

Model Minimum Inventory of Roadway Elements—MMIRE

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Foreword

Good safety and highway inventory data are crucial in today's processes to make sound safety improvement decisions. They will become even more important, if agencies are to take advantage of a new generation of safety analysis tools, such as the FHWA's Interactive Highway Safety Design Model (IHSDM) and *SafetyAnalyst*, AASHTO's Data and Analysis Guide, and the Highway Safety Manual. Development of a **Model Minimum Inventory of Roadway Elements**, referred to as **MMIRE**, is recommended so that State, local, and Federal agencies understand the importance of roadway inventory and traffic data for safety programs and know what critical roadway data variables are required to make more effective and efficient safety improvement decisions, as well as to take advantage of current and future cutting-edge analytical tools and resources.

The establishment and adoption of **MMIRE** has potential advantages beyond improved safety. State and local asset management systems also will benefit by collecting and monitoring of the **MMIRE**. Since a major portion of **MMIRE** will be comprised of an inventory of various roadway assets, asset managers can benefit from standardized definitions, consistent measurement accuracies, and geo-spatial location and performance levels of these assets. This joint effort between safety and asset management can result in shared data, improved interdepartmental cooperation, reductions in data discrepancy, and improved data collection and reliability. The initiative will improve both the overall safety and the asset management programs. Finally, collection of **MMIRE** in a current asset management system will allow safety practitioners to access that information from the database and reduce the burden on enforcement or investigators to collect the information at the crash scene.

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Research and Development

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16. Abstract Safety data provide the key to making sound decisions on the design and operation of roadways, but deficiencies in many States' safety databases do not allow for good decisionmaking. The Federal Highway Administration, American Association of State Highway and Transportation Officials, and the National Cooperative Highway Research Program sponsored a scanning study of how agencies in the Netherlands, Germany, and Australia develop and use traffic safety information systems. That scan produced a report that included recommendations for advancing safety themes in the areas of strategy, efficiency, and utility. A recently completed follow-on effort built on the scan team's final report and draft implementation plan by reviewing in detail the strategies suggested, providing action-related details to some of the critical strategies, and adding new strategies to help reach the team's goals. ⁽¹⁾ As noted in that White Paper, while considerable attention and effort has been devoted to the improvement in crash data, one of the primary safety databases, much less effort has been devoted to improvements in the second primary safety database—roadway inventory and traffic data. One of the five critical strategies detailed there involved improving safety data by defining <i>good inventory data</i> , and specifically recommended the development of a Model Minimum Inventory of Roadway Element (MMIRE) that would define the critical inventory and traffic data elements needed by State and local jurisdictions to meet current safety analysis needs and data needs arising from a new generation of safety analysis tools. This current report presents a proposed MMIRE and documents the development process, which included review of the proposed MMIRE elements in a workshop of safety data experts. A listing of high-priority and supplemental inventory and traffic elements are presented, along with proposed coding for each element.			
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in ²	square inches	645.2	square millimeters	mm ²
ft ²	square feet	0.093	square meters	m ²
yd ²	square yard	0.836	square meters	m ²
ac	acres	0.405	hectares	ha
mi ²	square miles	2.59	square kilometers	km ²
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft ³	cubic feet	0.028	cubic meters	m ³
yd ³	cubic yards	0.765	cubic meters	m ³
NOTE: volumes greater than 1000 L shall be shown in m ³				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in ²	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm ²	square millimeters	0.0016	square inches	in ²
m ²	square meters	10.764	square feet	ft ²
m ²	square meters	1.195	square yards	yd ²
ha	hectares	2.47	acres	ac
km ²	square kilometers	0.386	square miles	mi ²
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m ³	cubic meters	35.314	cubic feet	ft ³
m ³	cubic meters	1.307	cubic yards	yd ³
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
TEMPERATURE (exact degrees)				
°C	Celsius	1.8C+32	Fahrenheit	°F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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ACRONYMS

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
ADT	average daily traffic
AMF	accident modification factor
DOT	department of transportation
FHWA	Federal Highway Administration
FIPS	Federal Information Processing Standards
GLC	geographic locator code
GSA	General Services Administration
HPMS	Highway Performance Monitoring System
HSIS	Highway Safety Information System
HSM	<i>Highway Safety Manual</i>
IHSDM	Interactive Highway Safety Design Model
ITRF	International Traffic Records Forum
MMIRE	Model Minimum Inventory of Roadway Elements
MMUCC	Model Minimum Uniform Crash Criteria
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
TRB	Transportation Research Board
TSIMS	Transportation Safety Information Management System
USDOT	U.S. Department of Transportation

INTRODUCTION

Safety data are the key to sound decisions on the design and operation of roadways. Critical safety data include not only crash data, but also roadway inventory data, traffic data, driver history data, citation/adjudication information, and other files. The need for such data is increasing due to the development of a new generation of safety data analysis tools and methods. However, the quality of safety databases in many States and local agencies appears to be eroding. In 2003, the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the National Cooperative Highway Research Program (NCHRP) sponsored a scanning study of how agencies in the Netherlands, Germany, and Australia develop and use traffic safety information systems. The expert scan team's findings included a series of recommendations concerning needed improvements in this country.⁽²⁾ In a follow-on effort funded by the FHWA, the recommendations from that scan team's report were reviewed and expanded in the *Traffic Safety Information Scan Strategy Implementation White Paper*.⁽¹⁾ Action-related details were added to some of the critical strategies, and new strategies were proposed to help reach the team's goals.

While strategies in the *White Paper* related to both crash data and other noncrash safety data such as roadway inventory and traffic volumes, more emphasis was placed on the noncrash (inventory and traffic) data. Traditionally, more emphasis has been given to improving crash data, resulting in both programs and organized user groups that do not exist for the noncrash data. Over the past decade efforts to develop a model and minimum set of good crash data elements has resulted in the Model Minimum Uniform Crash Criteria (MMUCC). The MMUCC has become the de-facto standard for crash data variables used by State and local jurisdictions when improving their crash data systems.

Indeed, a key strategy included in the *White Paper* concerned the need to better define *good safety inventory data*—those data that are important in today's safety decisions, and that will become even more important given the current development of a new generation of safety analysis tools. The concept of a minimum set of roadway elements was proposed. The recommended companion to the MMUCC has been termed the Model Minimum Inventory of Roadway Elements (MMIRE). In 2005, FHWA funded an effort to develop the initial version of MMIRE. This report documents that effort.

DEFINITION OF AND RATIONALE FOR MMIRE

The concept of MMIRE includes a listing of roadway inventory and traffic elements critical to safety management and the proposed coding for each of these critical elements. No such listing now exists. These high-priority inventory and traffic variables are linked to and then used with crash data elements in making decisions concerning implementing safety treatments and in developing knowledge about the safety effects of treatments, roadway designs and traffic operations (e.g., signal phasing). While crash data alone can be used by a State or local roadway safety agency to answer some questions (e.g., the identification of locations for treatment), they are not sufficient in many cases. Without sound inventory and traffic data, the safety professional's ability to make critical programmatic decisions is greatly reduced. Examples where sound inventory and traffic data are needed include:

- **Identification of locations that would benefit most from safety treatments.** Safety treatment dollars are limited, and should be used on locations that will most benefit from treatments. While these problem-location-identification decisions can, and often are, made on the basis of crash frequency alone, such a process does not allow the safety engineer to identify those sites that are most likely to benefit from safety treatment. To meet these criteria, the site must not just have the highest frequency of crashes, but have an elevated crash risk when compared to similar sites. More specifically, the identification of high-priority intersections by crash frequency alone would lead to a listing including primarily (or only) intersections with high traffic volumes. To identify both those high and lower volume intersections that will benefit most from treatment, one needs to identify those that have higher crash frequencies or rates when compared to similar intersections based on intersection characteristics (e.g., entering volumes on all legs, number of approach lanes, signalized versus unsignalized, presence of left turn lanes and signal phases). Without an inventory file that includes both the locations of all intersections within a system and characteristics of each of these intersection legs, one cannot conduct such analyses since the needed group of similar intersections cannot be identified. Even if the safety engineer decided not to use such a robust problem-identification process, but did want to compare intersections on the basis of crash rates (i.e., crashes per entering vehicle) rather than just crash frequencies, they could not even complete this less-robust process without approach volumes from both crossing roadways—data that are not available in most State and local agencies. This is particularly true when the crossing roadway is not a State-system road (i.e., is a county or local road).
- **Development of knowledge about roadway treatment effects.** As has been documented in various publications, including the NCHRP “Series 500” Implementation Guides for the AASHTO Strategic Highway Safety Plan efforts¹, accurate estimates of the treatment effect (i.e., accident modification factors—AMFs) of many commonly used safety treatments are unknown or are based on poor data and research methods. The safety professional and the safety research community are continually trying to evaluate critical treatments. However, conducting a sound evaluation requires much more than just comparing the before and after

¹ See <http://safety.transportation.org/guides.aspx>.

crash experience on the treated site. Current state-of-the-practice methods require the use of a *reference group* of similar untreated sites. Even less than optimum evaluations require a comparison group of similar sites. Without a good inventory system, these groups cannot be defined.

- **Use of the new generation of safety management tools.** For the past few years, FHWA and AASHTO have been developing a set of new cutting-edge analytical tools and resources to aid the roadway designer and the safety engineer in their design, operations, and treatment decisions. These include FHWA's Interactive Highway Safety Design Model (IHSDM)² and *SafetyAnalyst*³, AASHTO's *Series 500 Data and Analysis Guide*⁽³⁾, and the *Highway Safety Manual*⁴. IHSDM is a CAD-based system, comprised of multiple modules that allows the user to predict the expected safety performance of roadway design and redesign alternatives. Currently, only the rural two-lane version has been developed. However, similar tools are being developed for both suburban and urban arterials and rural multilane roadways. These tools will be included in the first edition of the *Highway Safety Manual*, a compilation of safety knowledge and safety analysis tools being developed by the Transportation Research Board with funding from AASHTO. FHWA's *SafetyAnalyst* is a package of safety management tools that will assist the user in efforts ranging from screening the roadway network to identify sites for improvement to analyzing the sites and choosing the most appropriate treatments, and evaluating the effects of the treatment. This set of tools will be completed and released in 2008. AASHTO's *Series 500 Guides*⁵ are compilations of current knowledge about low-cost safety treatments aimed at reducing specific crash types (e.g., run-off-road crashes, unsignalized intersection crashes, crashes involving drinking drivers) The final Guide in this series, *A Guide for Addressing Safety Data and Analysis in Developing Emphasis Area Plans*, contains analytical techniques to assist the safety engineer and other safety professionals in planning how to reduce each of 22 crash types covered in the *Series 500 Guides*.⁽³⁾ What is important to note is that *all* of these new tools require good inventory and traffic flow data for use. Without such data, the safety professional cannot take full advantage of the safety decision tools.
- **Development of knowledge about roadway elements and designs that increase or decrease crash risk.** While the study of changes in crash risk or crash injury risk due to changes in roadway elements is usually conducted by researchers rather than safety engineers, the knowledge gained from such analyses leads to improved design standards and operating procedures—outcomes that do affect how the engineers do their jobs. Such studies cannot be completed without detailed information on the roadway characteristics and traffic flows on roadway segments with and without crashes. At this point, very little is known about the true effects on crash risk of such elements as curvature or grade on multilane rural and suburban roads, driveway density, access control policies, and many others. The lack of this knowledge affects sound safety decisions, and this lack results from the fact that

² See <http://www.tfrc.gov/safety/ihsdm/ihsdm.htm>.

³ See <http://www.tfrc.gov/safety/pubs/06124/index.htm>.

⁴ See <http://www.wsdot.wa.gov/partners/hsm/public/>.

⁵ See <http://safety.transportation.org/guides.aspx>.

complete inventory data that can be linked with crashes is unavailable in most States and local jurisdictions.

Almost all State highway agencies and some local transportation agencies currently have roadway inventory and traffic flow data in their files. These data were often the result of expanding data collection efforts required by FHWA's Highway Performance Monitoring System (HPMS)⁶ for sample sections of roadways to the full State system of roadways. Although HPMS has been the driving force behind the collection of roadway inventory and traffic data by State departments of transportation (DOTs), it cannot be considered the model for safety inventory data because:

- It is based on the need for data on highway condition, performance, use, and operating characteristics of highways and is not driven by safety considerations.
- It requires complete inventory data of only basic (universe) variables, while other variables are captured only for certain sample sections of roadways (e.g., lane width, shoulder width).
- The format of certain variables, even those captured on only sample sections, is not conducive to safety use (e.g., horizontal curvature data specifies the total curve length within the sample for certain curve classes, but not the location of the individual curves within the section).

While the data elements in many States' current inventory systems are an expansion of the HPMS sample elements to all roads in the full State system and capture such variables as lane width, shoulder width and type, speed limit, and other cross sectional variables, very few State systems capture curvature or grade data, intersection inventory data, roadside inventory data, or other data elements critical to safety.

