

The benefits and pitfalls of using handheld GPS for surveying in PNG

Richard Stanaway

Quickclose

Handheld GPS

- An “accuracy” of approximately 6 m in PNG in good conditions. Accuracy is 3 m in mid-latitudes.
- WGS84 datum within 2 metres of PNG94, so WGS84 datum setting is OK for PNG94 surveys.
- Heighting is only accurate to about 12 metres in good conditions (uses low precision geoid model)



What is a Handheld GPS good for?

- Finding survey control and hidden treasure 😊
- Checking survey coordinates for gross errors (e.g. getting backsight bearing out by 180 degrees)
- Mapping and GIS surveys (10 m accuracy)
- Rural Class 4 surveys (only with strict quality procedures)
- Surveying route locations, tracks and roads for mapping

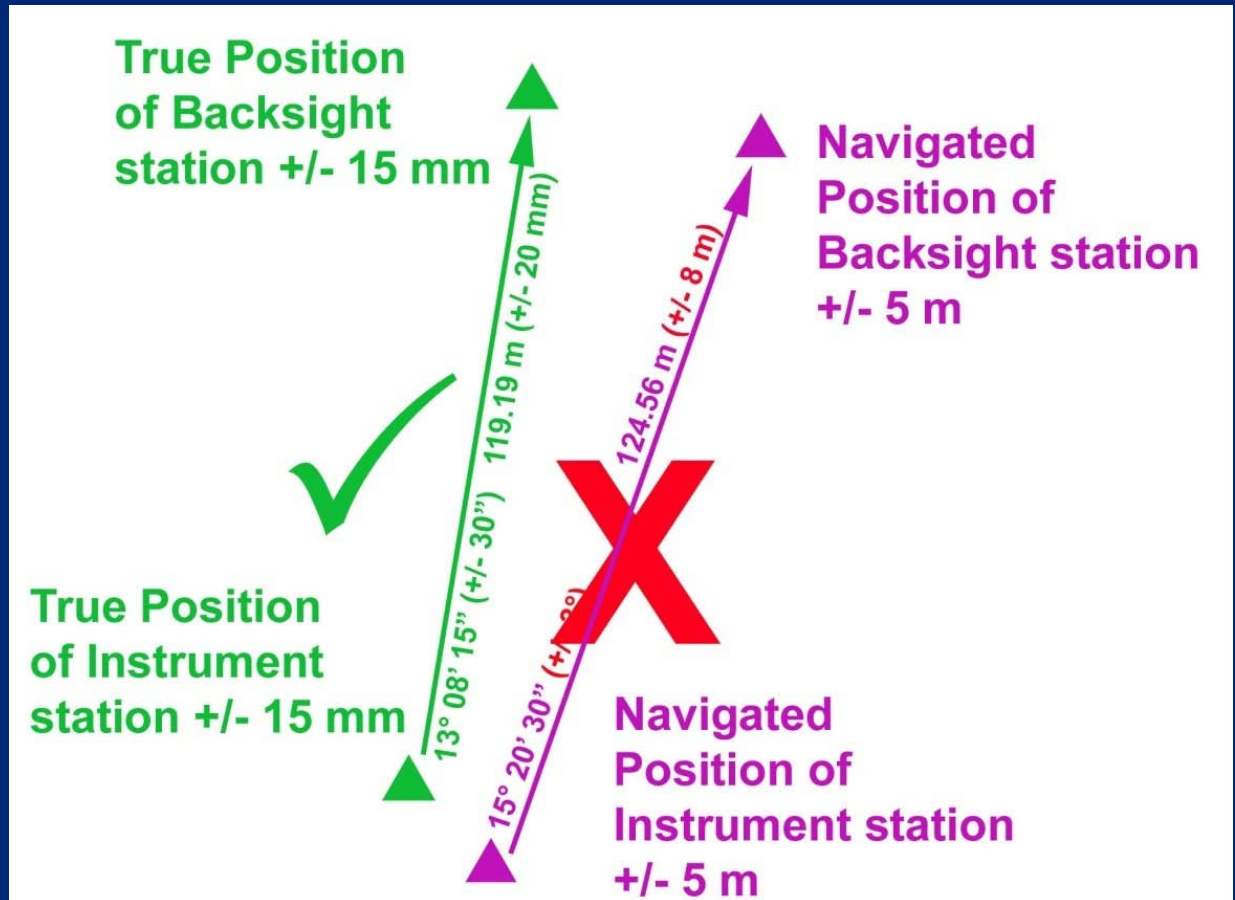
What is a Handheld GPS NOT good for?

