USGS
science for a changing world

SUPPLEMENTAL TECHNICAL INSTRUCTIONS

Supplement Number	Date Issued
98-1	10/23/97

National Mapping Division

SUBJECT

Reference System Treatment for Map Products of the National Mapping Program

BACKGROUND

Since 1979, the Supplemental Technical Instructions (STI) listed below were issued to document the reference systems used on standard National Mapping Program maps. ***This STI supersedes STI 94-10 and all of the listed STI's except STI 93-4-D.***

- STI 79-6-C (June 26, 1979) specified the projection and Universal Transverse Mercator (UTM) grid treatment. The grid was to be shown by full lines (vice ticks) on new and many revised maps. STI 94-10 reversed the practice, replacing the full-line grid with ticks.

- STI 82-2-C (April 22, 1982) modified the provisions of STI 79-6-C. New Orthophotoquads were to be cast on the UTM projection in those States where metric mapping had been approved.

- STI 83-6-C (December 27, 1983), STI 90-1-C (January 16, 1990), STI 91-3-C (May 30, 1991), and STI 92-2-C (August 11, 1992) provided instructions for showing State Plane Coordinate System (SPCS) grids.

- STI 89-2-C (September 5, 1989) implemented the use of the North American Datum of 1983 (NAD 83). STI 92-1-C (January 22, 1992) replaced STI 89-2-C and provided instructions for showing collar ticks and notes referencing the horizontal datums. STI 93-4-D replaced 92-1-C and provides additional specific instructions for transition to NAD 83.

Some map users have expressed valid reasons for restoring the full-line UTM grid on primary series maps. With a full-line grid any point on a 1:24,000-scale map can be visually located within a 1000 meter grid square without any special equipment, an advantage in emergency response and rescue operations. The use of Global Positioning System equipment to easily and precisely orient oneself with respect to mapped features, which is an increasingly utilized technology, is enhanced by a full-line UTM grid. The USGS is aware that there are users who object to the full-line grid, but has determined that the advantages of showing the grid outweigh the disadvantages, particularly as our paper maps are increasingly used for ground position applications. This STI reinstates the use of a full-line UTM grid for all primary series maps other than those published under the joint U.S. Geological Survey/Forest Service single edition specifications.

INSTRUCTIONS

Projection: Use the map projection specified in Table 1.

UTM: Show the UTM grid by full-line, as specified in Table 1. Show the

grid at the interval specified in Table 2.

SPCS: Determine the appropriate SPCS unit of measurement for each State from Table 1; and Table 3 for primary series maps on NAD 83. Show by ticks in all cases; use the interval specified in Table 2. Show ticks for secondary and other zones based on the following area criteria:

- Maps at 1:63,360 scale and larger - show for all mapped areas, regardless of size.
- Maps at scales smaller than 1:63,360 but larger than 1:250,000 - show for mapped areas larger than 25 square miles.
- Maps at 1:250,000 scale - show for mapped areas larger than 150 square miles.

APPLIES TO

All National Mapping Program standard series map products.

ISSUED TO

EDC, MAC, MCMC, RMMC, and WMC.

APPROVED BY

Kathryn R. Clement
Senior Program Advisor, Data Production and Integration

Table 1

REFERENCE SYSTEM TREATMENT
FOR MAP PRODUCTS OF THE NATIONAL MAPPING PROGRAM

PRODUCT	ACTION	DATUM[1]	PROJECTION	UTM[2]	SPCS
Quadrangle 1:12,000 Orthophoto Quarter Quad	New or Replacement	NAD 83	UTM	Full-line	Meters
Quadrangle 1:20,000 1:24,000 or 1:25,000 1:63,360 Topographic, Topographic/ Bathymetric, Orthophotomap, or Orthophotoquad Editions	New or Replacement	NAD 83	UTM	Full-line[10]	Feet or Meters[4]
		Other[3]	UTM	Full-line[10]	Feet
	Standard update	NAD 83	UTM	Full-line[10]	Feet or meters[4]
		Other	Existing	Full-line[10]	Feet
	Limited update	NAD 83	UTM	Full-line[10]	Feet or Meters[4]
		Other	Existing	Full-line[10]	Feet
	Minor revision reprint	NAD 83	UTM	Full-line[10]	Feet or meters[4]
		Other	Existing	Full-line [5]	Feet
	As-is reprint	Existing	Existing	Existing	Existing
Quadrangle 1:62,500[6]	As-is reprint	Existing	Existing	Existing	Existing
Quadrangle 1:100,000 1:250,000	New or Replacement	NAD 83	UTM	Full-line	Meters
	Conversion[7]	Existing	Existing	Full-line	Meters
	Revision	Existing	Existing	Full-line	Meters
	Standard reprint	Existing	Existing	Existing[8]	Existing
	As-is reprint	Existing	Existing	Existing	Existing

