

The US National Grid (USNG): A Simple and Powerful Geospatial Tool

Information Sheet 4 in this series.

FGDC-STD-011-2001

From www.fgdc.gov/usng

The Problem. In a time of growing location based services (i.e. Global Positioning System, etc.), need to support homeland security/emergency services, the general public, and commercial activities with better geospatial information capabilities, we had no standard, nationally consistent map grid. *For example:* Washington, DC maps for consumers. - 35 maps, 30 different atlas grids. - Same street names, but different grids, none of which work with GPS. - No universal map index.



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The Solution. US National Grid (USNG).

This standard established a nationally consistent grid reference system, just as all street maps use a common set of street names. USNG provides a seamless plane coordinate system across jurisdictional boundaries and map scales; it enables precise position referencing with GPS, web map portals and hardcopy maps. Unlike latitude and longitude, the USNG is *simple* enough that it can be taught and effectively used at the 5th grade level. It enables a practical system of *geoadresses* and the *universal map index*.

Point of Interest	Street Address	USNG Grid:	Telephone:
		18S UJ	(202)
Subway Sandwich & Salads	2030 M St., NW	2256 0826	223-2587
Subway Sandwich & Salads	1412 Good Hope Rd., SE	2781 0387	889-5888
Subway Sandwich & Salads	3504 12 th St., NE	274 112	526-5999
Subway Sandwich & Salads	1500 Benning Rd, NE	2815 0757	388-0421

Three purposes of the USNG on larger-scale maps:

- Provide a N-S baseline for measuring direction.
- Provide visual scale and to measure distance.
- Provide a standard XY convention to describe locations.

→ *Organization and abbreviation of a USNG grid value.*

Complete USNG value: 18S UJ 2337 0651 - World wide unique.

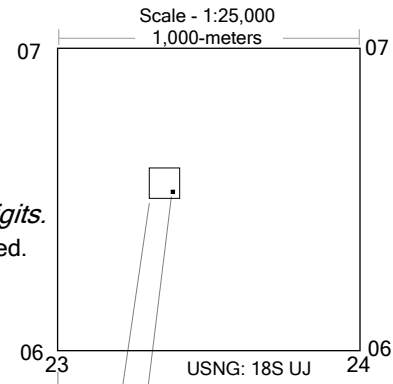
Without Grid Zone Designation (GZD): UJ 2337 0651 - Regional areas.

Without GZD and 100,000-m Square ID: 2337 0651 - Local areas.

A flexible reference system: Use the precision you require, truncate insignificant digits.
2 to 10-digits -- each additional digit pair improves precision by an order of magnitude squared.

How we graph locations with the grid: Read *right*, then *up*.

Locating the Jefferson Pier at: 18S UJ 23371 06519



Four digits: 23 06 Locating a point within a 1,000-m square.
Requires two more characters than the classic atlas grid (i.e. A3), yet seamlessly ties into a standards based, globally extent, locally optimized grid reference system.

Six digits: 233 065 Locating a point within a 100-m square (football field size).
Think, "23.3 06.5" Another digit pair guides the eye to 1% of the 1,000-m grid square.

Eight digits: 2337 0651 Locating a point within a 10-m square (modest size home).
Adding another digit pair allows easy measurable, discrimination of 1 / 10,000 of the grid square.
This is too precise for visual estimation, but is easily and accurately measured with a Romer Scale.

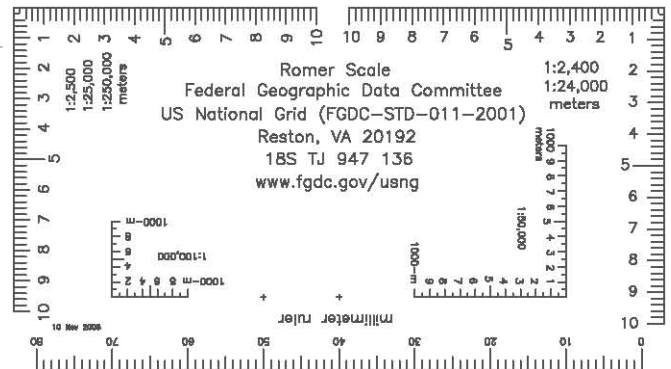
Ten digits: 23371 06519 Locating a point within a 1-m square (manhole cover size).
Another pair of digits allows discrimination of 1 / 1,000,000 of the grid square.
This is far too precise for measurement on a map of this scale.
It is useful on maps larger than ~ 1:5,000 using a Romer Scale.