FHWA and AASHTO initiated efforts to develop a "Draft Model Highway Data Dictionary" for subsequent use in the development of the Transportation Safety Information Management System (TSIMS). The data dictionary is viewed as a starting point for developing a comprehensive, uniform set of roadway characteristic data attributes.⁷ However, it cannot be considered a model for a sound safety inventory database due to some limitations in the explanatory descriptions of the items, missing critical safety elements (e.g., clear-zone width), and in the classification of the priority of the elements.

In summary, there is no current listing of critical safety-related inventory and traffic data elements—no MMIRE. In contrast, the U.S. Department of Transportation's (USDOT's) National Highway Traffic Safety Administration, working with the Governors' Highway Safety Association and safety data advocates across the Nation, have developed a listing of and definitions for critical crash data elements over the past decade—the Model Minimum Uniform Crash Criteria (MMUCC).⁸ Although not an official national standard, this data element

⁶ For more information on HPMS, refer to <http://www.fhwa.dot.gov/policy/ohpi/hpms/>.

⁷ For more information, refer to http://tsims.aashtoware.org/ContentManagement/PageBody.asp?PAGE_ID=3&CONTENT_ID=23.

⁸ For more information on MMUCC, refer to <http://www.mmucc.us/>.

guideline has become the de facto standard that is used by almost all State agencies when they reexamine and modify their crash report form. What is needed is a companion for MMUCC—thus the birth of MMIRE.

Three final background points are noted concerning what MMIRE is envisioned to be. First, since the development of the concept in the Council and Harkey *White Paper*,⁽¹⁾ it has been strongly recommended that like MMUCC (but unlike HPMS), the collection of MMIRE elements will be *voluntary* rather than mandatory. Like MMUCC, MMIRE is envisioned as a tool to be used by State and local agencies in their safety data improvement efforts. The only MMIRE-related requirement currently being discussed concerns States applying for Federal safety-data improvement grants under Section 2006(e)—“State Traffic Safety Information System Improvements” in the new Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) legislation. The language in that section indicates that the USDOT Secretary will define *model data elements* for use in safety analyses, and that States applying for the grants will need to certify that they have adopted the model elements or will use the grant funds to work toward adopting and using them. While not known at this time, it is anticipated that elements in MMIRE, like MMUCC, ultimately will be included in the listing of these model data elements.

Second, it also has been recommended strongly from inception that MMIRE efforts be continually reviewed by the data collectors and users—the State and local DOTs. The *White Paper*⁽¹⁾ suggested that the listing of proposed elements be vetted by review committees of State and local agency safety and inventory engineers and users. The vetting effort should include strong participation from appropriate individuals and committees in AASHTO, because their endorsement and support will be critical to gaining State agency acceptance. As described below, this vetting process has begun with the convening of State and local data experts in a MMIRE review workshop. It is anticipated that FHWA will continue that vetting process in further reviews.

Third, the choice of elements considered for MMIRE and the priority assigned are based on the need for that element in *safety* efforts. There are clearly other variables collected in HPMS and other files that are used for nonsafety analyses (e.g., pavement depth). These may well be key variables for other purposes, but were not included (or recommended) in MMIRE unless they were felt to be important for safety uses.

DEVELOPMENT OF MMIRE

MMIRE has been developed through a multistage process involving identification of potential elements, review and comment by data collection and data use experts, modification of MMIRE element listing based on that review, and developing of proposed coding schemes for each element. The following narrative describes that process.

IDENTIFICATION OF POTENTIAL MMIRE ELEMENTS

As noted above, the goal of MMIRE is to define *critical safety data inventory elements*—those elements needed by State and local agencies to conduct their internal analyses, and those elements required by existing safety analysis tools and resources. However, this effort was not limited to existing data element needs. Thought also was given to critical elements that will be needed for use in future analysis tools and program decisions. For example, pedestrian and bicycle safety are both high-priority areas for both State and local jurisdictions. As in program decisions and knowledge developed for other road users, both crash and exposure data are needed by the analyst. While pedestrian and bicycle exposure data currently are not collected, these counts may be possible by using digital-image-based methods now under development. Such critical, but nonexistent, elements are included in the proposed MMIRE structure. The research team based their choice of proposed elements on five specific existing tools and resources:

- *HPMS—the Highway Performance Monitoring System*. As noted above, HPMS is very likely the reason why current inventory systems exist in State DOTs. Even given the fact that HPMS was not developed as a safety data base, it was a high-priority source of potential elements, with elements from both the “universe” and the “sample” datasets of HPMS being considered in terms of possible use in safety analyses. Conversations were held with HPMS staff to ensure that the proposed MMIRE would be compatible with current HPMS revision efforts, and HPMS staff provided inputs on elements before initial review by outside experts.
- *IHSDM—FHWA’s Interactive Highway Safety Design Model*. This is a CAD-based system composed of multiple modules that allow the user to predict the expected safety performance of roadway design and redesign alternatives. Currently, only the rural two-lane version has been developed. However, similar tools are being developed for both suburban and urban arterials and rural multilane roadways. These tools will be included in the first edition of the *Highway Safety Manual*. Elements related to these road types have been added to the MMIRE matrix based on IHSDM user documents.⁽⁴⁾
- *SafetyAnalyst*. FHWA is currently developing this package of safety management tools that will assist the user in efforts ranging from screening the roadway network to identify sites for improvement, analyzing the sites and choosing the most appropriate treatments, and evaluating the effects of the treatment. Variables required by SafetyAnalyst as noted in the user documentation are considered to be very critical MMIRE elements. “Optional” or “recommended” SafetyAnalyst variables also were included and considered.⁽⁵⁾

- *TSIMS—AASHTO’s Traffic Safety Information Management System.* The overall goal of the TSIMS project is to develop an enterprise safety data warehouse, software that will assist the State and local agency in the collection, storage and linkage of the many types of safety data. A component of the current TSIMS package is a “Data Dictionary” that includes listings of “minimum,” “basic,” and “extended” roadway inventory variables. Since this is very similar to what MMIRE is attempting to do, many of these elements were reviewed and included in the MMIRE matrix.
- *MMUCC—The Model Minimum Uniform Crash Criteria.* While MMUCC is a crash data element system, it contains reference to 18 roadway inventory variables that should exist in a roadway inventory file and thus be linked to for analyses. Based on inputs from MMUCC specialists at the review workshop, these variables were checked against the listing of draft MMIRE variables, and all were found to be included.

These four original inventory element listings were reviewed in detail by the project team staff, and potential MMIRE elements were identified. In addition to elements in these four listings, the project team also included additional elements that are felt to be critical MMIRE variables. These additions were based primarily on four other sources:

1. Project team knowledge of State inventory databases that arose from their work with the nine States and two local agencies that are or have participated in FHWA’s *Highway Safety Information System (HSIS)*.⁹
2. Project team knowledge of roadway safety research efforts, and the data needed to conduct that research (including data that are not available in most or all State and local data files).
3. Project team knowledge of efforts related to the development of the *Highway Safety Manual*, and the data elements needed in the research and tools supporting that effort.
4. Project team knowledge of data needed in other “nontraditional” safety data analyses—primarily those related to pedestrian, bicycle, and roundabout safety.

This element identification effort produced a listing of over 150 potential MMIRE elements. The listing was converted to a matrix for use in the review workshop described in the section below. For each data element, the project team provided a proposed priority—1st, 2nd, and not recommended. This priority was based on a combination of factors including the requirements of the four major data sources and tools noted above (i.e., MMUCC was added later) and the team’s knowledge of current and expected future analysis and tool needs. In some cases, the difficulty of data collection was considered in this prioritization.

In addition to the draft priority, the matrix also provided information on the presence of or requirement for each data element in the four basic data sources and the “level of priority” provided by each source (e.g., HPMS has both Sample Section and Universe elements; *SafetyAnalyst* has “mandatory,” “optional,” and “supplemental” elements).

⁹ For more information, refer to <http://www.hsisinfo.org/>.

Finally, the project team searched for each potential data element in inventory files for 20 States that were available to them—the eight current HSIS States and 12 other States. Each State file was examined to determine which of the MMIRE elements being considered were collected by that State. For example, information on “county” is captured in 18 of the 20 State systems examined (i.e., 90 percent). This information was also provided to the reviewers in the workshop to give them some sense of the current presence of each variable in the sample State data systems.

THE MMIRE REVIEW WORKSHOP

A one-day MMIRE review workshop was held August 3, 2006, in conjunction with the International Traffic Records Forum (ITRF). As indicated above, the purpose of the workshop was to have State and local agency data collectors and data users review and provide feedback on the potential data elements in the draft MMIRE matrix described above. To ensure input from State and local DOT data collection managers, State and local data users, roadway safety researchers, and other roadway data experts, the workshop participants include both an invited group of attendees whose travel expenses were funded by FHWA and other ITRF attendees who signed up for the workshop. The workshop included 34 attendees—18 from State DOTs, 2 from local DOTs, 6 from the USDOT, 6 roadway safety researchers, one data-product vendor, and one representative from AASHTO. A full list of attendees is provided in Appendix A.

The above-described MMIRE draft matrix was presented to the attendees, who were asked to:

1. Provide feedback including their thoughts on the adequacy of the proposed MMIRE and the proposed priority of the elements.
2. Provide suggestions concerning additional/fewer elements and difficulties and solutions to collection of each element.
3. Provide suggestion on how best to proceed toward the development of a MMIRE implementation plan.

MODIFICATION OF DRAFT MMIRE ELEMENT LISTING

Following the workshop, the project team incorporated the feedback from the workshop participants into the final proposed MMIRE elements. Changes incorporated included addition of a small number of new variables and deletion of a smaller number of proposed variables, minor variable name changes, and changes in the priorities for some variables. The most significant changes involved (1) reorganization of sections of the matrix, (2) changing what were originally “intersection” descriptors to include additional “junctions” such as mid-block pedestrian and bicycle crossings, and (3) a change in how the “priority” of each element is defined. With respect to the latter, while the draft priorities discussed at the workshop could be affected by the anticipated difficulty in data collection, the discussion there resulted in the final priority being only based on the importance of the element in safety analyses, and a new variable was added estimating the level of difficulty of data collection.

DEVELOPMENT OF PROPOSED CODING SCHEME FOR EACH MMIRE ELEMENT

Following finalization of the proposed listing of MMIRE elements, the project team defined a proposed coding scheme for each element. For existing elements found in any of the five data sources noted above, the team reviewed the proposed coding from each. As would be expected, the coding for a given variable differed to some degree across the sources. The final decision was made based on the expected use in future analyses. Thus, additional weight was given to the schemes now used in both the IHSDM and SafetyAnalyst and anticipated for use in future tools. However, an attempt was made to ensure that the proposed scheme also was compatible with HPMS codes, on the assumption that States may have used that coding when developing their inventory files, thus reducing the amount of recoding that might be necessary in a conversion to the MMIRE formats.

PROPOSED MMIRE ELEMENTS AND CODES

PROPOSED MMIRE ELEMENTS

The proposed listing of MMIRE elements is presented in the matrix in Appendix B. For clarity of presentation, the project team divided the listing into the following categories and subcategories. Individual elements/variables are then listed under each subheading.

Table 1. Category and subcategory headings for MMIRE elements.

I. Roadway Segment Descriptors
I.a. Segment Location/Linkage Variables
I.b. Segment Roadway Classification
I.c. Segment Cross Section
I.c.1. Surface Descriptors
I.c.2. Lane Descriptors
I.c.3. Shoulder Descriptors
I.c.4. Median Descriptors
I.d. Roadside Descriptors
I.e. Other Segment Descriptors
I.f. Segment Traffic Flow Data
I.g. Segment Traffic Operations/Control Data
II. Segment Alignment
II.a. Horizontal Curve Data
II.b. Vertical Grade Data
III. Road Junctions
III.a. At-Grade Intersection/Junctions
III.a.1. At-Grade Intersection/Junction General Descriptors
III.a.2. At-Grade Intersection/Junction Descriptors (Each Approach)
III.b. Interchange and Ramp Descriptors
III.b.1. General Interchange Descriptors
III.b.2. Interchange Ramp Descriptors

As shown, the descriptors are categorized into three basic groups—roadway segment descriptors (e.g., begin and end route milepost, number of lanes, AADT), roadway segment alignment descriptors (e.g., degree of curve, percent grade), and road junction descriptors (e.g., type of junction, approach traffic volume, presence of protected left turn phasing). While most current inventory systems are divided into these three basic file types, relational databases would allow the data to be stored in alternative ways. Thus, the categorization is logic driven and used for explanation purposes rather than a prescription for file layouts.

The matrix in Appendix B includes the following information:

- *Column A—The MMIRE Data Elements.* The elements are organized into the subfiles indicated above.

