

### CMF Guide (All-Severity and Property Damage Only Crashes)

| Project Type                                  | Additional Qualifiers  | Area Type      | CMF   | Value              | Adjusted Standard Error | Star Rating | In HSM? | Crash type  | Crash Severity |
|---|--|----------------|-------|--------------------|-------------------------|-------------|---------|---|----------------|
| <b>Pedestrian</b>                             |  |                |       |                    |                         |             |         |   |                |
| Median Construction                           | Marked, Uncontrolled Pedestrian Crossing   | Urban/Suburban | 175   | 0.54               | 0.48                    | 3           | No      | Veh/Ped   | All            |
| Median Construction                           | Uncontrolled Pedestrian Crossing, Marked or Unmarked   | Urban/Suburban | 8800  | 0.742              | NA                      | 4           | No      | All   | All            |
| High Visibility Crosswalk                     | High Visibility Crosswalk  | Urban          | 4123  | 0.6                | NA                      | 2           | No      | Veh/Ped   | All            |
| Install Shared Path                           | No Share Path Present  | Urban          | 9250  | 0.75               | NA                      | 3           | No      | Veh/Bicycle   | All            |
| Install Bike Lanes                            | No Bike Facilities Present   | Urban          | 2159  | 1.05               | NA                      | 3           | No      | All   | All            |
| Install Bike Lanes                            | No Bike Facilities Present   | Urban          | 4658  | 0.855              | NA                      | 3           | No      | Veh/Ped   | All            |
| <b>Reduced Conflict Intersections*</b>        |  |                |       |                    |                         |             |         |   |                |
| RCUT  | Previously Signalized or Stop Controlled   | All            | 10382 | 0.8                | NA                      | 4           | No      | All   | All            |
| RCUT  | Previously Two Way Stop Controlled   | All            | 10384 | 0.42               | NA                      | 4           | No      | All   | All            |
| J-Turn  | Previously Two Way Stop Controlled   | Rural          | 5555  | 0.652              | NA                      | 4           | No      | All   | All            |
| <b>Intersection</b>                           |  |                |       |                    |                         |             |         |   |                |
| Turn Lane                                     | Install Left Turn Lane   | Urban          | 3950  | 0.8                | NA                      | 3           | No      | All   | PDO            |
| Turn Lane                                     | Install Left Turn Lane   | Rural          | 7853  | 0.69               | NA                      | 2           | No      | All   | All            |
| Turn Lane                                     | Left Turn Lane on One Major Approach   | Rural          | 253   | 0.56               | 0.07                    | 4           | Yes     | All   | All            |
| Turn Lane                                     | Left Turn Lane on Both Major Approaches  | Rural          | 268   | 0.52               | 0.04                    | 5           | Yes     | All   | All            |
| Turn Lane                                     | Two Way Left Turn Lanes  | Rural          | 583   | 0.64               | 0.04                    | 5           | No      | All   | All            |
| Turn Lane                                     | Improve Angle of Channelized Right Turn Lane   | Not Specified  | 8431  | 0.937              | 0.397                   | 4           | No      | Right Turn, Other   | All            |
| Single Lane Roundabout                        | Originally Stop Controlled   | All            | 227   | 0.56               | 0.05                    | 5           | Yes     | All   | All            |
| Single Lane Roundabout                        | Originally Stop Controlled   | Rural          | 229   | 0.29               | 0.05                    | 5           | Yes     | All   | All            |
| Single Lane Roundabout                        | Originally Stop Controlled   | Rural          | 207   | 0.42               | 0.13                    | 4           | No      | All   | All            |
| Single Lane Roundabout                        | Originally Stop Controlled   | Urban          | 206   | 0.28               | 0.11                    | 4           | No      | All   | All            |
| Single Lane Roundabout                        | Originally Signalized, Stop Controlled, and Non-Controlled                                       | Rural          | 9333  | 0.48               | NA                      | 3           | No      | Other   | All            |
| Single Lane Roundabout                        | Originally Signalized  | All            | 225   | 0.52               | 0.06                    | 4           | Yes     | All   | All            |
| Single Lane Roundabout                        | High Speed   | Rural          | 4699  | 0.26               | NA                      | 4           | No      | All   | All            |
| Multi-Lane Roundabout                         | Originally No Control, Yield, TWSC, AWSC, or Signal Control                                      | All            | 4926  | 1.062              | NA                      | 4           | No      | All   | All            |
| Signal Head                                   | Add Signal (Additional Primary Head)   | Urban          | 1414  | 0.72               | NA                      | 3           | No      | All   | All            |
| Signal Head                                   | Add Signal (Additional Primary Head)   | Urban          | 1419  | 0.65               | NA                      | 2           | No      | Angle   | All            |
