

Drainage Network

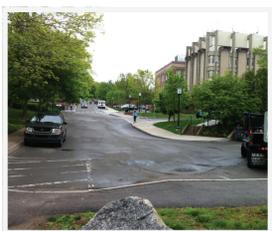
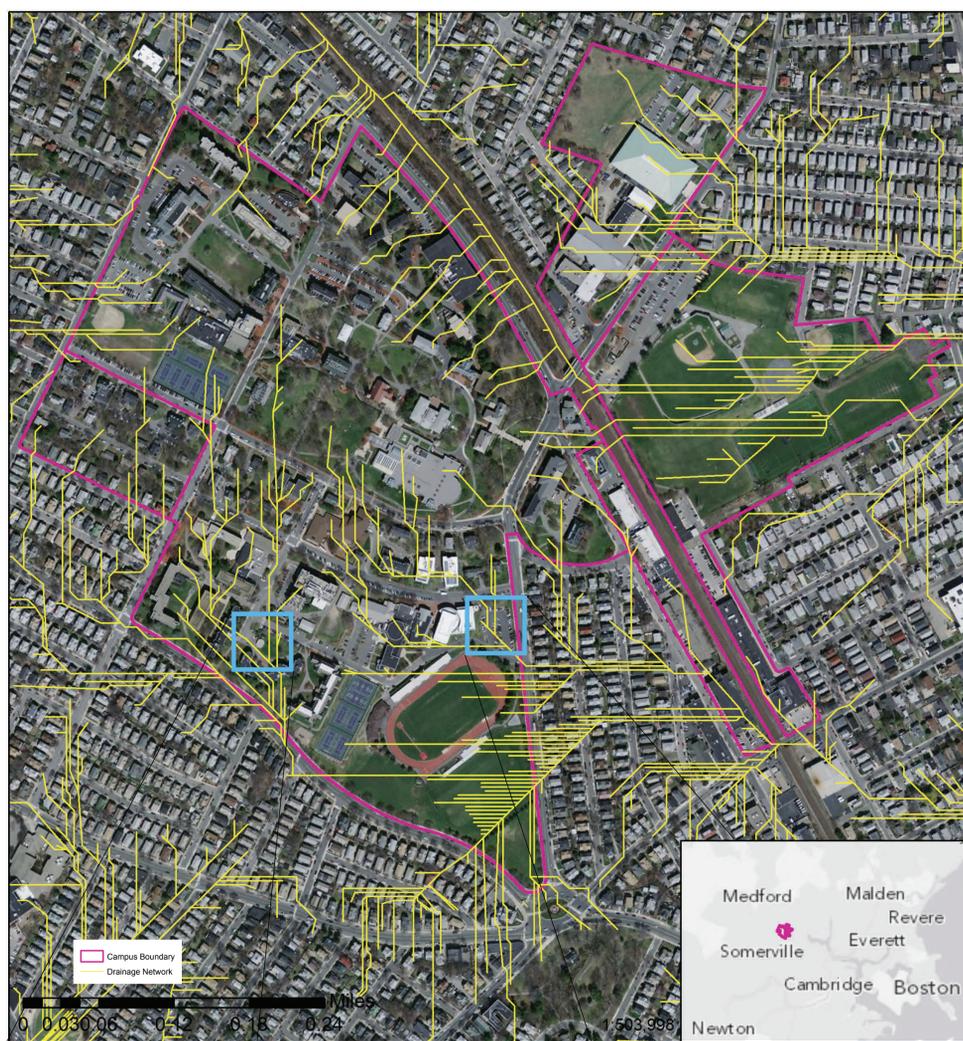
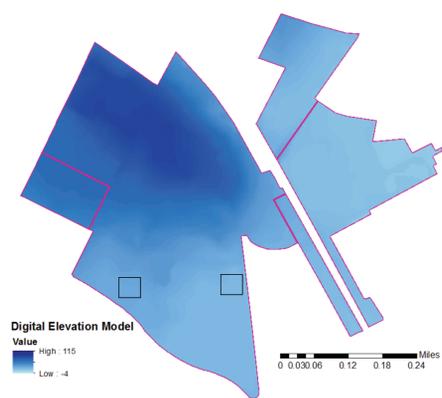


Figure 1: Open Space in front of Latin Way Dormitory that could be retrofitted with a bio-retention area to treat and infiltrate stormwater runoff.