Azimuth control
(by inverse of two
coordinates)!

Control surveys

Surveys requiring
better than 10 m
accuracy

Accurate
Heighting



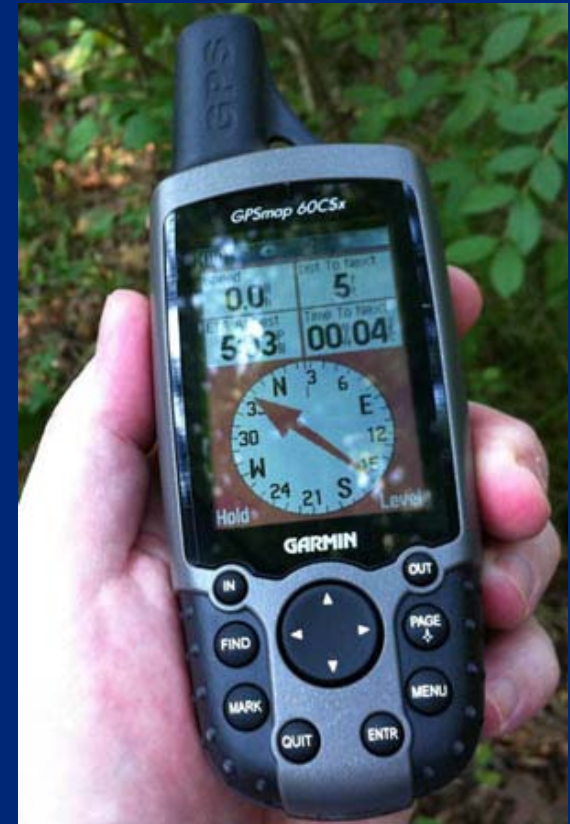
Setting the right Datum and Coordinate Display

- Default datum is WGS84 (ok for PNG94 surveys at +/- 2m)
- Default coordinates are Latitude and Longitude
- If using old 1:100,000 PNG topo maps, or finding AGD66 coordinates – set datum to AGD66 (transformation is accurate to 10 metres)
- Select UTM/UPS coordinate system to use grid coordinates
- Select decimal minutes system for Pilot usage
(e.g. $145^{\circ} 45' 30''$ is $145^{\circ} 45.500'$ in Pilot system)