- The USNG enables a nationally consistent language of location, optimized for local applications.
6 and 8-digit grids: The most commonly used formats in a local setting.



Consumer GPS receivers (<\$100) can locate a USNG point position to within 4-meters half of the time, and to within 8-meters 95% of the time.

Examples of use include in New Orleans, LA during Hurricane KATRINA response, and adoption by Skagit County, WA, Clark County, CO, the State of Florida, FEMA Urban Search and Rescue (US&R), USGS, Census Bureau, DoD, Garmin, Magellan GPS, ESRI, Delorme, and others.



<http://www.fgdc.gov/usng>

Example Points of Interest (POI) Map Index: Washington, DC

Edition: November 6, 2006

This POI Map Index provided for demonstration purposes. Grid values obtained from Washington, DC GIS web site: <http://dcatlas.dcgis.dc.gov/mar/>

#	Point of Interest	Street Address	USNG Grid: 18S UJ	Telephone: (202)
1	National Geographic Society	1145 17 th St., NW	2327 0823 233 082	857-7000
2	Typical Residence	1717 Willard St., NW	2321 0948	
3	National Postal Museum	2 Massachusetts Ave., NE	2585 0739 259 074	633-5555
4	National Building Museum	401 F St., NW	2503 0736 250 074	272-2448
5	DC World War Memorial	Independence Ave. SW	2276 0628	
6	President Franklin Delano Roosevelt	Pennsylvania Ave., NW	24502 06903	
7	Subway Sandwich & Salads	3801 Nebraska Ave NW, Nebraska Ave Complex, Bldg 14	1935 1213	362-8992
8	Subway Sandwich & Salads	5028 Wisconsin Ave NW	1947 1390	686-9870
9	Subway Sandwich & Salads (Per Subway web site.)	Federal Bldg #2, Box 2029, Food Court, Washington DC	204 042	(703) 920-7916
10	Subway Sandwich & Salads	800 21st Street NW, Marvin Center Loading Dock	2247 0766	994-1801
11	Subway Sandwich & Salads	2033 K St NW	2255 0801	833-1363
12	Subway Sandwich & Salads	2030 M St NW	2256 0826	223-2587
13	Subway Sandwich & Salads	2010 P St NW	2265 0871	530-0698
14	Subway Sandwich & Salads	2469 18th St NW	2296 1013	667-2251
15	Subway Sandwich & Salads	1129 18th St NW	2298 0822	862-9840
16	Subway Sandwich & Salads	1776 G St NW	2299 0743	898-0520
17	Subway Sandwich & Salads	1666 K St NW	2327 0789	223-8720
18	Subway Sandwich & Salads	1444 I St NW	2373 0775	289-4301
19	Subway Sandwich & Salads	1401 K St NW	2377 0796	898-5784
20	Subway Sandwich & Salads	1100 New York Ave NW	2418 0771	289-7709
21	Subway Sandwich & Salads	1201 Tuckerman Street NW	2431 1513	291-7800
22	Subway Sandwich & Salads	709 H St., NW	2462 0762	842-2273
23	Subway Sandwich & Salads	406 1st St., SE	2604 0590	547-7827
24	Subway Sandwich & Salads	430 8th St., SE	2698 0567	547-8200
25	Subway Sandwich & Salads	3504 12th St NE	274 112	526-5999
26	Subway Sandwich & Salads	1213 Brentwood Rd NE	2752 0980	529-8206
27	Subway Sandwich & Salads	1412 Good Hope Rd SE	2781 0387	889-5888
28	Subway Sandwich & Salads	1500 Benning Rd NE, Hechinger Mall	2815 0757	388-0421
29	Subway Sandwich & Salads	3950 Minnesota Ave NE	3090 0687	398-3222
30	Subway Sandwich & Salads	4518 Benning Rd SE	3203 0624	575-2889

Inclusion of any specific commercial POI in this example list does not imply endorsement by any government organization.

