Fiscal Year 2010

HOMELAND SECURITY GRANT PROGRAM

SUPPLEMENTAL RESOURCE: GEOSPATIAL GUIDANCE

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U.S. DEPARTMENT OF HOMELAND SECURITY

GEOSPATIAL GUIDANCE

DHS recognizes the important contribution that geospatial information and technology plays in strengthening our Nation's security posture. Federal, State and local organizations have increasingly incorporated geospatial information and technologies as tools for use in emergency management and homeland security applications. Geospatial systems – and the aerial images, critical infrastructure information, and regional land base data they contain – are increasingly viewed as a central tool for decision making and disaster response. Geospatial systems can help emergency and homeland security managers to establish essential context-sensitive relevancy to information technology applications. This enhances public security and emergency preparedness, and contributes to efficient all-hazards response capability.

There are a wide variety of file formats, levels of accuracy, and varying stages of metadata completeness across the landscape. Although such incompatibilities are relatively unimportant in the day to day operation of a geographic information system (GIS), when disaster strikes the lack of geospatial interoperability becomes a critical issue.

To this end, DHS strongly encourages all grant recipients to create or maintain their geospatial data and resources in an open, interoperable and shareable system. As a specific measure to drive interoperability, DHS has developed the standards-based Homeland Security Geospatial Data Model to provide baseline definition for whatever system grantees may choose to develop.

The DHS geospatial data model should be used for collection, discovery, storage, and sharing of geospatial data, and can serve as an extract, transform, and load (ETL) template for content aggregation. The model will also support development of the Department's services-based geospatial architecture. By conforming to the DHS geospatial data model, your local geospatial programs will develop in concert with the standard view that is evolving within the Department as a whole. For those users considering an implementation, a current version of the model should be obtained directly from the Federal Geographic Data Committee web site at *http://www.fgdc.gov/dhsgdm*. Model artifacts are available as a Universal Markup Language (UML) package, HTML reference product, and technology-specific implementation/physical products. The Department of Homeland Security, Geospatial Management Office has also developed an automated online tool that will generate custom user-defined schema definitions for geospatial users. The Schema Generation Tool allows users to select specific geographic features, choose the appropriate attribute definitions describing those features, and export industry-standard format files for immediate use within a GIS.

Perhaps the most important geospatial assets for disaster response are tax parcels and other highly detailed local content (such as water, sewer, power distribution, facilities information, telecommunications, etc.). These data sets may well be considered as critical as the physical asset itself, because they are invariably part of the restoration and recovery process. Although other data are no less useful, parcels establish the critical link between who, what, and where that can help guide many forms of response and recovery.

Grant recipients should note it is not necessary to implement the entire data structure and schema associated with the themes in the DHS geospatial data model. However, wherever significant

overlap occurs in geospatial information (e.g. fields, attribution), grant recipients should follow the DHS models' naming conventions, definitions and metadata attributes. In particular, rigorous adherence to the models' attribution and metadata requirements will go a long way to assisting in the discovery and query operations that are such a significant part of the assistance process. Regardless of the partners who may be involved, collaboration programs are more easily implemented when reference data can be shared more readily.

Potential grantees should review the guidance provided below, prior to submitting proposals. This will ensure that grantees have applied due diligence in reviewing and assessing requirements for their objectives that involve geospatial components.

A. Considerations

The following considerations should be made when developing a geospatial program:

Coordination and Strategic Planning Considerations

- Does the State have a homeland security geospatial strategy or, at a minimum, address how geospatial data and technologies can support the State Homeland Security Strategy? Examples of strategies with geospatial content can be found through the Responder Knowledge Base (RKB) (*https://www.rkb.us*).

- Has the State/jurisdiction identified homeland security geospatial requirements?

- Does the State have a geospatial coordination council or a statewide coordination effort that interfaces and coordinates with private, academic, military, and Tribal communities, and government agencies on homeland security geospatial information issues including those relevant to homeland security?

- Does the State/jurisdiction place an emphasis on making data readily available to other local jurisdictions, within their States, and with Federal agencies? Does the State/jurisdiction have data sharing agreements in place to support the homeland security mission? Does the State/jurisdiction include parcel information in these data sharing agreements?

