

# Grids & Datums

## BARBADOS

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Probably originally inhabited by Arawaks, Barbados was first visited by Europeans in the 16<sup>th</sup> century. First claimed by England in the early 17<sup>th</sup> century, it was first settled under the auspices of William Courteen, *circa* 1625. Slaves were freed in 1838, and it was the seat of government of the Windward Islands from 1833 to 1885, when it was made a separate administration. Barbados achieved independence within the Commonwealth in 1966 (*Merriam-Webster's Geographical Dictionary, 3<sup>rd</sup> Edition*).

The terrain of Barbados is relatively flat, and it rises gently to a central highland region. The lowest point is the Atlantic Ocean (0 m), and the highest point is Mount Hillaby (336 m). The land area comprises 430 km<sup>2</sup>, and is approximately 2.5 times the size of Washington, D.C.; Barbados is about 170 km due East of St. Vincent (*PE&RS, February 2004*).

The coordinate systems of Barbados seem to be somewhat of an enigma for a Commonwealth nation. According to a statement found on the Barbados Land Surveyors Association some years ago, they stated that triangulation "was used to establish the major control stations in Barbados in the 1920's" (*sic*). However, the local datum name is H.M.S. Challenger Astro Datum of 1938, and thanks to the EPSG database, the origin at St. Ann's Tower is:  $\Phi_o = 13^{\circ} 04' 32.53''$  N,  $\Lambda_o = 59^{\circ} 36' 29.34''$  W, which is on the southern coast just west of the town of St. Lawrence.

The original topographic mapping of British Commonwealth nations was undertaken by the Directorate of Overseas Surveys (DOS), after WWII. Barbados was one of the very first nations to be surveyed and mapped by DOS, and the first series of 1:10,000 scale maps with 20-foot contours was published in 1954-56. Recompiled in 1986, the number of sheets was reduced from 18 to 12. The DOS maps were based on the Challenger Datum of 1938, the ellipsoid of reference is the Clarke 1880 (RGS) where:  $a = 6,378,249.145$  m, and  $1/f = 293.465$ . The *original* DOS grid system used for Barbados was the British West Indies, "BWI Transverse Mercator Grid" where the central meridian,  $\lambda_o = 62^{\circ}$  W, the latitude of origin,  $\phi_o =$  equator, the scale factor at the latitude of origin,  $m_o = 0.9995$ , False Easting = 400 km, and False Northing = nil. The formulae are the Gauss-Krüger, but for such a small span of latitude and longitude the distinction is

irrelevant. As is common with the BWI Grid usage, the grid is also used as an "atlas index" numbering system for the popular tourist maps, and is not numbered with coordinate values but with an alphanumeric system for facile use to locate tourist interest points. The grid is easy to recover if one is familiar with the standard BWI grid conventions, but the defining parameters are unfortunately obscure to many. (See my past column on Grenada in *PE&RS*, February 2005.)

The Barbados National Grid (BNG), is also based on a Transverse Mercator projection, referenced to the Challenger Datum of 1938 where the central meridian,  $\lambda_o = 59^{\circ} 33' 35''$  W, the latitude of origin,  $\phi_o = 13^{\circ} 10' 35''$  N, the scale factor at the latitude of origin,  $m_o = 0.9999986$ , False Easting = 30 km, and False Northing = 75 km.

About 4 years ago, Kevin Grootendorst sent some collocated coordinates to me on Barbados. They were represented as one set of coordinates being on the BNG and another on UTM, WGS84. The 3-parameter datum transformation of 4 points well-distributed (a 5<sup>th</sup> point resulted in being an outlier), about the island *from* Challenger 1938 Datum *to* WGS84 Datum yields:  $\Delta X = +60$  m,  $\Delta Y = +264$  m, and  $\Delta Z = +43$  m, and the accuracy of my solution is about  $\pm 4$  m – for 4 points. Around that same time, Leo Romeijn sent another set of transformation parameters to me for exactly the same thing (from Challenger 1938 Datum to WGS84 Datum), as published by the EPSG parameter set version of "6.tenC" where:  $\Delta X = +32$  m,  $\Delta Y = +301$  m, and  $\Delta Z = +419$  m, and the accuracy is stated to be about  $\pm 2.5$  m, and is "derived at 2 stations (S40 and M1, St. Annes Tower) in 2004." Considering the whopping difference in datum shift parameters between the same two datums on the island of Barbados, I'd say it still remains an enigma...



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