Washington, DC

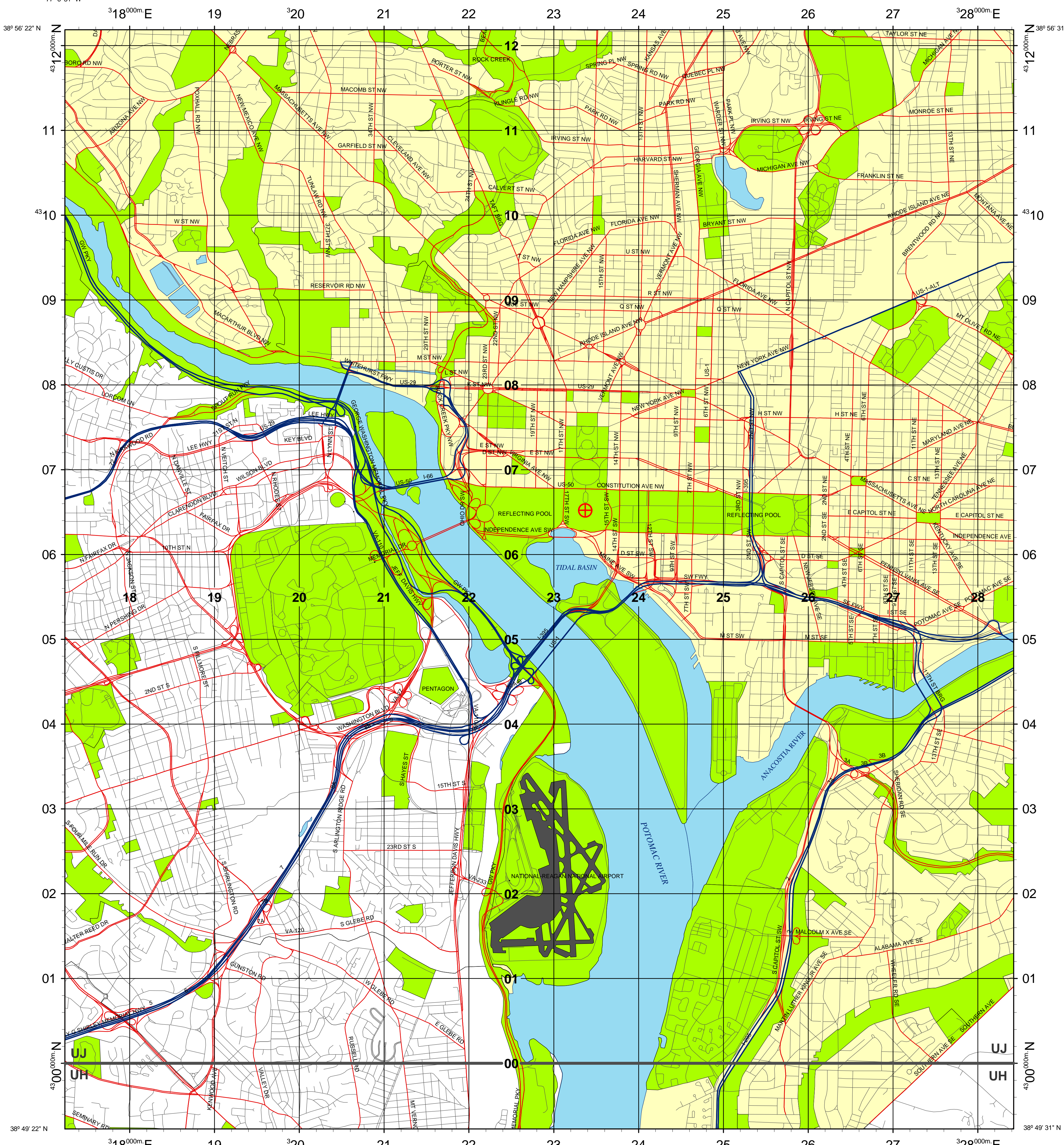
(USNG Demonstration Map)


