Reading, PA	Ozone_8-hr.1997.Reading
Pennsylvania	Reading, PA	PM-2.5.1997.Reading
Pennsylvania	Scranton-Wilkes-Barre, PA	Ozone_8-hr.1997.Scranton
Pennsylvania	State College, PA	Ozone_8-hr.1997.State_College
Pennsylvania	Tioga Co., PA	Ozone_8-hr.1997.Tioga_Co
Pennsylvania	York, PA	Ozone_8-hr.1997.York
Pennsylvania	York, PA	PM-2.5.1997.York
Pennsylvania	Youngstown-Warren-Sharon, PA-OH	Ozone_8-hr.1997.Youngstown
Rhode Island	Providence (all of RI), RI	Ozone_8-hr.1997.Providence
South Carolina	Charlotte-Gastonia-Rock Hill, NC-SC	Ozone_8-hr.1997.Charlotte
South Carolina	Greenville-Spartanburg-Anderson, SC	Ozone_8-hr.1997.Greenville

State	Area Name	Pollutant Standard
Tennessee	Chattanooga, TN-GA	PM-2.5.1997.Chattanooga
Tennessee	Clarkesville-Hopkinsville, TN-KY	Ozone_8-hr.1997.Clarksville
Tennessee	Knoxville, TN	Ozone_8-hr.1997.Knoxville
Tennessee	Knoxville, TN	PM-2.5.1997.Knoxville
Tennessee	Knoxville-Sevierville-La Follette, TN	PM-2.5.2006.Knoxville
Tennessee	Memphis, TN-AR	Ozone_8-hr.1997.Memphis
Texas	Beaumont/Port Arthur, TX	Ozone_8-hr.1997.Beaumont
Texas	Dallas-Fort Worth, TX	Ozone_8-hr.1997.Dallas
Texas	Houston-Galveston-Brazoria, TX	Ozone_8-hr.1997.Houston
Utah	Logan, UT-ID	PM-2.5.2006.Logan
Utah	Provo, UT	PM-2.5.2006.Provo
Utah	Salt Lake City, UT	PM-2.5.2006.Salt_Lake
Virginia	Fredericksburg, VA	Ozone_8-hr.1997.Fredericksburg
Virginia	Madison & Page Cos. (Shenandoah NP), VA	Ozone_8-hr.1997.Madison_and_Page_Cos
Virginia	Norfolk-Virginia Beach-Newport News (Hampton	Ozone_8-hr.1997.Norfolk
Virginia	Richmond-Petersburg, VA	Ozone_8-hr.1997.Richmond
Virginia	Washington, DC-MD-VA	Ozone_8-hr.1997.Washington
Virginia	Washington, DC-MD-VA	PM-2.5.1997.Washington
Washington	Seattle-Tacoma, WA	PM-2.5.2006.Tacoma
West Virginia	Charleston, WV	Ozone_8-hr.1997.Charleston
West Virginia	Charleston, WV	PM-2.5.1997.Charleston
West Virginia	Charleston, WV	PM-2.5.2006.Charleston
West Virginia	Huntington-Ashland, WV-KY	Ozone_8-hr.1997.Huntington
West Virginia	Huntington-Ashland, WV-KY-OH	PM-2.5.1997.Huntington
West Virginia	Martinsburg, WV-Hagerstown, MD	PM-2.5.1997.Hagerstown
West Virginia	Parkersburg-Marietta, WV-OH	Ozone_8-hr.1997.Parkersburg
West Virginia	Parkersburg-Marietta, WV-OH	PM-2.5.1997.Parkersburg
West Virginia	Steubenville-Weirton, OH-WV	Ozone_8-hr.1997.Weirton
West Virginia	Steubenville-Weirton, OH-WV	PM-2.5.1997.Weirton
West Virginia	Steubenville-Weirton, OH-WV	PM-2.5.2006.Weirton
West Virginia	Wheeling, WV-OH	Ozone_8-hr.1997.Wheeling
West Virginia	Wheeling, WV-OH	PM-2.5.1997.Wheeling
Wisconsin	Door County, WI	Ozone_8-hr.1997.Door_Co
Wisconsin	Kewaunee County, WI	Ozone_8-hr.1997.Kewaunee_Co
Wisconsin	Manitowoc County, WI	Ozone_8-hr.1997.Manitowoc_Co
Wisconsin	Milwaukee-Racine, WI	Ozone_8-hr.1997.Milwaukee
Wisconsin	Milwaukee-Racine, WI	PM-2.5.2006.Milwaukee
Wisconsin	Sheboygan, WI	Ozone_8-hr.1997.Sheboygan