A Proposal for a Project to Develop a New Standard

1. Source of the Proposed Project:
Federal Geographic Data Committee

1.1 Title:
United States National Grid

1.2 Date Submitted:
October 24, 2006

1.3 Proposer(s):
INCITS L1

2. Process Description for the Proposed Project:
This project is proposed as a Fast Track process as it is based on Federal Geographic Data Committee (FGDC) US National Grid (FGDC-STD-011-2001) standard. No original development work is required at this time as the standard was already developed through the FGDC's standards development process.

2.1 Project Type (Development or Revision)
D

2.2 Type of Document:
Standard

2.3 Definitions of Concepts and Special Terms:
The concepts and special terms used in this standard have already been developed and have been in use for some years. Most of the basic concepts were developed by the late 1940's.

2.4 Expected Relationship with Approved Reference Models, Frameworks, Architectures, etc.:
This standard will be based on the Federal Geographic Data Committee (FGDC) standard, which is identified as a preferred Federal standard in the current Geospatial Profile of the Federal Enterprise Architecture (version 1.1, January 2006). As such it is consistent with all the geospatial standards work being done by INCITS L1 in close coordination with the FGDC. It is also consistent with the revision work for INCITS 61, Representation of Geographic Point Locations for Information Interchange where U.S. National Grid coordinates are being included.

2.5 Recommended INCITS Development Technical Committee (Existing or New):
Existing – L1 Geographic Information Systems

2.6 Anticipated Frequency and Duration of Meetings:
No development meetings are expected in this fast track process.

2.7 Target Date for Initial Public Review (Milestone 4):
1 August 2006

2.8 Estimated Useful Life of Standard or Technical Report:
At least 10 years. (See 3.2 for a further discussion of the useful life estimate.)

3. Business Case for Developing the Proposed Standard or Technical Report

3.1 Description:
This standard defines a preferred U.S. National Grid (USNG) for mapping applications at scales of approximately 1:1,000,000 and larger. It defines how to present Universal Transverse Mercator (UTM) coordinates at various levels of precision. It specifies the use of those coordinates with the grid reference system defined by the Military Grid Reference System (MGRS). Additionally, it addresses specific presentation issues such as grid spacing. The UTM coordinate representation, the MGRS grid, and the specific grid presentation requirements together define the USNG.

3.2. Existing Practice and the Need for a Standard:
The objective of this standard is to create a more favorable environment for developing location-based services within the United States and to increase the interoperability of location services appliances with printed map products by establishing a nationally consistent grid reference system as the preferred grid for National Spatial Data Infrastructure applications.

There are a number of coordinate reference systems that can be used either in location service appliances or on printed maps for the purpose of establishing a location. Within automated location service appliances, the conversion of coordinates based on one well-defined reference system to coordinates based on another can be both automatic and transparent to the user. These devices can support multiple coordinate reference systems with little difficulty. However, it is not easy for humans to work in multiple reference systems and humans cannot convert between systems without the aid of location service appliances, calculators, or conversion tables. Furthermore, it is difficult for humans to accurately determine a location coordinate from paper maps when latitude and longitude are used because they do not appear square on the flat map. As a consequence paper maps created for the general public frequently have a square reference grid that overlays the non-rectangular coordinate reference system. It is computationally difficult, labor intensive, and time consuming to convert the reference grid coordinate obtained from one printed map to another printed map with a different grid even when both grid reference systems are well defined. It can be impossible when proprietary grids are used. This situation greatly limits the ability of humans to use location service devices with traditional printed maps. Subsequently, location based services in this country have been limited to totally digital environments, restricting the number of uses and retarding the development of the location based service industry.

The need for this standard was well documented in the aftermath of Hurricane KATRINA in 2005 where multiple reference systems were used by Federal, State, and local first responders complicating search and rescue efforts. In spite of the power that geographic information systems have to convert coordinates from one reference system to another, Katrina rescue efforts reemphasized the need for a single common reference system that can be used easily and interchangeably with paper maps, GPS receivers, and geographic information systems. The national scale of the response to this local event has also made it clear that this Federal standard now needs to be a national standard. As a national standard the U.S. National Grid will help save lives, reduce the costs of disaster, and enhance preparedness, response, recover, and mitigation efforts. It has been requested by Department of Homeland Security.

Although national grid standards are common throughout the industrialized world, there has been no nationally consistent standard practice – a preferred way – in this country, for emergency responders and the general public to describe locations as coordinates. The U.S. National Grid (USNG) as an American National Standard will do that.

Technically, this standard is extremely stable. The basic mapping techniques standardized by the U.S. National Grid were developed in the 1940's and have remained unchanged. The Universal Transverse Mercator (UTM) grid and the reference system upon which the U.S. National Grid is based is the underlying grid used in most national grid systems. The basic definition of UTM is not going to change. The specifics of the U.S. implementation are tied to the current U.S. national geodetic datum established in 1983. This standard will require revision if and when a new national datum is established, but is otherwise stable. Currently no datum revision is planned and a revision is assumed to be at least ten years in the future.

3.3. Implementation Impacts of the Proposed Standard:

3.3.1 Development Costs:

This is an adoption of an existing standard. Development costs are limited to the time and effort needed to guide the standard through the INCITS review and editing process.