Be very careful that the correct Datum is set!!! Always check

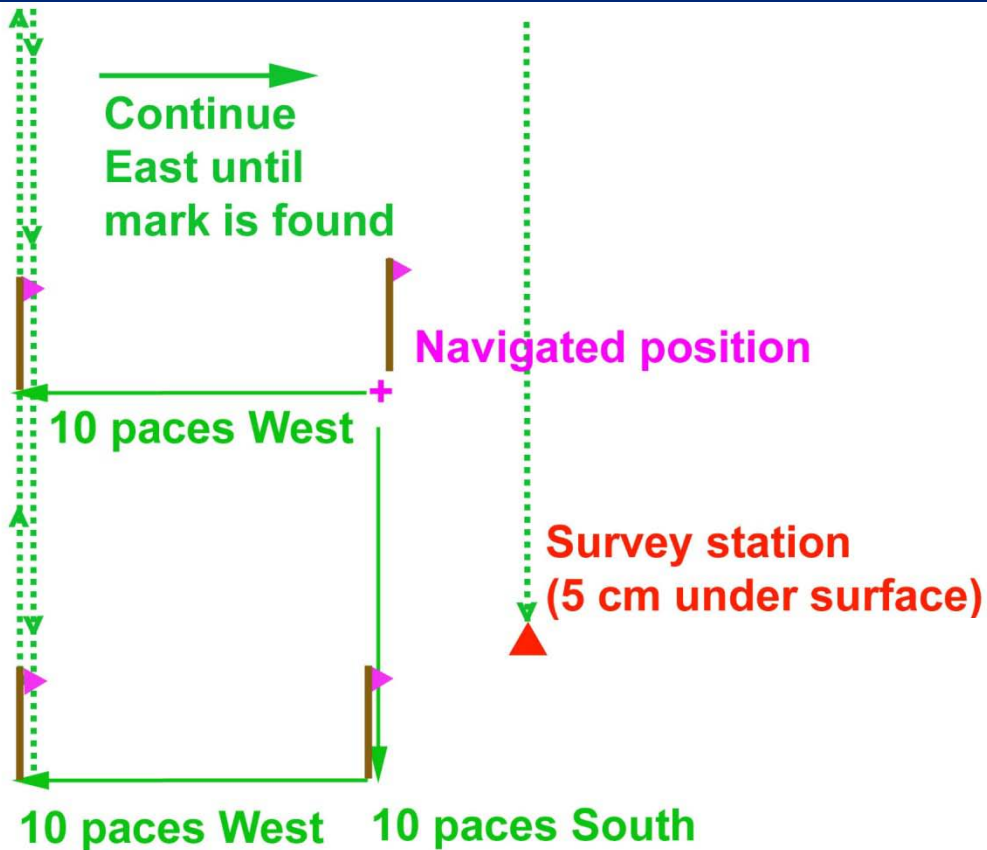
Finding Survey Control

- Enter coordinates of control into GPS (with correct datum)
- Navigate to station using “Go To” or “Find” function
- Wait until coordinate stabilises
- Look for witness posts, depressions in the ground etc..
- Do systematic search within 10 metre radius of navigated position (using bushknife, bar or metal detector / pipe finder)



