## **List of Tables**

Table 1-1. General Project Types and Activities and the HSM	CHAPTER '	I—INTRODUCTION AND OVERVIEW	1-1
Table 2-1.       Example Scenarios of Driver Overload       2-3         CHAPTER 3—FUNDAMENTALS       3-1         Table 3-1.       Example Haddon Matrix for Identifying Contributing Factors       3-7         Table 3-2.       Facility Types and Site Types Included in Part C       3-18         Table 3-3.       Values for Determining Confidence Intervals Using Standard Error       3-22         Table 3A-2.       Illustration of Yearly Proportions and Relative Last Year Rates       3-33         Table 3A-3.       Estimates of Expected Average Crash Frequency Using the Longer Crash History       3-34         Table 3A-3.       Intervention Data for Railroad-Highway Grade Crossings       (with 0-1,000 vehicles/day, 1-2 trains/day, single track, urban area) (2004)       3-36         Table 3A-5.       Comparison of Three Estimates of an example using crash counts, groups of similar roadways or facilities, and combination of both)       3-39         Table 3A-6.       Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, including the Statistical Parameter of Overdispersion φ (an example)       3-40         Table 3E-1.       Estimates of α (exponent in Equation 3E-1)       3-55         Table 3E-2.       Crash Modification Factors for Changes in Average Operating Speed (10)       3-57         CHAPTER 4—NETWORK SCREENING       4-1         Table 4-1.       Summary of Data Needs for P	Table 1-1.	General Project Types and Activities and the HSM	1-9
CHAPTER 3—FUNDAMENTALS	CHAPTER 2	2—HUMAN FACTORS	2-1
Table 3-1.Example Haddon Matrix for Identifying Contributing Factors3-7Table 3-2.Facility Types and Site Types Included in Part C3-18Table 3-3.Values for Determining Confidence Intervals Using Standard Error3-22Table 3A-1.Values for Determining Confidence Intervals Using Standard Error3-31Table 3A-2.Illustration of Yearly Proportions and Relative Last Year Rates3-33Table 3A-3.Estimates of Expected Average Crash Frequency Using the Longer Crash History3-34Table 3A-4.National Crash Data for Railroad-Highway Grade Crossings(2004)3-36Table 3A-5.Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)3-39Table 3A-6.Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)3-40Table 3E-1.Estimates of α (exponent in Equation 3E-1)3-55Table 3E-2.Crash Modification Factors for Changes in Average Operating Speed (10)3-57CHAPTER 4—NETWORK SCREENING4-1Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-9Table 4-3.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-4.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-10.Societal Crash Cost Assumptions4-24	Table 2-1.	Example Scenarios of Driver Overload	2-3
Table 3-2.       Facility Types and Site Types Included in Part C       3-18         Table 3-3.       Values for Determining Confidence Intervals Using Standard Error       3-22         Table 3A-1.       Values for Determining Confidence Intervals Using Standard Error       3-31         Table 3A-2.       Illustration of Yearly Proportions and Relative Last Year Rates       3-33         Table 3A-3.       Estimates of Expected Average Crash Frequency Using the Longer Crash History       3-34         Table 3A-4.       National Crash Data for Railroad-Highway Grade Crossings       3-36         Table 3A-5.       Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)       3-36         Table 3A-6.       Estimated Constants for Stop-Controlled and signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)       3-40         Table 3E-1.       Estimates of α (exponent in Equation 3E-1)       3-55         Table 4-1.       Stability of Performance Measures       4-8         Table 4-2.       Stability of Performance Measures       4-9         Table 4-3.       Performance Measure Consistency with Screening Methods       4-19         Table 4-4.       Intersection Traffic Volumes and Crash Data Summary       4-22         Table 4-5.       Intersection Detailed Crash Data Summary (3	CHAPTER 3	3—FUNDAMENTALS	3-1
Table 3-3.Values for Determining Confidence Intervals Using Standard Error3-22Table 3A-1.Values for Determining Confidence Intervals Using Standard Error3-31Table 3A-2.Illustration of Yearly Proportions and Relative Last Year Rates3-33Table 3A-3.Estimates of Expected Average Crash Frequency Using the Longer Crash History3-34Table 3A-4.National Crash Data for Railroad-Highway Grade Crossings (with 0-1,000 vehicles/day, 1-2 trains/day, single track, urban area) (2004)3-36Table 3A-5.Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)3-39Table 3A-6.Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)3-40Table 3E-1.Estimates of α (exponent in Equation 3E-1)3-55Table 3E-2.Crash Modification Factors for Changes in Average Operating Speed (10)3-57CHAPTER 4—NETWORK SCREENING4-1Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-8Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-4.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-26Table 4-9.	Table 3-1.	Example Haddon Matrix for Identifying Contributing Factors	3-7
