

HOW ACCURATE IS GOOGLE EARTH's GPS PLOTTING & MOBILE PHONE GPS ???

Following is some recent comparisons I've completed while on the Cocos (Keeling) Islands between the following GPAS devices:

- A known +/- 1 cm accurate reference site of Geoscience Australia
- HTC Sensation Mobile Phone's inbuilt GPS
- Navig8r Model G35 vehicle / portable GPS

1.0 Background

I've been curious for some time on the accuracy of GPS devices especially that they are now commonly used for land survey work and wanted to determine the accuracy of my mobile phone inbuilt GPS.

2.0 Geoscience Australia (GA)

Before a recent work visit to Cocos I asked a frequent contributor to the BackShed Forum Trevor Dalziell (Talbit) who works for GA what was available re accurate GPS reference sites as I wanted to compare their known reference to some details on some island CAD drawings that I was referencing .

Trevor advised me that GA has a GPS antenna at the met office on the edge of the runway & the coordinates are.

-12 11' 18.0391" Lat +96 50' 02.2993" Long With an accuracy of +/- 1cm

He further directed me to a site that identifies accurate GPS reference sites worldwide that seem to monitor east movements in 3 axis. Follow this link and try clicking on the teardrops for a site in your area.

<http://192.104.43.25/status/solutions/analysis.html>

Following images shows the Cocos site on the side of the West Island runway at the MET Office.



The last photo above shows the proximity of my mobile phone to the centre of the GPS antenna where I assume the 3 axis sensor is located.

3.0 Cocos Demographics

Cocos (Keeling) Islands are a territory of Australia and comprise 27 islands around the rim of a volcano with a lagoon in the middle.

West island is where the international airport runway is located and has a permanent population of approximately 120 (maybe 60 adults & 60 children) & at times another 20 – 30 visiting contractors and some tourists.

The only other occupied island is Home Island on the other side of the lagoon with a population of approximately 650 Cocos-Malays who were originally imported to island as workers for a copra industry in the early 1800's.

4.1 Accuracy / Resolution of GPS Devices

Geoscience Australia's advice their GPS antenna is located at:

-12 11' 18.0391" LATITUDE +96 50' 02.2993" LONGITUDE With an accuracy of +/- 1cm

These positions are obviously in Degrees / Minutes / Seconds with seconds down to 4 decimal places.

The distance between lines of latitude & longitude depend on reference latitude, for example the latitude spacing is widest at the equator and 0 degrees at the poles.

At 0 degree latitude (Equator)

A degree of Latitude is 110,574.27 metres

A degree of Longitude is 111,319.46 meters

At 12 degree latitude (Cocos)

A degree of Latitude is 110,622.28 metres

divide Degrees by 60 means 1 Minute = 1,843.7046 M

divide Minute by 60 means 1 Seconds = 30.72841 M

Now as Seconds are defined down to a resolution of 4 decimal places then latitude position can be determined down to 0.003072841 Metres or 0.03 of a millimetre. Plus / Minus the resolution & maybe other variables that I'm not aware of so it seems to me that GA can comfortably claim an accuracy of +/- 1cm or 10mm.

Resolution for Longitude can be determined in a similar manner but for the exercise I'll just use Latitude in my comparison.

4.2 Accuracy / Resolution of HTC Mobile Phone

Accuracy of the GPS device in the phone is unknown & for the exercise I'm only going to consider the displayed resolution which when sitting approx. 100mm from the centre of the GA reference GPS Phone display showed 12° 11.302 Latitude and 96° 50.038 which when converted to D / M / S equates to 12° 11' 18.1200 and 96° 50' 02.2800

4.3 Accuracy / Resolution of Navig8r Model G35 portable GPS

Likewise the accuracy of the GPS device is unknown & for the exercise I'm only going to consider the displayed resolution which when sitting approx. 00mm from the

centre of the GA reference GPS Navig8r display showed 12.1883° and 96.8340° which when converted to D / M / S equates to 12° 11' 17.8800 and 96° 50' 02.4000

5.0 Comparison of Results

When all readings were converted to the common Degrees / Minutes / Seconds and then ignoring the Degrees & Minutes which were identical the following readings were noted :

Device	Latitude Sec	Longitude Sec	Lat Diff (error) from Geo Aust	Long Diff (error) from Geo Aust
Geoscience Aust	18.0391"	02.2993"		
Mobile Phone	18.1200"	02.2800"	+ 0.0809	+ 0.0193
Navig8r Portable	17.8800"	02.4000"	- 0.1591	+ 0.1007

As the Navig8r has a much higher error it will be excluded from further consideration. It only cost less than \$100 over 5 years so what do I expect

As previously indicated I don't put too much faith in the accuracy of a GPS in a mobile phone and are going by the displayed resolution.

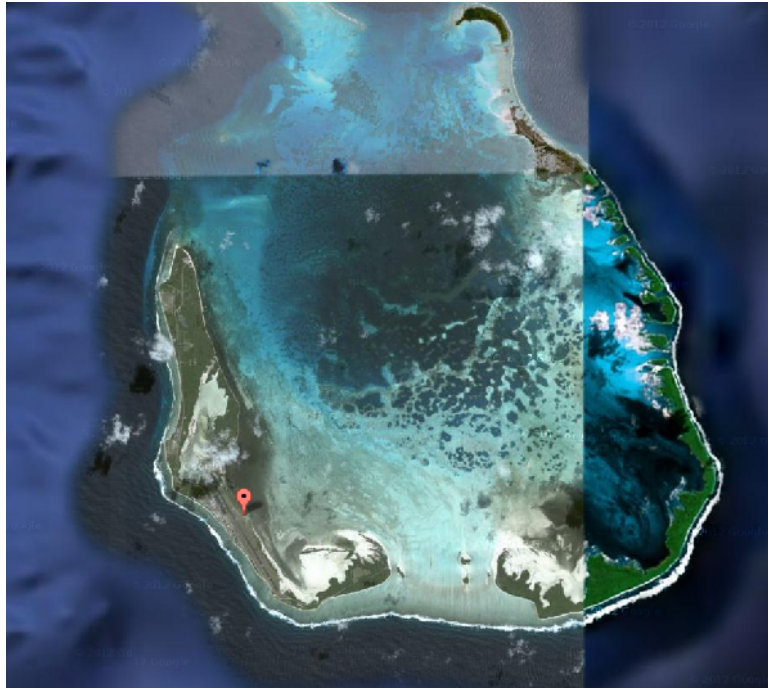
Previously I estimated that a value of Latitude in seconds and defined down to 4 decimal places would suggest an accuracy of 0.003072841 Metres and that 1 Second = 30.72841 M

So if the Mobile Phone Latitude Difference when compared to the Geoscience Aust GPS at approx. 12 degrees latitude was + 0.0809 of a Second then the difference would be 2.4859283 metres

This 2.5 metre accuracy would be something I would have expected from a phone GPS.

6.0 So how Good is Google Earth Displayed Positions ?

Image below shows the Cocos atoll with a teardrop over the assumed position of the Geoscience Regional Australia GPS Antenna on the side of the air strip



The Yellow Dot below indicates where Google indicates the position of the Reference GPS.

In reality the white patch 5 meters to the North West is the concrete plinth on which the antenna sits so there is considerable error.