- *Column B—Definitions of MMIRE Data Elements.*
- *Column C—Project Team’s Recommended Priority.* For each data element, the project team has provided a proposed priority—1st or 2nd. This priority is based on a combination of factors including the requirements of the four major data sources and tools noted above and the team’s knowledge of current and expected future analysis and tool needs. Note that other elements were considered both by the project team prior to the workshop and by the review team at the workshop, but are not included in the final proposed list of elements since no strong current or future association with safety analysis or management could be identified.
- *Column D—Ease of Data Collection.* For each data element, the project team has provided an estimate of the ease of data collection for that variable—easy, moderately difficult, difficult. This estimate is based a number of factors including whether a data item is likely to be already collected (e.g., is an HPMS-required universe variable) and the team’s knowledge of State agencies’ attempts to collect the data. An asterisk (*) indicates that a proposed new data collection system is currently being developed to assist in the compilation of these elements (e.g., the FHWA Digital Highway Measurement System⁽⁶⁾).
- *Columns E-I—Presence of Each Data Element in the Five Basic Data Sources.* Note that the level of requirement is coded for each column (e.g., for HPMS, whether the element is required in the Universe File or in the Sample File.)

PROPOSED MMIRE ELEMENT CODING

Appendix C contains the proposed coding for each of the proposed MMIRE elements. The element name, definition, attributes (i.e., proposed coding), and source of coding is presented. When similar coding was found in the major sources, “All Sources” is noted. In many cases, “Project team” indicates coding for a new variable proposed by the project team. In other cases, it indicates that no coding was found for an element in the major sources, and the coding was based on the project team’s knowledge of coding in existing State inventory files.

ADDITIONAL SAFETY VARIABLES IN THE NATIONAL BRIDGE INDEX AND USDOT NATIONAL HIGHWAY-RAIL CROSSING INVENTORY

The MMIRE matrix in Appendix B includes reference to both the National Bridge Index¹⁰ and the USDOT National Highway-Rail Crossing Inventory¹¹. Both these inventories contain multiple variables, some of which are related to safety and some related to nonsafety usage (e.g., bridge strength ratings). At the request of and with the input of a State DOT workshop participant, a listing of those elements in each file that are most related to safety analyses are included for information in Appendix D.

¹⁰ For description of NBI, see <http://www.ire.org/datalibrary/databases/viewdatabase.php?dbaseindex=16>. To obtain NBI data see <http://www.fhwa.dot.gov/bridge/britab.htm> for contact information.

¹¹ See <http://www.fra.dot.gov/us/content/801>.

PRIORITIZING DATA COLLECTION

The listing of proposed MMIRE variables included in this document is extensive. Adoption of MMIRE by a transportation agency will require adequate resources, since very few if any of the agencies now collect all the proposed variables. In some cases, depending on the nature of existing safety inventory files, significant resources will be required to complete the effort. However, the adoption of MMIRE can clearly be done in stages. The report presents the authors' rating of element-priority based on the needs of current and future safety analysis procedures and tools. State and local agencies may have their own safety analysis procedures that would modify these priorities, but clearly there is the opportunity to concentrate early-stage data collection on the highest priority variables. The authors have not attempted to provide "sub-priorities"—e.g., element-specific priorities for all elements within the priority "1" category. Based on their knowledge of safety analysis needs, the authors would note that perhaps the most important elements missing from at least most State DOT databases are those related to intersections and roadway curvature. As noted above, a sound safety management program for intersections demands at least a listing of (and locations of) all intersections within the system being managed, along with key descriptors of the intersections. In like fashion, curvature significantly affects crash risk, particularly on two-lane rural roads. Managing these locations again requires the location of and description of curves.

Collection of these "missing data" will not be easy. However, technology is being developed that will assist the agencies in this effort (e.g., FHWA's Digital Highway Measurement System). Agency personnel charged with MMIRE responsibilities are urged to monitor advancements with this and other similar systems. However, as noted in Action Item 3.2a of the earlier referenced *White Paper*⁽¹⁾, there are other commercially available systems that do not appear to provide data as accurate as that provided by the FHWA system. As recommended there, agencies should purchase only safety data collection equipment that has been validated for accuracy.

CLOSURE

This report describes a proposed set of data elements for inclusion in MMIRE—the Model Minimum Inventory of Roadway Elements. As has been noted throughout the report, this listing is viewed as a first step in a process to establish MMIRE and to begin the voluntary adoption by State and local DOTs. It is expected that additional review of, and possible modification to, this initial listing will follow. As noted above, the adoption of MMIRE by a State or local agency will not be easy—it will require commitment, adequate resources, and a staging plan. However, the results of this effort will be the foundation for one of the most important tasks conducted by any transportation agency—the development and use of a safety management system that reduces the crashes, deaths, and injuries involving the agency’s primary customer, the road user.

APPENDIX A. MMIRE WORKSHOP ATTENDEES

Janet Allbee Colorado State Patrol	Loren Hill Minnesota DOT	David Smith FHWA
Rory Austin NHTSA	Elizabeth Hilton Texas DOT	Reginald Souleyrette Iowa State University
William Beans New Jersey DOT	Roger Horton Washington State DOT	Mary Spicer Vermont DOT
Toni Bianchi AASHTO	Peggy Knight Iowa DOT	Ida van Schalkwyk University of Arizona
Patrick Brady Florida DOT	Matthew Koukol Minnesota DOT	Dennis Utter NHTSA
Tim Burks Oregon DOT	Kevin Lacy North Carolina DOT	Mark Wills Oregon DOT
Jim Ellison Pierce County (WA) Public Works	Dale Lighthizer Michigan DOT	Jack Zogby Transportation Safety Management Systems
Mark Finch Washington State DOT	Donald McNamara NHTSA	<u>Workshop Leaders</u>
Carl Gonder Alaska DOT	Bich-Hanh Nguyen Univ. of New Mexico	Forrest Council VHB
Mike Griffith FMCSA	Richard Paddock TSASS, Inc.	David Harkey UNC Highway Safety Research Center
Doug Harwood Midwest Research Institute	Michael Pawlovich Iowa DOT	Carol Tan FHWA Safety R&D
Joe Hausman Ohio DOT	Robert Pollack FHWA	
Tim Heideman Traffic Improvement Assoc., Michigan	Robert Richie Tennessee DOT	
Matt Hiland GeoDecisions, Inc.	Bob Scopatz Data Nexus, Inc.	
	L.C. Smith North Carolina DOT	

APPENDIX B. PROPOSED MMIRE ELEMENTS

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
I. ROADWAY SEGMENT DESCRIPTORS								
I.a. Segment Location/Linkage Variables								
1. County ¹⁸	County location of segment	1	E			M	B	
2. City/Local Jurisdiction	City/local jurisdiction location of segment if applicable	1	E	U		O	M	
3. Route Number	Route number	1	E	U	Y	M	M	
4. Street Name	Street name	1	E					
5. Section End-Points Descriptors	Location information defining the location on a route of each endpoint of the section	1	E	U	Y	M	E	
6. Section Identifier	Unique segment identifier, derived from other variables (e.g., combination of route number, county location and beginning and ending mileposts)	1	E	U		M	E	
7. Section Length	Section length	1	E	U	Y	M		
8. Highway District	Highway district	1	E			O		
9. Governmental Ownership	Governmental owner of segment (including FIPS code)	1	E	U				
10. Type of Governmental Ownership	Type of governmental ownership	1						
11. Route Signing	Type of route signing on the segment	1	E	U		M	M	

¹² 1 = 1st Priority, 2 = 2nd Priority

¹³ E = Easy, M = Moderate, D = Difficult. Note that an asterisk (*) indicates an element for which data collection technology is being developed.

¹⁴ U = Universe File, S = Sample Section

¹⁵ Y = Yes, O = Optional

¹⁶ M=Mandatory, O=Optional, S=Supplemental

¹⁷ M=Minimum, B=Basic, E=Extended

¹⁸ Variable numbers are cross-referenced to variable coding in Appendix C.

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
12. Route Signing Qualifier	Whether the route is "business" or other qualifier	1	E	U				
13. Coinciding Route Indicator	Whether the route segment is a "primary" coinciding route (i.e., the route that crashes are referenced to) or a "minor" coinciding route	1	E					
14. Coinciding-Route Primary Route Number	If a minor coinciding route segment, the route number for the major (primary) route	1	E					
15. Direction of Inventory	Direction of inventory	1	E					
I.b. Segment Roadway Classification								
16. Functional Class	Functional class	1	E	U		M	M	YES
17. Rural/Urban Designation	Rural/urban designation	1	E	U	Y	M	B	
18. Federal Aid/ Route Type	Federal aid/route type	1	E	U			E	
19. Access Control	Access control	1	E	S		O	M	YES
20. Operational Class	Operational class of segment, if different from official functional class	2	D					
I.c. Segment Cross Section								
I.c.1. Surface Descriptors								
21. Surface Type	Surface type (paved, unpaved or types of pavement)	1	E	S	Y			
22. Surface Friction	Surface friction indicator	1	D					
23. Surface Friction Date	Date surface friction measured	1						
24. Total Surface Width	Total paved surface width (could be derived if all other lane widths are captured)	2	M				B	
25. Pavement Roughness	Pavement roughness (roughness number)	2	D	U			E	

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
26. Pavement Roughness Date	Date pavement roughness number assigned	2						
27. Pavement Condition	Pavement condition (descriptive scale)	2	D	S			M	
28. Pavement Condition Date	Date pavement condition assigned	2						
I.c.2. Lane Descriptors								
29. No. of Thru Lanes	Number of thru lanes, including HOV and reversible lanes	1	E	U	Y	M	M	YES
30. Average Thru Lane Width	Average lane width used by traffic (i.e., not including wide curb lanes, parking area, bicycle lanes, etc.)	1	M	S	Y	O	M	YES
31. Exclusive Left Turn Lane Presence	Exclusive left turn lane type	1	E					
32. Exclusive Left Turn Lane Length	Exclusive left turn lane length	1	E					
33. Exclusive Right Turn Lane Presence	Exclusive right turn lane type	1	E					
34. Exclusive Right Turn Lane Length	Exclusive right turn lane length	1	E					
35. Auxiliary Lane Presence/Type	Presence or type of auxiliary lane	1	E					
36. Auxiliary Lane Length	Length of auxiliary lane	1	E					
37. HOV Lanes	Presence of HOV lanes in segment	1	M	U		M/O		
38. HOV Lane Types	HOV lane types	2	E					
39. Reversible Lanes	Number of reversible lanes present on segment	1						
40. Presence/Type of Bicycle Facility	Presence or type of bicycle facility on segment	1	D			O	B	YES
41. Width of Marked Bicycle Lane or Bike Path	Width of marked bicycle lane or bike path	1	D					

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
42. Width of Wide Curb Lane	Width of wide curb lane used by both vehicles and bicycles	1	M					
43. Number of Peak Hour Lanes	Number of through lanes used in peak period in the peak direction	2	M	U				
I.c.3. Shoulder Descriptors								
44. Right Shoulder Type	Shoulder type on right side of road in direction of inventory	1	E	S	Y	M	M	
45. Right Shoulder Total Width	Total width of right shoulder, including paved and unpaved parts	1	M		Y	O	B	YES
46. Right Paved Shoulder Width	Width of paved portion of right shoulder	1	E	S	Y	O	B	YES
47. Left Shoulder Type	Shoulder type on left side of roadway in direction of inventory. For undivided roads and divided roads with one direction of inventory, this will be the outside shoulder on the opposing side. NOTE that information on paved width of the inner (left) shoulder on divided roads is captured in the Median descriptors.	1	E	S	Y	M	M	
48. Left Shoulder Total Width	Width of left (outside) shoulder, including paved and unpaved parts	1	M		Y	O	B	YES
49. Left Paved Shoulder Width	Width of paved portion of left shoulder	1	E	S	Y	O	B	YES
50. Shoulder Rumble Strip Presence	Presence of shoulder rumble strip	1	M			S		
51. Rumble Strip Type	Rumble strip type if present	2	M					
52. Sidewalk Presence	Presence of sidewalk in direction of inventory	1	D*				B	
53. Curb Presence	Presence of curb	1	M				B	
54. Curb Type	Curb type	2	D					
I.c.4. Median Descriptors								
55. Median Type	Median type (including two-way left turn lane)	1	E	S		M	M	

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
56. Median Width	Median width, including inside shoulders	1	E	S		O	M	YES
57. Median Barrier Type	Median barrier type	1	E			M		
58. Median (Inner) Paved Shoulder Width	Median (inner) paved shoulder width	1	E					
59. Median Shoulder Rumble Strip Presence	Presence of median shoulder rumble strip	1	M					
60. Median Rumble Strip Type	Rumble strip type if present	2	M					
61. Median Left Turn Lane Type	Type of left turn lane in median.	1	E					
62. Median Left Turn Lane Width	Width of median left turn lane	1	E					
I.d. Segment Roadside Descriptors								
63. Roadside Clearzone Width	Roadside clearzone width	1	D*					
64. Sideslope	Sideslope	1	D*					
65. Roadside Rating	A rating of the safety of the roadside from Appendix D, Publication No. FHWA-RD-99-207, Prediction of the Expected Safety Performance of Rural Two-Lane Highways. Only collect if clearzone width and sideslope are not collected.	1 (only if clearzone and sideslope variables are not collected)	D		Y			
66. Driveway Information	Driveway count by type	1	D*		Y			
67. Roadside Hardware Descriptors	Roadside hardware descriptors (including type, location, size, distance from lane edge). Examples include barrier (type and terminal type), signs (size, breakaway?), culverts, etc.	2 (Linkage to Asset Management ?)	D*					
I.e. Other Segment Descriptors								

