A7

methods

Appendix 7 Table of Contents

A7.1 Data Sources and Year Ranges 185
A7.2 GIS Analysis Steps 185
A7.3 Metadata for Spatial Layers 186
A7.4 Notes on Assumptions, Limitations, and Quality Checks 186
A7.5 Description of Prioritization Methods 186

A7.1 Data Sources and Year Ranges

Traffic safety analysis for the Scottsbluff SS4A Safety Action Plan was based on multiple data sources, with an emphasis on completeness, consistency, and relevance to fatal and serious injury risk.

The primary dataset used for crash analysis was Nebraska Department of Transportation (NDOT) crash data covering the period 2014–2023, inclusive. Only complete calendar years were included; no partial-year data were used. Crash severity was classified using MMUCC-compliant definitions, with analysis focused on fatal and serious injury (KSI) crashes, consistent with FHWA SS4A guidance.

Additional supporting datasets included:

- Traffic volumes, using the most recent and complete NDOT traffic counts available (primarily 2023 data)
- Pedestrian counts at select locations, including the South Beltline Highway and Broadway signalized intersection
- Citation and enforcement data, where available, for limited time periods and locations (2024: Broadway, 5th Avenue, Avenue B, Avenue I, 27th Street, 20th Street, East & West Overland, and South Beltline Highway)
- Roadway centerlines, intersections, rail corridors, and jurisdictional boundaries
- School locations, parks, land use context, and demographic data used for qualitative context and equity considerations
- Adopted plans, ordinances, standards, and studies, reviewed qualitatively to inform risk interpretation and implementation feasibility

Together, these datasets supported a data-driven, systemic evaluation of transportation safety risk across the Scottsbluff roadway network.

A7.2 GIS Analysis Steps

Spatial analysis was conducted using ArcGIS Pro, following FHWA-recommended practices for systemic safety analysis and High Injury Network (HIN) development.

Crash Data Processing

- Crash records were spatially joined to the roadway network and intersections.
- Only fatal and serious injury (KSI) crashes were included in HIN development.
- Duplicate records and invalid locations were reviewed and corrected as part of quality control.

Intersection Analysis

- Intersections were represented as point features derived from roadway centerlines.
- A 40-meter (~131-foot) buffer was applied to each intersection to capture crashes associated with intersection influence areas, including turning, crossing, and approach-related crash activity.
- On divided roadways, each directional carriageway was represented as a separate centerline. As a result, intersections where divided highways cross divided streets were represented by multiple intersection points (up to four), allowing more precise attribution of crash risk by movement and approach.

Corridor Segmentation

- Roadway corridors were segmented using a fixed-length approach of 100 meters (~328 feet). Additional shorter segments were retained between adjacent intersection buffers to ensure continuous network coverage and avoid unassigned roadway gaps. The selected segment length balances sensitivity to localized crash patterns while maintaining sufficient crash aggregation for meaningful systemic screening.
- Divided roadways were analyzed as separate directional segments to preserve geometric and operational characteristics.

High Injury Network (HIN) Development

- KSI crashes were aggregated to both corridor segments and intersection buffers.
- Density and frequency measures were used to screen for elevated risk locations.
- The High Injury Network (HIN) was defined as the subset of roadway corridors and intersections accounting for a disproportionate share of fatal and serious injury (KSI) crashes relative to the overall transportation network.

Modifiers and Contextual Factors

The HIN analysis was refined using additional contextual modifiers developed specifically for the Scottsbluff SS4A effort, including:

- Roadway classification and function
- Traffic volume context
- Presence of vulnerable road user activity generators (schools, parks, commercial centers)
- Jurisdictional considerations (e.g., state-controlled corridors)
- Land use and access characteristics

These modifiers were used to support prioritization and interpretation, not to exclude locations from consideration.

A7.3 Metadata for Spatial Layers

All spatial analysis was performed using Nebraska State Plane Coordinates, NAD 1983, U.S. Feet.

Key spatial layers included:

- Crash point layer (2014–2023, NDOT)
- Roadway centerline network
- Intersection point layer (derived)
- High Injury Network (HIN) corridor segments
- High Injury Network (HIN) intersections
- City of Scottsbluff corporate limits
- Rail corridors
- School locations and community facilities

Spatial layers were reviewed for completeness, spatial alignment, and projection consistency prior to analysis. Attribute fields relevant to safety analysis (severity, year, roadway type, etc.) were verified to ensure consistency with source documentation.

A7.4 Notes on Assumptions, Limitations, and Quality Checks

As with all transportation safety analyses, several assumptions and limitations apply:

- Crash data underreporting is possible, particularly for minor crashes and non-motorized incidents.
- Exposure data (e.g., pedestrian and bicycle volumes) were limited to select locations and were not available citywide.
- Jurisdictional constraints affect implementation feasibility, particularly on state-controlled corridors such as US Highway 26.
- Citation and enforcement data were available only for limited periods and locations and were used for contextual understanding rather than quantitative modeling.

Quality assurance and quality control measures included:

- Verification of crash severity coding
- Review of spatial joins and intersection assignments
- Visual inspection of HIN outputs for consistency with known roadway conditions
- Cross-checking results against public input and documented safety concerns

These steps ensured that analysis results are reasonable, repeatable, and appropriate for SS4A planning purposes.

A7.5 Description of Prioritization Methods

Project prioritization for the Scottsbluff SS4A Safety Action Plan followed a risk-based, systemic approach, consistent with FHWA SS4A guidance and Safe System principles.

Using the GIS analysis described above, the project team:

- Identified a High Injury Network of corridors and intersections
- Applied contextual modifiers reflecting roadway function, exposure, and vulnerable road user risk
- Evaluated jurisdictional feasibility and implementation considerations

From this process, the top 26 intersections were identified based on cumulative risk, crash severity, and contextual importance. Corridors and intersections were then grouped into priority tiers to guide project development rather than assigned a single numeric score.

This approach emphasizes:

- Reducing fatal and serious injury risk
- Addressing systemic safety challenges
- Supporting corridor-level solutions
- Aligning projects with documented data and adopted policy

The prioritization framework establishes a clear, defensible connection between analysis results and recommended safety projects, consistent with FHWA SS4A expectations.