| Signal Head                                   | Add Signal (Additional Primary Head)   | Urban          | 1416  | 0.69               | NA                      | 3           | No      | All   | PDO            |
| Signal Head                                   | Convert Signal From Pedestal-Mounted to Mast Arm   | Not Specified  | 1420  | 0.51               | NA                      | 3           | No      | All   | All            |
| Signal Head                                   | Convert Signal From Pedestal-Mounted to Mast Arm   | All            | 1428  | 0.26               | NA                      | 3           | No      | Angle   | All            |
| Signal Head                                   | Add Signal (One Over Each Approach Lane)   | Urban          | 1485  | 0.54               | NA                      | 2           | No      | Angle   | All            |
| Signal Head                                   | Replace 8" Red with 12"  | Not Specified  | 2334  | 0.97               | NA                      | 3           | No      | All   | All            |
| Signal Phasing                                | Leading Pedestrian Interval  | Urban          | 1993  | 0.413              | NA                      | 3           | No      | Veh/Ped   | All            |
| Intersection Traffic Control                  | Change Permissive Left to Protected or Protected/Permissive                                      | Urban          | 4140  | 0.58               | NA                      | 2           | No      | All   | All            |
| Intersection Traffic Control                  | Change Protected/Permissive to Flashing Yellow Arrow   | Urban          | 4177  | 0.806              | NA                      | 4           | No      | Left Turn   | All            |
| Intersection Traffic Control                  | Install Pedestrian Countdown Timer   | Not Specified  | 8790  | 0.912              | NA                      | 4           | No      | All   | All            |
| Intersection Traffic Control                  | Install Pedestrian Countdown Timer   | Not Specified  | 5272  | 0.3                | NA                      | 4           | No      | Veh/Ped   | All            |
| Intersection Traffic Control                  | Install Adaptive Traffic Signal Control  | Urban/Suburban | 6858  | 0.79               | NA                      | 4           | No      | All   | All            |
| Intersection Traffic Control                  | Change from Permissive Only to Flashing Yellow Arrow   | Not Specified  | 7684  | 0.598              | NA                      | 2           | No      | Left Turn   | All            |
| Intersection Traffic Control                  | Change from Protected Only to Flashing Yellow Arrow  | Not Specified  | 7690  | 0.901**            | NA                      | 4           | No      | All   | All            |
| Intersection Traffic Control                  | Change Number of Traffic Signal Cycles Per Hour on Arterial with Signal Coordination From X to Y | Urban/Suburban | 3072  | $e^{-0.0444(Y-X)}$ | NA                      | 3           | No      | Rear End  | All            |
| Advanced Technology and ITS                   | Install Red-Light Indicator Lights   | Not Specified  | 8824  | 0.713              | NA                      | 4           | No      | Other   | All            |
| Access Management                             | Create Directional Median Openings to Allow Left-Turns and U-Turns                               | Not Specified  | 1516  | 0.49               | NA                      | 2           | No      | All   | All            |
| <b>Roadway</b>                                |  |                |       |                    |                         |             |         |   |                |
| Lighting                                      | Illumination   | Not Specified  | 496   | 0.69               | 0.36                    | 3           | No      | All   | PDO            |
| Lighting                                      | Highway Lighting   | All            | 193   | 0.83               | 0.07                    | 4           | Yes     | Nighttime   | PDO            |
| Wet-Reflective Pavement Markings              | Previously Standard Markings   | Not Specified  | 8111  | 0.538              | NA                      | 4           | No      | Run Off Road  | All            |
| Median  | Install Cable Median Barrier (High Tension)  | Not Specified  | 1967  | 0.04               | 0.06                    | 3           | No      | Cross Median, Frontal and Opposing Direction Sideswipe, Head On | All            |
| Install Centerline and Shoulder Rumble Strips | No Existing Rumble Strips  | Rural          | 6942  | 0.653              | NA                      | 4           | No      | All   | All            |
| Improve Pavement Friction                     | Increase Skid Resistance   | All            | 2265  | 0.589              | 0.216                   | 3           | No      | All   | All            |
| Improve Pavement Friction                     | Increase Skid Resistance   | All            | 2276  | 0.304              | 0.086                   | 3           | No      | Rear End  | All            |
| Road Diet                                     | Previously Four Lane Undivided   | Suburban       | 2841  | 0.53               | NA                      | 4           | No      | All   | All            |
| Road Diet                                     | Previously Four Lane Undivided   | Urban          | 5553  | 0.748              | NA                      | 4           | No      | All   | All            |
| <b>Shoulder Treatments</b>                    |  |                |       |                    |                         |             |         |   |                |
| Widen Shoulder                                | Previously Narrow Paved Shoulder   | Rural          | 6703  | 0.67               | NA                      | 4           | Yes***  | Fixed Object, Head on, Run Off Road, Sideswipe                  | PDO            |