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
68. Terrain Type (e.g., Mountainous, Level)	Basic terrain type around segment. This is a (poor) surrogate for detailed data on curvature and grade, and would be collected only in the absence of those variables. See "Alignment" variables below.	1	M	S		O	B	
69. Bridge Descriptors for Bridges in Segment	Bridge descriptors for bridges in segment	Linkage to Bridge File	E					
70. RR Grade Crossing Descriptors for Crossings in Segment	RR grade crossing descriptors for crossings in segment	Linkage to RR File	E					
71. Number of Signalized Intersections in Section	Number of signalized intersections in section	1 (only if no intersection file)	M*	S				
72. Number of Stop-Controlled Intersections in Section	Number of stop-controlled intersections in section	1 (only if no intersection file)	M*	S				
73. Number of Uncontrolled/Other Intersections	Number of uncontrolled/other intersections	1 (only if no intersection file)	M*	S				
1.f. Segment Traffic Flow Data								
74. Average Daily Traffic Volume	Average Annual Daily Traffic	1	E	U	Y	M	M	YES
75. AADT Year	Year of AADT	2 (if annual file)	E		Y		M	YES
76. AADT Annual Escalation Percentage	AADT annual escalation percentage	2 (if annual file)	M		O	O	B	
77. Percentage Truck or Truck AADT	Percentage truck or truck AADT (includes tractor-semis and trucks with 6+ wheels)	1	M	S		O	E	

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
78. Total Daily Two-Way Pedestrian Count/Exposure	Total daily pedestrian flow in both directions (unless directional segment). This is a (poor) surrogate for crossing pedestrian counts.	2 (Collect only if crossing counts are unavailable for intersection/junction approaches. see below)	D					
79. Bicycle Count/Exposure	Total daily bicycle flow in both directions (unless directional segment)	1	D			S		
80. Motorcycle Count or Percentage	Motorcycle daily count or percentage of AADT	1	D					
81. Hourly Traffic Volumes (or Peak and Off-Peak AADT)	Hourly traffic volumes (or peak and off-peak AADT)	2	D			O		
82. K-Factor	The K-factor is the 30th highest hourly volume (i.e., the design hour volume) for a year, as a percentage of the annual average daily traffic	2	D	S			B	
83. Future AADT	Forecasted AADT	2	D	U	O		B	
84. Future AADT Year	Year of forecasted AADT	2	D	U	O		B	
85. Directional Factor	Proportion of peak hour traffic in the predominate direction of flow	2	D	S		O		
86. Percent Combination Trucks - Daily Average	Percent combination trucks—daily average	2	M	S			E	
87. Percent Single Unit Trucks - Daily Average	Percent single unit trucks—daily average	2	M	S			E	
I.g. Segment Traffic Operations/Control Data								
88. One/Two-Way Operations	Whether the segment operates as a one- or two-way roadway	1	E	U		M		
89. Speed Limit	Speed limit	1	E	U		O	M	

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
90. School Zone Indicator	Whether segment contains a school zone	1	M					
91. On-Street Parking Presence	Time-based parking restrictions	1	D			S	M	
92. On-Street Parking Type	On-street parking type	1	D	S				
93. Roadway Lighting	Type of roadway lighting	1	M			S	B	YES
94. Truck Route Designation	Truck route designation	1	E	U				
95. Toll Facility?	Toll facility indicator	1	E	U				
96. Edgeline Presence/Type	Edgeline presence/type	1	D*					
97. Centerline Presence/Type	Centerline presence/type	1	D*					
98. No Passing Zone Code / Passing Permissibility	No passing zone code/passing permissibility	2	D*	S				
99. 85th % Speed	Traffic speed exceeded by 15 percent of the vehicles in the flow	2	D			S		
II. Roadway Alignment Descriptors								
II.a. Horizontal Curve Data (NOTE: Each data record will define an angle point or a single curve, even if the curve is a component of a compound or reverse curve. Spirals or other transitions are part of the curve.)								
100. Curve Identifiers and Linkage Variables	All variables needed to define location of each curve record and all variables necessary to link with other safety files	1	D*		Y			
101. Curve Feature Type	Type of horizontal alignment feature being described in the data record	1	D*					
102. Horizontal Curve Degree or Radius	Degree or radius of curve	1	D*	S	Y	S		YES
103. Horizontal Curve Length (Including Spiral)	Length of curve	1	D*	S	Y	S	E	YES
104. Curve Superelevation or Superelevation Adequacy	Either measured superelevation rate or percent or adequacy of superelevation when compared to AASHTO design standards	2	D*		Y			YES

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
105. Horizontal Transition/Spiral Curve Presence	Presence/type of transition from tangent to curve	1	D		Y			
106. Horizontal Curve Intersection/Deflection Angle	The angle between the two intersecting tangents in the direction of inventory (sometimes called the "deflection angle")	2	D					
107. Horizontal Curve Direction	Direction of curve in direction of inventory	1	M*		Y	S		
II.b. Vertical Grade Data (NOTE: Each data record will define an individual grade or the angle point or vertical curve linking two grades.)								
108. Grade Identifiers and Linkage Variables	All variables needed to define location of each vertical feature and all variables necessary to link with other safety files	1	E					
109. Vertical Alignment Feature Type	Type of vertical alignment feature being described in the data record	1	E					
110. Percent of Gradient	Percent of gradient	1	D*		Y	S	E	YES
111. Grade Length	Grade length	1	D*	S	Y			
112. Vertical Curve Length	Vertical curve length	1	D					
III. Roadway Junction Descriptors								
III.a. At-Grade Intersection/Junctions (NOTE: These junctions can include both normal "intersections" and also junctions of roadways with independent pedestrian crossings, bike trails, railroad grade crossings, etc. Thus, the category includes what has been considered "mid-block" crossings.)								
III.a.1. General Descriptors								
113. Unique Intersection Identifier	A numeric unique identifier for each intersection/junction	1	E					

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
114. Type of Intersection/Junction	Type of junction being described in the data record	1	E					
115. Location Identifier for Road 1 Crossing Point	Location on the first intersecting route (e.g., route-milepost)	1	M		Y		B	
116. Location Identifier for Road 2 Crossing Point	Location on the second intersecting route (e.g., route-milepost)	1	D (unless spatial data system)					
117. Location Identifier for Road 3, 4, etc., Crossing Point (e.g., Route-Milepost), etc.	Location on the third and subsequent intersecting route (e.g., route-milepost)	1	D (unless spatial data system)		Y			
118. Intersection/Junction No. of Legs	Intersection/junction no. of legs	1	M		Y	M		
119. Intersection/Junction Geometry	Intersection/junction geometry	1	E		Y	M		
120. School Zone Indicator	Whether the intersection/junction is in a school zone	1	E					
121. Railroad Crossing Number if a RR Grade Crossing	Railroad crossing number if a RR grade crossing (for linkage to National Highway-Rail Crossing Inventory)	1	M					
122. Intersection Skew Angle	Angle from perpendicular of intersection of the roads	1	D		Y	S		
123. Intersection/Junction Offset	Whether crossroad approach centerlines are directly opposed or offset by some distance	1	D			O	E	
124. Intersection/Junction Offset Distance	Distance that approach centerlines are offset	1	D			O	M	

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
125. Intersection/Junction Traffic Control	Traffic control present at intersection/junction	1	M		Y	M		YES
126. Signalization Type (e.g., Actuated, Fixed, System)	Type of signalization at intersection/junction	2	M			S		
127. Number of Intersection/Junction Quadrants With Limited Sight Distance	Number of intersection/junction quadrants with limited sight distance	1	D		Y		B	
128. Intersection/Junction Lighting	Type of lighting at intersection/junction	1	M					
129. Roundabout - No. of Circulatory Lanes	No. of circulatory lanes in roundabout	1	E					
130. Roundabout - Circulatory Width	Width of the roadway between the central island and outer edge of the circulatory lane	1	E					
131. Roundabout—Inscribed Diameter	Distance between the outer edges of the circulatory roadway	1	M					
132. Roundabout—Bicycle Facility	Type of bicycle facility at roundabout	1	E					
III.a.2. At Grade Intersection/Junction Descriptors—Each Approach								
133. Approach AADT	AADT on approach described	1	E (if system road), M (if nonsystem crossroad)					YES
134. Approach Use Type	Usage of approach	1	E					
135. Approach Is Two-Way, One-Way	One-way or two-way flow on approach	1	E			M		
136. No. of Thru Lanes	Total number of thru lanes on approach, both directions	1	E					

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
137. No. of Exclusive Left Turn Lanes	Number of exclusive left turn lanes on approach	1	M		Y	M	M	
138. No. of Exclusive Right Turn Lanes	Number of exclusive right turn lanes on approach	1	M		Y	M		
139. Length of Exclusive Left Turn Lanes	Length of exclusive left turn lanes	2	M					
140. Length of Exclusive Right Turn Lanes	Length of exclusive right turn lanes	2	M					
141. Median Type at Intersection	Median type at intersection on approach	1	M			M		
142. Approach Traffic Control	Traffic control present on approach	1	M					
143. Left Turn Protection	Presence and time of left turn protection	1	D			O		
144. Signal Progression	Signal progression on approach	1	D			S	E	
145. Crosswalk Presence/Type	Type of crosswalk	1	D					
146. Pedestrian Signalization Type	Type of pedestrian signalization on approach	1	M				B	
147. Pedestrian Signal Special Features	Special features for either pushbutton or recall pedestrian signals	2	M					
148. Crossing Pedestrian Count/Exposure	Count or estimate of average daily pedestrian flow crossing this approach (Note: only applicable to approaches with vehicular traffic.)	1	D			S		
149. Left/Right Turn Prohibitions	Left or right turn prohibitions on this approach	1	D			O		

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
150. Left Turn Counts/Percent	Count or estimate of average daily left turns, or percent of total approach traffic turning left (Note: This could also be captured for peak-periods only or by hour of day.)	2	D			O		
151. Right Turn Counts/Percent	Count or estimate of average daily right turns, or percent of total approach traffic turning right (Note: This could also be captured for peak-periods only or by hour of day.)	2	D			O		
152. Transverse Rumble Strip Presence	Presence of transverse rumble strip on approach	2	D					
153. Roundabout—Entry Width	Full width of entry where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width.	1	E					
154. Roundabout—Number of Entry Lanes	Number of entry lanes into roundabout on this approach	1	E					
155. Roundabout—Entry Radius	Minimum radius of curvature of the curb on the right side of the entry	2	D					
156. Roundabout—Exit Width	Full width of exit where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width.	1	E					
157. Roundabout—Number of Exit Lanes	Number of exit lanes from roundabout on this approach leg	1	E					
158. Roundabout—Exit Radius	Minimum radius of curvature of the curb on the right side of the exit	2	D					
159. Roundabout—Pedestrian Facility	Type of pedestrian crossing facility on this approach to roundabout	1	E					

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
160. Roundabout—Crosswalk Location (Distance From Yield Line)	Location of marked pedestrian crosswalk relative to yield line	1	E					
161. Roundabout—Splitter Island Width	Width of the splitter island separating entry and exit legs (measured at the inscribed circle)	1	E					
III.b. Interchange and Ramp Descriptors								
III.b.1. General Interchange Descriptors								
162. Unique Interchange Identifier	A numeric unique identifier for each interchange	1	E					
163. Location Identifier for Road 1 Crossing Point	Location on the first intersecting route (e.g., route-milepost)	1	M					
164. Location Identifier for Road 2 Crossing Point	Location on the second intersecting route (e.g., route-milepost)	1	D (unless spatial data system)					
165. Location Identifier for Road 3, 4, etc., Crossing Point, etc.	Location on the third and subsequent intersecting route (e.g., route-milepost)	1	D (unless spatial data system)					
166. Interchange Type	Type of interchange	1	M			M		
167. Interchange Lighting	Type of interchange lighting	1	M					
III.b.2. Interchange Ramp Descriptors								
168. Unique Ramp Identifier	An identifier for each ramp that is part of a given interchange	1	E					
169. Ramp Length	Length of ramp	1	M			O	M	
170. Ramp No. of Lanes	Number of lanes on ramp	1	M			O	E	
171. Ramp AADT	AADT on ramp	1	M					
172. Ramp Posted Speed Limit	The posted (not advisory) speed limit on the ramp							

Generic Variable Description	Definition	MMIRE Priority ¹²	Ease of Data Collection ¹³	HPMS ¹⁴	IHSDM ¹⁵	SafetyAnalyst ¹⁶	TSIMS ¹⁷	MMUCC
173. Feature at Beginning Ramp Terminal	A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the beginning terminal.	1	E					
174. Ramp Descriptor at Beginning Ramp Terminal	Description of the beginning terminal of the ramp	1	M			M		
175. Location Identifier For Roadway at Beginning Ramp Terminal	Location on the roadway at the beginning ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point.	1	E (if begin point is on a system roadway)					
176. Roadway Traffic Flow Direction at Beginning Ramp Terminal	Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp.	1	E					
177. Feature at Ending Ramp Terminal	A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the ending terminal.	1	E					
178. Ramp Descriptor at Ending Ramp Terminal	Description of the ending terminal of the ramp	1	M			M		
179. Location Identifier for Roadway at Ending Ramp Terminal	Location on the roadway at the ending ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point	1	E (if end point is on a system roadway)					
180. Roadway Traffic Flow Direction at Ending Ramp Terminal	Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp.	1	E					

APPENDIX C. PROPOSED MMIRE ELEMENT CODING

The following describes the proposed MMIRE elements. In each case, the element name is in bold, followed by a brief *definition* of the element, the *attributes* (proposed coding), and the *source of coding*. The latter will be one or more of the four primary data sources or the project team. The elements are numbered for cross-referencing with the same element in the Appendix B matrix.

