Nighttime Campus Safety

Focus
Blue Light Phones and SafeRide are important to campus safety. Pedestrians should be able to quickly access phones and SafeRide stops, so the distribution of these safety features changes their effectiveness.

Objective
This project will plot walking distances for pedestrians to Blue Light Phones and SafeRide stops—safety points—from anywhere on campus. This graphical interpretation will make it very easy to visualize the coverage provided. Hopefully, we can find locations that could be made safer by adding phones or SafeRide stops.

Assumptions
Constant movement speed to the safety point is assumed. This allows easier calculations while still giving meaningful results. This effectively equates velocity and time. In reality, the pedestrian would get fatigued, or be slowed down by obstacles like stairs or fences.

It is assumed that the pedestrian always knows where the nearest safety point is, even if it is not in their line of sight.

The unpredictable patterns of real pursuits are not modeled here. Instead, the assumption is that a pedestrian will move to the nearest safety point in a straight line, and that the pursuit ends when the pedestrian reaches the safety point.

Tools
This analysis was performed with ArcGIS.

Editor
The Editor was used to input the Blue Light Phones, SafeRide routes, and SafeRide stops into a map, which was overlaid on an existing base map of Brown buildings and streets.

Model Builder
The maps required repeated tweaking and refinement to give precise results, and altering parameters was a lengthy, multi-step process. These tasks were constructed as procedures in Model Builder to make analyses faster and ensure consistency.

Spatial Analyst
The Cost Distance tool provided important spatial analysis functionality by calculating walking distances to safety points.

Input for a Cost Distance calculation consists of a set of safety points and a cost raster. The value of a pixel in the cost raster is the cost, or time, required to traverse that pixel. For the purposes of this analysis, the cost raster had a very large value inside building footprints, and a low positive number outside. The motivation for this cost raster is to generate paths that never go through buildings.

The output of this Cost Distance calculation is a raster where the value of a pixel is the cost to move from that location to the nearest safety point.

The Cost Distance tool emphasizes an important phenomenon. Closely packed buildings can decrease the coverage of safety points by creating a maze effect. The illustration above shows the difference between having to negotiate zero corners and one corner. Consider a pedestrian P and a safety point S, which is a constant straight-line distance away. By induction, as the number of buildings B in the way increases, the time required for P to travel along the path increases.

Data Sources
Campus buildings and streets Lynn Carlson, EarthLab
Blue Light Phones SafeRide website
SafeRide routes and stops Department of Public Safety website

Blue Light Phones
Brown’s overall phone coverage is excellent. Areas near residence halls are heavily blanketed, such as Patriots Court, Pembroke, Vartan Gregorian, Keeney, and Perkins. Libraries are also well-covered. Trace a path from a residence to a library and see how easy it is to stay in the yellow.

The coverage of walking routes, while still dense, is not as high as residential areas. If the Department of Public Safety decides to install new phones, the focus should be on improving sidewalks, as these areas are more dangerous at night than residences. Consider the following. First, there are more people around residence halls at night because they are common starting or destination points, and the buildings tend to be clustered together. Second, residential halls are generally inside walled areas away from roads, so the risk of a robbery or kidnapping involving an escape vehicle is much lower.

Installing phones near Barus and Holley and along the route from there to residence halls would be beneficial. Overall, Brown’s campus is mostly saturated with Blue Light Phones. The campus would not become significantly safer if more phones were added, because the marginal return on new installations is very low in most areas.

SafeRide Stops
The SafeRide stops on Brown’s campus are relatively sparse, and shuttles are scheduled to arrive at a given stop every five minutes. This may seem like an ineffective distribution, but SafeRide fills a different purpose than the Blue Light Phone system.

While the phone network is densely distributed, using it is a reactive measure, and immediate access is essential. SafeRide, on the other hand, is a precautionary measure. Pedestrians intending to use SafeRide would plan their route beforehand. This matches up with the way SafeRide was planned, because the emphasis is on stopping near residence halls and libraries, which would fit the start and end points for most pedestrians’ trips at night.

Still, there are a few areas that should have more coverage. Barus and Holley is far from a SafeRide stop from every exit. Perhaps Stop 12, near Minden, could be moved south so it covers Minden, Barus and Holley, and the CIT.

It may also be useful to move Stop 3, near Wayland, so that it is between Wayland and Keeney.

Taken as a whole, the distribution of SafeRide stops is effective.