Grids & Datums

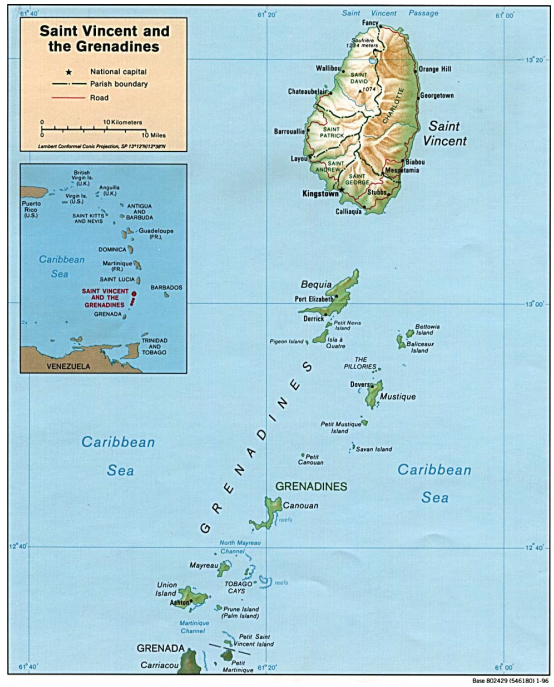
Saint Vincent and the Grenadines

BY Clifford J. Mugnier, CP, CMS, FASPRS

The Grids & Datums column has completed an exploration of every country on the Earth. For those who did not get to enjoy this world tour the first time, *PE&RS* is reprinting prior articles from the column. This month's article on Saint Vincent and the Grenadines was originally printed in 2004 but contains updates to their coordinate system since then.

The cannibal warrior Carïbs arrived in Saint Vincent around the 14th century, and they strongly resisted colonial settlers until the 18th century. Christopher Columbus probably sighted the island on 22 January 1498 (St. Vincent's Day). In 1673 the first African slaves were shipwrecked in the Grenadines, but they managed to get to St. Vincent, intermarry with the Carïbs, and became known as the "Black Carïbs." In 1795 the Carïbs un-successfully rose in revolt against the British, and 5,000 or more of them were deported to Roatan Island off the coast of Honduras. The hurricane of 1898 and the volcanic eruption of 1902 were disastrous to the economy. In 1958 Saint Vincent joined the West Indies Federation, it received a new constitution in 1960, and it became a state in association with the United Kingdom (*PE&RS, October 2003*) in 1969. Independence for Saint Vincent and the Grenadines was achieved on 27 October 1979. *Encyclopedia Britannica* says, "In 1979 the Soufrière volcano (1,234 m) erupted once again, damaging agriculture and the tourist trade. Hurricane Allen virtually wiped out the all-important banana crop in 1980."

Slightly less than twice the size of Washington, D.C., there are 32 Grenadine islands and cays, of which the largest are Bequia, Mustique, Canouan, and Union. Of a total 389 km^2, the area of Saint Vincent is 344 km^2. Some of the smaller islands are privately owned-probably not by retired cartographers. Part of the Windward Islands, the name dates back to the 18th century when English ships bound for Jamaica followed the trade-wind passage, and stopped at islands along the way. The islands constitute a north-south chain in the southern section of the Lesser Antilles and share a volcanic rock formation.



The earliest geodetic survey of Saint Vincent was of Fort Charlotte (lighthouse) in 1946 by the Hydrographic Service of the British Admiralty on 04 December. The coordinates of Fort Charlotte (V.1) are Φ_o = 13° 09′ 24″ N and Λ_o = 61° 14′ 43″ West of Greenwich, the reference azimuth from "V. 1" to "V. 3" is α_o = 107° 30′ 13.42″, the elevation of "V.2" is: H_o = 370.36 feet, and the baseline length (measured in 1945 by the Royal Engineers [R.E.] by catenary) from "V.30" to "V.32" is 2,347.504 m. (Invar tapes or wires were commonly calibrated for a standard length by being supported only at the ends of the tape or wire with a specific tension, thus the sag formed a catenary curve). The reference ellipsoid is the Clarke 1880 where: a = 6,378,249.136 m, and $^1/_f$ = 293.46631, the same parameters as for Jamaica (*PE&RS, May 2003*). Courtesy of the U.K. Military Survey, "The height of V.2 was established by the R.E. party by leveling from a Bench Mark on a step of the Aquatic Club, Kingstown; the height of the Bench Mark