I. ROADWAY SEGMENT DESCRIPTORS

I.A. SEGMENT LOCATION/LINKAGE VARIABLES

(Note that whatever linear reference or spatial variables are used, they must be consistent across all safety data files.)

1. COUNTY

Definition: County location of segment

Attributes:

- Record the county name or equivalent entity. If codes are used instead of name, use the GSA Geographic Locator Codes (GLC) that can be found on the Internet at: http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_OVERVIEW&contentId=8815&noc=T. If State-assigned codes are used, they should be convertible to the GSA/FIPS format.

Source of Coding: Project Team

2. CITY/LOCAL JURISDICTION

Definition: City/local jurisdiction location of segment if applicable

Attributes:

- Record the city name or equivalent entity. If codes are used instead of name, use the GSA Geographic Locator Codes (GLC) that can be found on the Internet at: http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_OVERVIEW&contentId=8815&noc=T. If State-assigned codes are used, they should be convertible to the GSA/FIPS format.

Source of Coding: Project Team

3. ROUTE NUMBER

Definition: Route number

Attributes:

- 20-character alphanumeric value

Source of Coding: SafetyAnalyst

4. STREET NAME

Definition: Street name

Attributes:

- Alphanumeric Street Name

Source of Coding: All sources

5. SECTION END-POINTS DESCRIPTORS

Definition: Location information defining the location on a route of each endpoint of the section

Attributes:

- Section end-point descriptors can be either related to a Linear Reference System (e.g., Route-beginning milepoint, Route-ending milepoint) or to a spatial data system (i.e., longitude/latitude for begin and end points). The descriptor-types used must be common across all MMIRE files and compatible with crash data location coding.

Source of Coding: All sources

6. SECTION IDENTIFIER

Definition: Unique segment identifier, derived from other variables (e.g., combination of route number, county location and beginning and ending mileposts)

Attributes:

- See definition

Source of Coding: All sources

7. SECTION LENGTH

Definition: Section length

Attributes:

- Section length in miles or kilometers

Source of Coding: All sources

8. HIGHWAY DISTRICT

Definition: Highway district

Attributes:

- Numeric district number
- Not applicable
- Unknown

Source of Coding: SafetyAnalyst

9. GOVERNMENTAL OWNERSHIP

Definition: Governmental owner of segment (including FIPS code)

Attributes:

- Record the city name or equivalent entity. If codes are used instead of name, use the GSA Geographic Locator Codes (GLC) that can be found on the Internet at: http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_OVERVIEW&contentId=8815&noc=T. If State-assigned codes are used, they should be convertible to the GSA/FIPS format.

Source of Coding: Project Team

10. TYPE OF GOVERNMENTAL OWNERSHIP

Definition: Type of governmental ownership

Attributes:

- State
- County
- Town/township
- Municipal
- Other State agency
- Other local agency
- Federal agency
- Other

Source of Coding: HPMS

11. ROUTE SIGNING

Definition: Type of route signing on the segment

Attributes:

- Interstate
- U.S.
- State
- Off-interstate business marker
- County
- Township
- Municipal
- Parkway or forest route
- Other
- Not signed

Source of Coding: HPMS

12. ROUTE SIGNING QUALIFIER

Definition: Whether the route is "business" or other qualifier

Attributes:

- Unqualified
- Alternate
- Business route
- Bypass
- Spur
- Loop
- Proposed
- Temporary
- Truck route
- None of the above

Source of Coding: HPMS

13. COINCIDING ROUTE INDICATOR

Definition: Whether the route segment is a “primary” coinciding route (i.e., the route that crashes are referenced to) or a “minor” coinciding route

Attributes:

- Numeric code indicating “primary” (crash-linked) route or “minor” route

Source of Coding: Project Team

14. COINCIDING-ROUTE PRIMARY ROUTE NUMBER

Definition: If a minor coinciding route segment, the route number for the major (primary) route

Attributes:

- 20-character alphanumeric value

Source of Coding: SafetyAnalyst

15. DIRECTION OF INVENTORY

Definition: Direction of Inventory

Attributes:

- Compass direction if divided roads are inventoried in each direction due to different characteristics on each roadway; “both” if inventory in only one direction

Source of Coding: Project Team

I.B. SEGMENT ROADWAY CLASSIFICATION

16. FUNCTIONAL CLASS

Definition: Functional class

Attributes:

- Principal arterial interstate
- Principal arterial other freeways and expressways
- Principal arterial other
- Minor arterial
- Major collector
- Minor collector
- Local

Source of Coding: HPMS, IHSDM

17. RURAL/URBAN DESIGNATION

Definition: Rural/urban designation

Attributes:

- Rural
- Urban
- Not applicable
- Unknown

Source of Coding: SafetyAnalyst

18. FEDERAL AID/ ROUTE TYPE

Definition: Federal aid/route type

Attributes:

- Route is on NHS
- Route is an NHS connector
- Route is unrelated to NHS

Source of Coding: HPMS

19. ACCESS CONTROL

Definition: Access control

Attributes:

- Full
- Partial
- None

Source of Coding: All sources

20. OPERATIONAL CLASS

Definition: Operational class of segment if different from official functional class

Attributes:

- Principal arterial interstate
- Principal arterial other freeways and expressways
- Principal arterial other
- Minor arterial
- Major collector
- Minor collector
- Local

Source of Coding: HPMS, IHSDM

I.C. SEGMENT CROSS SECTION

I.C.1. SURFACE DESCRIPTORS

21. SURFACE TYPE

Definition: Surface type

Attributes:

- Concrete
- Asphalt
- Gravel
- Dirt

Source of Coding: SafetyAnalyst

22. SURFACE FRICTION

Definition: Surface friction indicator

Attributes:

- Measured skid number on the segment or general indication of wet-surface friction (e.g., high, medium, low)

Source of Coding: Project Team

23. SURFACE FRICTION DATE

Definition: Date surface friction was measured or assigned

Attributes:

- mm/dd/yyyy

Source of Coding: Project Team

24. TOTAL SURFACE WIDTH

Definition: Total paved surface width (could be derived if all other lane widths are captured)

Attributes:

- Feet or meters

Source of Coding: All sources

25. PAVEMENT ROUGHNESS/CONDITION

Definition: Pavement roughness (roughness number)

Attributes:

- International Roughness Index (IRI)

Source of Coding: HPMS

26. PAVEMENT ROUGHNESS DATE

Definition: Date pavement roughness was assigned

Attributes:

- mm/dd/yyyy

Source of Coding: Project Team

27. PAVEMENT CONDITION

Definition: Pavement condition (descriptive scale)

Attributes:

- Numeric rating 1.0–5.0 if IRI not provided

Source of Coding: HPMS

28. PAVEMENT CONDITION DATE

Definition: Date pavement condition was assigned

Attributes:

- mm/dd/yyyy

Source of Coding: Project Team

I.C.2. LANE DESCRIPTORS

29. NO. OF THRU LANES

Definition: Number of thru lanes, including HOV and reversible lanes

Attributes:

- Numeric

Source of Coding: All sources

30. AVERAGE THRU LANE WIDTH

Definition: Average lane width used by traffic (i.e., not including wide curb lanes, parking area, bicycle lanes, etc.)

Attributes:

- Feet or meters

Source of Coding: All sources

31. EXCLUSIVE LEFT TURN LANE PRESENCE

Definition: Exclusive left turn lane presence and number for both divided and undivided roadways. Supplemental information on left turn lane type in medians of divided roadways (e.g., directional left turn lane) is captured under Median Descriptors

Attributes:

- None
- Single LT lane
- Multiple LT lane

Source of Coding: Project Team

32. EXCLUSIVE LEFT TURN LANE LENGTH

Definition: Exclusive left turn lane length

Attributes:

- Full segment length
- Length in feet or meters if not full segment length

Source of Coding: Project Team

33. EXCLUSIVE RIGHT TURN LANE PRESENCE

Definition: Exclusive right turn lane presence and number

Attributes:

- None
- Single RT lane
- Multiple RT lanes

Source of Coding: Project Team

34. EXCLUSIVE RIGHT TURN LANE LENGTH

Definition: Exclusive right turn lane length

Attributes:

- Full segment length, or length in feet or meters if not full segment length

Source of Coding: Project Team

35. AUXILIARY LANE PRESENCE/TYPE

Definition: Presence or type of auxiliary lane

Attributes:

- Climbing lane
- Passing lane
- Acceleration lane
- Deceleration lane
- Other

Source of Coding: Project Team

36. AUXILIARY LANE LENGTH

Definition:

Attributes:

- Full segment length, length in feet or meters if not full segment length

Source of Coding: Project Team

37. HOV LANES

Definition: Presence of HOV lanes in segment

Attributes:

- None
- Increasing direction
- Decreasing direction
- Both directions

Source of Coding: Project Team

38. HOV LANE TYPES

Definition: HOV lane types

Attributes:

- No HOV lanes
- Has exclusive HOV lanes
- Normal thru lanes used as HOV at specified times
- Shoulder/parking lanes used as HOV at specified times

Source of Coding: HPMS

39. REVERSIBLE LANES

Definition: Number of reversible lanes present on segment

Attributes:

- No reversible lanes
- One reversible lane
- Two reversible lanes
- More than two reversible lanes

Source of Coding: Project Team

40. PRESENCE/TYPE OF BICYCLE FACILITY

Definition: Presence or type of bicycle facility on segment

Attributes:

- None
- Wide curb lane
- Marked bike lane
- Separate parallel bike path
- Signed bike route only
- Other

Source of Coding: Project Team, SafetyAnalyst

41. WIDTH OF MARKED BICYCLE LANE OR BIKE PATH

Definition: Width of marked bicycle lane or bike path

Attributes:

- Feet or meters

Source of Coding: Project Team

42. WIDTH OF WIDE CURB LANE

Definition: Width of wide curb lane used by both vehicles and bicycles

Attributes:

- Feet or meters

Source of Coding: Project Team

43. NUMBER OF PEAK HOUR LANES

Definition: Number of through lanes used in peak period in the peak direction, Include HOV lanes, reversible lanes, parking lanes, or shoulders that legally are used for through traffic during the peak period in the peak direction.

Attributes:

- Numeric

Source of Coding: HPMS

I.C.3. SHOULDER DESCRIPTORS

44. RIGHT SHOULDER TYPE

Definition: Shoulder type on right side of road in direction of inventory

Attributes:

- Paved
- Composite
- Gravel
- Turf
- Curb with no shoulder in front of it
- No shoulder
- Not applicable
- Unknown

Source of Coding: SafetyAnalyst

45. RIGHT SHOULDER TOTAL WIDTH

Definition: Total width of right shoulder including paved and unpaved parts

Attributes:

- Feet or meters

Source of Coding: All sources

46. RIGHT PAVED SHOULDER WIDTH

Definition: Width of paved portion of right shoulder

Attributes:

- Feet or meters

Source of Coding: All sources

47. LEFT SHOULDER TYPE

Definition: Shoulder type on left side of roadway in direction of inventory. For undivided roads and divided roads with one direction of inventory, this will be the outside shoulder on the opposing side. Note that information on paved width of the inner (left) shoulder is included under median descriptors.

Attributes:

- Paved
- Composite
- Gravel
- Turf
- Curb with no shoulder in front of it
- No shoulder
- Not applicable
- Unknown

Source of Coding: SafetyAnalyst

48. LEFT SHOULDER TOTAL WIDTH

Definition: Width of left (outside) shoulder, including paved and unpaved parts. See definition of “Left Shoudler Type” above.

Attributes:

- Feet or meters

Source of Coding: All sources

49. LEFT PAVED SHOULDER WIDTH

Definition: Width of paved portion of left shoulder. See definition of “Left Shoudler Type” above.