- Has the State/jurisdiction reviewed and considered the importance of using IT/geospatial for an all-hazards approach to Homeland Security? Examples of state strategies with geospatial content can be found through the National Governor's Association (NGA) Center for Best Practices (*http://www.nga.org*).

Operational Considerations

- Does the State maintain a current inventory of geospatial assets (equipment, personnel, databases, services, metadata, systems, and documentation)?

- Does the State have a geospatial data clearinghouse to aggregate and securely store high-quality local geospatial information?

- Does the State have homeland security geospatial data stored in more than one location

and readily accessible to responders, State and Local fusion Centers, and to emergency operations centers?

- Does the State have an established trained team of geospatial personnel that can provide 24/7 expertise and equipment for emergencies?

- Does the State incorporate the use of geospatial applications into standard operating procedures for homeland security mission areas?

- Does the State have education and training programs for the use of geospatial applications in homeland security missions?

Compliance with Standards / Use of Best Practices Considerations

- Does the State promote interoperability through the use of the geospatial data and services by complying with Federally-adopted geospatial standards, specifications, and guidelines such as those published by the Federal Geographic Data Committee (FGDC), the Open Geospatial Consortium (OGC™), the American National Standards Institute (ANSI), and the International Standards Organization (ISO)?

- Does the State register and/or publish the availability of geospatial resources to avoid redundant expenditures of time, effort, and funds?

- Does the State implement efficient geospatial metadata management capability following international and Federal Geographic Data Committee standards?

- Does the State/jurisdiction provide their geospatially related lessons learned via the Lessons Learned Information Sharing portal (*https://www.llis.dhs.gov*)?

B. Recommended Content

DHS Geospatial Data Model

The DHS Office of the Chief Information Officer (OCIO), Geospatial Management Office (GMO) has developed the DHS Geospatial Data Model (DHS GDM) in support of urgent DHS mission requirements. This DHS GDM is a standards-based, logical data model to be used for collection, discovery, storage, and sharing of homeland security geospatial data. The model will support development of the Department's services-based geospatial architecture, and will serve as an extract, transform, and load (ETL) template for content aggregation. Observing the geospatial data content requirements reflected in the DHS GDM is the surest way for the Nation to achieve the geospatial interoperability required in the planning and execution of multiple Homeland Security missions.

This data model is being constructed in phases. As new versions of the model are delivered, associated documentation will be made available through the following web site: *www.fgdc.gov/dhsgdm*. This site will publish the master model (UML format) as well as technology-specific implementation products and explanatory documents, such as the online Schema Generation Tool.

Data Quality

Two types of geographic areas are of special interest. For Urban Areas, the data should have the currency and positional accuracy qualities typically sought by local governments. For large areas (for example, States or groups of States), the data should have the positional accuracy qualities of USGS primary topographic map series (typically 1:24,000-scale; 1:63,360-scale in Alaska). The table below provides minimum goals for these two classes of data.

Table 1 – Minimum ("no worse than") Goals for Resolution, Accuracy, & Currency*

	Urban Areas		Large Areas	
Data Theme	**Minimum Resolution or Accuracy**	**Minimum Currency**	**Minimum Resolution or Accuracy**	**Minimum Currency**
Orthoimagery	1 foot resolution; 3 meters horizontal accuracy	Two years	1 meter resolution; 11.70 meters horizontal accuracy	Five years
Elevation	1/9 arcsecond (~3 meters) resolution; 0.73 meter vertical accuracy	Two years	1/3 arcsecond (~10 meters) (2 arcsecond in Alaska) resolution; vertical accuracy commensurate with contour interval of USGS primary topographic map for area	Five years
Hydrography	4.68 meters horizontal accuracy	Two years	13.90 meters horizontal accuracy; 36.69 meters horizontal accuracy for Alaska	Five years
Transportation	4.68 meters horizontal accuracy	Two years	13.90 meters horizontal accuracy; 36.69 meters horizontal accuracy for Alaska	Five years
Boundaries	4.68 meters horizontal accuracy	Two years	13.90 meters horizontal accuracy; 36.69 meters horizontal accuracy for Alaska	Five years
Structures	4.68 meters horizontal accuracy	Two years	13.90 meters horizontal accuracy; 36.69 meters horizontal accuracy for Alaska	Five years
Land Cover	Should align with base maps that have the accuracies listed above.	Two years	Should align with base maps that have the accuracies listed above.	Five years
Geographic Names	Same as the associated feature		Same as the associated feature	