Table 3A-1.Values for Determining Confidence Intervals Using Standard Error3-31Table 3A-2.Illustration of Yearly Proportions and Relative Last Year Rates3-33Table 3A-3.Estimates of Expected Average Crash Frequency Using the Longer Crash History3-34Table 3A-4.National Crash Data for Railroad-Highway Grade Crossings (with 0-1,000 vehicles/day, 1-2 trains/day, single track, urban area) (2004)3-36Table 3A-5.Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)3-39Table 3A-6.Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)3-40Table 3E-1.Estimates of α (exponent in Equation 3E-1)3-55Table 3E-2.Crash Modification Factors for Changes in Average Operating Speed (10)3-57CHAPTER 4—NETWORK SCREENING4-1Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-9Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-5.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.<	Table 3-2.	Facility Types and Site Types Included in Part C	3-18
Table 3A-2.Illustration of Yearly Proportions and Relative Last Year Rates3-33Table 3A-3.Estimates of Expected Average Crash Frequency Using the Longer Crash History3-34Table 3A-4.National Crash Data for Railroad-Highway Grade Crossings (with 0-1,000 vehicles/day, 1-2 trains/day, single track, urban area) (2004)3-36Table 3A-5.Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)3-39Table 3A-6.Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)3-40Table 3E-1.Estimates of α (exponent in Equation 3E-1)3-55Table 3E-2.Crash Modification Factors for Changes in Average Operating Speed (10)3-57CHAPTER 4—NETWORK SCREENING4-1Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-9Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-4.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-	Table 3-3.	Values for Determining Confidence Intervals Using Standard Error	3-22
Table 3A-3.       Estimates of Expected Average Crash Frequency Using the Longer Crash History       3-34         Table 3A-4.       National Crash Data for Railroad-Highway Grade Crossings (with 0–1,000 vehicles/day, 1–2 trains/day, single track, urban area) (2004)       3-36         Table 3A-5.       Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)       3-39         Table 3A-6.       Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)       3-40         Table 3E-1.       Estimates of α (exponent in Equation 3E-1)       3-55         Table 3E-2.       Crash Modification Factors for Changes in Average Operating Speed (10)       3-57         CHAPTER 4—NETWORK SCREENING       4-1         Table 4-1.       Summary of Data Needs for Performance Measures       4-8         Table 4-2.       Stability of Performance Measures       4-8         Table 4-3.       Performance Measure Consistency with Screening Methods       4-19         Table 4-4.       Intersection Traffic Volumes and Crash Data Summary       4-22         Table 4-5.       Intersection Detailed Crash Data Summary (3 Years)       4-23         Table 4-6.       Estimated Predicted Average Crash Frequency from an SPF       4-24         Table 4-7.       Societ	Table 3A-1.	Values for Determining Confidence Intervals Using Standard Error	3-31
Table 3A-4.       National Crash Data for Railroad-Highway Grade Crossings (with 0–1,000 vehicles/day, 1–2 trains/day, single track, urban area) (2004)       3-36         Table 3A-5.       Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)       3-39         Table 3A-6.       Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)       3-40         Table 3E-1.       Estimates of α (exponent in Equation 3E-1)       3-55         Table 3E-2.       Crash Modification Factors for Changes in Average Operating Speed (10)       3-57         CHAPTER 4—NETWORK SCREENING         4-1         Table 4-1.       Summary of Data Needs for Performance Measures       4-8         Table 4-2.       Stability of Performance Measures       4-9         Table 4-3.       Performance Measure Consistency with Screening Methods       4-19         Table 4-4.       Intersection Traffic Volumes and Crash Data Summary.       4-22         Table 4-5.       Intersection Detailed Crash Data Summary (3 Years)       4-23         Table 4-6.       Estimated Predicted Average Crash Frequency from an SPF.       4-24         Table 4-7.       Societal Crash Cost Assumptions       4-29         Table 4-10.       Estimated Predicte	Table 3A-2.	Illustration of Yearly Proportions and Relative Last Year Rates	3-33
(with 0–1,000 vehicles/day, 1–2 trains/day, single track, urban area) (2004)3-36Table 3A-5.Comparison of Three Estimates (an example using crash counts, groups of similar roadways or facilities, and combination of both)3-39Table 3A-6.Estimated Constants for Stop-Controlled and Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example)3-40Table 3E-1.Estimates of α (exponent in Equation 3E-1)3-55Table 3E-2.Crash Modification Factors for Changes in Average Operating Speed (10)3-57CHAPTER 4—NETWORK SCREENING4-1Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-9Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-4.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF4-46Table 4-11.LOSS Categories4-47Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-66Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Road	Table 3A-3.	Estimates of Expected Average Crash Frequency Using the Longer Crash History	3-34
groups of similar roadways or facilities, and combination of both)	Table 3A-4.	3 , 3	3-36