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was established by the R.E. party from mean tide gauge reading taken over a period of four months." (*Note that a Metonic cycle is 18.67 years! – Ed.*)

The coordinate system used by the Lands and Surveys Department of Saint Vincent and the Grenadines is the British West Indies (BWI) Grid which is based on the Transverse Mercator projection where the Central Meridian $\lambda_o = 62^o$ W, the Scale Factor at Origin $m_o = 1999/2000 = 0.9995$, and the False Easting is 400 km. Note that the unit of measurement for this BWI Grid is the meter where 1 meter = 3.2828456 feet. The strange conversion factor is likely due to an earlier colonial length standard that was used for property surveys; a common quirk of old British Colonies throughout the world.

In 1996, the United States National Geodetic Survey (NGS) performed a GPS survey of selected points on the island of Saint Vincent. The NGS occupied a number of existing survey control marks previously set by the Lands and Surveys Department (L&SD), and I was successful in obtaining the classical St. Vincent Datum of 1946 coordinates of four of the six points collocated with GPS observations. Unfortunately, I do not have a record of who it was that sent the information to me on official L&SD stationery. I ran a solution for the three parameters of geocentric translation for those four points; two were listed as First Order and two were listed as Second Order. The resultant relation I derived from the St. Vincent Datum of 1946 to WGS 84 is $\Delta X = +196$ m, $\Delta Y = +332$ m, and $\Delta Z = +275$ m. I estimate the horizontal accuracy to be good to about 1 meter for the island of Saint Vincent. Because I had zero data on collocated points on any of the other islands, my guess is that the three-parameter shift values listed above are likely good to no more than a few meters for the remainder of the islands to the south because of the usually superb quality of work produced by the Royal Engineers. Thanks to Dave Doyle of NGS for the NAD83 coordinates of Saint Vincent.

St. Vincent and the Grenadines Update

New 2019 publication on Limits in the Seas from the U.S. Dept. of State: https://www.state.gov/wp-content/uploads/2019/10/LIS-144.pdf

2007 Update on history details from Mr. Russell Fox, Librarian for the Directorate of Overseas Surveys:

"DOS* work in St Vincent and the Grenadines

Summarised from DOS Annual Reports and notes held by Russell Fox (OS International Library Manager 1994-2004)

- DOS is used here as shorthand for the Directorate of Colonial Surveys (DCS, 1946-57), Directorate of Overseas Surveys (DOS, 1957-84), Overseas Surveys Directorate, Ordnance Survey (OSD, 1984-91) and Ordnance Survey International (1991-2004).

Other abbreviations: SVSD St Vincent Survey Department
SVG St Vincent Government
RE Royal Engineers
RN Royal Navy

Surveys and Computations

- 1947/48—RE 1945 primary trig of St V. computed by DCS; co-ords issued.
- 1951/52—DCS Senior Surveyor W H Young, and two surveyors recruited from Trinidad by the SVG, identified existing trigs on air photos and established 93 new trigs to provide extra control for 25K mapping, road traversing and cadastral surveys. Extra height control was fixed for 25K contouring.
- 1952/53—St Vincent. Control for 25K mapping completed. Closer control established for cadastral surveys. Many existing property beacons were tied in during this work. Subsequent investigation showed gross error in the existing property surveys. Brigadier Hotine, Director of Colonial Surveys, visited St V. in Dec 1952 and decided that a complete cadastral re-survey of the island was necessary. Mr Young was instructed to commence this work while a suitably qualified surveyor could be recruited to continue the work permanently.
- 1953/54—St Vincent. Cadastral surveys continued. Little cadastral re-survey work was possible owing to ad hoc surveys urgently required by SVG and carried out up to May 1954. The cadastral re-survey was postponed until trained staff were available. Five Vincentians were selected for the two-year survey training course in Trinidad. [Mr Young probably left St V. in mid-1954]. All trig computations were completed at DCS and lists prepared for issue.
- 1957—Mr Young visited St V. in May and Sep to advise on local surveys and do 25K field completion.
- 1962/63—The Grenadines. Tellurometer traversing & trig observed from St V. to Grenada by DOS/SVSD/RN. 115 stations built, 96 observed, 91 lines measured. Preliminary investigation of existing control in the Grenadines completed at DOS.
- 1964—The Grenadines computations were completed at DOS. Co-ords and heights computed for 121 stations. Two sets of co-ords were produced, one on St V. datum and the other on Grenada datum.
- 1965—A DOS surveyor spent one week in St V. assisting SVSD in premarking control for large scale mapping and measuring 11 Tellurometer lines to fix additional stations.
- 1971-73—St Vincent. A DOS field party of 4 surveyors established a dense network of fourth order traverse stations for cadastral purposes. A perime-