Table 1

REFERENCE SYSTEM TREATMENT
FOR MAP PRODUCTS OF THE NATIONAL MAPPING PROGRAM

PRODUCT	ACTION	DATUM[1]	PROJECTION	UTM[2]	SPCS
County, National Park[9], and State Maps 1:50,000 1:100,000 1:500,000 (do not show SPCS)	New or Replacement	NAD 83	UTM	Full-line	Meters
	Revision	Existing	Existing	Full-line	Meters
	Standard re-print	Existing	Existing	Existing[8]	Existing
	As-is reprint	Existing	Existing	Existing	Existing

1. Supplemental Technical Instruction 93-4-D defines horizontal datum use for map products.
2. Based on the Clarke 1866 ellipsoid for maps cast on NAD 27 and on the GRS 80 ellipsoid for maps cast on NAD 83.
3. Orthophotoquads only if the corresponding existing line map is cast on a datum other than NAD 83
4. See Table 3 for State-by-State instructions.
5. Convert existing UTM grid ticks to full-line grid; add full-line grid if there is no existing UTM grid.
6. Special set of “100" maps only.
7. Conversion of 1:100,000-scale planimetric edition quadrangles to topographic edition.
8. If there is no existing UTM grid, add a full-line grid, except Forest Service single edition maps.
9. Various other scales were used on early editions.
10. Forest Service single edition maps to portray UTM grid with blue ticks.

Table 2

REFERENCE SYSTEM SPACING

MAP SCALE	SPCS SPACING			UTM SPACING		
	Ground Distance	Map Distance		Ground Distance	Map Distance	
		Inches	mm		Inches	mm
1:10 000	1 000 m 5 000 ft	3.94 6.0	100.1 152.4	1 000 m	3.94	100.0
1:12 000	1 000 m 5 000 ft	3.28 5.00	83.3 127.0	1 000 m	3.28	83.3
1:20 000	2 500 m 10 000 ft	4.92 6.0	125.0 152.4	1 000 m	1.97	50.0
1:24 000	2 500 m 10 000 ft	4.10 5.0	104.1 127.0	1 000 m	1.64	41.6
1:25 000	2 500 m 10 000 ft	3.94 4.8	100.1 122.0	1 000 m	1.57	40.0
1:50 000	5 000 m 20 000 ft	3.94 4.8	100.1 122.0	5 000 m	3.94	100.0
1:62 500	5 000 m 20 000 ft	3.15 3.84	80.0 97.5	5 000 m	3.15	80.0
1:63 360	5 000 m 20 000 ft	3.11 3.78	79.0 96.0	5 000 m	3.10	78.7
1:100 000	10 000 m 25 000 ft	3.94 6.0	100.1 152.4	10 000 m	3.94	100.0
1:250 000	25 000 m 100 000 ft	3.94 4.8	100.1 122.0	10 000 m	1.57	40.0
1:500 000	----	--	--	50 000 m	3.94	100.0

Table 3

UNIT OF MEASUREMENT FOR SPCS UNITS ON NAD 83

STATE[1]	SPCS UNITS	STATE	SPCS UNITS	STATE	SPCS UNITS
Alabama	U.S. Survey Foot	Louisiana	U.S. survey Foot	Ohio	Meters
Alaska	Meters	Maine	Meters	Oklahoma	U.S. Survey Foot
Arizona	Meters	Maryland[2]	U.S. Survey Foot	Oregon	Meters
Arkansas	U.S. Survey Foot	Massachusetts	U.S. Survey Foot	Pennsylvania	Meters
California	U.S. Survey Foot	Michigan	U.S. Survey Foot	Rhode Island	U.S. Survey Foot
Colorado	U.S. Survey Foot	Minnesota	U.S. Survey Foot	South Carolina	International Foot
Connecticut	U.S. Survey Foot	Mississippi	Meters	South Dakota	U.S. Survey Foot
Delaware	U.S. Survey Foot	Missouri	U.S. Survey Foot	Tennessee	U.S. Survey Foot
Florida	Meters	Montana	Meters	Texas	U.S. Survey Foot
Georgia	U.S. Survey Foot	Nebraska	U.S. Survey Foot	Utah	Meters
Hawaii	U.S. Survey Foot	Nevada	Meters	Vermont	Meters
Idaho	U.S. Survey Foot	New Hamp-shire	U.S. Survey Foot	Virginia	Meters
Illinois	U.S. Survey Foot	New Jersey	Meters	Washington	Meters
Indiana	Meters	New Mexico	Meters	West Virginia	Meters
Iowa	Meters	New York	Meters	Wisconsin	Meters
Kansas	Meters	North Carolina	Meters	Wyoming	U.S. Survey Foot
Kentucky	U.S. Survey Foot	North Dakota	Meters		

1. Label the grid reference systems for Puerto Rico and the Virgin Islands in meters.
2. Includes District of Columbia.