Signalized Four-Leg Intersections' SPF Shown in Equation A-13, Including the Statistical Parameter of Overdispersion φ (an example) 3-40  Table 3E-1. Estimates of α (exponent in Equation 3E-1) 3-55  Table 3E-2. Crash Modification Factors for Changes in Average Operating Speed (10) 3-57  CHAPTER 4—NETWORK SCREENING 4-1  Table 4-1. Summary of Data Needs for Performance Measures 4-8  Table 4-2. Stability of Performance Measures 4-9  Table 4-3. Performance Measure Consistency with Screening Methods 4-19  Table 4-4. Intersection Traffic Volumes and Crash Data Summary 4-22  Table 4-5. Intersection Detailed Crash Data Summary (3 Years) 4-23  Table 4-6. Estimated Predicted Average Crash Frequency from an SPF 4-24  Table 4-7. Societal Crash Cost Assumptions 4-29  Table 4-8. Crash Cost Estimates by Crash Type 4-32  Table 4-9. Confidence Levels and P Values for Use in Critical Rate Method 4-36  Table 4-10. Estimated Predicted Average Crash Frequency from an SPF 4-46  Table 4-11. LOSS Categories 4-47  Table 4-12. Societal Crash Cost Assumptions 4-66  Table 4-13. Estimated Predicted Average Crash Frequency from an SPF 4-67  Table 4-14. Societal Crash Cost Assumptions 4-67  Table 4-15. Roadway Segment Characteristics 4-79  Table 4-16. Roadway Segment Detail Crash Data Summary (3 Years) 4-80	Table 3A-5.		3-39
Table 3E-2.Crash Modification Factors for Changes in Average Operating Speed (10)3-57CCHAPTER 4—NETWORK SCREENING.4-1Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-9Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-4.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-8.Crash Cost Estimates by Crash Type4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF4-46Table 4-11.LOSS Categories4-47Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-67Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	Table 3A-6.	Signalized Four-Leg Intersections' SPF Shown in Equation A-13,	3-40
CHAPTER 4—NETWORK SCREENING	Table 3E-1.	Estimates of $\alpha$ (exponent in Equation 3E-1)	3-55
Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-9Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-4.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-8.Crash Cost Estimates by Crash Type4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF4-46Table 4-11.LOSS Categories4-47Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-67Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	Table 3E-2.	Crash Modification Factors for Changes in Average Operating Speed (10)	3-57
Table 4-1.Summary of Data Needs for Performance Measures4-8Table 4-2.Stability of Performance Measures4-9Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-4.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-8.Crash Cost Estimates by Crash Type4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF4-46Table 4-11.LOSS Categories4-47Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-67Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	CHARTER	A NETWORK CORENING	4.1
Table 4-2.Stability of Performance Measures4-9Table 4-3.Performance Measure Consistency with Screening Methods4-19Table 4-4.Intersection Traffic Volumes and Crash Data Summary4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-8.Crash Cost Estimates by Crash Type4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF4-46Table 4-11.LOSS Categories4-47Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-67Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80			
Table 4-3. Performance Measure Consistency with Screening Methods		•	
Table 4-4.Intersection Traffic Volumes and Crash Data Summary.4-22Table 4-5.Intersection Detailed Crash Data Summary (3 Years).4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF.4-24Table 4-7.Societal Crash Cost Assumptions.4-29Table 4-8.Crash Cost Estimates by Crash Type.4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method.4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF.4-46Table 4-11.LOSS Categories.4-47Table 4-12.Societal Crash Cost Assumptions.4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF.4-67Table 4-14.Societal Crash Cost Assumptions.4-75Table 4-15.Roadway Segment Characteristics.4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years).4-79Table 4-17.Relative Severity Index Crash Costs.4-80	labic + 2.	Stability of Partormanca Maasuras	1_9
Table 4-5.Intersection Detailed Crash Data Summary (3 Years)4-23Table 4-6.Estimated Predicted Average Crash Frequency from an SPF4-24Table 4-7.Societal Crash Cost Assumptions4-29Table 4-8.Crash Cost Estimates by Crash Type4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF4-46Table 4-11.LOSS Categories4-47Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-67Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	Table 1-3	•	
Table 4-6.Estimated Predicted Average Crash Frequency from an SPF.4-24Table 4-7.Societal Crash Cost Assumptions.4-29Table 4-8.Crash Cost Estimates by Crash Type.4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method.4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF.4-46Table 4-11.LOSS Categories.4-47Table 4-12.Societal Crash Cost Assumptions.4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF.4-67Table 4-14.Societal Crash Cost Assumptions.4-75Table 4-15.Roadway Segment Characteristics.4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years).4-79Table 4-17.Relative Severity Index Crash Costs.4-80		Performance Measure Consistency with Screening Methods	4-19
Table 4-7.Societal Crash Cost Assumptions4-29Table 4-8.Crash Cost Estimates by Crash Type4-32Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF4-46Table 4-11.LOSS Categories4-47Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-67Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	Table 4-4.	Performance Measure Consistency with Screening Methods  Intersection Traffic Volumes and Crash Data Summary	4-19 4-22
Table 4-8.Crash Cost Estimates by Crash Type	Table 4-4. Table 4-5.	Performance Measure Consistency with Screening Methods  Intersection Traffic Volumes and Crash Data Summary  Intersection Detailed Crash Data Summary (3 Years)	4-19 4-22 4-23
