Appendix A: Criticality Screening Process

AREA-BASED/TAZ CRITICALITY DETERMINATION

Traffic analysis zones were considered as geographical units for a zone/area-based criticality determination. A relative importance of criticality of a zone or area depended on the magnitude of population, employment, and the geographical area of the zone. A combined measure of population and jobs density was used as the area-based criticality measure for analysis. For example, the higher the total measure of population and employment and the smaller the zone, meant that the zone ranked as being highly critical.

$$TAZ\ Criticality\ = \frac{Population + Employment}{Area\ of\ TAZ}$$

This criticality measure can be tailored to the needs and data availability of stakeholders of a given region. Based on locational information available on critical assets of importance to the study area, they can be introduced into the criticality measure. For example, if hospitals and storm shelters are identified as critical assets deemed to be provided priority access through transport infrastructure, the TAZ in which they are located can be provided a higher area-based criticality. This can be done by a simple GIS process where the magnitude of such facilities (number of beds for hospitals, number of people accommodated for storm shelters) are used as numerator in the above equation (population + employment). In absence of magnitude data, a weighting factor for each facility can also be included in criticality determination.

ROADWAY NETWORK CRITICALITY DETERMINATION

Criticality of roadway network was determined by slightly modifying the highway skimming and traffic assignment steps in a travel demand model to assign criticality instead of the traditional "trip assignment".

A highway skim was run using TBRPM travel demand model's multi path procedure creating a travel time skim table. Thereby, an Origin-Destination (O-D) Criticality value was calculated for each origin-destination pair in order to capture the relative importance during traffic assignment procedure. This O-D Criticality (α) was derived from the following formula:

$$O - D\ Criticality\ (\alpha) = \frac{Origin\ TAZ\ Criticality\ (Co) \times Destination\ TAZ\ Criticality\ (Cd)}{Travel\ Time\ (tod)}$$

Thus each O-D pair got an O-D criticality. This criticality value was then used during the assignment process. A criticality table replaces the traditional trip table created for the assignment process that utilizes O-D criticality between each O-D pair. Each given link was assigned the score of each O-D pair utilizing it. The travel demand model's assignment process can be used to show the assignment flow on each link, which is essentially the cumulative O-D criticality scores as criticality measures are assigned during this process.

After completion of the criticality determination process, each TAZs and roadway links were assigned a critical score, which are used to rank their criticality. Figure 2 presents the 2040 criticality levels of the TAZs and roadway links in Hillsborough County. The top three percent ranked TAZs and links were selected as the extremely critical (very high) assets.