Attributes:

- Feet or meters

Source of Coding: All sources

50. SHOULDER RUMBLE STRIP PRESENCE

Definition: Presence of shoulder rumble strip

Attributes:

- On both shoulders of roadway segment
- Right shoulder only
- Left shoulder only
- No shoulder rumble strip

Source of Coding: Project Team

51. RUMBLE STRIP TYPE

Definition: Rumble strip type if present

Attributes:

- Milled
- Rolled
- Milled or rolled on edgeline
- Raised on edgeline

Source of Coding: Project Team

52. SIDEWALK PRESENCE

Definition: Presence of sidewalk in direction of inventory

Attributes:

- None
- Left side
- Right side
- Both sides

Source of Coding: Project Team

53. CURB PRESENCE

Definition: Presence of curb

Attributes:

- No curb
- Curb on left
- Curb on right
- Both curbs

Source of Coding: TSIMS

54. CURB TYPE

Definition: Curb type

Attributes:

- No curb
- Straight-face curb (i.e., "barrier curb")
- Slope-face curb

Source of Coding: Project Team

I.C.4. MEDIAN DESCRIPTORS

55. MEDIAN TYPE

Definition: Median type

Attributes:

- Undivided
- Flush paved median [at least 4 ft in width]
- Raised median with curb
- Depressed median
- Two-way left turn lane
- Railroad or rapid transit
- Other divided

Source of Coding: Project Team

56. MEDIAN WIDTH

Definition: Median width, including inside shoulders

Attributes:

- Feet or meters

Source of Coding: HPMS

57. MEDIAN BARRIER TYPE

Definition: Median barrier type

Attributes:

- None
- Rigid barrier system (i.e., concrete)
- Semi-rigid barrier system (i.e., box beam, W-beam strong post, etc.)
- Flexible barrier system (i.e., cable, W-beam weak post, etc.),

Source of Coding: Based on SafetyAnalyst

58. MEDIAN (INNER) PAVED SHOULDER WIDTH

Definition: The width of the paved shoulder on the median (inner) side of the roadway on a divided roadway. Note that information on type, width and paved width of nonmedian shoulders is included in the Shoulder Descriptors. See definition of Left Shoulder Type..

Attributes:

- Feet or meters

Source of Coding: All sources

59. MEDIAN SHOULDER RUMBLE STRIP PRESENCE

Definition: Presence of median shoulder rumble strip

Attributes:

- Yes
- No

Source of Coding: Project Team

60. MEDIAN RUMBLE STRIP TYPE

Definition: Rumble strip type if present

Attributes:

- Milled
- Rolled
- Milled or rolled on edgeline
- Raised on edgeline

Source of Coding: Project Team

61. MEDIAN LEFT TURN LANE TYPE

Definition: Supplemental information on type of left turn lane in median. Note that basic information on number of median left turn lanes and the median turn-lane length should be captured under “Exclusive Left Turn Lane Presence” and “Exclusive Left Turn Lane Length” in the Lane Descriptors

Attributes:

- None
- Left-turn lane bays
- Directional left turn lane bays (to prevent crossing traffic from driveways)
- Offset left turn lanes (at intersection)

Source of Coding: Project Team

62. LEFT TURN LANE WIDTH

Definition: Width of median left turn lane

Attributes:

- Feet or meters

Source of Coding: All sources

I.D. SEGMENT ROADSIDE DESCRIPTORS

63. ROADSIDE CLEARZONE WIDTH

Definition: Roadside clearzone width

Attributes:

- Feet or meters

Source of Coding: Project Team

64. SIDESLOPE

Definition: Sideslope

Attributes:

- Numeric percent

Source of Coding: IHSDM

65. ROADSIDE RATING

Definition: A rating of the safety of the roadside from Appendix D, Publication No. FHWA-RD-99-207, Prediction of the Expected Safety Performance of Rural Two-Lane Highways. Collect only if clearzone width and sideslope are not collected.

Attributes:

- Roadside hazard is ranked on a seven-point categorical scale from 1 (best) to 7 (worst), based on a comparison with pictures in the report.

Source of Coding: IHSDM

66. DRIVEWAY INFORMATION

Definition: Driveway count by type

Attributes:

- Numeric

Source of Coding: Based on SafetyAnalyst, IHSDM

67. ROADSIDE HARDWARE DESCRIPTORS

Definition: Roadside hardware descriptors (including type, location, size, distance from lane edge). Examples include barrier (type and terminal type), signs (size, breakaway?), culverts, etc.

Attributes:

- Jurisdiction selected. Note that some Asset Management Systems may collect this information. If so link to that data.

Source of Coding: To be defined on the basis of Asset Management Systems

I.E. OTHER SEGMENT DESCRIPTORS

68. TERRAIN TYPE (E.G., MOUNTAINOUS, LEVEL)

Definition: Basic terrain type around segment. This is a (poor) surrogate for detailed data on curvature and grade, and would be collected only in the absence of those variables. See Alignment variables below.

Attributes:

- Mountainous
- Rolling
- Level

Source of Coding: All sources

69. BRIDGE DESCRIPTORS FOR BRIDGES IN SEGMENT

Definition: Bridge descriptors for bridges in segment

Attributes:

- Link to National Bridge Index. See Appendix D.

Source of Coding: National Bridge Index

70. RR GRADE CROSSING DESCRIPTORS FOR CROSSINGS IN SEGMENT

Definition: RR grade crossing descriptors for crossings in segment

Attributes:

- Link to USDOT Highway-Rail Crossing Inventory. See Appendix D.

Source of Coding: USDOT National Highway-Rail Crossing Inventory

71. NUMBER OF SIGNALIZED INTERSECTIONS IN SECTION

Definition: Number of signalized intersections in section

Attributes:

- Numeric

Source of Coding: HPMS

72. NUMBER OF STOP-CONTROLLED INTERSECTIONS IN SECTION

Definition: Number of stop-controlled intersections in section

Attributes:

- Numeric

Source of Coding: HPMS

73. NUMBER OF UNCONTROLLED/OTHER INTERSECTIONS

Definition: Number of uncontrolled/other intersections

Attributes:

- Numeric

Source of Coding: HPMS

I.F. SEGMENT TRAFFIC FLOW DATA

74. AVERAGE DAILY TRAFFIC VOLUME

Definition: AADT

Attributes:

- Vehicles per day

Source of Coding: All sources

75. AADT YEAR

Definition: Year of AADT

Attributes:

- Numeric

Source of Coding: All sources

76. AADT ANNUAL ESCALATION PERCENTAGE

Definition: Expected annual percent growth in AADT, with "AADT YEAR" as base year. This will allow calculation of current year's AADT if "AADT YEAR" differs from current year.

Attributes:

- Percent

Source of Coding: IHSDM

77. PERCENTAGE TRUCK OR TRUCK AADT

Definition: Percentage truck or truck AADT (includes tractor-semis and trucks with 6+ wheels)

Attributes:

- Percent or numeric count

Source of Coding: SafetyAnalyst

78. TOTAL DAILY TWO-WAY PEDESTRIAN COUNT/EXPOSURE

Definition: Total daily pedestrian flow in both directions (unless directional segment). This is a (poor) surrogate for crossing pedestrian counts.

Attributes:

- Average daily count (numeric)

Source of Coding: Project Team

79. BICYCLE COUNT/EXPOSURE

Definition: Total daily bicycle flow in both directions (unless directional segment)

Attributes:

- Average daily count (numeric)

Source of Coding: Project Team

80. MOTORCYCLE COUNT OR PERCENTAGE

Definition: Motorcycle daily count or percentage of AADT

Attributes:

- Percent or numeric count

Source of Coding: Project Team

81. HOURLY TRAFFIC VOLUMES (OR PEAK AND OFFPEAK AADT)

Definition: Hourly traffic volumes (or peak and offpeak AADT)

Attributes:

- Numeric count

Source of Coding: SafetyAnalyst

82. K-FACTOR

Definition: The K-factor is the 30th highest hourly volume (i.e., the design hour volume) for a year, as a percentage of the annual average daily traffic.

Attributes:

- Percent

Source of Coding: HPMS

83. FUTURE AADT

Definition: Forecasted AADT

Attributes:

- Vehicles per day

Source of Coding: HPMS

84. FUTURE AADT YEAR

Definition: Year of forecasted AADT

Attributes:

- Vehicles per day

Source of Coding: HPMS

85. DIRECTIONAL FACTOR

Definition: Proportion of peak hour traffic in the predominate direction of flow

Attributes:

- Proportion (numeric)

Source of Coding: HPMS

86. PERCENT COMBINATION TRUCKS - DAILY AVERAGE

Definition: Percent combination trucks - daily average

Attributes:

- Percent

Source of Coding: All sources

87. PERCENT SINGLE UNIT TRUCKS - DAILY AVERAGE

Definition: Percent single unit trucks - daily average

Attributes:

- Percent

Source of Coding: All sources

I.G. SEGMENT TRAFFIC OPERATIONS/CONTROL DATA

88. ONE/TWO-WAY OPERATIONS

Definition: Whether the segment operates as a one- or two-way roadway

Attributes:

- One-way
- Two-way
- One direction of travel for divided roadways

Source of Coding: SafetyAnalyst

89. SPEED LIMIT

Definition: Speed limit

Attributes:

- mph/kph

Source of Coding: All sources

90. SCHOOL ZONE INDICATOR

Definition: Whether segment contains a school zone

Attributes:

- Yes
- No

Source of Coding: Project Team

91. ON-STREET PARKING PRESENCE

Definition: Time-based parking restrictions

Attributes:

- Permitted 24 hrs/day
- Prohibited 24 hrs/day
- Permitted during specified times

Source of Coding: SafetyAnalyst, TSIMS

92. ON-STREET PARKING TYPE

Definition: On-street parking type

Attributes:

- No parking allowed
- Angle parking on one side
- Angle parking on both sides
- Parallel parking on one side
- Parallel parking on both sides

Source of Coding: HPMS and Project Team

93. ROADWAY LIGHTING

Definition: Type of roadway lighting

Attributes:

- None
- Spot on one-side
- Spot on both sides
- Continuous on one-side
- Continuous on both sides

Source of Coding: SafetyAnalyst

94. TRUCK ROUTE DESIGNATION

Definition: Truck route designation

Attributes:

- Designated truck route
- Not a designated truck route

Source of Coding: HPMS

95. TOLL FACILITY?

Definition: Whether the segment is a toll facility

Attributes:

- Toll segment
- Nontoll segment

Source of Coding: HPMS

96. EDGELINE PRESENCE/TYPE

Definition: Edgeline presence/type

Attributes:

- No marked edgeline
- Standard width edgeline
- Wide edgeline
- Other

Source of Coding: Project Team

97. CENTERLINE PRESENCE/TYPE

Definition: Centerline presence/type

Attributes:

- No marked centerline
- Standard centerline markings
- Centerline with centerline rumble strip

Source of Coding: Project Team

98. NO PASSING ZONE CODE/PASSING PERMISSIBILITY

Definition: No passing zone code/passing permissibility

Attributes:

- Percent of section length striped for passing

Source of Coding: HPMS

99. 85TH % SPEED

Definition: Traffic speed exceeded by 15 percent of the vehicles in the flow

Attributes:

- mph/kph

Source of Coding: SafetyAnalyst

II. ROADWAY ALIGNMENT DESCRIPTORS

(Note that these variables are best captured in a separate file that is linkable to inventory, crash, and other files.)

II.A. HORIZONTAL CURVE DATA

(Each data record will define an angle point or a single curve, even if the curve is a component of a compound or reverse curve. Spirals or other transitions are part of the curve.)

100. CURVE IDENTIFIERS AND LINKAGE VARIABLES

Definition: All variables needed to define location of each curve record and all variables necessary to link with other safety files.

Attributes:

- Route and location descriptors (e.g., route and beginning and ending milepoints or route and beginning and ending spatial coordinates). Must be consistent with other MMIRE files for linkage.

Source of Coding: All sources

101. CURVE FEATURE TYPE

Definition: Type of horizontal alignment feature being described in the data record

Attributes:

- Horizontal angle point (i.e., joining of two tangents without a horizontal curve)
- Independent horizontal curve
- Component of compound curve (i.e., one curve in compound curve)
- Component of reverse curve (i.e., one curve in a reverse curve)

Source of Coding: Project Team

102. HORIZONTAL CURVE DEGREE OR RADIUS

Definition: Degree or radius of curve

Attributes:

- Numeric, feet or meters if radius

Source of Coding: All sources

103. HORIZONTAL CURVE LENGTH

Definition: Length of curve including spiral

Attributes:

- Feet or meters

Source of Coding: All sources

104. CURVE SUPERELEVATION OR SUPERELEVATION ADEQUACY

Definition: Either measured superelevation rate or percent or adequacy of superelevation when compared to AASHTO design standards

Attributes:

- Rate/percent or yes/no

Source of Coding: Project Team

105. HORIZONTAL TRANSITION/SPIRAL CURVE PRESENCE

Definition: Presence/type of transition from tangent to curve and curve to tangent

Attributes:

- No transition
- Spiral transition
- Other transition

Source of Coding: Project Team

106. HORIZONTAL CURVE INTERSECTION/DEFLECTION ANGLE

Definition: The angle between the two intersecting tangents in the direction of inventory (sometimes called the “deflection angle”).

