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ULSTER COUNTY TRANSPORTATION RESILIENCY PROJECT
CRITICALITY DETERMINATION MEMORANDUM

April 2022
File No. 18.0175293.00

ULSTER COUNTY TRANSPORTATION COUNCIL

PREPARED FOR:
Ulster County Transportation Council
244 Fair Street
Kingston, NY 12401

GZA GeoEnvironmental of New York
104 West 29th Street, 10th Floor | New York, NY 10001
212-594-8140

31 Offices Nationwide
www.gza.com

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144 Elm Street
Amesbury, MA 01913
T: 781.278.4800
F: 978.834.6269
www.gza.com

April 14, 2022
File No. 18.0175293.00

Mr. Dennis Doyle, Director
Ulster County Planning Department
244 Fair Street
Kingston, New York 12401

Re: Criticality Determination Memorandum
Critical Transportation Infrastructure Vulnerability Assessment
Ulster County, New York

Dear Mr. Doyle:

In accordance with GZA's current contract with the County of Ulster dated August 18, 2021, for the above referenced project solicited under the RFP-UC21-015 Critical Transportation Infrastructure Vulnerability Assessment and its contract terms, we are pleased to present this report containing the Criticality Determination Memorandum. This document is subject to the limitations outlined in **Appendix A**.

Please contact Sam Bell, the Project Manager for GZA, at (781) 223-7091 or by email at samuel.bell@gza.com with any questions.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Samuel J. Bell, CFM
Sr. Project Manager/Climate Resiliency Planner

Chad W. Cox P.E.(MA)
Consultant Reviewer/Sr. Principal

David M. Leone, CFM, P.E.
Associate Principal

Attachment: Criticality Determination Memorandum

Cc: Suseel Indrakanti, Cambridge Systematics

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UCTC Critical Infrastructure Vulnerability Assessment

Criticality Determination

1.0 Introduction and Purpose

Criticality is the degree to which a given asset is important to fulfilling the mission and goals of the agency/project sponsor conducting the vulnerability assessment. The concept of criticality has been widely used as a prioritization tool in conducting desk-based indicator vulnerability assessments. Asset criticality determination provides a basis for establishing which assets provide significant contributions to advancing the region's transportation resilience policy and investment goals.

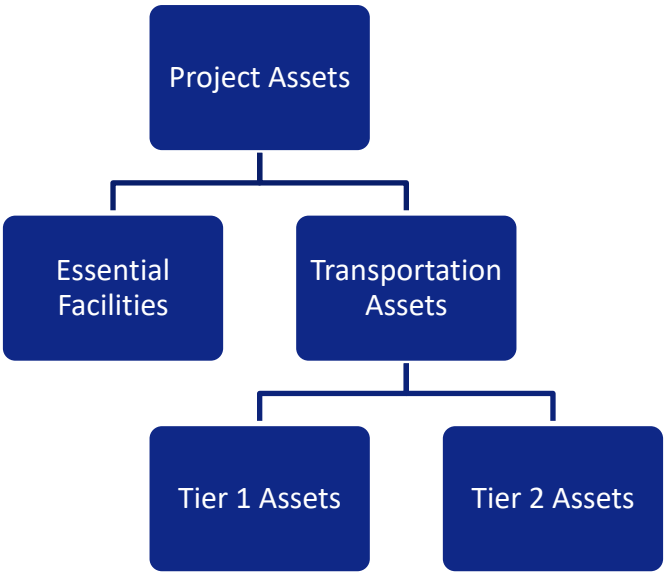
The project team has developed and configured this criticality construct for roadways and bridges in consultation with the staff at Ulster County Transportation Council's (UCTC) to align with the larger UCTC vision and the 2045 long-term planning goals to be applied in a context-based manner. Additionally, the proposed criticality construct was informed by literature review of similar transportation criticality assessments used in Federal Highway Administration's guidance on Assessing Criticality in Transportation Adaptation Planning, Resilient Tampa Bay: Transportation Pilot Program Project among others.