Search techniques

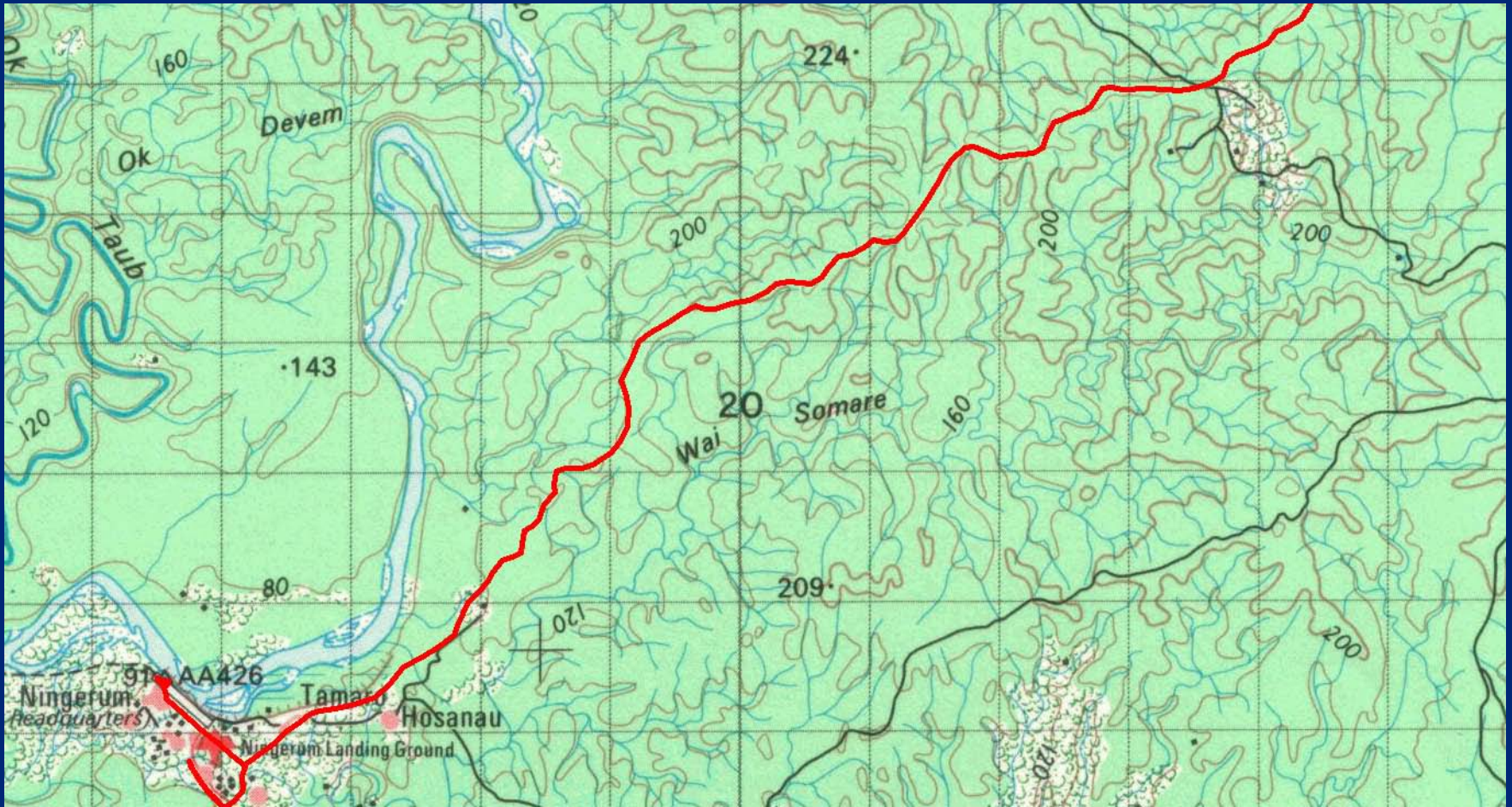
Radial Search



Grid Search



Using GPS track log to map roads and routes



Rural Class 4 surveys – field procedure

- Set datum to WGS84 (ok for PNG94 surveys at +/- 2m)
Set coordinate display to UTM Grid system
- Verify / calibrate at nearest PNG94 Control
- Ensure 3D mode at all times
- “walk the boundary” and measure / log waypoints for corners or use track log for a general boundary defined by a linear feature (e.g. track, road, ridgeline, watercourse).
- Before logging a waypoint, stay still until coordinate precision improves. Manually log elevation.
- “Close” on PNG94 control
- Repeat the survey and mean the coordinates of waypoints and track logs.