Table 4-9.Confidence Levels and P Values for Use in Critical Rate Method.4-36Table 4-10.Estimated Predicted Average Crash Frequency from an SPF.4-46Table 4-11.LOSS Categories.4-47Table 4-12.Societal Crash Cost Assumptions.4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF.4-67Table 4-14.Societal Crash Cost Assumptions.4-75Table 4-15.Roadway Segment Characteristics.4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years).4-79Table 4-17.Relative Severity Index Crash Costs.4-80	Table 4-4. Table 4-5. Table 4-6.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF.	4-19 4-22 4-23 4-24
Table 4-10.Estimated Predicted Average Crash Frequency from an SPF.4-46Table 4-11.LOSS Categories.4-47Table 4-12.Societal Crash Cost Assumptions.4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF.4-67Table 4-14.Societal Crash Cost Assumptions.4-75Table 4-15.Roadway Segment Characteristics.4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years).4-79Table 4-17.Relative Severity Index Crash Costs.4-80	Table 4-4. Table 4-5. Table 4-6. Table 4-7.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF Societal Crash Cost Assumptions	4-19 4-22 4-23 4-24 4-29
Table 4-11.LOSS Categories	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Crash Cost Estimates by Crash Type.	4-19 4-22 4-23 4-24 4-32
Table 4-12.Societal Crash Cost Assumptions4-66Table 4-13.Estimated Predicted Average Crash Frequency from an SPF4-67Table 4-14.Societal Crash Cost Assumptions4-75Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF Societal Crash Cost Assumptions Crash Cost Estimates by Crash Type Confidence Levels and P Values for Use in Critical Rate Method	4-19 4-22 4-23 4-24 4-29 4-36
Table 4-13.Estimated Predicted Average Crash Frequency from an SPF.4-67Table 4-14.Societal Crash Cost Assumptions.4-75Table 4-15.Roadway Segment Characteristics.4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years).4-79Table 4-17.Relative Severity Index Crash Costs.4-80	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Crash Cost Estimates by Crash Type Confidence Levels and P Values for Use in Critical Rate Method. Estimated Predicted Average Crash Frequency from an SPF.	4-19 4-22 4-23 4-24 4-32 4-36
Table 4-14.Societal Crash Cost Assumptions.4-75Table 4-15.Roadway Segment Characteristics.4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10. Table 4-11.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF.  Societal Crash Cost Assumptions Crash Cost Estimates by Crash Type.  Confidence Levels and P Values for Use in Critical Rate Method. Estimated Predicted Average Crash Frequency from an SPF.  LOSS Categories.	4-19 4-22 4-23 4-24 4-29 4-32 4-36 4-46
Table 4-15.Roadway Segment Characteristics4-79Table 4-16.Roadway Segment Detail Crash Data Summary (3 Years)4-79Table 4-17.Relative Severity Index Crash Costs4-80	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10. Table 4-11. Table 4-12.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF.  Societal Crash Cost Assumptions Crash Cost Estimates by Crash Type.  Confidence Levels and P Values for Use in Critical Rate Method. Estimated Predicted Average Crash Frequency from an SPF.  LOSS Categories.  Societal Crash Cost Assumptions.	4-19 4-22 4-23 4-24 4-32 4-36 4-46 4-66
Table 4-16. Roadway Segment Detail Crash Data Summary (3 Years) 4-79  Table 4-17. Relative Severity Index Crash Costs 4-80	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10. Table 4-11. Table 4-13.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF Societal Crash Cost Assumptions Crash Cost Estimates by Crash Type Confidence Levels and P Values for Use in Critical Rate Method Estimated Predicted Average Crash Frequency from an SPF LOSS Categories Societal Crash Cost Assumptions Estimated Predicted Average Crash Frequency from an SPF	4-19 4-22 4-23 4-24 4-32 4-36 4-46 4-66
Table 4-17. Relative Severity Index Crash Costs	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10. Table 4-11. Table 4-12. Table 4-13. Table 4-14.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF.  Societal Crash Cost Assumptions Crash Cost Estimates by Crash Type.  Confidence Levels and P Values for Use in Critical Rate Method. Estimated Predicted Average Crash Frequency from an SPF.  LOSS Categories.  Societal Crash Cost Assumptions.  Estimated Predicted Average Crash Frequency from an SPF.  Societal Crash Cost Assumptions.	4-19 4-22 4-24 4-29 4-36 4-46 4-66 4-67
·	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10. Table 4-11. Table 4-12. Table 4-13. Table 4-14. Table 4-15.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Crash Cost Estimates by Crash Type Confidence Levels and P Values for Use in Critical Rate Method. Estimated Predicted Average Crash Frequency from an SPF. LOSS Categories. Societal Crash Cost Assumptions. Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Roadway Segment Characteristics.	4-19 4-22 4-24 4-29 4-32 4-46 4-47 4-66 4-67 4-79
iable 4-10. Segitient i shuniy vvinuow ratatheters	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10. Table 4-11. Table 4-12. Table 4-13. Table 4-14. Table 4-15. Table 4-16.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary. Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Crash Cost Estimates by Crash Type. Confidence Levels and P Values for Use in Critical Rate Method. Estimated Predicted Average Crash Frequency from an SPF. LOSS Categories. Societal Crash Cost Assumptions. Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Roadway Segment Characteristics Roadway Segment Detail Crash Data Summary (3 Years).	4-19 4-22 4-23 4-24 4-32 4-36 4-46 4-67 4-67 4-79