2.0 Approach

Asset Criticality Considerations

The criticality construct is tailored to regional needs and priorities and reflective of planning priorities balanced by available and suitable data to support the criticality determination. A tiering approach was adopted to classify UCTC's Transportation Systems into three categories - Tier 1 Assets, Tier 2 Assets and Essential Facilities. **Figure 1** shows the categorization of the project's assets into tiers.

Figure 1 Project Asset Tiering and Categorization

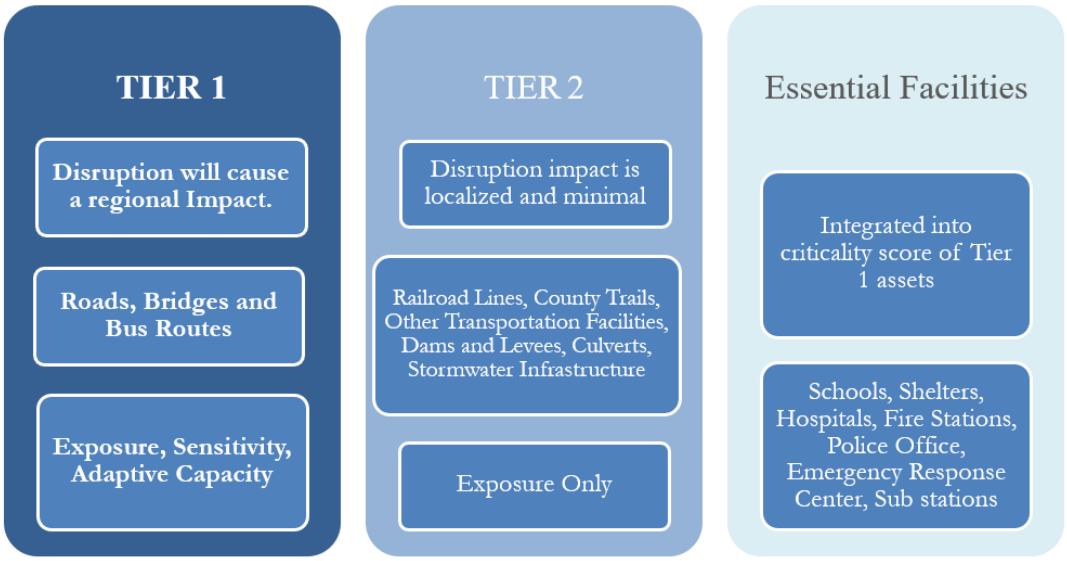


The tiering approach is intended to broadly organize the assets considered in the project based on their disruption potential thereby indicative of their impact on regional transportation and mobility needs.

- ***Tier 1 Assets*** consist of transportation assets whose potential disruption could results in regional impacts to transportation including impacts to accessibility, reliability, and mobility. Criticality determination is performed for these assets.
- ***Tier 2 assets*** are characterized as assets whose disruption would cause localized or minimal impact. These assets are characterized as low criticality by the nature of their importance and magnitude of impact to the regional transportation system.
- ***Essential facilities*** are largely non-transportation assets that have strategic, socioeconomic, health and safety importance. They are also characterized as critical destinations or supporting facilities that the transportation system provides connectivity and, in some cases, relies on them for operational purposes. These essential facilities have been incorporated into the criticality scoring of Tier 1 assets as the transportation assets provide access to and support these facilities.

Based on data availability and to optimize project resources, the project team, in consultation with the UCTC staff has determined that a comprehensive vulnerability assessment exposure, sensitivity, and adaptive capacity assessment will be performed for the Tier 1 assets compared to exposure analysis for Tier 2 Assets. **Figure 2** shows the tiering organization, asset types under each tier, and proposed vulnerability assessment approaches.

Figure 2 Asset Criticality Considerations



3.0 Proposed Criticality Construct – Tier 1 Assets

For Tier 1 assets, factors included in the criticality construct were chosen based on the regional transportation and mobility goals and balanced by data availability and UCTC's inputs. For ease of application and analysis, the criticality determination process was conducted on roadway assets and associated with the bridges based on connectivity and location. Bridges were assigned a criticality score of the higher scoring connecting roadway segments.