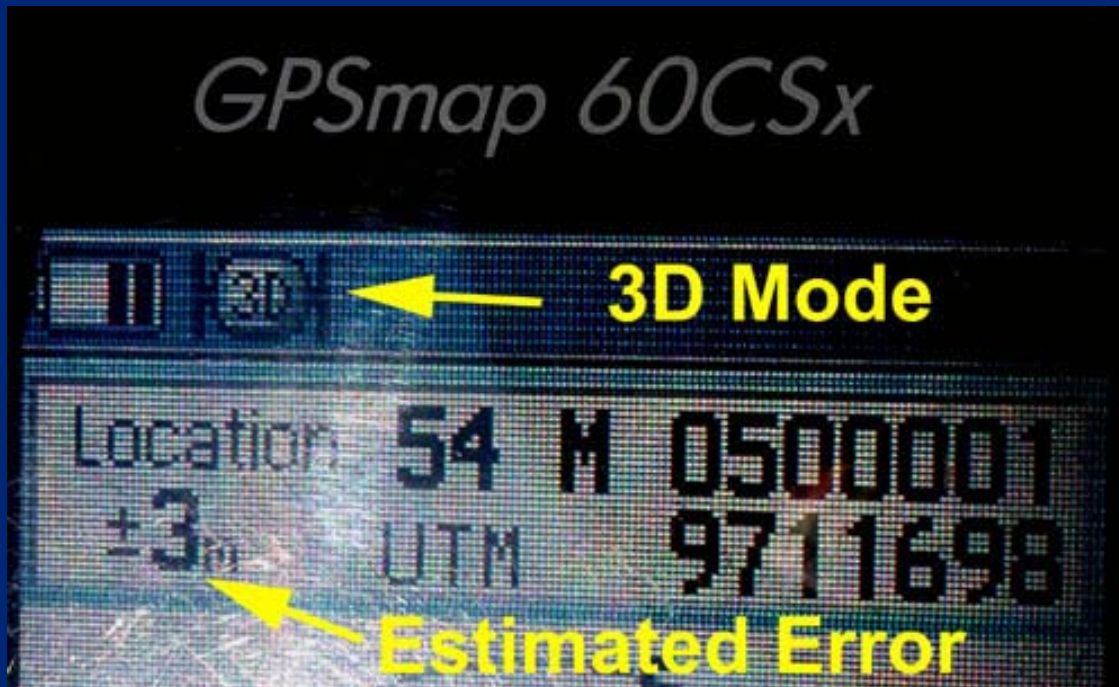
Rural Class 4 surveys – calcs

- Average waypoint coordinates for first survey and repeat survey.
- Compute grid bearing and distance between waypoints for straight boundaries.
- Apply Grid / Sea level scale factor to compute ground distance at mean elevation for each line, and
to compute area, use mean elevation of land parcel to compute a single grid / sea level scale factor.

Things to check

Good Sky
Visibility!

Accuracy
degrades to
30+ m in
forest



If GPS is in 2D mode DO NOT USE COORDINATES
Double estimated error in 3D mode for realistic error
Correct Datum is set!

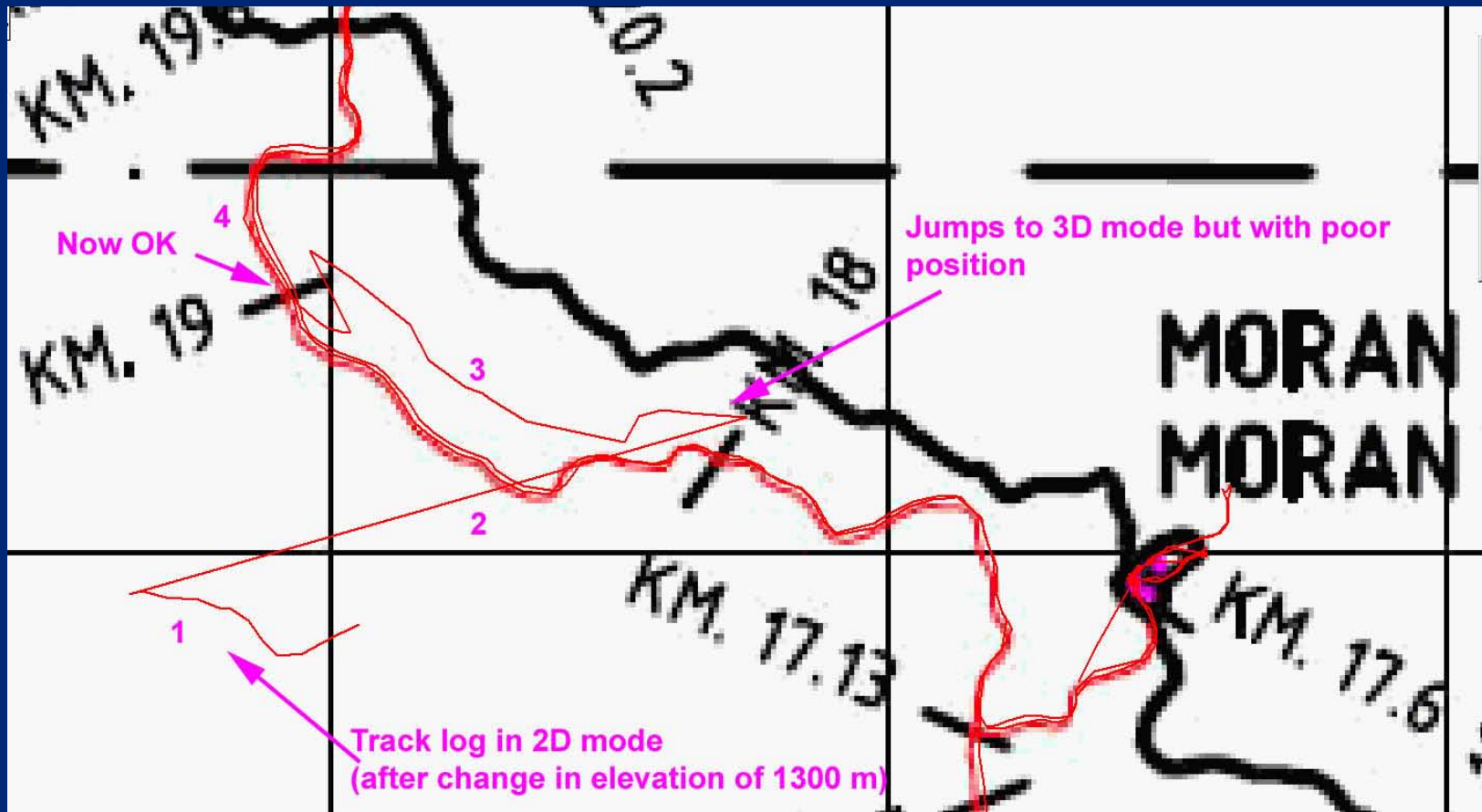
Beware of the 2D Monster!