Table 4-19. Segment 1 Crash Data per Sliding Window Subsegments	Table 4-4. Table 4-5. Table 4-6. Table 4-7. Table 4-8. Table 4-9. Table 4-10. Table 4-11. Table 4-12. Table 4-13. Table 4-14. Table 4-15. Table 4-16. Table 4-17.	Performance Measure Consistency with Screening Methods Intersection Traffic Volumes and Crash Data Summary Intersection Detailed Crash Data Summary (3 Years) Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Crash Cost Estimates by Crash Type Confidence Levels and P Values for Use in Critical Rate Method. Estimated Predicted Average Crash Frequency from an SPF. LOSS Categories Societal Crash Cost Assumptions. Estimated Predicted Average Crash Frequency from an SPF. Societal Crash Cost Assumptions. Roadway Segment Characteristics Roadway Segment Detail Crash Data Summary (3 Years) Relative Severity Index Crash Costs	4-19 4-22 4-24 4-29 4-32 4-46 4-66 4-67 4-79 4-80

Table 4A-1.	Crash Cost Estimates by Crash Severity	4-84
Table 4A-2.	Crash Cost Estimates by Crash Type	4-85
CHAPTER	5—DIAGNOSIS	5-1
Table 5-1.	Example Tabular Summary	5-4
Table 5-2.	Sites Selected for Further Review	5-12
Table 5-3.	Intersection Crash Data Summary	5-13
Table 5-4.	Roadway Segment Crash Data Summary	5-13
CHAPTER	6—SELECT COUNTERMEASURES	6-1
Table 6-1.	Example Haddon Matrix for Rear-End Crash	6-2
Table 6-2.	Assessment Summary	6-11
CHAPTER	7—ECONOMIC APPRAISAL	7-1
Table 7-1.	Societal Crash Cost Estimates by Crash Severity	7-5
Table 7-2.	Summary of Crash Conditions, Contributory Factors, and Selected Countermeasures	
Table 7-3.	Expected Average Crash Frequency at Intersection 2 WITHOUT Installing the Roundabout	
Table 7-4.	Societal Crash Costs by Severity	
Table 7-5.	Economic Appraisal for Intersection 2	
Table 7-6.	Expected Average FI Crash Frequency at Intersection 2 WITH the Roundabout	
Table 7-7.	Expected Average Total Crash Frequency at Intersection 2 WITH the Roundabout	
Table 7-8.	Change in Expected Average in Crash Frequency at Intersection 2 WITH the Roundabout	
Table 7-9.	Annual Monetary Value of Change in Crashes	
Table 7-10.	Converting Annual Values to Present Values	
CHAPTER	8—PRIORITIZE PROJECTS	8-1
Table 8-1.	Summary of Project Prioritization Methods	8-6
Table 8-2.	Intersections and Roadway Segments Selected for Further Review	
Table 8-3.	Summary of Countermeasure, Crash Reduction, and Cost Estimates for Selected Intersections and Roadway Segments	
Table 8-4.	Project Facts	
Table 8-5.	Cost-Effectiveness Evaluation	
Table 8-6.	Cost-Effectiveness Ranking	
Table 8-8.	Net Present Value Results	
Table 8-9.	Cost of Improvement Ranking	
Table 8-10.	Incremental BCR Analysis	8-12
Table 8-11.	Ranking Results of Incremental BCR Analysis	
CHAPTER	9—SAFETY EFFECTIVENESS EVALUATION	9-1
Table 9-1.	Generic Evaluation Study Design	9-3
Table 9-2.	Observational Before/After Evaluation Study Design	
Table 9-3.	Observational Cross-Sectional Evaluation Study Design	9-6
Table 9-4.	Selection Guide for Observational Before/After Evaluation Methods	9-6
Table 9-5.	Experimental Before/After Evaluation Study Design	9-7
Table 9-6.	Overview of Data Needs and Inputs for Safety Effectiveness Evaluations	9-7

PART C—II	NTRODUCTION AND APPLICATIONS GUIDANCE	C-1
Table C-1.	Safety Performance Functions by Facility Type and Site Types in Part C	C-5
Table C-2.	Constructing Confidence Intervals Using CMF Standard Error	C-17
CHAPTER '	10—PREDICTIVE METHOD FOR RURAL TWO-LANE, TWO-WAY ROADS	10-1
Table 10-1.	Rural Two-Lane, Two-Way Road Site Type with SPFs in Chapter 10	10-3
Table 10-2.	Safety Performance Functions included in Chapter 10	10-14
Table 10-3.	Default Distribution for Crash Severity Level on Rural Two-Lane, Two-Way Roadway Segments	10-17
Table 10-4.	Default Distribution by Collision Type for Specific Crash Severity Levels on Rural Two-Lane, Two-Way Roadway Segments	10-17
Table 10-5.	Default Distribution for Crash Severity Level at Rural Two-Lane, Two-Way Intersections	10-21
Table 10-6.	Default Distribution for Collision Type and Manner of Collision at Rural Two-Way Intersections	10-22
Table 10-7.	Summary of Crash Modification Factors (CMFs) in Chapter 10 and the Corresponding Safety Performance Functions (SPFs)	10-23
Table 10-8.	CMF for Lane Width on Roadway Segments (CMF <sub>ra</sub> )	10-24
Table 10-9.	CMF for Shoulder Width on Roadway Segments (CMF <sub>wra</sub> )	10-25
Table 10-10.	Crash Modification Factors for Shoulder Types and Shoulder Widths on Roadway Segments (CMF <sub>tra</sub> )	10-26
Table 10-11.	Crash Modification Factors (CMF <sub>5/</sub> ) for Grade of Roadway Segments	10-28
Table 10-12.	Nighttime Crash Proportions for Unlighted Roadway Segments	10-31
Table 10-13.	Crash Modification Factors (CMF <sub>2</sub> ) for Installation of Left-Turn Lanes on Intersection Approaches	10-32
Table 10-14.	Crash Modification Factors (CMF <sub>3/</sub> ) for Right-Turn Lanes on Approaches to an Intersection on Rural Two-Lane, Two-Way Highways	10-33
Table 10-15.	Nighttime Crash Proportions for Unlighted Intersections	10-33
Table 10-16.	List of Sample Problems in Chapter 10	10-35
CHAPTER	11—PREDICTIVE METHOD FOR RURAL MULTILANE HIGHWAYS	11-1
Table 11-1.	Rural Multilane Highway Site Type with SPFs in Chapter 11	11-3
Table 11-2.	Safety Performance Functions included in Chapter 11	11-14
