

# Grids & Datums

## REPUBLIC OF SIERRA LEONE

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"European contacts with Sierra Leone were among the first in West Africa. In 1652, the first slaves in North America were brought from Sierra Leone to the Sea Islands off the coast of the southern United States. During the 1700s there was a thriving trade bringing slaves from Sierra Leone to the plantations of South Carolina and Georgia where their rice-farming skills made them particularly valuable. In 1787 the British helped 400 freed slaves from the United States, Nova Scotia, and Great Britain return to Sierra Leone to settle in what they called the 'Province of Freedom.' Disease and hostility from the indigenous people nearly eliminated the first group of returnees. This settlement was joined by other groups of freed slaves and soon became known as Freetown. In 1792, Freetown became one of Britain's first colonies in West Africa. Thousands of slaves were returned to or liberated in Freetown. Most chose to remain in Sierra Leone. These returned Africans -- or Krio as they came to be called -- were from all areas of Africa. Cut off from their homes and traditions by the experience of slavery, they assimilated some aspects of British styles of life and built a flourishing trade on the West African coast. In the early 19th century, Freetown served as the residence of the British governor who also ruled the Gold Coast (now Ghana) and The Gambia settlements. Sierra Leone served as the educational center of British West Africa as well. Fourah Bay College, established in 1827, rapidly became a magnet for English-speaking Africans on the West Coast. For more than a century, it was the only European-style university in western Sub-Saharan Africa. The colonial history of Sierra Leone was not placid. The indigenous people mounted several unsuccessful revolts against British rule and Krio domination. Most of the 20th century history of the colony was peaceful, however, and independence was achieved without violence. The 1951 constitution provided a framework for decolonization. Local ministerial responsibility was introduced in 1953, when Sir Milton Margai was appointed Chief Minister. He became Prime Minister after successful completion of constitutional talks in London in 1960. Independence came in April 1961, and Sierra Leone opted for a parliamentary system within the British Commonwealth. Sir Milton's Sierra Leone Peoples Party (SLPP) led the country to independence and the first general election under universal adult franchise in May 1962." Significant political unrest has plagued the republic since then. (*Background Notes, U.S. Dept. of State, 2011*)

Slightly smaller than South Carolina, Sierra Leone is bordered by Guinea (652 km) and Liberia (306 km) (*PE&RS, March 2011*). With a coastline of 402 km, the terrain is comprised of a coastal belt of mangrove swamps, wooded hill country, upland plateau, and mountains in the east. The lowest point is the Atlantic Ocean (0 m), and the highest point is Loma Mansa (1,948 m). (*World Factbook, 2011*)

"An Anglo-French convention of June 28, 1882, delimited a bound-

ary between the territories of Sierra Leone and Guinea from the Atlantic Ocean inland along the drainage divide of the Great Scarcies and Melikhoure to an indefinite point in the interior. On August 10, 1889, France and the United Kingdom signed an arrangement extending the Guinea-Sierra Leone boundary northward to the 10<sup>th</sup> parallel and then eastward to the 13<sup>th</sup> meridian west of Paris (10° 39' 46.05" West of Greenwich). In order to determine the boundary between British and French spheres of influence west and south of the upper Niger river, an Anglo-French agreement of June 26, 1891, stated that the 13<sup>th</sup> meridian west of Paris was to be followed where possible from the 10<sup>th</sup> parallel to Timbuktu (the source of the Timbe or Niger). The boundary commissions were to keep both banks of the Niger in the French sphere, but the line could be deflected by agreement east or west of the meridian. A Franco-Liberian convention of December 8, 1892 delimited the western sector of the Guinea-Liberia boundary as the parallel of Timbuktu (9° 05' N.) to the 13<sup>th</sup> meridian west of Paris.