3.3.2 Impact on Existing or Potential Markets:

This standard is already having an impact on existing and potential markets. The standard has been adopted in low cost consumer GPS receivers, the Defense Advanced GPS Receiver (DAGR), consumer digital mapping software, web mapping portals, and map products. Geographic information system vendors and commercial map vendors are preparing products that use this standard rather than the current practice that uses a plethora of non-standard grids. This standard makes possible the implementation of universal map index values that can be used on many different maps.

The cost of implementing the U.S. National Grid (USNG) in geographic information systems and other electronic devices such as GPS receivers is trivial. Many commercial systems already support the standard. As the underlying system is based on the UTM and

MGRS, implementation in commercial products is relatively easy. MGRS often serves as a surrogate and bridge until U.S. National Grid specific code is prepared for individual products. The National Geodetic Survey, U.S. Department of Commerce, provides free software for implementing the USNG on its Web page. Likewise the cost of implementing the USNG on paper maps is trivial if one considers the cost of computing the grid and preparing the map separates to be used in printing. If the cost of reprinting the current suite of government and commercial maps is considered, then the cost is substantial. This cost, however, has not been considered here because it is expected that the USNG will be implemented on paper maps as part of the routine cycle of updating. If implemented in this manner, only the trivial cost of computing the grid is relevant. Alternatively, the continuing cost in operational friction imposed by many disparate systems without availability of this standard is substantial.

Just in lives saved, this standard will provide immeasurable benefits. An easily used and nationally recognized grid system will;

- provide first responders with a way to communicate location when street signs and landmarks have been blown away by hurricanes and tornados or covered by floods,
- provide police, fire, and rescue personnel a more precise way of locating incidences along highways, in large building complexes, and in shopping mall parking lots where a street address is insufficient,
- provide police, fire, and rescue personnel a precise way of locating incidences in remote areas where there are no street address or even no streets,
- remove that ambiguity of identical or similar street addresses in different quadrants of a city (100 First St, NW vs. 100 First St. NE) and, thereby, reduce response time.

In addition to saving lives there are commercial benefits. In the same way that the USNG enhances location positioning for emergency services, it enhances service delivery for everything from pizza to parcels. This standard makes possible the implementation of universal map index values that can be used on many different maps. As tourist guides, gazetteers, maps, GPS receivers, web portals, etc become more widely available with USNG functionality, their value will be enhanced through the use of USNG based universal map index values.

3.3.3 Costs and Methods for Conformity Assessment:

Conformity assessment for the U.S. National Grid (USNG) is currently seen as passive and self correcting. Since a primary objective of the standard is to a allow products that use the standard to interoperate with other products that use the standard, implementation errors will be immediately apparent to product developers and users alike. The existing body of implementations will become the readily available yardstick by which new implementations will be measured. This should make self-assessment of conformity reasonable and sufficient.

No other conformity assessment method is currently planned, however, certification of independent labs to test the conformity of implementations would be technically simple

to achieve. It is not clear at this time whether such a formal testing program would provide enough value to users to be financially self-sustaining.

3.3.4 Return on Investment:
Considering the low cost to develop the standard and conformity assessment, the return on investment for implementing this standard is expected to be high.

3.4 Legal Considerations:

3.4.1 Patent Assertions:
The developer is unaware of any possible patent assertions for the standard itself. The existing Federal Geographic Data Committee standard is in the public domain. The developers are aware of existing copyrights or patents for specific presentation styles for labeling USNG grid values on maps.

3.4.2 Dissemination of the Standard or Technical Report:
Drafts of this standard, in the form of the Federal Geographic Data Committee (FGDC) standard are currently available from the FGDC Web site. The initial NCITS version of the standard will be a single page document adopting the FGDC standard in its entirety. The INCITS standard will be the property of INCITS while the referenced FGDC standard will remain in the public domain. There are no intellectual property right assertions connected with this standard.

4. Related Standards Activities:

4.1 Existing Standards:
- FGDC-STD-011-2001, United States National Grid, which is proposed to be adopted in it's entirety by INCITS. Under existing standards practices of the Federal Geographic Data Committee (FGDC) such an adoption would eliminate the need for a separate FGDC standard.
- INCITS.61-1986 [R 2002], Representation of Geographic Point Locations for Information Interchange, which standardizes representation of geographic coordinates for computer representation. The existence of a national grid standard should affect the content of INCITS 61.
- ISO19116:2004, Geographic information - Positioning services, which provides an interface for real-time output from a GPS receiver and other positioning technologies has affected the development of the U.S. National Grid.
- ISO19111:2003, Geographic information - Spatial referencing by geographic coordinates, which provides a conceptual schema for the description of coordinate reference systems has been considered in the development of the U.S. National Grid and will affect future technical descriptions of the standard.

4.2 Related Standards Activity:
- FGDC-STD-011-2001, United States National Grid. INCITS L1 already enjoys a close relationship with the Federal Geographic Data Committee (FGDC). A liaison for this standard has been established and the two organizations will work

to eliminate a separate FGDC standard and to coordinate future maintenance of the standard.

- INCITS.61-1986 [R 2002], Representation of Geographic Point Locations for Information Interchange. This standard is currently under revision and has been affected by the U.S. National Grid. Liaison arrangements have been made and representation of U.S. National Grid coordinates will be included in the next release of INCITS 61.

4.3 Recommendations for Close Liaison:
None.

5. Units of Measurement used in the Standard:
International Systems of Units (SI)