Table 11-3.	SPF Coefficients for Total and Fatal-and-Injury Crashes on Undivided Roadway Segments (for use in Equations 11-7 and 11-8)	11-15
Table 11-4.	Default Distribution of Crashes by Collision Type and Crash Severity Level for Undivided Roadway Segments	11-17
Table 11-5.	SPF Coefficients for Total and Fatal-and-Injury Crashes on Divided Roadway Segments (for use in Equations 11-9 and 11-10)	11-18
Table 11-6.	Default Distribution of Crashes by Collision Type and Crash Severity Level for Divided Roadway Segments	11-20
Table 11-7.	SPF Coefficients for Three- and Four-Leg Intersections with Minor-Road Stop Control for Total and Fatal-and-Injury Crashes (for use in Equation 11-11)	11-22
Table 11-8.	SPF Coefficients for Four-Leg Signalized Intersections for Total and Fatal-and-Injury Crashes (for Use in Equations 11-11 and 11-12)	11-22
Table 11-9.	Default Distribution of Intersection Crashes by Collision Type and Crash Severity	11-24
Table 11-10.	Summary of CMFs in Chapter 11 and the Corresponding SPFs	11-25
Table 11-11.	CMF <sub>RA</sub> for Collision Types Related to Lane Width	11-26
	CMF for Collision Types Related to Shoulder Width (CMF <sub>WRA</sub> )	
Table 11-13.	CMF for Collision Types Related to Shoulder Type and Shoulder Width (CMF <sub>TRA</sub> )	11-28

Table 11-14.	CMF for Sideslope on Undivided Roadway Segments (CMF <sub>3rd</sub> )	11-28
Table 11-15.	Night-time Crash Proportions for Unlighted Roadway Segments	11-29
Table 11-16.	CMF for Collision Types Related to Lane Width (CMF <sub>RA</sub> )	11-30
Table 11-17.	CMF for Right Shoulder Width on Divided Roadway Segments (CMF <sub>2rd</sub> )	11-31
Table 11-18.	CMFs for Median Width on Divided Roadway Segments without a Median Barrier (CMF <sub>3rd</sub> )	. 11-31
Table 11-19.	Nighttime Crash Proportions for Unlighted Roadway Segments	11-32
Table 11-20.	CMFs for Three-Leg Intersections with Minor-Road Stop Control (3ST)	11-32
Table 11-21.	CMFs for Four-Leg Intersection with Minor-Road Stop Control (4ST)	11-33
Table 11-22.	Crash Modification Factors (CMF <sub>2/</sub> ) for Installation of Left-Turn Lanes on Intersection Approaches	. 11-34
Table 11-23.	Crash Modification Factors (CMF <sub>3/</sub> ) for Installation of Right-Turn Lanes on Intersections Approaches	. 11-35
Table 11-24.	Default Nighttime Crash Proportions for Unlighted Intersections	11-35
Table 11-25.	List of Sample Problems in Chapter 11	11-37
Table 11-26.	Summary of Results for Sample Problem 6	11-61
	2—PREDICTIVE METHOD FOR URBAN AND SUBURBAN ARTERIALS	
Table 12-1.	Urban and Suburban Arterial Site Type SPFs included in Chapter 12	
Table 12-2.	Safety Performance Functions included in Chapter 12	
Table 12-3.	SPF Coefficients for Multiple-Vehicle Nondriveway Collisions on Roadway Segments	. 12-19
Table 12-4.	Distribution of Multiple-Vehicle Nondriveway Collisions for Roadway Segments by Manner of Collision Type	. 12-20
Table 12-5.	SPF Coefficients for Single-Vehicle Crashes on Roadway Segments	. 12-21
Table 12-6.	Distribution of Single-Vehicle Crashes for Roadway Segments by Collision Type	
Table 12-7.	SPF Coefficients for Multiple-Vehicle Driveway Related Collisions	
Table 12-8.	Pedestrian Crash Adjustment Factor for Roadway Segments	. 12-27
Table 12-9.	Bicycle Crash Adjustment Factors for Roadway Segments	. 12-28
Table 12-10.	SPF Coefficients for Multiple-Vehicle Collisions at Intersections	. 12-30
Table 12-11.	Distribution of Multiple-Vehicle Collisions for Intersections by Collision Type	
Table 12-12.	SPF Coefficients for Single-Vehicle Crashes at Intersections	. 12-33
Table 12-13.	Distribution of Single-Vehicle Crashes for Intersection by Collision Type	. 12-36
Table 12-14.	SPFs for Vehicle-Pedestrian Collisions at Signalized Intersections	. 12-37
Table 12-15.	${\it Estimates of Pedestrian Crossing Volumes Based on General Level of Pedestrian Activity} \$	. 12-37
Table 12-16.	Pedestrian Crash Adjustment Factors for Stop-Controlled Intersections	. 12-38
Table 12-17.	Bicycle Crash Adjustment Factors for Intersections	. 12-38
Table 12-18.	Summary of CMFs in Chapter 12 and the Corresponding SPFs	. 12-39
Table 12-19.	Values of $f_{\it pk}$ Used in Determining the Crash Modification Factor for On-Street Parking	. 12-40
Table 12-20.	Fixed-Object Offset Factor	. 12-41
Table 12-21.	Proportion of Fixed-Object Collisions	. 12-41
Table 12-22.	CMFs for Median Widths on Divided Roadway Segments without a Median Barrier (CMF $_{\rm 3}$ /)	12-42
Table 12-23.	Nighttime Crash Proportions for Unlighted Roadway Segments	. 12-42
Table 12-24.	Crash Modification Factor (CMF,) for Installation of Left-Turn Lanes on Intersection Approaches	. 12-43
Table 12-25.	Crash Modification Factor (CMF <sub>2</sub> ) for Type of Left-Turn Signal Phasing	. 12-44
Table 12-26.	Crash Modification Factor (CMF <sub>3/</sub> ) for Installation of Right-Turn Lanes on Intersection Approaches	. 12-44

Table 12-27.	Nighttime Crash Proportions for Unlighted Intersections	12-45
Table 12-28.	Crash Modification Factor (CMF <sub>to</sub> ) for the Presence of Bus Stops near the Intersection	12-46
Table 12-29.	Crash Modification Factor (CMF <sub>2p</sub> ) for the Presence of Schools near the Intersection	12-46
Table 12-30.	Crash Modification Factor (CMF <sub>3p</sub> ) for the Number of Alcohol Sales Establishments near the Intersection	12-47
Table 12-31.	List of Sample Problems in Chapter 12	12-49
APPENDIX	A—SPECIALIZED PROCEDURES COMMON TO ALL PART C CHAPTERS	A-1
Table A-1.	SPFs in the Part C Predictive Models that Need Calibration	A-3