Six criticality factors were selected to determine the criticality of roadway assets. The scoring criteria is shown in **Table 1**. Each factor has a maximum score reflecting its relative weighting of importance among other factors. The higher the score, the greater the criticality of the asset. The asset criticality score is a combined total of the six indicator scores grouped into three categories:

- Low criticality: 0 to 5
- Medium criticality: greater than 5 and less than or equal to 10
- High criticality: greater than 10.

The maximum score any given roadway asset could score in this construct is 15.

Table 1: Criticality Determination Factors

Factor	Max Score	Scoring Method	Score	Description
Functional Class	4	Local	1	Roadway functional classification (UCTC) combining urban and rural roadway classes.
		Major Collector	2	
		Minor Arterial	3	
		Principal Arterial	4	
Access to Essential Facilities	3	0 facilities in a ½-mile distance	0	Number of Essential Facilities within a ½-mile distance from the road (*distance calculated is not network-distance, but crow-fly distance*)
		1 to 2 facilities in a ½-mile distance	1	
		3 to 5 facilities in a ½-mile distance	2	
		>5 facilities in a ½-mile distance	3	
Evacuation/Detour Route	1	1 if Yes, 0 otherwise	0-1	Whether the roadway is an evacuation route
Transit Corridor	1	1 if Yes, 0 otherwise	0-1	Whether the roadway is a transit corridor
Population Density	3	<=100;	1	Population density normalized by network density to avoid any disproportionate impact to rural areas/assets
		101 – 200;	2	
		> 201;	3	
Equity Areas	3	0 - 10%	1	Based on the proportion of population with 3+ risk factors (Census Community Resilience Estimates (CRE) Data)
		11% - 20%	2	
		21 % - 35%	3	
Maximum Total Score	**15**			

4.0 Results

Results of the criticality determination for roadway assets is shown in **Figure 3**. Roadway asset criticality is shown in the three groups of low, medium, and high criticality. Map overlays with criticality drivers including essential facilities, transit corridors, evacuation routes, population density, and equity zones will be included in the "Criticality Determination StoryMap". Bridge assets will also be included for display in the StoryMap. Given the incidence of high criticality roadways in the Kingston area, a map inset is being included to show additional details.

