

Facilities Information Technology: Sanitary Sewer Manhole Project

Photo 1 and 2: RTK GPS and UNH Base Station



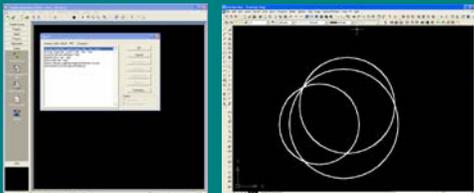
These photographs show Guerra measuring the location of a sewer manhole with the RTK GPS unit. The RTK GPS unit connects to the UNH Base Station to find sub-centimeter accuracy.

Photo 3: Total Station and Reflecting Rod



The Total Station and Reflecting Rod were used to survey manholes that could not be collected with the RTK GPS unit. The Total Station required a two-man team and was more time consuming.

Figure 2: Trimble Geomatics Office and AutoCAD



Trimble Geomatics Office was used to transfer data from the RTK GPS unit to ArcMap. For manholes collected with the Total Station it was necessary to use AutoCAD before transferring the data into ArcMap.

GIS Department

University of New Hampshire, Durham, NH

By Joe Guerra

Abstract

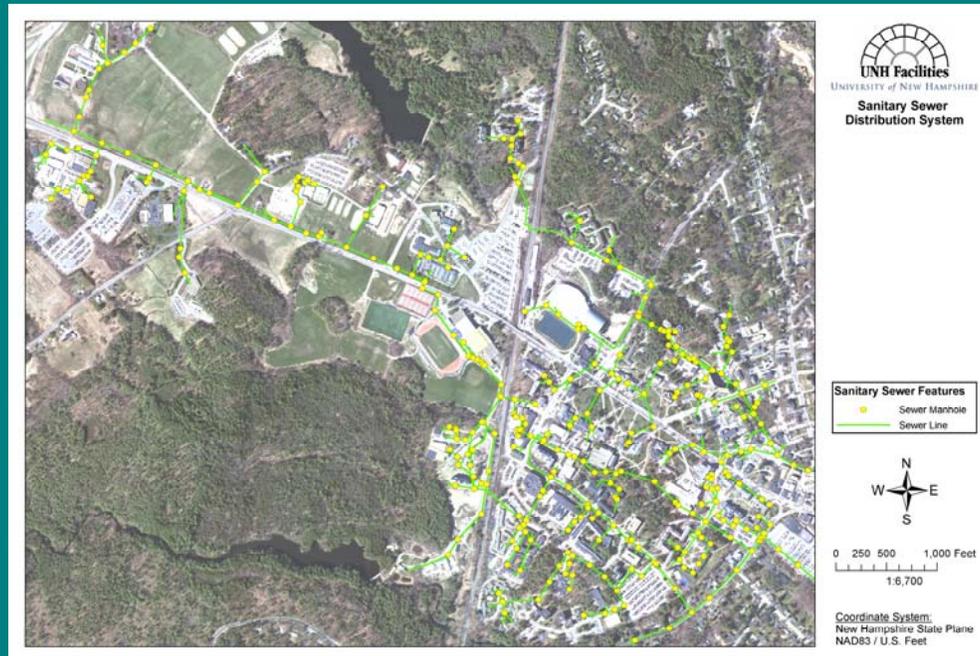
Introduction

In the spring of 2007, the University of New Hampshire (UNH) Facilities Information Technology Geographic Information Systems (FIT GIS) Department was given the task to validate and update the campus sanitary sewer dataset. Undergraduate Joe Guerra continued his employment as a seasoned GIS intern for this project, furthering his experience with RTK GPS equipment and ArcGIS software. In addition he gained new experience with Total Station equipment and AutoCAD software. Guerra gained credit towards his Geography Major and hopes to continue his work for FIT GIS into the future.

Technologies

The Sanitary Sewer Project required the use of a large variety of software and hardware. Initially the RTK GPS unit was used to make a sweep of the campus to measure the precise location of sewer manholes. The RTK unit utilizes a network of 26 orbiting GPS satellites and the UNH Base Station to map to sub-centimeter accuracy. RTK GPS data is stored in a Trimble Data Logger via Bluetooth and was transferred to ArcGIS software via Trimble Geomatics Office. When the RTK unit could not be used it was necessary to use the Total Station. The Total Station measures accurate locations using control points, angles, distances, and a reflecting rod. Total Station data required significant post processing using Trimble Geomatics Office and AutoCAD before importing into ArcGIS. Eventually all data, regardless of collection method, was assembled, edited and analyzed in ArcMap.

Figure 1: Sanitary Sewer Geodatabase



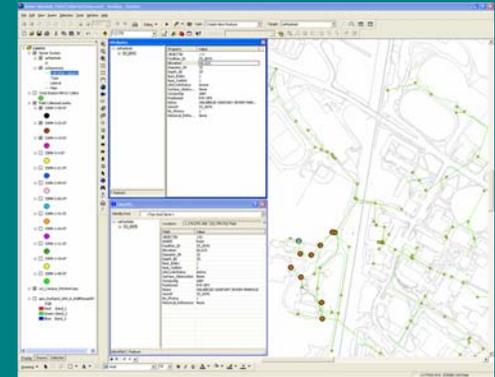
Project Overview

The purpose of the Sanitary Sewer Project was to map previously collected sewer manholes with RTK GPS in order to obtain sub-centimeter accuracies and elevation measurements. A total of 395 sewer manholes were located; attributes recorded include diameter, obstruction, label, and elevation. Prior to this project elevation measurements did not exist. These measurements were especially important for flow and other statistical analysis.

Results

The Sanitary Sewer Project produced a comprehensive and updated geodatabase of sewer manholes for the UNH campus. This geodatabase contains the most updated and complete information as of May 2007. The success of this project did not come without a few difficulties. Collecting data in the field was often challenging and tedious. Poor satellite coverage made RTK GPS measurements especially difficult for manholes close to buildings or in areas with heavy tree cover. When RTK GPS measurements were impossible, it was necessary to employ a two-man team with the Total Station. This was often quite time consuming and required lengthy post processing. In addition to poor satellite coverage, winter also presented a few challenges. Poor weather and deep snow made locating manholes difficult. Nevertheless, ArcGIS, Trimble Geomatics Office, and AutoCAD were all efficient software to use.

Figure 3: ArcMap Editing Session



ArcMap 9.2 was used to edit attribute information of existing manholes and add newly discovered manholes to the sanitary sewer geodatabase.

Figure 4: Areas of Ease



Large open areas made RTK GPS collection quick and easy since buildings and trees did not obscure satellite signals.

Figure 5: Areas of Difficulty



Some areas required the use of the Total Station (See Photo 3) since RTK GPS could not be used close to buildings or in areas of dense tree cover.