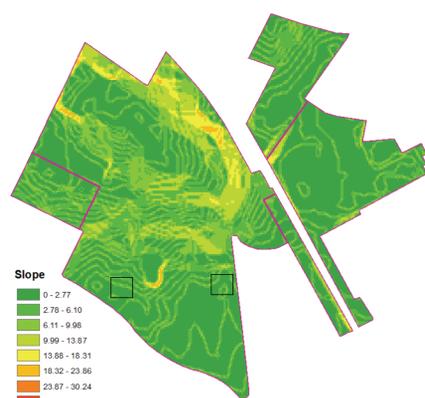
Figure 2: Aidekman Parking Lot 1 that could incorporate pervious pavement or pavers and bio-retention islands to treat and infiltrate stormwater runoff.

Methodology



Digital Elevation Model

I used 5-meter elevation data from MassGIS to create a digital elevation model (DEM) of the campus and surrounding area. The accuracy of the map results from data type, mine being floating point. Errors in were found in my DEM called sinks; areas surrounded by higher elevation values and are areas of internal drainage. These areas are corrected by using the Fill tool and reprocessing the DEM map. The resulting map shows the highest elevation at the top of the campus green, as expected.



Slope

The slope of the area is reported in degrees, and it is calculated using the DEM information. The slope of each cell is calculated as the maximum change in value from that cell to its neighbor. The lower the slope value, the flatter the terrain; conversely the higher the slope value, the steeper the terrain. The flattest slopes are shown in green, and the steepest in red. The steepest slope values are on the sides of the campus green, as expected, with flat slopes on the green and the campus area below.

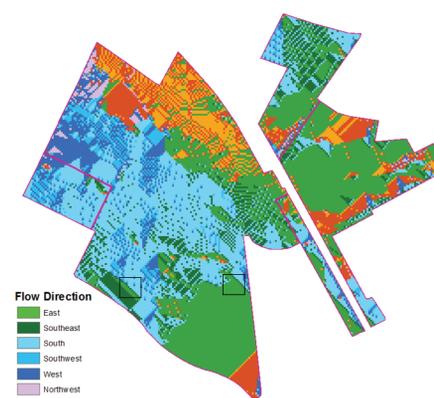
Results

The results of this process are seen in the drainage network map, which is overlaid onto an imagery of the area. With this map, the areas of high volumes of flow are shown in yellow. Many of these areas stem from very compact soils or impervious surfaces, which are areas with no infiltration like roads, parking lots, and sidewalks.

Impending regulation changes for the Tufts campus will soon encourage a reduction in volume of stormwater runoff and impervious surfaces. Using this map, I have chosen two areas of high flow accumulation that could benefit from the implementation of LID stormwater practices. The first area is the open space and road in front of Latin

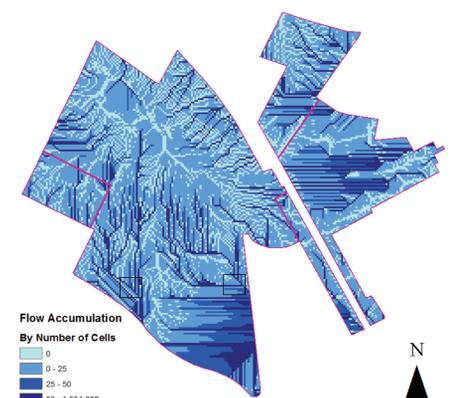
Way Dormitory (figure 1). This space could be turned into an educational bio-retention area or repaved with pervious pavement. The second is Aidekman Parking Lot 1 off Lower Campus Road, which could be retrofitted with pervious pavement, curb cuts, and vegetated bio-retention islands (figure 2).

The results of the flow accumulation map show stormwater flowing off the upper campus green down to the surrounding municipal streets. Implementing more LID features could reduce the volume of runoff collected by municipal stormwater sewer systems through on-site infiltration.



Flow Direction

This map shows the direction of flow for every cell using cardinal directions, calculated from the direction of the steepest point in each cell. Each direction is shown in a different color. This shows the trend of direction of water flow for the campus area, which is useful to find the ideal location for LID stormwater practices, like both sites chosen, where flow direction is predominately south and east.



Flow Accumulation

Flow accumulation shows the total number of cells that flow into each cell by weight. Some areas with very high concentrated flow may be natural stream channels or artificial channels produced by altering land use. This map highlights the areas of high flow accumulation on campus and outline possible problem areas. Both sites are located in heavy flow accumulation areas.