**Can I Use This Thing? Verifying GPS Data Collection Accuracy**

The purpose of this exercise is to test how well you can measure points using the GPS systems available for this class. Most of you will have Trimble ProXT units, which are capable of accuracies of about a meter. Some of you will have ProXH units, which can be as good as 30 cm. Some students will have Pro6H systems, which may be as accurate as 10 cm.

Your goal is to GPS the locations at three or more NGS points along Larpenteur Avenue.
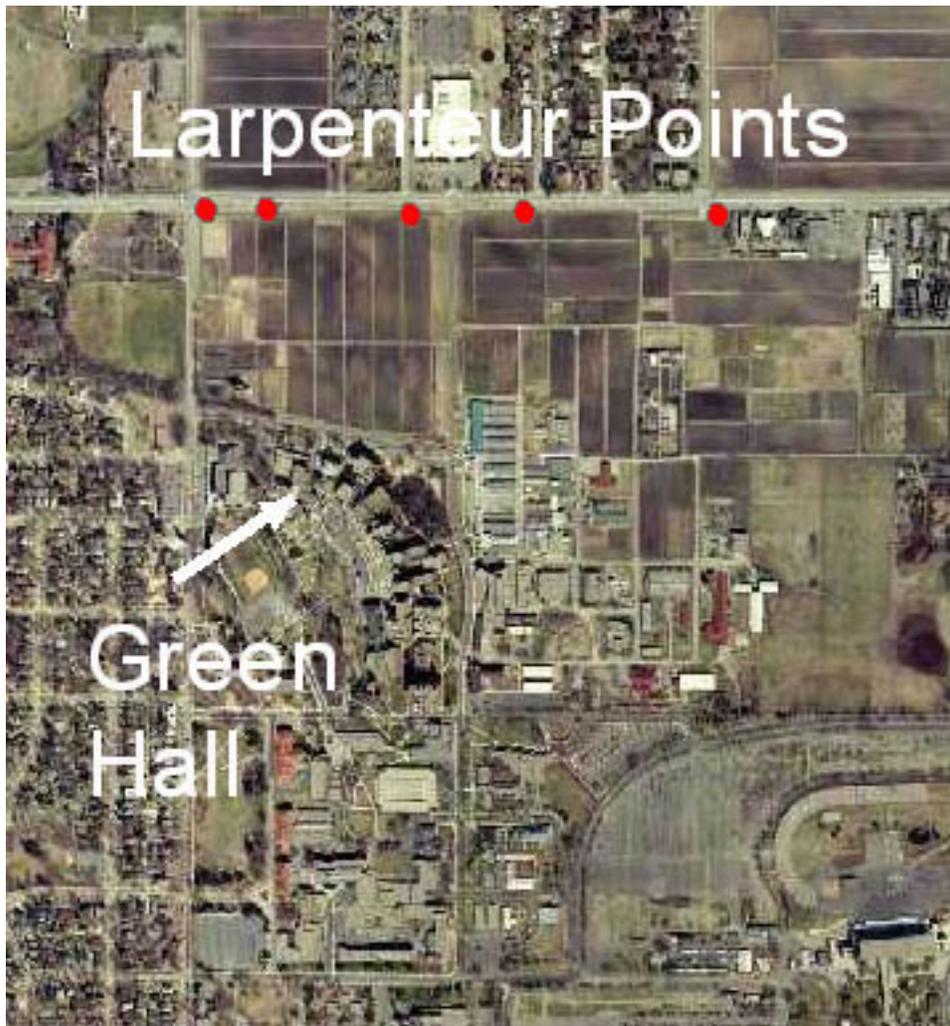
First, go to the NGS website, and download the data sheets for the base points A through E on Larpenteur Avenue (see link to NGS on the class resource page). You'll have to record, and perhaps transform the NGS coordinates you read from the data sheets, so that you are in a datum/coordinate system you can measure from the GPS.

We'll demonstrate the use of the Trimble equipment on Monday of the first full week of class. You should collect at least one point on the Monday of the first full week of class, and bring it back to the lab that same day to download and go through the differential correction process. You'll then collect and process the remaining points during the week.

The basic process is to check out a logger/PDA (little phone-like handheld computer), a Trimble receiver (yellow brick or dome), and a tripod. You then

1) pair the logger with the receiver using Bluetooth
2) open the Terrasync software on the logger, make sure the settings are correct under Settings
3) Place the GPS receiver on a tripod precisely positioned over one of the NGS control points
4) Create/open a file using the Data menu in Terrasync on the logger, enter the antenna height (measured from the base of the receiver to the top of the benchmark point), and start logging
5) Stop collection and close the data file after 15-20 minutes of logging, close Terrasync, and turn off the logger and GPS receiver
6) When you're done collecting points, return to the lab, download the data (we'll show how, but typically by removing a storage card from the logger and plugging it into the computer), and import it into the Pathfinder Office software (PFO)
7) Differentially correct the data via PFO to improve accuracy
8) Export the data via PFO to a shapefile
9) Extract the X/Y coordinates in an appropriate coordinate system, most likely using add xy in the tables function in ArcMap
10) Compare your measured point locations to the NGS reported positions for the benchmark points, and complete and NSSDA spreadsheet

We will describe the use of the Trimble Pathfinder Office software for GPS processing in class, but you are welcome to work ahead using the documents and videos on the course website, or on the shared drive in the lab.

If your point locations are seriously in error (1 meter or more) you should troubleshoot to identify he cause, looking at datum conversions, calculations, or export settings, and perhaps go back out to recollect.

Once you're sure you can accurately collect position data, visit the remaining of the points, and collect carrier-phase GPS data for at least 15-20 minutes for a total of three points if you are working alone, and four points if working together. You can work in pairs to collect the data, but each person must operate the equipment/be present for at least two of the points (so if you work in pairs, you must collect 4 points, in groups of three, six points – no groups larger than three).

If you work in a group to collect the data, each group member should do all the remaining steps individually after you've downloaded your data.

Correct your full set of points against local GPS base stations, and compare the positions you measured to those reported in the NGS data sheets corresponding to your points. If the error is substantially larger than you expected, there is something amiss with the process, probably with the datum transformations or corrections steps. Errors greater than about 75 cm with the Trimble XT, 50 cm with the XH, and 25cm with the 6H systems are probably too large. Correct any errors until you are satisfied you can collect and process the data accurately.

Complete an NSSDA table/sheet available on the course website, or in the course lab drive (CLD).

To recap what to turn in, as per the deadlines on the course Moodle site:

1) The NSSDA spreadsheet of data collected this week. It should be complete, with all your data points entered, but if not, submit what you have
2) Your complete ssf, cors, and shape files or geodatabase for your completed set of points. If you submit shapefiles, remember to zip all the files together (the .shp, .shx, .dbf, .prj, etc.) when you turn in the bundle

And subsequently, for 4295 students only:
3) Write a four to six page report (1.5 spaced, remember, a and a cover page doesn't count), including your goals, a brief description of the study area and methods used (GPS and settings, collection points and duration, data collected, post-processing, accuracy comparison), your results, and a conclusion as to whether you can measure points accurately, or need further work. You should include a map of the points you measured and the NSSDA calculations in your report.