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

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Quickclose

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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° 45’ 30” is 145 ° 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

Grid Search

Continue East until mark is found

10 paces West

Survey station
(5 cm under surface)

10 paces South

Navigated position

Radial Search

Survey station
(5 cm under surface)

Navigated position

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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.
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 website 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 brands of GPS receivers for real-time tracking of GPS position (Moving Map).

OziExplorer allows you to work with maps on the computer screens that you can 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

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)
- Post 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.oziexplorer.com

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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