Figure 3 Roadway Network Criticality

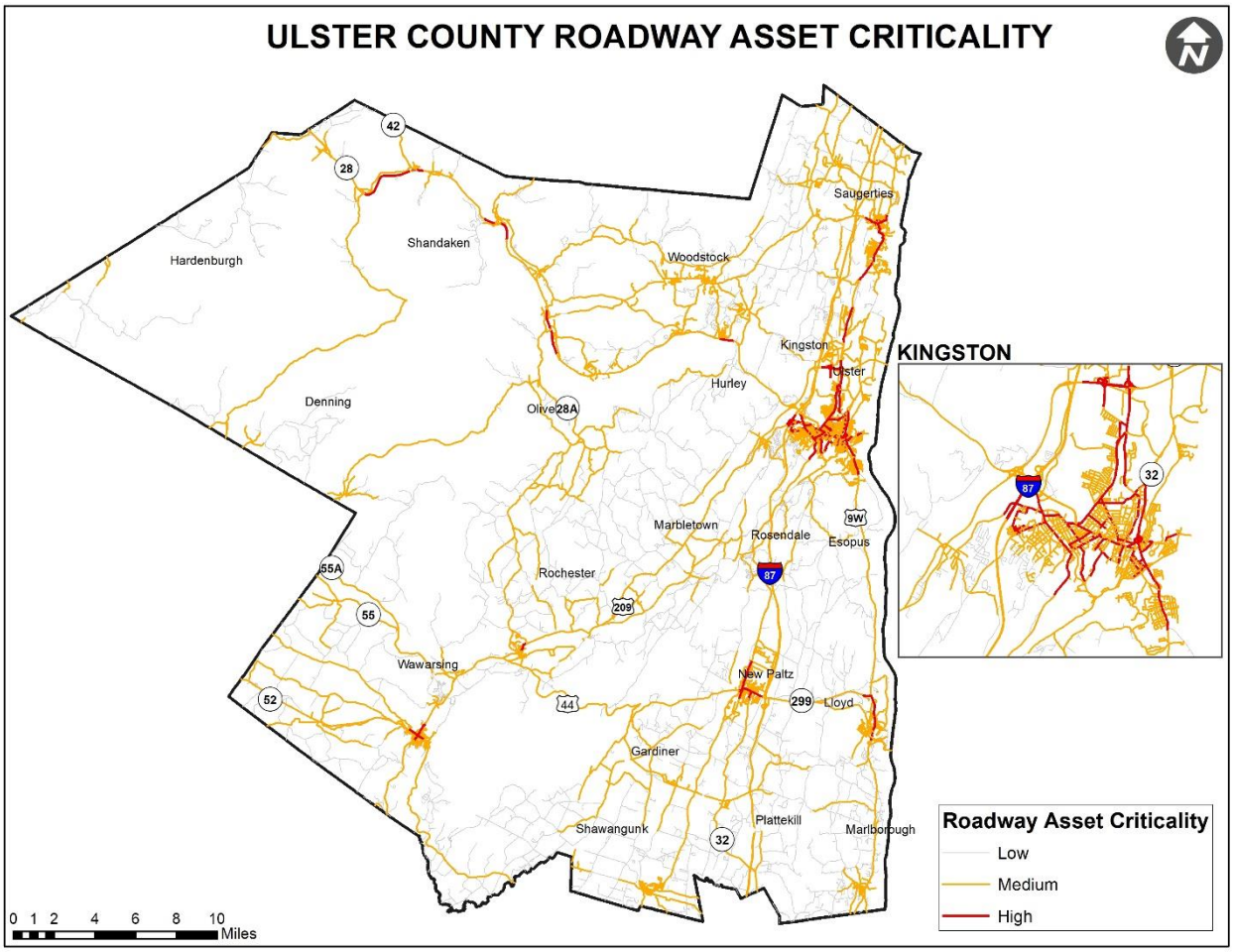


Table 2 shows the distribution of roads and bridges in the three scoring categories. According to this classification, five percent of roadways (369 segments) and six percent of bridges (25 bridges) are designated as highly critical.

Table 2 Final Criticality Scoring

Total Score	Criticality	Number of Roads	Number of Bridges
11 - 15	High	369 (5%)	25 (6%)
6 - 10	Medium	3359 (50%)	215 (52%)
0 - 5	Low	2982 (44%)	170 (41%)

5.0 Next Steps:

Criticality determination is a key prioritization method that is helpful to agencies conducting vulnerability assessments to identify needs-based and impact-oriented actions, and improvements that have the potential to positively impact the resilience of a regional transportation system. Upon the completion of the vulnerability assessment, UCTC will be able to organize the assets into tiers of vulnerability (high/medium/low), which can be combined with criticality to determine priority for investments or resilience improvements as one of the considerations to support policy.

APPENDIX A - LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of the Ulster County Transportation Council (Client) for the stated purpose(s) and location(s) identified in the Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. Our findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Report and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. Our services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

4. Note that the probabilities presented in this study are approximate and uncertain. They describe future potential conditions to support planning-level decision-making. The scenarios are appropriate for use in understanding the risk of different climate change scenarios and planning. For example, applying higher amounts of inland flooding may be appropriate when considering risk mitigation for high value lifeline assets, which would merit protection against events with a low probability of occurrence.

General

5. The observations described in this report were made under the conditions stated therein. The conclusions presented were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the Client.

6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein available to GZA at the time of the evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Any GZA hydrologic analysis presented herein is for the rainfall volumes and distributions stated herein. For storm conditions other than those analyzed, the response of the site's spillway, impoundment, and drainage network has not been evaluated.

8. Observations were made of the site and of structures on the site as indicated within the report. Where access to portions of the structure or site, or to structures on the site was unavailable or limited, GZA renders no opinion as to the condition of that portion of the site or structure.

9. In reviewing this Report, it should be realized that the reported condition of any features discusses is based on observations of field conditions during the course of this study along with data made available to GZA. It is important to note that the conditions noted depend on numerous and constantly changing circumstances and are evolutionary in nature.

Compliance with Codes and Regulations

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

GZA GeoEnvironmental, Inc.