"An agreement of January 21, 1895 between the United Kingdom and France established the present Guinea-Sierra Leone boundary from the Atlantic Ocean to Timbuktu. The agreement stated that the sector from the 10<sup>th</sup> parallel to Timbuktu would follow the drainage divide or '*watershed separating the basin of the Niger on the one hand from the basins of the Little Scarcies and other rivers, falling westward to the Atlantic Ocean on the other hand.*' In accordance with the Anglo-French agreement of January 21, 1895 British and French commissions between December 1895 and May 1896 surveyed and demarcated the boundary as contained in a *proces-verbal* of April 9–30, 1896. The demarcation was accepted by the French and British Governments by notes exchanged at Paris on June 14 and 16, 1898. In accordance with *proces-verbaux* of March 12, 1903 the Guinea-Sierra Leone boundary was demarcated by pillars between Tembikundu and the 13<sup>th</sup> meridian west of Paris. The demarcation was approved by an exchange of notes between France and the United Kingdom on March 22 and April 5, 1904, respectively. In the meantime, on June 25, 1903 an Anglo-Liberian *proces-verba*/delimited the Liberia-Sierra Leone boundary as the 13<sup>th</sup> meridian west of Paris southward from the Wulafu (Ou Lafou) to the Mano river. A Franco-Liberian agreement of September 18, 1907 stated that it was physically impossible to apply the theoretical lines of their 1892 convention and that natural topographical lines should be used where possible. The agreement redrew the Guinea-Liberia boundary and transferred a large strip of Liberian territory to French Guinea. In implementation of the 1907 agreement, a commission delimited the boundary as approved by a second agreement on January 13, 1911. Located between the Makona and Mauwa rivers to the east of the 13<sup>th</sup> parallel west of Paris, the Liberian Kailahan area was transferred to Sierra Leone by

continued on page 109

an Anglo-Liberian convention of January 21, 1911. The transfer of the area moved the tripoint with French Guinea eastward to the left bank of the Makona and the center of the Dundugbia. By an exchange of notes on July 6, 1911, the United Kingdom and France agreed to extend the Guinea-Sierra Leone boundary to the tripoint with Liberia by utilizing the Wulafu, Meli, and Makona rivers. An Anglo-French agreement of September 4, 1913 reconfirmed the 1903 demarcation east of Timbekundu and delimited in detail the present Guinea-Sierra Leone boundary from the Wulafu to the Liberian tripoint on the left bank of the Makona at the center of the Dundugbia" (*Guinea – Sierra Leone Boundary, International Boundary Study No. 136 – July 2, 1973, U.S. Department of State*).

"An Anglo-Liberian convention of November 11, 1885, established the Mano river as the boundary between Sierra Leone and Liberia from the Atlantic Ocean to a somewhat indefinite point in the interior. To the north a *proces verbal* of June 25, 1903 demarcated a line from the right bank of the Wulafo (Ou Lafou), at the point where the 13<sup>th</sup> meridian west of Paris intersects the river, and then followed this meridian to the Mano. A Franco-Liberian agreement of September 18, 1907, indicated it was physically impossible to apply the theoretical lines of their boundary convention of December 8, 1892 and that as far as possible natural topographical lines should be used to prevent future disputes. Article I of the 1907 agreement stated that the Franco (Guinean)-Liberian boundary would begin at *'The left bank of the Makona River, from the point where that river enters Sierra Leone to a point to be determined, approximately five kilometers south of Bofosso.'* Thus the sector formerly a part of the Liberia-Sierra Leone boundary between the Oudalfou and Makona became a part of the Guinea-Sierra Leone boundary. An Anglo-Liberian convention of January 21, 1911, readjusted the northern and southern parts of the 1903-meridian sector of the Liberia-Sierra Leone boundary in accordance with natural features and tribal divisions. In the north the Kailahun area east of the meridian between the Makona and Mauwa was transferred by Liberia to Sierra Leone in exchange for an area west of the meridian between the Morro and Mano. Article 1 of the 1911 convention affords the transfer of territory as follows:

- (a.) The line marking the western boundary of the Republic shall start from the meeting point on the Moa River of the Tengea and Kunyo sections of the Kissi country, and shall be continued in a southerly direction to a point on the Maia River, so that it corresponds, between these two points, with the western boundary of the Tengea section and the eastern boundaries of the Kunyo and Tungi sections of that country.
- (b.) From this point the boundary shall follow the course of the Maia, Makwoi, and Mauwa Rivers to the point where the Mauwa River intersects the provisional line laid down by the Anglo-Liberian Boundary Commission of 1902-3.
- (c.) From this point the boundary shall follow the provisional line mentioned above until it reaches the point where that line meets the Morro River.
- (d.) From this point the boundary shall follow the Morro River to the junction of that river with the Mano River.
- (e.) From this point the boundary shall follow the provisional line to the sea-coast.

In accordance with the 1911 convention, a demarcation of the boundary between the Makona and Mauwa by a joint commission in 1913–14 was approved by an agreement of June 19-26, 1917.

An exchange of notes between Liberia and the United Kingdom on January 16-17, 1930 approved a later demarcation of the meridian boundary between the Mauwa and Morro" (*Liberia – Sierra Leone Boundary, International Boundary Study No. 129 – October 13, 1972, U.S. Department of State*).

