**MEng Design Project Announcement 2017-2018**

**Project Title:** Soil and Water Lab Collection Station 002

**Brief Description of Design Project Goals:**

**Overview:** The Cornell Soil and Water lab (within Biological and Environmental Engineering) is interested in monitoring a host of environmental conditions, data logging the information, and providing near-real-time visualization of these data. We propose to update existing equipment in order to deploy additional collection stations into a campus network that would enable extensive monitoring and greater accessibility to data for research purposes. This research group is especially interested in inexpensive approaches that would allow it to deploy many sensors and systems over whole landscapes and engage community scientists, maker-spaces, and similar groups.

**Specific MEng contributions:** The MEng team will work with the water and soil group to establish a base station capable of recording, collecting and delivering data for research purposes. The collection station will have the following characteristics:

- Microcontroller capable of
  - running embedded collection programs (in python or C)
  - collecting data locally (on a USB flash drive, for example)
  - time-stamping events
  - interfacing to local WIFI networks and transmitting data to collection database
  - Ad-hoc network designed to link sensors when WIFI unavailable

- The system will be enclosed in a weather-proof case for field deployment.

- System will be designed to implement a variety of sensors (rainfall, soil moisture content, and water depth, for example).

- Embedded control software will be developed (python or C) to record device parameters as defined by the team’s requirements. Code should take into account error recovery (sensor, communication, storage, power, etc... failures)

- MySQL DB will be established for collection of data from a variety of systems

- Data displayed on accessible web site co-designed by users in the department of Soil and Water

- Adaption of an existing system will be encouraged (for example, see the TABER, Raspberry Pi base station)

Performance characteristics of the station should be identified (for example, collection frequency, limits of local data storage, system run time on full battery charge, etc...) The use of the system will be tested in the lab and several stations will be implemented for field testing within the academic year.

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**Outside Client, Name and Affiliation:** Natalie Morse, Biological and Environmental Engineering, nrb75@cornell.edu; Todd Walter, Biological and Environmental Engineering, mtw5@cornell.edu

**Number of MEng students needed:** 1 - 2
Required Skills: Microcontroller and Raspberry Pi programming, including Linux, Python and C; battery and solar power management, MySQL programming, sensor development and interfacing, radio tag networks.

Estimated Project Time Frame: Fall 2017 + Spring 2018 semesters