

APPENDIX Q

Appendix/Attachment Title

Critical Security Bridges

Appendix/Attachment Revision and Year:

Version 1.0, 2020

Appendix/Attachment Introduction and Discussion

As directed by ED-18, the BMO is required to maintain the list of Critical Security Bridges (CSB). Bridges which appear on the CSB list are considered to be security sensitive or vulnerable. ED-18 provides direction on the release of bridge plans and bridge information for persons outside SCDOT, persons inside SCDOT and persons under contract with SCDOT.

SCDOT uses bridge information to provide a criticality index of all the bridges listed in the National Bridge Inventory (NBI), and non-NBI bridges are not assessed. This index is calculated by the BMO. The criticality index formula accounts for several criteria that are measured using data available from the NBI.

The criteria incorporated into the formula were items SCDOT considered important, based, in part, upon the responses to an AASHTO/TRB Task Force survey that helped define and prioritize these criteria. The joint survey, titled “*Security and Emergency Response Survey of State Transportation Agencies*”, was a cooperative effort of the AASHTO Task Force on Transportation Security and the TRB Task Force on Critical Transportation Infrastructure Protection. The criteria included the economic impact due to disruption of commerce, which is quantified in the SCDOT formula in terms of ADTT. General passenger transportation needs and risks to public safety are considered in terms of Total ADT and Detour Length. Connectivity, which represents the ripple effect within the highway system, is considered in terms whether the bridge in question represented an interstate crossing.

Another criterion is whether a damaged bridge could restrict permitted navigation access to important waterways maintained by the USCG. Given South Carolina’s important role in contributing to support our nation’s military, the inclusion of the bridge on the Strategic Highway Network, which functions as a system of primary routes for the movement of military personnel and supplies, is another consideration. Finally, consideration to any bridges on the list of the Bridges with Complex Components and consideration to any bridge on a SCDOT hurricane evacuation route is given.

As part of the formula, the relative importance given to each criterion can be adjusted by the use of an importance factor to reflect the significance SCDOT assigns. Should relative importance change in the future, the various importance factors can easily be changed and a new listing of CSBs can be made by the BMO. SCDOT’s importance factors are included in Table 1. Figure 1 includes the criticality index formula. **Any bridges with a criticality index of 3.5 or higher shall be considered CSBs.**

Table 1 CSB Criteria and Importance Factors

| Criteria | Importance Factor | Criteria | Importance Factor |
|----------------------------|-------------------|----------------------------|-------------------|
| ADTT Factor | 1.0 | USCG Navigation Factor | 1.0 |
| ADT Factor | 1.0 | Military Importance Factor | 1.0 |
| Detour Factor | 1.0 | Bridge Complexity Factor | 1.0 |
| Interstate Crossing Factor | 1.0 | Evacuation Route Factor | 1.0 |

South Carolina Criticality Index Formula: The following equation represents the formula for determining a bridge’s criticality index.

$$\text{Criticality Index} = \left(\frac{\text{ADTT}}{\text{Max. ADTT}} \right) \times F_{\text{ADTT}} + \left(\frac{\text{ADT}}{\text{Max. ADT}} \right) \times F_{\text{ADT}} + \left(\frac{\text{Detour} \times \text{ADT}}{\text{Max. Detour} \times \text{Max. ADT}} \right) \times F_{\text{DET}} + \text{Interstate Intersection} \times F_{\text{INT}} + (\text{Navigation Importance} \times F_{\text{NAV}} + \text{Military Importance} \times F_{\text{MIL}} + \text{Bridge Complexity} \times F_{\text{COMP}} + \text{Evacuation Route} \times F_{\text{EVAC}})$$

Figure 1 CSB Criticality Index Formula

South Carolina Basic Elements of the Formula: The South Carolina Bridge Criticality Formula has the following elements and definitions.

Commerce Criteria

- ADTT: Average Daily Truck Traffic based on NBI Item 109.
- Max. ADTT: The maximum ADTT for any bridge in South Carolina’s (SC’s) NBI.
- F_{ADTT}: Importance Factor which relates the relative importance of this criterion to the other criteria. See Table 1.

Transportation Needs Criteria

- ADT: Average Daily Traffic based on NBI Item 29.
- Max. ADT: The maximum ADT for any bridge in SC’s NBI.
- F_{ADT}: SCDOT defined Importance Factor which relates the relative importance of this criterion to the other criteria in the formula. See Table 1.
- Detour: Bypass or detour length based on NBI Item 19.
- Max. Detour: Maximum detour for any bridge in SC’s NBI.
- F_{DET}: Importance Factor which relates the relative importance of this criterion to the other criteria. See Table 1.

Interstate Connectivity Criteria

- Equals 2 if the bridge carries an interstate over an interstate.
- Equals 1 if the bridge carries an interstate over a non-interstate or if the bridge carries a non-interstate over an interstate.
- Equals 0 if the bridge neither carries an interstate nor crosses an interstate.
- F_{INT}: Importance Factor which relates the relative importance of this criterion to the other criteria. See Table 1.

Navigational Access Criteria

- Navigation Importance: equals 1 if the bridge requires a USCG Permit based on NBI Item 38, or 0 if none is required.
- F_{NAV}: Importance Factor which relates the relative importance of this criterion to the other criteria. See Table 1.

Military Movement Criteria

- Military Importance: equals 1 if the bridge is on the Strategic Highway Network based on NBI Item 100, or 0 if it is not.
- F_{MIL}: Importance Factor which relates the relative importance of this criterion to the other criteria. See Table 1.

Bridge Complexity Criteria

- Bridge Complexity: equals 1 if the bridge is included in the Bridges with Complex Components list (Appendix C).
- F_{COMP}: Importance Factor which relates the relative importance of this criterion to the other criteria. See Table 1.

Excavation Route Criteria

- Evacuation Route: equals 1 if the bridge is included in SCDOT’s hurricane evacuation routes.
- F_{EVAC}: Importance Factor which relates the relative importance of this criterion to the other criteria. See Table 1.

Appendix/Attachment Description

For security reasons, the list of CSBs is **not publically available**. The list is maintained by the BMQE under the supervision of the SBME or ASBME. The list will be updated internally at SCDOT a minimum of once every 10 years at the discretion of the SBME. This Appendix does include:

- The criticality index formula,
- CSB criterion, and
- CSB importance factors.