Table A-2.	Data Needs for Calibration of Part C Predictive Models by Facility Type	A-5
Table A-3.	Default Crash Distributions Used in Part C Predictive Models Which May Be Calibrated by Users to Local Conditions	A-11
PART D—II	NTRODUCTION AND APPLICATIONS GUIDANCE	D-1
Table D-1. Ca	ategories of Information in Part D	D-3
CHAPTER '	13—ROADWAY SEGMENTS	13-1
Table 13-1.	Summary of Treatments Related to Roadway Elements	13-3
Table 13-2.	CMF for Lane Width on Rural Two-Lane Roadway Segments (16)	13-4
Table 13-3.	CMF for Lane Width on Undivided Rural Multilane Roadway Segments (34)	13-7
Table 13-4.	CMF for Lane Width on Divided Rural Multilane Roadway Segments (34)	13-8
Table 13-5.	Potential Crash Effects of Adding Lanes by Narrowing Existing Lanes and Shoulders (4)	13-10
Table 13-6.	Potential Crash Effects of Four to Three Lane Conversion, or "Road Diet" (15)	13-10
Table 13-7.	CMF for Shoulder Width on Rural Two-Lane Roadway Segments	13-11
Table 13-8.	Potential Crash Effects of Paved Right Shoulder Width on Divided Segments (15)	13-12
Table 13-9.	Potential Crash Effects of Modifying the Shoulder Type on Rural Two-Lane Roads for Related Crash Types (16,33,36)	13-13
Table 13-10.	Potential Crash Effects of Providing a Median on Urban Two-Lane Roads (8)	13-14
Table 13-11.	Potential Crash Effects of Providing a Median on Multi-Lane Roads (8)	13-14
Table 13-12.	Potential Crash Effects of Median Width on Rural Four-Lane Roads with Full Access Control (15)	13-15
	Potential Crash Effects of Median Width on Rural Four-Lane Roads with Partial or No Access Control (15)	13-15
Table 13-14.	Potential Crash Effects of Median Width on Urban Four-Lane Roads with Full Access Control (15)	13-16
Table 13-15.	Potential Crash Effects of Median Width on Urban Roads with at least Five Lanes with Full Access Control (15)	13-16
Table 13-16.	Potential Crash Effects of Median Width on Urban Four-Lane Roads with Partial or No Access Control (15)	13-17
Table 13-17.	Summary of Treatments Related to Roadside Elements	13-19
Table 13-18.	Potential Crash Effects on Total Crashes of Flattening Sideslopes (15)	13-20
Table 13-19.	Potential Crash Effects on Single Vehicle Crashes of Flattening Sideslopes (15)	13-20
Table 13-20.	Potential Crash Effects of Sideslopes on Undivided Segments (15,34)	13-22
Table 13-21.	Potential Crash Effects of Increasing the Distance to Roadside Features (8)	13-23
	Potential Crash Effects of Changing Barrier to Less Rigid Type (8)	
Table 13-23.	Potential Crash Effects of Installing a Median Barrier (8)	13-24
Table 13-24.	Potential Crash Effects of Installing Crash Cushions at Fixed Roadside Features (8)	13-25

Table 13-	25. Quantitative Descriptors for the Seven Roadside Hazard Ratings (16)	13-25
Table 13-	26. Summary of Treatments Related to Alignment Elements	13-26
Table 13-	Potential Crash Effects of Improving Superelevation Variance (SV)     of Horizontal Curves on Rural Two-Lane Roads (16,35)	13-28
Table 13-	28. Potential Crash Effects of Changing Vertical Grade on Rural Two-Lane Roads (16,24)	13-28
Table 13-	29. Summary of Treatments Related to Roadway Signs	13-29
Table 13-	30. Potential Crash Effects of Installing Combination Horizontal Alignment/ Advisory Speed Signs (W1-1a, W1-2a) (8)	13-30
Table 13-	31. Potential Crash Effects of Installing Changeable Crash Ahead Warning Signs (8)	13-30
Table 13-	32. Potential Crash Effects of Installing Changeable "Queue Ahead" Warning Signs (8)	13-31
Table 13-	33. Potential Crash Effects of Installing Changeable Speed Warning Signs for Individual Drivers (8)	13-31
	34. Summary of Treatments Related to Delineation	
Table 13-	35. Potential Crash Effects of Installing PMDs (8)	13-33
Table 13-	36. Potential Crash Effects of Placing Standard Edgeline Markings (4 to 6 inches wide) (8)	13-33
Table 13-	37. Potential Crash Effects of Placing Wide (8 inch) Edgeline Markings (8)	13-34
Table 13-	38. Potential Crash Effects of Placing Centerline Markings (8)	13-34
Table 13-	39. Potential Crash Effects of Placing Edgeline and Centerline Markings (8)	13-35
Table 13-	40. Potential Crash Effects of Installing Edgelines, Centerlines, and PMDs (8)	13-35
Table 13-	41. Potential Crash Effects of Installing Snowplowable, Permanent RPMs (2)	13-36
Table 13-	42. Potential Crash Effects of Installing Snowplowable, Permanent RPMs (2)	13-36
Table 13-	43. Summary of Treatments Related to Rumble Strips	13-37
	44. Potential Crash Effects of Installing Continuous Shoulder Rumble Strips on Multilane Highways (6)	13-38
Table 13-	45. Potential Crash Effects of Installing Continuous Shoulder Rumble Strips on Freeways (25,13)	13-38
Table 13-	46. Potential Crash Effects of Installing Centerline Rumble Strips (14)	13-40
	47. Summary of Treatments Related to Traffic Calming	
	48. Potential Crash Effects Of Installing Speed Humps (8)	
	49. Summary of Treatments Related to On-Street Parking	
	50. Potential Crash Effects of Prohibiting On-Street Parking (22,19)	
Table 13-	51. Potential Crash Effects of Converting from Free to Regulated On-Street Parking (8)	13-43
Table 13-	52. Potential Crash Effects of Implementing Time-Limited On-Street Parking (8)	13-44
Table 13-	53. Type of Parking and Land Use Factor ( $f_{pk}$ in Equation 13-6)	13-45
Table 13-	54. Summary of Roadway Treatments for Pedestrians and Bicyclists	13-48
Table 13-	55. Summary of Treatments Related to Highway Lighting	13-49
Table 13-	56. Potential Crash Effects of Providing Highway Lighting (7,8,12,27)	13-49
Table 13-	57. Summary of Treatments Related to Access Management	13-50