Among the coordinate systems utilized in the country are the Sierra Leone Colony Datum of 1924 with origin point at Kortright where:  $\Phi_0 = 08^\circ 28' 44.4''N$ ,  $\Lambda_0 = 13^\circ 13' 03.81''W$ , and the reference ellipsoid was the War Office (or McCaw) where:  $a = 20,926,201$  feet,  $\kappa_f = 296$ , and the Grid system was the Colony Coordinates or New Sierra Leone Peninsula Transverse Mercator where the Central Meridian,  $\lambda_0 = 12^\circ 00'W$ , the Latitude of Origin,  $\Phi_0 = 6^\circ 40'N$ , Scale Factor at Origin,  $m_0 = \text{Unity}$ , False Easting = 500,000 feet, and False Northing = Nil (*Private communication to Adam I. Alimi from Russell D. Fox, Overseas Surveys Directorate, Ordnance Survey, 13 April 1988*). According to John W. Hager, this Grid has also been used with a False Easting = 166,666.66 Yards.

The Sierra Leone Datum of 1960 origin point is at SLX2 Astro station where:  $\Phi_0 = 08^\circ 27' 17.567''N$ ,  $\Lambda_0 = 12^\circ 49' 40.186''W$ , reference azimuth,  $\alpha_0 = 142^\circ 41' 34.5''$ , and the reference ellipsoid was the Clarke 1880 where:  $a = 6,378,249.145$  meters,  $\kappa_f = 293.465$ , and the Grid system was the UTM where the Central Meridian,  $\lambda_0 = 12^\circ W$ .

Precise Ephemeris Doppler fixes were observed at four existing trigonometrical stations in Sierra Leone during 1984 as part of the African Doppler Survey (ADOS), a project initiated by the International Association of Geodesy and the African Cartographic Association. The following lists the results and, for comparison, the corresponding Sierra Leone 1960 Datum positions: ADOS stn # ASL001, Local stn # 62-X-2, Mile 6 Village, (WGS72 Datum):  $\phi = 08^\circ 20' 31.268''N$ ,  $\lambda = 12^\circ 59' 08.727''W$ ,  $h = 63.2$  m, (Sierra Leone Datum 1960):  $\phi = 08^\circ 20' 30.993''N$ ,  $\lambda = 12^\circ 59' 07.608''W$ ,  $H = 29.0$  m; ADOS stn # ASL002, Local stn # DOS 4, Kabala Town, (WGS72 Datum):  $\phi = 09^\circ 34' 45.254''N$ ,  $\lambda = 11^\circ 33' 41.228''W$ ,  $h = 564.4$  m, (Sierra Leone Datum 1960):  $\phi = 09^\circ 34' 45.354''N$ ,  $\lambda = 11^\circ 33' 40.223''W$ ,  $H = 530.6$  m; ADOS stn # ASL003, Local stn # 71-X-1, Kailahun Rest House, m (WGS72 Datum):  $\phi = 08^\circ 16' 22.103''N$ ,  $\lambda = 10^\circ 34' 19.965''W$ ,  $h = 358.5$ , (Sierra Leone Datum 1960):  $\phi = 08^\circ 16' 21.831''N$ ,  $\lambda = 10^\circ 34' 19.053''W$ ,  $H = 325.2$  m; ADOS stn # ASL004, Local stn # 118-X-2, Kwaje, (WGS72 Datum):  $\phi = 06^\circ 59' 31.112''N$ ,  $\lambda = 11^\circ 28' 13.849''W$ ,  $h = 100.0$  m, (Sierra Leone Datum 1960):  $\phi = 06^\circ 59' 30.467''N$ ,  $\lambda = 11^\circ 28' 12.887''W$ ,  $H = 68.0$  m" (*op. cit., Adam I. Alimi, Russell D. Fox, 1988*).

"Survey Beacon SLS 28/57/107 at  $\phi = 07^\circ 58' 01''N$ ,  $\lambda = 11^\circ 47' 38''W$ . This position was scaled from a large scale map and is listed as the origin of the Grid where FN = 80,000 feet, and FE = 40,000 feet. This position appears to be in the neighborhood of Bo" (*Personal communication - John W. Hager, 7 December 2011*).

*Technical Report 8350.2* lists the 3-parameter transformation **from** Sierra Leone Datum of 1960 **to** WGS84 as:  $\Delta X = -88$  m,  $\Delta Y = +4$  m,  $\Delta Z = +101$  m.



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