\*Minnesota study underway

\*\*Results in Minnesota have indicated an increase in crashes

\*\*\*See section 13.4.2.4 in the HSM for additional shoulder CMF information

### CMF Guide (Injury Crashes)

| Project Type                           | Additional Qualifiers  | Area Type     | CMF  | Value | Adjusted Standard Error | Star Rating | In HSM? | Crash type                                     | Crash Severity |
|--|--|---------------|------|-------|-------------------------|-------------|---------|--|----------------|
| <b>Pedestrian</b>                      |  |               |      |       |                         |             |         |  |                |
| Median Treatment for Ped/Bike Safety   | Install Various Treatments Such as Fencing, Planters, Pedestrian Islands | Urban         | 9121 | 0.91  | NA                      | 4           | No      | All  | K, A, B        |
| Install Sidewalk                       | No Existing Sidewalk   | Urban         | 9240 | 0.41  | NA                      | 2           | No      | Veh/Bicycle                                    | K, A           |
| Install Bike Lanes                     | No Bike Facilities Present   | Urban         | 4660 | 0.946 | NA                      | 3           | No      | All  | K, A, B, C     |
| <b>Reduced Conflict Intersections*</b> |  |               |      |       |                         |             |         |  |                |
| J-Turn                                 | Previously Two Way Stop Controlled                                       | Rural         | 5559 | 0.14  | NA                      | 2           | No      | All  | A              |
| <b>Intersection</b>                    |  |               |      |       |                         |             |         |  |                |
| Turn Lane                              | Install Left Turn Lane   | Urban         | 3948 | 0.79  | NA                      | 3           | No      | All  | K, A, B, C     |
| Turn Lane                              | Install Left Turn Lane   | Rural         | 7852 | 0.73  | NA                      | 3           | No      | All  | K, A, B, C     |
| Turn Lane                              | Left Turn Lane on One Major Approach                                     | Rural         | 255  | 0.45  | 0.1                     | 4           | Yes     | All  | K, A, B, C     |
| Turn Lane                              | Left Turn Lane on Both Major Approaches                                  | Rural         | 272  | 0.42  | 0.04                    | 5           | Yes     | All  | K, A, B, C     |
| Turn Lane                              | Right Turn Lane on One Major Approach                                    | All           | 287  | 0.77  | 0.08                    | 4           | Yes     | All  | K, A, B, C     |
| Lighting                               | Provide Intersection Illumination  | Not Specified | 433  | 0.62  | 0.13                    | 4           | Yes     | Nighttime                                      | A, B, C        |
| Single Lane Roundabout                 | Originally Stop Controlled   | All           | 228  | 0.18  | 0.04                    | 5           | Yes     | All  | A, B, C        |
| Single Lane Roundabout                 | Originally Stop Controlled   | Rural         | 211  | 0.18  | 0.16                    | 4           | No      | All  | A, B, C        |
| Single Lane Roundabout                 | Originally Stop Controlled   | Rural         | 230  | 0.13  | 0.04                    | 5           | Yes     | All  | A, B, C        |
| Single Lane Roundabout                 | Originally Stop Controlled   | Urban         | 210  | 0.12  | 0.14                    | 4           | No      | All  | A, B, C        |
| Single Lane Roundabout                 | High Speed   | Rural         | 4700 | 0.11  | NA                      | 4           | No      | All  | A, B, C        |
| Multi-Lane Roundabout                  | Originally No Control, Yield, TWSC, AWSC, or Signal Control              | All           | 4927 | 0.367 | NA                      | 4           | No      | All  | K, A, B, C     |
| Single or Multi-Lane Roundabout        | Originally TWSC  | All           | 4931 | 0.65  | NA                      | 4           | No      | All  | K, A, B, C     |
| Roundabout                             | Originally AWSC  | All           | 4933 | 0.544 | NA                      | 3           | No      | All  | K, A, B, C     |
| Low Speed Roundabout                   | Originally No Control, Yield, TWSC, AWSC, or Signal Control              | All           | 5228 | 0.473 | NA                      | 4           | No      | All  | K, A, B, C     |
| <b>Roadway</b>                         |  |               |      |       |                         |             |         |  |                |
| Lighting                               | Illumination   | Urban         | 578  | 0.69  | 0.07                    | 4           | No      | All  | A, B, C        |
| Lighting                               | Illumination   | All           | 571  | 0.31  | 0.36                    | 3           | No      | All  | K              |
| Lighting                               | Highway Lighting   | All           | 192  | 0.72  | 0.06                    | 4           | Yes     | Nighttime                                      | A, B, C        |
| Median                                 | Install Cable Median Barrier (High Tension)                              | Rural         | 8214 | 0.47  | NA                      | 3           | No      | Other  | K, A           |
| <b>Shoulder Treatments</b>             |  |               |      |       |                         |             |         |  |                |
| Widen Shoulder                         | Previously Narrow Paved Shoulder   | Urban         | 6705 | 0.74  | NA                      | 3           | No      | Fixed Object, Head on, Run Off Road, Sideswipe | A, B, C        |

\*Minnesota study underway