Attributes:

- Degrees. positive if angled right in the direction inventory and negative if angled left

Source of Coding: IHSDM

107. HORIZONTAL CURVE DIRECTION

Definition: Direction of curve in direction of inventory

Attributes:

- Right
- Left

Source of Coding: IHSDM

II.B. VERTICAL GRADE DATA

(Each data record will define an individual grade or the angle point or vertical curve linking two grades.)

108. GRADE IDENTIFIERS AND LINKAGE VARIABLES

Definition: All variables needed to define location of each vertical feature and all variables necessary to link with other safety files.

Attributes:

- Route/linear reference system descriptors (e.g., route and beginning and ending milepoints or route and beginning and ending spatial coordinates). Must be consistent with other MMIRE files for linkage.

Source of Coding: All sources

109. VERTICAL ALIGNMENT FEATURE TYPE

Definition: Type of vertical alignment feature being described in the data record

Attributes:

- Vertical angle point (i.e., joining of two vertical gradients without a verticle curve)
- Vertical gradient
- Sag vertical curve (i.e., vertical curve that connects a segment of roadway with a segment of roadway that has a more positive grade)
- Crest vertical curve (i.e., vertical curve that connects a segment of roadway with a segment of roadway that has a more negative grade)

Source of Coding: Project Team

110. PERCENT OF GRADIENT

Definition: Percent of gradient

Attributes:

- Percent

Source of Coding: All sources

111. GRADE LENGTH

Definition: Grade length

Attributes:

- Feet or meters

Source of Coding: All sources

112. VERTICAL CURVE LENGTH

Definition: Vertical curve length

Attributes:

- Feet or meters

Source of Coding: All sources

III. ROADWAY JUNCTION DESCRIPTORS

III.A. AT-GRADE INTERSECTION/JUNCTIONS

III.A.1. GENERAL DESCRIPTORS

113. UNIQUE INTERSECTION IDENTIFIER

Definition: A numeric unique identifier for each intersection/junction

Attributes:

- Node number, LRS of primary route, etc.

Source of Coding: Project Team

114. TYPE OF INTERSECTION/JUNCTION

Definition: Type of Junction being described in the data record

Attributes:

- Roadway/roadway (not interchange related)
- Roadway/roadway (interchange ramp terminal)
- Roadway/pedestrian crossing (e.g., midblock crossing)
- Roadway/bicycle path or trail
- Roadway/railroad grade crossing
- Other

Source of Coding: Project Team

115. LOCATION IDENTIFIER FOR ROAD 1 CROSSING POINT

Definition: Location on the first intersecting route (e.g., route-milepost)

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates).
Must be consistent with other MMIRE files for linkage.

Source of Coding: Project Team

116. LOCATION IDENTIFIER FOR ROAD 2 CROSSING POINT

Definition: Location on the second intersecting route (e.g., route-milepost)

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates).
Must be consistent with other MMIRE files for linkage.

Source of Coding: Project Team

117. LOCATION IDENTIFIER FOR ROAD 3, 4, ETC., CROSSING POINT (E.G., ROUTE-MILEPOST), ETC.

Definition: Location on the third and subsequent intersecting route (e.g., route-milepost)

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates).
Must be consistent with other MMIRE files for linkage.

Source of Coding: Project Team

118. INTERSECTION/JUNCTION NO. OF LEGS

Definition: Intersection/junction no. of legs

Attributes:

- Numeric

Source of Coding: SafetyAnalyst

119. INTERSECTION/JUNCTION GEOMETRY

Definition: Intersection/junction geometry

Attributes:

- T
- Wye
- Cross
- More than four legs
- Roundabout

Source of Coding: Project Team

120. SCHOOL ZONE INDICATOR

Definition: Whether the intersection/junction is in a school zone

Attributes:

- Yes
- No

Source of Coding: Project Team

121. RAILROAD CROSSING NUMBER

Definition: Railroad crossing number if a RR grade crossing (for linkage to National Highway-Rail Crossing Inventory)

Attributes:

- Numeric

Source of Coding: Project Team

122. INTERSECTION SKEW ANGLE

Definition: Angle from perpendicular of intersection of the roads

Attributes:

- Degrees

Source of Coding: SafetyAnalyst

123. INTERSECTION/JUNCTION OFFSET

Definition: Whether crossroad approach centerlines are directly opposed or offset by some distance

Attributes:

- Yes
- No

Source of Coding: SafetyAnalyst

124. INTERSECTION/JUNCTION OFFSET DISTANCE

Definition: Distance that approach centerlines are offset

Attributes:

- Numeric (zero if not offset)

Source of Coding: SafetyAnalyst

125. INTERSECTION/JUNCTION TRAFFIC CONTROL

Definition: Traffic control present at intersection/junction

Attributes:

- Uncontrolled
- Two-way stop
- Four-way stop
- Yield sign
- Signalized (with ped signal)
- Signalized (w/o ped signal)
- Other

Source of Coding: Project Team

126. SIGNALIZATION TYPE (E.G., ACTUATED, FIXED, SYSTEM)

Definition: Type of signalization at intersection/junction

Attributes:

- No signal
- Uncoordinated fixed time
- Traffic actuated
- Linear coordination
- System coordination
- Pushbutton- actuated
- Other

Source of Coding: SafetyAnalyst and Project Team

127. NUMBER OF INTERSECTION/JUNCTION QUADRANTS WITH LIMITED SIGHT DISTANCE

Definition: Number of intersection/junction quadrants with limited sight distance

Attributes:

- Number of quadrants

Source of Coding: IHSDM

128. INTERSECTION/JUNCTION LIGHTING

Definition: Type of lighting at intersection/junction

Attributes:

- None
- Spot lighting at intersection
- Continuous segment lighting

Source of Coding: Project Team

129. ROUNDABOUT - NO. OF CIRCULATORY LANES

Definition: No. of circulatory lanes in roundabout

Attributes:

- Numeric

Source of Coding: Project Team

130. ROUNDABOUT—CIRCULATORY WIDTH

Definition: Width of the roadway between the central island and outer edge of the circulatory lane

Attributes:

- Feet or meters

Source of Coding: Project Team

131. ROUNDABOUT - INSCRIBED DIAMETER

Definition: Distance between the outer edges of the circulatory roadway

Attributes:

- Feet or meters

Source of Coding: Project Team

132. ROUNDABOUT—BICYCLE FACILITY

Definition: Type of bicycle facility at roundabout

Attributes:

- None
- Separate cycle path
- Circulatory bike lane
- Other

Source of Coding: Project Team

III.A.2. AT-GRADE INTERSECTION/JUNCTION DESCRIPTORS (EACH APPROACH)

133. APPROACH AADT

Definition: AADT on approach described

Attributes:

- Vehicles per day

Source of Coding: All sources

134. APPROACH USE TYPE

Definition: Usage of approach

Attributes:

- Shared Use (e.g., vehicles, peds, bikes)
- Pedestrians Only
- Bicycles Only
- Pedestrians and Bicycles
- Railroad
- Other

Source of Coding: Project Team

135. APPROACH IS TWO-WAY, ONE-WAY

Definition: One-way or two-way flow on approach

Attributes:

- One-way
- Two-way
- One direction of travel for divided roadways

Source of Coding: All sources

136. NO. OF THRU LANES

Definition: Total number of thru lanes on approach, both directions

Attributes:

- Numeric

Source of Coding: All sources

137. NO. OF EXCLUSIVE LEFT TURN LANES

Definition: Number of exclusive left turn lanes on approach

Attributes:

- Numeric

Source of Coding: All sources

138. NO. OF EXCLUSIVE RIGHT TURN LANES

Definition: Number of exclusive right turn lanes on approach

Attributes:

- Numeric

Source of Coding: All sources

139. LENGTH OF EXCLUSIVE LEFT TURN LANES

Definition: Length of exclusive left turn lanes

Attributes:

- Feet or meters

Source of Coding: Project Team

140. LENGTH OF EXCLUSIVE RIGHT TURN LANES

Definition: Length of exclusive right turn lanes

Attributes:

- Feet or meters

Source of Coding: Project Team

141. MEDIAN TYPE AT INTERSECTION

Definition: Median type at intersection on approach

Attributes:

- None
- Curbed
- Not curbed
- Barrier

Source of Coding: Project Team

142. APPROACH TRAFFIC CONTROL

Definition: Traffic control present on approach

Attributes:

- Uncontrolled
- Stop sign
- Yield sign
- Traffic signal with ped signal
- Pedestrian signal only
- Other

Source of Coding: Project Team

143. LEFT-TURN PROTECTION

Definition: Presence and time of left turn protection

Attributes:

- Unsignalized
- Signalized with no left turn projection
- All-day protection
- Peak hour protection only
- Other

Source of Coding: Project Team

144. SIGNAL PROGRESSION

Definition: Signal progression on approach

Attributes:

- No signal
- Uncoordinated fixed time
- Traffic actuated
- Linear coordination
- System coordination
- Other

Source of Coding: SafetyAnalyst and Project Team

145. CROSSWALK PRESENCE/TYPE

Definition: Type of crosswalk

Attributes:

- Marked crosswalk
- Unmarked crosswalk
- Marked with refuge island
- Marked with in-street yield sign
- Marked with in-pavement warning lights
- Other

Source of Coding: Project Team

146. PEDESTRIAN SIGNALIZATION TYPE

Definition: Type of pedestrian signalization on approach

Attributes:

- Pushbutton actuated
- Recall (activated by traffic signal)
- Other

Source of Coding: Project Team

147. PEDESTRIAN SIGNAL SPECIAL FEATURES

Definition: Special features for either pushbutton or recall pedestrian signals

Attributes:

- Accessible pedestrian signal (i.e., audible tones for low-vision pedestrians)
- Countdown pedestrian signal
- Both accessible and countdown features
- Other

Source of Coding: Project Team

148. CROSSING PEDESTRIAN COUNT/EXPOSURE

Definition: Count or estimate of average daily pedestrian flow crossing this approach (Note: only applicable to approaches with vehicular traffic.)

Attributes:

- Numeric

Source of Coding: Project Team and SafetyAnalyst

149. LEFT/RIGHT TURN PROHIBITIONS

Definition: Left- or right turn prohibitions on this approach

Attributes:

- No left turns permitted at any time
- No left turn permitted during certain portions of the day
- No right turns permitted at any time
- No right turns permitted during certain portions of the day
- No U-turns

Source of Coding: Based on SafetyAnalyst

150. LEFT TURN COUNTS/PERCENT

Definition: Count or estimate of average daily left turns, or percent of total approach traffic turning left. (Note: This could also be captured for peak-periods only or by hour of day.)

Attributes:

- Count or percent

Source of Coding: Project Team

151. RIGHT TURN COUNTS/PERCENT

Definition: Count or estimate of average daily right-turns, or percent of total approach traffic turning right. (Note: This could also be captured for peak-periods only or by hour of day.)

Attributes:

- Count or percent

Source of Coding: Project Team

152. TRANSVERSE RUMBLE STRIP PRESENCE

Definition: Presence of transverse rumble strip on approach

Attributes:

- Yes
- No

Source of Coding: Project Team

153. ROUNDABOUT—ENTRY WIDTH

Definition: Full width of entry where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width.

Attributes:

- Feet or meters

Source of Coding: Project Team

154. ROUNDABOUT—NUMBER OF ENTRY LANES

Definition: Number of entry lanes into roundabout on this approach

Attributes:

- Numeric

Source of Coding: Project Team

155. ROUNDABOUT—ENTRY RADIUS

Definition: Minimum radius of curvature of the curb on the right side of the entry.

Attributes:

- Feet or meters

Source of Coding: Project Team

156. ROUNDABOUT—EXIT WIDTH

Definition: Full width of exit where it meets the inscribed circle. Note that total width of the approach can be derived from totaling entry width, exit width and splitter island width.

Attributes:

- Feet or meters

Source of Coding: Project Team

157. ROUNDABOUT—NUMBER OF EXIT LANES

Definition: Number of exit lanes from roundabout on this approach leg.

Attributes:

- Numeric

Source of Coding: Project Team

158. ROUNDABOUT—EXIT RADIUS

Definition: Minimum radius of curvature of the curb on the right side of the exit.

Attributes:

- Feet or meters

Source of Coding: Project Team

159. ROUNDABOUT—PEDESTRIAN FACILITY

Definition: Type of pedestrian crossing facility on this approach to roundabout

Attributes:

- Marked crosswalk with raised splitter island
- Marked crosswalk with flush splitter island
- Unmarked crosswalk with raised splitter island
- Unmarked crosswalk with flush splitter island
- Other

Source of Coding: Project Team

160. ROUNDABOUT—CROSSWALK LOCATION (DISTANCE FROM YIELD LINE)

Definition: Location of marked pedestrian crosswalk relative to yield line

Attributes:

- Feet or meters

Source of Coding: Project Team

161. ROUNDABOUT—SPLITTER ISLAND WIDTH

Definition: Width of the splitter island separating entry and exit legs (measured at the inscribed circle).

