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COMMISSIONING A GPS SURVEY

GPS mapping can be as complicated as the purchase of your first cell phone. It's not until you receive the first bill that you fully realize you didn't understand the program.

Not all GPS surveys are comparable. The end product that the course receives needs to be highly accurate, as that's the purpose of creating the map in the first place. GPS mapping options and levels of accuracy can be a bit overwhelming and just as confusing as that cell phone plan. Hopefully I can provide a few points to aid you in choosing a service, but first let's review just how the GPS collection and mapping process works.

WHAT IS IT?

GPS is a satellite-based navigation system made up of a network of 24 satellites operating in high orbit (18,000-28,000 km). Created by the Department of Defense, it was originally intended for military applications, but in the 1980s, it was made available for civilian use. GPS works in any weather condition, anywhere in the world, 24 hours a day.

HOW IT WORKS

GPS satellites circle the earth twice a day in a very precise orbit and transmit radio signals to earth. A GPS unit (receiver) obtains this information and uses triangulation to calculate its location. Basically, the GPS compares the time a signal is transmitted by a satellite and the time it was received (around .06 seconds). The difference tells the GPS how far away the satellite is from the unit. By using the same process with a few more satellites, the receiver triangulates its position. The GPS unit is connected to a datalogger that can store this position information and other data associated to it.

HOW ACCURATE IS IT?

There are a number of factors that affect the accuracy of a GPS receiver. Orbital errors, satellites positions, atmospheric delays, heavy tree canopies, buildings and timing errors are just a few. These errors are inherent in every GPS unit; what makes the real difference in the final accuracy the unit produces is the quality of the receiver, the method by which the error is differentially corrected and the way in which the equipment is used by the operator. This equipment is not available at your local sporting goods store.

The numerous ways in which various GPS units deal with correcting these errors can be very complex and difficult to understand let alone explain. Adding insult to injury is the way in which the manufacturers themselves characterize accuracy. Have you ever heard the expression, "The devil is in the details?" Well that is especially true with GPS datasheets.

Here is a real example:

"Accuracy (HRMS)# after differential correction" = 30 cm."

The actual footnote for this example has almost 200 words that in extremely technical terms explain that this unit will only achieve the 30 cm level of accuracy 68 percent of the time even under perfect conditions, and that in reality this unit will have a sigma 3 accuracy level of somewhere around 2 to 5 meters, as much as 16 feet.

When it comes to units, you get what you pay for:

- Recreational unit – $100 to $500 = 5 to 15 meters;
- Mapping grade unit (handheld) – $3,000 to $5,000 = 2 to 5 meters;
- Mapping grade unit (with external antenna) – $8,000 to $15,000 = 1 to 3 meters;
- Survey grade GPG unit – $30,000 to $50,000-plus = sub-mm to sub-cm.

WHAT DOES YOUR CLUB NEED?

Most clubs are looking for a high level of accuracy.

Sometimes it's nearly impossible to achieve high accuracy positions with GPS alone due to obstructions such as heavy tree canopy or buildings. In cases like this it's essential to use more conventional survey equipment that is designed to work seamlessly with the GPS. One such piece of equipment is a robotics optical total station. With this type of unit, the obstructed positions can be determined by establishing known positions in open areas with integrated GPS. These positions then can be used to establish a setup point and a bearing. With that information the unit will use a high accuracy laser to calculate the distance and bearing to the operator using a pole with a 360-degree prism mounted at the top. The unit can robotically track the operator continuously transmitting his position via a radio link between the units (even under canopy). As long as the operator has line of sight back to the unit, positions can be collected. These positions are not affected by the obstructed GPS signal and can maintain the high accuracy required.

Certainly it's very challenging to continually explain all the items that go into a quality mapping collection, but don't be fooled by claims that a map can be created to a high level of accuracy with unaccredited equipment. It's just not true. All you'll be left with is an inaccurate map that won't be an asset for the club. **GCI**