76° 58' 47" W

77° 6' 31" W

38° 56' 22" N

38° 56' 31" N

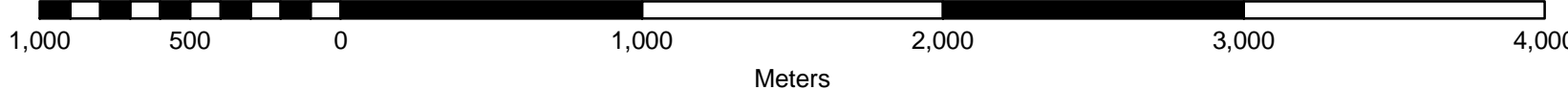


Jefferson Pier in Washington, DC 
18S UJ 2337 0652

1000-meter grid, US National Grid
North American Datum 1983
Grid Zone Designation 18S
100,000-m Square Identification: UJ, UH

U.S. National Grid	
100,000-m Square ID	
UJ	4300
UH	
Grid Zone Designation	18S

Scale:
1:24,000 (printed size: 21 x 27 inches)
1:61,000 (printed size: 8.5 X 11 inches)



2006 G-M Angle
9° 30' W (169 mills)

Grid Convergence
1° 17' (23 mills)

To convert a grid azimuth to a magnetic azimuth add G-M angle.

To convert a magnetic azimuth to a grid azimuth subtract G-M angle.



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For additional information:
see www.fgdc.gov/usng/index.html

Washington_DC_USNG_Demo_V3

Reading US National Grid (USNG) Coordinates: "Read right, then up."

Information Sheet 5 in this series.

FGDC-STD-011-2001

From www.fgdc.gov/usng

The example below locates the Jefferson Pier at USNG: 18S UJ 23371 06519.

U.S. National Grid	
100,000-m Square ID	
UJ	⁴³ 00
UH	
Grid Zone Designation	18S

A USNG value has three components.

Some maps may give this leading information in a grid reference box.

Grid Zone Designation (GZD):

6° longitude zone x 8° latitude band.

100,000-m Square Identification:

18S UJ 2337 0651

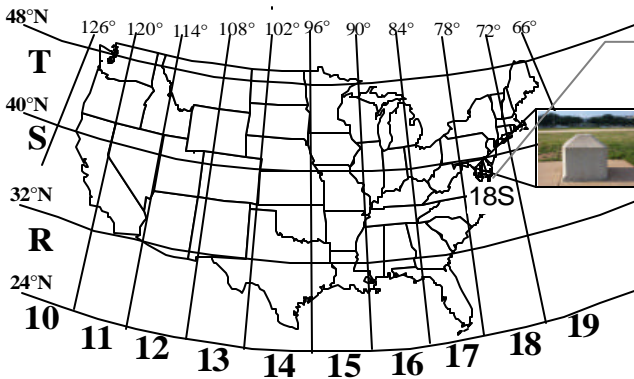
Grid Coordinates:

Read right, then up.

"Read right, then up."