GPS uses 2D mode
(using last elevation fix)
until 4 or more
satellites are tracked.

This is OK if there has
been no change in
elevation

More 2D errors with GPS



1.3 km position error in 2D due to change in elevation of 1300 metres!! This can be fatal.

Recommended Handhelds & Software



Garmin GPSMAP 62s

3-axis tilt-compensated compass

barometric altimeter

Base maps can be loaded in.

Rugged and waterproof

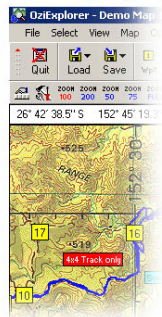
quad helix antenna

high-speed USB connection

approx. K900 from Johnny Appleseed

www.ja-gps.com.au

Des Newman's **OziExplorer** GPS Mapping Software



This is the official web site for the **OziExplorer** GPS Mapping Software which runs on your PC or laptop and will work with **Magellan, Garmin, Lowrance, Eagle, Brunton/Silva** and **MLR** GPS receivers for the upload/download of waypoints, routes and tracks and most brand of GPS receivers for real time tracking of GPS position (Moving Map).

OziExplorer allows you to work with maps on the computer screen that you create from scanned or digital maps. Ideal for planning trips for boating, 4 wheel driving, flying, hiking etc and as a real time navigation aid.

- more than 500,000 downloads
- more than 3 Million unique web site visits

Free Upgrades for all our software products

New in OziExplorer version 3.95.4 +

- Support for Garmin USB GPS receivers
- Support for Magellan USB GPS receivers
- 10,000 waypoints can be loaded (increased from 1000)
- Print preview ability added
- New map Search dialog
- New track filtering method

OziExplorer software

import scanned base map

manage and display waypoints

manage and display track logs

approx. K200 from www.ozieplorer.com

Take away points

- Handheld GPS is OK for surveys +/- 10 metres
- Check that the datum is set correctly
- Check coordinates against known control
- Only use when in 3D mode
- Keep an eye on the accuracy indicator (e.g. under trees)
- Repeat the survey for quality assurance

Thank You