ter Tellurometer traverse, with a cross-island link, was observed to check the scale of the existing trig. Additional control was observed for the Kingstown 2.5K mapping. Photo control for 5K mapping of the west coast was observed. In all, some 700 new stations were established. Field revision was carried out for the 25K third edition mapping. During Nov 1971 the Soufriere volcano became active. DOS surveyors and geologists from Trinidad made periodic observations of the level of the crater lake and lava islands in it. Geodimeter observations were made between Chateaubelair and Soufriere to detect earth movements associated with recent eruptions. At DOS the perimeter Tellurometer traverse was computed, revealing inconsistencies in the scale of the existing network. DOS prepared to carry out a comprehensive re-adjustment of the main surveys observed since 1944/45 [but the re-adjustment was not done until the late 1970s].

- 1972-74—Grenadines. Extra control was established for 2.5K mapping in the islands. 65 new stations were fixed by EDM traverse and trig. On Mustique, existing Fairey Surveys control points were re-occupied by DOS; only one new station was required there. DOS computed final co-ords and provisional heights for Bequia, Mustique, Cannouan, Mayreau and Union islands.
- 1976/77—DOS computed provisional co-ords and heights for St V. from the 1972 fieldwork.
- 1978-80—St Vincent. Two DOS surveyors were detached from the St Lucia field party for a month to recce and photo-identify control for 2.5K mapping N of Kingstown and on the E coast.
- St Vincent and the Grenadines. DOS re-computed all surveys in one adjustment comprising 1528 observation equations in 416 unknowns. Final co-ords were produced for 209 points. Two further adjustments were carried out to incorporate the minor control and a final co-ordinate list of 1177 points was issued.
- 1980-82—The DOS Caribbean Map Revision/Field Completion team and an SVSD surveyor carried out field completion and 2.5K map revision in St Vincent and the Grenadines, plus 5K and 10K map revision on some islands of the Grenadines. Plan and height control for 2.5K mapping in the Grenadines was observed and then computed at DOS.
- 1982/83—2.5K field completion was completed on St Vincent and Union islands by two surveyors from DOS and SVSD. The DOS party closed down in 1983, SVSD continuing the field completion work.

Aerial Photography

DOS Contract no.	Year	Scale	Coverage
2	1950	18K	St Vincent
3	1951	14-18K	W & central St Vincent
RAF	1965	25K	The Grenadines
85	1966	6-12.5K	W & SE St V. and Mustique
RAF	1966	?	Partial coverage of the Grenadines
113	1970	12.5K	Central & E St Vincent
116	1971	20K	W St Vincent
116	1971	12.5K	The Grenadines
RAF	1972	20K	Partial coverage of St Vincent
RN	1972	?	Helicopter phy of Ronde and Bequia
163	1977	12.5K	W, S & E St Vincent
186	1981	25K	St Vincent
186	1981	12.5K	Bequia, Mustique and Union islands and parts of St Vincent

I believe that the RAF flew some photography in 1946 but I have no details.

DOS Mapping

Scale	Series	Year	Coverage
200K	?	?	St Vincent & the Grenadines
50K	DOS417	1961-91, 8 eds	St Vincent. Ed 8 has the St Vincent Grenadines on the reverse
50K	DOS417	1991	St V. Grenadines
25K	DOS317	1959-83, 5 eds	St Vincent in 2 sheets
25K	DOS344	1967-70	The Grenadines in 5(?) sheets; this was a dual scale series with DOS244
10K	DOS244	1967-70	The Grenadines in ? sheets; dual scale series with DOS344
10K	DOS217	1983-88	St V Grenadines in 5 sheets

I may have omitted some printed, large-scale editions from the 1970s. I have not attempted to summarise here any DOS geological and land use mapping of St Vincent and the Grenadines.

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