Attributes:

- Feet or meters

Source of Coding: Project Team

III.B. INTERCHANGE AND RAMP DESCRIPTORS

III.B.1. GENERAL INTERCHANGE DESCRIPTORS

162. UNIQUE INTERCHANGE IDENTIFIER

Definition: A numeric unique identifier for each interchange

Attributes:

- Node number, LRS of primary route, etc.

Source of Coding: Project Team

163. LOCATION IDENTIFIER FOR ROAD 1 CROSSING POINT

Definition: Location on the first intersecting route (e.g., route-milepost)

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates).
Must be consistent with other MMIRE files for linkage.

Source of Coding: Project Team

164. LOCATION IDENTIFIER FOR ROAD 2 CROSSING POINT

Definition: Location on the second intersecting route (e.g., route-milepost)

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates).
Must be consistent with other MMIRE files for linkage.

Source of Coding: Project Team

165. LOCATION IDENTIFIER FOR ROAD 3, 4, ETC., CROSSING POINT

Definition: Location on the third and subsequent intersecting route (e.g., route-milepost)

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates).
Must be consistent with other MMIRE files for linkage.

Source of Coding: Project Team

166. INTERCHANGE TYPE (DIAMOND, CLOVER, ETC.)

Definition: Type of interchange

Attributes:

- Diamond
- Full cloverleaf
- Partial cloverleaf
- SPUI
- Other

Source of Coding: Project Team

167. INTERCHANGE LIGHTING

Definition: Type of interchange lighting

Attributes:

- None
- Full interchange-area lighting
- Partial interchange lighting
- Continuous lighting on one or more approach roads
- Other

Source of Coding: Project Team

III.B.2. INTERCHANGE RAMP DESCRIPTORS

(NOTE that each ramp in an interchange is described by the following variables. Thus, each ramp record includes a full description of an individual ramp. If a ramp splits into two ramps, a new record is generated for the second and all subsequent ramps.)

168. UNIQUE RAMP IDENTIFIER

Definition: An identifier for each ramp that is part of a given interchange. This defines which ramp the following variables are describing.

Attributes:

- Alpha or Numeric—each set of interchange ramps could begin with “1” or “A”

Source of Coding: Project Team

169. RAMP LENGTH

Definition: Length of ramp

Attributes:

- Miles, feet or meters

Source of Coding: SafetyAnalyst

170. RAMP NO. OF LANES

Definition: Number of lanes on ramp

Attributes:

- Numeric

Source of Coding: SafetyAnalyst

171. RAMP AADT

Definition: AADT on ramp

Attributes:

- Numeric

Source of Coding: All sources

172. RAMP POSTED SPEED LIMIT

Definition: The posted (not advisory) speed limit on the ramp

Attributes:

- Numeric
- No posted limit (i.e., limit will be the same as on the connecting roadways)

Source of Coding: Project Team

173. FEATURE AT BEGINNING RAMP TERMINAL

Definition: A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the beginning terminal.

Attributes:

- Freeway
- Nonfreeway (surface street)
- Other ramp
- Frontage road
- Other

Source of Coding: Project Team

174. RAMP DESCRIPTOR AT BEGINNING RAMP TERMINAL

Definition: Description of the beginning terminal of the ramp

Attributes:

- Acceleration Lane
- Deceleration Lane
- Weaving lane (e.g., the weaving area joining two ramps under an overpass in a cloverleaf interchange)
- Intersection with roadway—ramp stop/yield controlled
- Intersection with roadway—ramp signal controlled
- Another ramp
- Other

Source of Coding: Project Team

175. LOCATION IDENTIFIER FOR ROADWAY AT BEGINNING RAMP TERMINAL

Definition: Location on the roadway at the beginning ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point.

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates) for the roadway intersected at the beginning ramp terminal. Must be consistent with other MMIRE files for linkage.
- NA (Not applicable) if beginning terminal is not at a roadway (e.g., another ramp)

Source of Coding: Project Team

176. ROADWAY TRAFFIC FLOW DIRECTION AT BEGINNING RAMP TERMINAL

Definition: Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp.

Attributes:

- Increasing direction of flow (with respect to roadway inventory direction)
- Decreasing direction of flow (with respect to roadway inventory direction)
- NOTE—Alternative coding could be compass direction of flow

Source of Coding: Project Team

177. FEATURE AT ENDING RAMP TERMINAL

Definition: A ramp is described by a beginning and ending ramp terminal in the direction of inventory. This variable describes the type of feature intersecting with the ramp at the ending terminal.

Attributes:

- Freeway
- Nonfreeway (surface street)
- Other Ramp
- Frontage road
- Other

Source of Coding: Project Team

178. RAMP DESCRIPTOR AT ENDING RAMP TERMINAL

Definition: Description of the ending terminal of the ramp

Attributes:

- Acceleration Lane
- Deceleration Lane
- Weaving lane (e.g., the weaving area joining two ramps under an overpass in a cloverleaf interchange)
- Intersection with roadway—ramp stop/yield controlled
- Intersection with roadway—ramp signal controlled
- Another ramp
- Other

Source of Coding: Project Team

179. LOCATION IDENTIFIER FOR ROADWAY AT ENDING RAMP TERMINAL

Definition: Location on the roadway at the beginning ramp terminal (e.g., route-milepost for that roadway) if the ramp connects with a roadway at that point.

Attributes:

- Route and location descriptors (e.g., route and milepoint or route and spatial coordinates) for the roadway intersected at the ending ramp terminal. Must be consistent with other MMIRE files for linkage.
- NA (Not applicable) if ending terminal is not at a roadway (e.g., another ramp)

Source of Coding: Project Team

180. ROADWAY TRAFFIC FLOW DIRECTION AT ENDING RAMP TERMINAL

Definition: Ramps can intersect a roadway on either of two sides. This defines the side of the road intersected by the ramp.

Attributes:

- Increasing direction of flow (with respect to roadway inventory direction)
- Decreasing direction of flow (with respect to roadway inventory direction)
- NOTE—Alternative coding could be compass direction of flow

Source of Coding: Project Team

**APPENDIX D. PRIORITY SAFETY VARIABLES IN THE NATIONAL BRIDGE INDEX
AND THE USDOT NATIONAL HIGHWAY-RAIL CROSSING INVENTORY**

Table 2. High priority safety variables in the National Bridge Inventory.

FIELD_NAME	DESCRIPTION	FIELD_NAME	DESCRIPTION
STATE	State Code	APPGUARD	Approach Guardrail
STRUCNUM	Structure Number	GUARDEND	Approach Guardrail Ends
RTSIGPRF	Route Signing Prefix	STRCSTAT	Structure Open/Posted/Closed
RTNUM	Route Number	ONSERVE	Type of Service on Bridge
DIRSUFF	Directional Suffix	UNDSERVE	Type of Service Under Bridge
HWYAGNCY	Highway Agency District	TOTHORCL	Inventory Rte Total Horz Clearance
CNTY	County (Parish) Code	TOTHORNO	Numeric Conversion for TOTHORCL
PLACE	Place Code	STRLENGT	Structure Length
FEATURE	Features Intersected	STRLNGNO	Numeric Conversion for STRLENGT
STRUCTURE	Facility Carried by Structure	LEFTWALK	Left Curb/Sidewalk Width
LOCATION	Location	LFTWLKNO	Numeric conversion for LEFTWALK
INVRTE	Inventory Rte, Min Vert Clearance	RITEWALK	Right Curb/Sidewalk Width
MILEPT	Mile point	RTWALKNO	Numeric Conversion for RITEWALK
KMPT	Numeric Kilometerpoint	ROADWID	Bridge Roadway Width Curb-to-Curb
BASEHWY	Base Highway Network	RDWIDNO	Numeric Conversion for ROADWID
LRSNVRTE	LRS Inventory Route	MINVERTO	Min Vert Clear Over Bridge Roadway
SUBRTNUM	Subroute Number	MVCONO	Numeric Conversion for MINVERTO
LATITUDE	Latitude	MINVERTU	Minimum Vertical Underclearance
LONGTUDE	Longitude	MVCUNO	Numeric Conversion for MINVERTU
FUNCLASS	Functional Class of Inventory Rte.	MINLATU	Minimum Lateral Underclearance
LANESON	Lanes on Structure	MLCURNO	Numeric Conversion for MINLATU
LANESUN	Lanes Under Structure	MINLATL	Min Lateral Underclear on Left
AVGDAY	Average Daily Traffic		
AVDAYNO	Num. Field—Avg. Daily Traf.		
YRAVG	Year of Average Daily Traffic		
APPROW	Approach Roadway Width		
APPRDNO	Num. Field for APPROW		
BRIMED	Bridge Median		
SKEW	Skew		
RAIL	Bridge Railings		
TRANSIT	Transitions		

Table 3. High priority safety variables in the National Bridge Inventory (continued).

FIELD_NAME	DESCRIPTION	FIELD_NAME	DESCRIPTION
MLCULNO	Numeric Conversion for MINLATL	AVTRAFF	Average Daily Truck Traffic
RDALIGN	Approach Roadway Alignment	AVTRAFNO	Numeric Conversion for AVTRAFNO
STRAHWY	STRAHNET Highway Designation	DESNET	Designated National Network
DIRTRAF	Direction of Traffic	PIERPRO	Pier/Abutment Protection
HIGHINV	Highway System of Inventory Route	NBISLENG	NBIS Bridge Length
FEDLNDHY	Federal Lands Highways		

Table 4. High-priority safety variables in the USDOT National Highway Rail Crossing Inventory.

Crossing Identification	Four-quadrant (or Full Barrier) Gates
Crossing Number	Cantilevered (or Bridged) Flashing Lights
Effective Date	Mast Mounted Flashing Lights
Part I: Location and Classification Information	Number of Flashing Light
State	Other Flashing Lights
County	Highway Traffic Signals
City (In or Near)	Wigwags
Street or Road Name	Bells
Highway Type & Number	Other Train Activated Warning Devices
Crossing Type	Specify Special Warning Device NOT Train Activated
Crossing Position	Channelization Devices With Gates
Latitude (Decimal)	Traffic Light
Longitude (Decimal)	Interconnection/Preemption
Part II: Railroad Information	Part IV: Physical Characteristics
Typical Total No. of Daily Trains	Smallest Crossing Angle
Total Switching Trains	Number of Traffic Lanes Crossing Railroad
Total Daylight Thru Trains (6 AM to 6 PM)	Are Truck Pullout Lanes Present?
Check if Less Than One Movement Per Day	Is Highway Paved?
Typical Speed Range of Trains Over Crossing	Crossing Surface (on Main Line)
Type and Number Tracks	Does Track Run Down a Street?
Part III: Traffic Control Device Information	Nearby Intersecting Highway?
No Signs or Signals	Is It Signalized?
Type of Warning Device at Crossing - Signs	Is Crossing Illuminated?
Crossbucks	Part V: Highway Information
Highway Stop Signs (R1-1)	Highway System
RR Advance Warning Signs (W10-1)	Is Crossing on State Highway System?
Hump Crossing Sign (W10-5)	Functional Classification of Road at Crossing
Pavement Markings	Posted Highway Speed
Other Signs	Annual Average Daily Traffic (AADT)
Gates	Estimated Percent Trucks
	Average Number of School Buses Over Crossing per School Day

REFERENCES

1. Council, F.M., and Harkey, D.L. (2006). *Traffic Safety Information Systems International Scan: Strategy Implementation White Paper* (Report No. FHWA-HRT-06-099). Washington, DC: Federal Highway Administration.
2. Crow, M., Halladay, M.L., Martinovich, S., Delucia, B.H., Harkey, D.L., McNamara, D.J., Ellison, J.W., Lacy, K., Serian, B.L., Griffith, M.S., and MacGregor, S. (2004). *Traffic Safety Information Systems in Europe and Australia* (Report No. FHWA-PL-04-010). Washington, DC: Federal Highway Administration.
3. Council, F.M., Harwood, D.W., Potts, I.B., Torbic, D.J., Graham, J.L., Hutton, J.M., Delucia, B.H., and Peck, R.C. (2007). *Guidance for Implementation of the AASHTO Strategic Highway Safety Plan: A Guide for Addressing Safety Data and Analysis in Developing Emphasis Area Plans* (NCHRP Report 500, Volume 21). Washington, DC: National Cooperative Highway Research Program.
4. Federal Highway Administration. “Basic Services Engineer’s Manual, Section 3.2 Data Elements,” *IHS DM Documentation* at http://www.ihsdm.org/ihsdm_public/html/user/docs/docs_all.html.
5. Federal Highway Administration. “Appendix A—Roadway Segment Inventory Data,” *Functional Specification for Master Safety Analyst Program* (September 2004).
6. Federal Highway Administration. (2006). *Draft Executive Summary. Repeatability and Accuracy of Geometry Measured by the Digital Highway Measurement Vehicle*.

