

This material is taken from Chapter 10 “Map Projections and State Plane Coordinates” of The 3-D Global Spatial Data Model: Foundation of the Spatial Data Infrastructure by Earl F. Burkholder and published by CRC Press in 2008.

Sidebar (Relationship between the Meter, the International Foot, and the U.S. Survey Foot):

1. The length of the meter was established as 1/10,000,000 of the distance from the Equator to the North Pole as determined by a geodetic survey in France in the 1790's. Alder (2002) provides a fascinating account of that effort.
2. In the early 1800's, prototype meter bars were made and distributed to the nations of the world.
3. Although the meter has been used as the standard of length for geodetic surveys in the USA since establishment of the Coast Survey (predecessor to the NGS) in 1807, the meter length unit was declared legal for trade in the U.S. in 1866. The relationship between the foot and meter was stated in 1866 to be 39.37 inches = 12.00 meters exactly.
4. Leading up to and during World War II; Canada, the USA, and Great Britain each used a slightly different relationship between the foot and meter.

US:	1.00 meter = 39.37 inches	or 1 inch = 2.540005 cm
England:		1 inch = 2.539997 cm
Canada:		1 inch = 2.540000 cm

5. Following WWII, NATO aircraft mechanics discovered that parts of aircraft engines built according to the same blueprints were not interchangeable due to differences in unit definitions. A compromise was reached that adopted the Canadian relationship (1 inch = 2.54 centimeters) as the International Foot (1 foot = 0.3048 meters).
6. However, to avoid recomputing and republishing thousands of existing state plane coordinates, the U.S.A. retained use of 12 meters = 39.37 feet and gave that long standing relationship a name, the U.S. Survey Foot. A Federal Register Notice (24 FR 5348) published in 1959 stated that the U.S. Survey Foot should be used “until such time as it becomes desirable to readjust the basic geodetic networks in the United States, after which the ratio of a yard, equal to 0.9144 meter, shall apply” (emphasis added).
7. In 1960 the Eleventh General Conference of Weights and Measures redefined the meter, but not the length. The redefinition made it possible to duplicate the 1.00 meter distance in terms of wavelengths of Krypton 86 gas instead of relying

upon the distance between two marks on a prototype bar.

8. The definition of the length of the meter was changed again in 1983 – this time in terms of the distance light would travel in a vacuum in 1/299,792,458 seconds. The new definition is the equivalent to saying that light travels 299,792,458 meters in one second.

Although the definition used for duplicating the length of the meter has evolved over the years, the fundamental unit of length has not changed. The relationship of 12.00 meters = 39.37 feet has existed in the United States for over 100 years. The name “U.S. Survey Foot” was developed in 1959 to describe the relationship already in existence. “International Foot” is the name given to the relationship used before 1959 by Canada (1 foot = 0.3048 meters) and adopted for use around the world (except for surveying and mapping in the United States). Neither the U.S. Survey Foot nor the International Foot is part of the International System of Units (SI) adopted by the 11th General Conference on Weights and Measures in 1960. Although the GSDM is based exclusively on metric units, each user has the option of specifying linear units of choice when displaying or printing P.O.B. results when using the BURKORD™ software and the underlying 3-D data base,

When the NAD27 datum was readjusted and published as the NAD83, the legislative intent was for the International Foot to be used as an alternate to meters. Recognizing that, a number of states included the International Foot in the state plane coordinate legislation written and adopted to accommodate the NAD83. Other states objected and ultimately won. A notice published in the Federal Register on May 16, 1998, closes by saying, “The effect of this notice is to allow the U.S. Survey Foot to be used indefinitely for surveying and mapping in the United States. No other part of the 1959 notice is in any way affected by this notice.” The NGS still uses meter units for all geodetic surveying operations.

The upshot is that NAD83 state plane coordinates in the United States may be meters, U.S. Survey Feet, or International Feet. Units for the GSDM are strictly metric. Provision is made for other derived units in the P.O.B. Datum option in which the user may select any linear units for output. It is intended that the underlying ECEF coordinates will always be metric when using the GSDM.

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