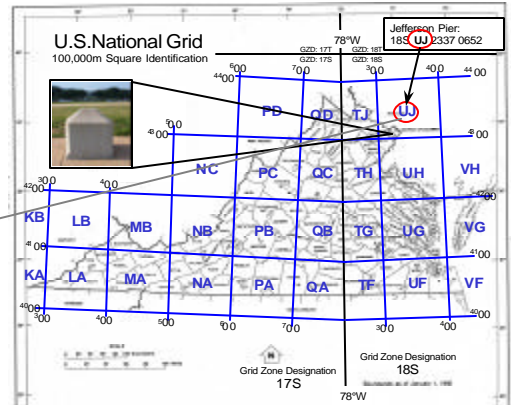
USNG values have three components as seen above. The GZD gives a USNG value world-wide context with 60 longitudinal zones each 6° wide. Zones 10 - 19 cover the conterminous US as seen below left. Zones are divided into 8° latitudinal bands. Together these make up Grid Zone Designations (GZD). Example: 18S

U TTM/USNG Grid Zone Designations



Example:

18S UJ

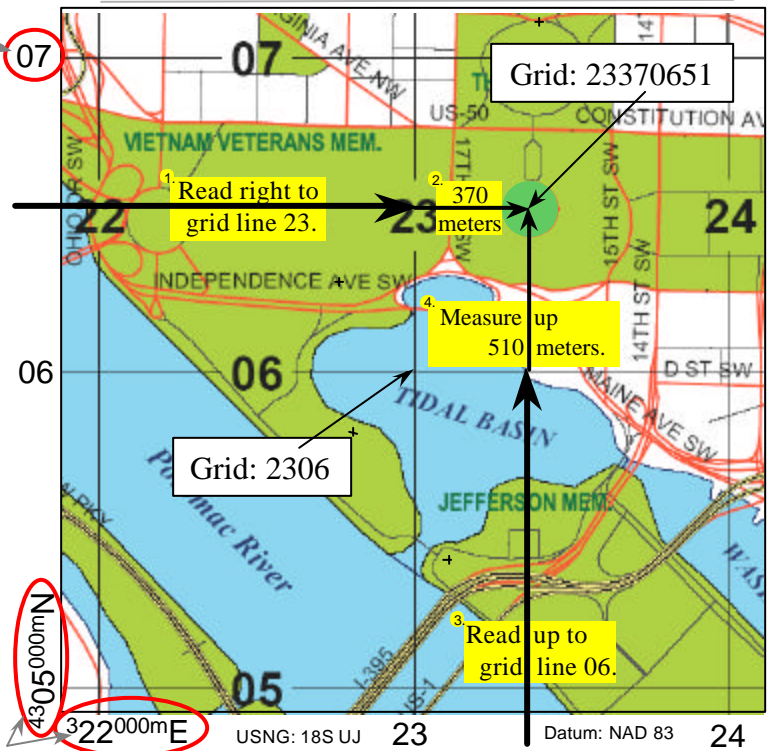


GZDs are further subdivided into large squares with 100,000-m Square Identifications. In this example, the Jefferson Pier is located in UJ. These squares are organized and labeled so they do not repeat themselves but every 18°, which is approximately 1,000 miles in the mid-latitudes. This ensures a given value such as UJ 2337 0651 is unique out of the entire state it is located in, as well as all surrounding states with the exception of Alaska.

1,000-m grid lines are identified by **Principal Digits**. Ignore the small superscript numbers like those in the lower left corner of this map.

Reading USNG Grid Coordinates.

- Coordinates are always given as an even number of digits (i.e. 23370651).
- Separate coordinates in half (2337 0651) into the easting and northing components.
- 1. Read right to grid line 23. 2. Then measure right another 370 meters. (Think 23.37)
- 3. Read up to grid line 06. 4. Then measure up another 510 meters. (Think 06.51)



Grid:	Examples:	
228 058	FDR Memorial:	+
231 054	George Mason Memorial:	+
2338 0710	Zero Milestone:	+
2275 0628	DC War Memorial:	+
213 017	Ft. Scott Park:	

UTM format.

USNG: 18S UJ 23 06 Datum: NAD 83 24

Ignore the small UTM superscript numbers that are provided for reference purposes. UTM numerical values are best suited for determining direction and distance as in surveying. USNG alpha-numeric values are best suited for describing particular locations because they can be given as only grid coordinates and with only the precision required for a particular task.