Table 13-	58. Potential Crash Effects of Reducing Access Point Density (8)	13-51
Table 13-	59. Summary of Treatments Related to Weather Issues	13-52
Table 13-	50. Potential Crash Effects of Raising Standards by One Class for Winter Maintenance for the Whole Winter Season (8)	13-53
CHAPTE	R 14—INTERSECTIONS	14-1
Table 14-	Treatments Related to Intersection Types	14-5
Table 14-		

Table 14-3.	Potential Crash Effects of Converting a Signalized Intersection into a Modern Roundabout (29)	14-10
Table 14-4.	Potential Crash Effects of Converting a Stop-Controlled Intersections into a Modern Roundabout (29)	14-11
Table 14-5.	Potential Crash Effects of Converting a Minor-Road Stop Control into an All-Way Stop Control (21)	14-12
Table 14-6.	Potential Crash Effects of Removing Unwarranted Signals (24)	14-13
Table 14-7.	Potential Crash Effects of Converting from Stop Control to Signal Control (8, 15)	14-13
Table 14-8.	Treatments Related to Access Management	14-14
Table 14-9.	Treatments Related to Intersection Design Elements	14-15
Table 14-10.	Potential Crash Effects of Providing a Left-Turn Lane on One Approach to Three-Leg Intersections (15, 16)	14-21
Table 14-11.	Potential Crash Effects of Providing a Left-Turn Lane on One Approach to Four-Leg Intersections (16)	14-22
Table 14-12.	Potential Crash Effects of Providing a Left-Turn Lane on Two Approaches to Four-Leg Intersections (16)	14-23
Table 14-13.	Potential Crash Effects of a Channelized Left-Turn Lane on Both Major- and Minor-Road Approaches at Four-Leg Intersections (9)	14-25
Table 14-14.	Potential Crash Effects of a Channelized Left-Turn Lane at Three-Leg Intersections (9) .	14-25
Table 14-15.	Potential Crash Effects of Providing a Right-Turn Lane on One Approach to an Intersection (16)	14-26
Table 14-16.	Potential Crash Effects of Providing a Right-Turn Lane on Two Approaches to an Intersection (16)	14-27
Table 14-17.	Potential Crash Effects of Increasing Intersection Median Width (18)	14-29
Table 14-18.	Potential Crash Effects of Providing Intersection Illumination (9,12,10,26)	14-29
Table 14-19.	Treatments Related to Intersection Traffic Control and Operational Elements	14-30
Table 14-20.	Potential Crash Effects of Prohibiting Left-Turns and/or U-Turns by Installing "No Left Turn" and "No U-Turn" Signs (6)	14-32
Table 14-21.	Potential Crash Effects of Providing "Stop Ahead" Pavement Markings (13)	14-33
Table 14-22.	Potential Crash Effects of Providing Flashing Beacons at Stop-Controlled, Four-Leg Intersections on Two-Lane Roads (31)	14-34
Table 14-23.	Potential Crash Effects of Modifying Left-Turn Phase at Urban Signalized Intersections (8,15,22)	14-35
Table 14-24.	Potential Crash Effects of Modifying Left-Turn Phase on One Intersection Approach (17,19)	14-36
Table 14-25.	Potential Crash Effects of Replacing Direct Left-Turns with Right-Turn/U-Turn Combination (32)	14-39
Table 14-26.	Potential Crash Effects of Permitting Right-Turn-On-Red Operation (7,27)	14-40
Table 14-27.	Potential Crash Effects of Modifying Change Plus Clearance Interval (28)	14-41
Table 14-28.	Potential Crash Effects of Installing Red-Light Cameras at Intersections (23,30)	14-42
Table 14A-1.	Summary of Bicycle Lanes and Wide Curb Lanes Crash Effects	14-48
Table 14A-2.	Potential Crash Effects of Marked Crosswalks at Uncontrolled Locations (Intersections or Midblock)	14-49
Table 14A-3.	Potential Crash Effects of Providing a Raised Median or Refuge Island at Marked and Unmarked Crosswalks	14-50
Table 14A-4.	Potential Crash Effects of Modifying Pedestrian Signal Heads	14-51
Table 14A-5.	Potential Crash Effects of Installing Additional Pedestrian Signs	14-53
CHAPTER 1	I5—INTERCHANGES	15-1
Table 15-1.	Treatments Related to Interchange Design	15-4

Table 15-2.	Potential Crash Effects of Converting an At-Grade Intersection into a Grade-Separated Interchange (3)	15-5
Table 15-3.	Potential Crash Effects of Designing an Interchange with Crossroad Above Freeway	15-5
Table 15-4.	Potential Crash Effects of Extending Deceleration Lanes (4)	15-6
Table 15-5.	Potential Crash Effects of Modifying Two-Lane-Change Merge/Diverge Area into One-Lane-Change (3)	15-8
CHAPTER	16—SPECIAL FACILITIES AND GEOMETRIC SITUATIONS	16-1
Table 16-1.	Treatments Related to Highway-Rail Grade Crossing Traffic Control and Operational Elements	16-3
Table 16-2.	Potential Crash Effects of Installing Flashing Lights and Sound Signals (2)	16-4
Table 16-3.	Potential Crash Effects of Installing Automatic Gates (2)	16-4
Table 16-4.	Treatments Related to Work Zone Design Elements	16-6
Table 16-5.	Treatments Related to TWLTL	16-10
Table 16-6.	Treatments Related to Passing and Climbing Lanes	16-12
Table 16-7.	Potential Crash Effects of Providing a Passing Lane/Climbing Lane or Short Four-Lane Section on Rural Two-Lane Roads (7)	16-12
CHAPTER	17—ROAD NETWORKS	17-1
Table 17-1.	Treatments Related to Network Planning and Design Approaches/Elements	17-3
Table 17-2.	Treatments Related to Network Traffic Control and Operational Elements	17-3
Table 17-3.	Potential Crash Effects of Applying Area-Wide or Corridor-Specific Traffic Calming to Urban Local Roads while Adjacent Collector Roads Remain Untreated (2,4,6) (injury excludes fatal crashes in this table)	17-4
Table 17-4.	Road-Use Culture Network Considerations and Treatments	17-5
Table 17-5.	Potential Crash Effects of Automated Speed Enforcement (1,3,5,7,9,12)	17-6
Table 17-6.	Potential Crash Effects of Installing Changeable Speed Warning Signs for Individual Drivers (7)	17-7