Cromwell Hall Drainage Rehabilitation: Design of a Stormwater BMP

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Abstract

During heavy rainfall events it has become evident that the current stormwater design does not provide adequate drainage through most of the campus at The College of New Jersey. Extreme flooding has been observed at the entrance and pathways leading to Cromwell Hall which poses a severe inconvenience and potential hazard to pedestrians in that area. The intention of this study, therefore, is to determine a design solution to the problem. Topographic analysis via GPS and GIS technologies, soils and soil properties characterizations via adherence to ASTM standards, and hydrologic analysis utilizing the NRCS methodology in combination with hydrologic modeling software (HEC-HMS) yielded results showing a watershed area of approximately 3.30 acres, a clayey soil representative of the area with a hydraulic conductivity of 6.11×10^{-5} cm/s (2.4×10^{-5} in/s), and an expected runoff volume for a 2-year design storm of approximately 20,500 ft^3. Using this data, three design alternatives were explored. They included resizing the stormwater pipes, a bioretention system, and a pervious paver system. An evaluation of drainage efficiency, cost effectiveness, and ease of implementation was completed choosing the bioretention basin as the best overall solution.

Keywords: watershed, Best Management Practice (BMP), GPS, GIS, hydraulic conductivity, clayey soil, ASTM, NRCS methodology, HEC-HMS, bioretention