*Accuracy statement based on Geospatial Positioning Accuracy Standard, Part 3, National Standard for Spatial Data Accuracy (FGDC-STD-007.3-1998) (*http://www.fgdc.gov/standards/status/sub1_3.html*). For horizontal accuracies (95% confidence level), 3 meters is commensurate with 1:3,075-scale maps under the National Map Accuracy Standard, 4.68 meters with 1:4,800-scale maps, 13.90 meters with 1:24,000-scale maps, and 36.69 meters with 1:63,360-scale maps. For vertical accuracy (95% confidence level), 0.73 meter is commensurate with a four-foot contour interval under the National Map Accuracy Standard. Estimated currency of the data at the date of service initiation; that is, the data served reflects the ground condition sometime during the two (or five) years prior to the start of service through *The National Map* (Note that, for themes in which the ground changes rarely, older data might meet this condition). Data should be in the North American Datum of 1983; elevation data in the North American Vertical Datum of 1988.

C. Relevant Initiatives

The following describes those Federally-maintained, endorsed or adopted initiatives that grantees are strongly recommended to review. Many of the specifications, documents, and guidance described within these initiatives have been adopted as industry standard. Grantees are encouraged to comply with these consensual guidance and standards wherever relevant to specific projects and objectives.

National Spatial Data Infrastructure (NSDI) (*http://www.fgdc.gov/nsdi/nsdi.html*)
The NSDI was created under Executive Order 12906 calling for the establishment of the NSDI defined as the technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, private and nonprofit sectors, and the academic community. The NSDI clearinghouse is available to Federal, State, local, and Tribal contributors to register as clearinghouse nodes where metadata about geospatial data, services, and resources can be published and harvested for discovery by any user. FGDC manages NSDI and provides guidance and instruction for using and registering nodes on NSDI.

States are encouraged to utilize statewide coordinating councils to develop and maintain strategic and business plans for efficient statewide geospatial data infrastructures in support of the National Spatial Data Infrastructure. DHS is encouraging States to examine statewide or large regional approaches to the production of certain data, particularly framework (base map) data and critical infrastructure data that are conducive to statewide data maintenance. Adopting this approach will align with Presidential directive A-16 for the National Spatial Data Infrastructure, save money, and promote data integration for mutual aid response.

Metadata of an organization's geographic data holdings is an important first step to participating in the NSDI. Metadata provides not only a way to inventory and preserve investments in costly geospatial data resources within an organization, but also is a means for its discovery and sharing with other organizations. Metadata standards recommended to comply include FGDC Content Standard for Digital Geospatial Metadata, Version 2 (CSDGM), FGDC-STD-001-1998 or when available the ISO Metadata Standard 19115 using draft ISO Technical Specification 19139; and Metadata Service Guidelines: Metadata must be posted and harvestable through the Geospatial One-Stop Portal.

Geospatial One Stop Portal
As a part of one of Office of Management and Budget's 24 Federal E-Gov initiatives, the Geospatial One Stop portal was established to promote data sharing across Federal entities and is available to the public for use as a discovery portal. Geospatial One Stop portal is an interface to NSDI established under Executive Order 12906. The portal harvests geospatial resource metadata from nodes registered with NSDI and is a repository for all metadata published and accessible on NSDI. Users also have the option to publish metadata holdings directly to Geospatial One Stop enabling smaller organizations with the ability to share and collaborate on geospatial resources. Version 2 of the portal will be OGC standards enabled for OGC Web Map Service (WMS), Web Feature Service (WFS), and Catalog Service for the Web (CSW).

An important feature on Geospatial One Stop for grantees is the *geodata.gov* Market Place. Here users can find information about planned acquisitions of geospatial resources and future projects or activities that may align with their own objectives. If grantees find no existing resources on Geospatial One Stop in either the metadata searches or in the Market Place, they are strongly

encouraged to register their planned activities for geospatial data acquisition or future projects and activities so that others may prevent from redundant efforts. (*http://www.geodata.gov*)

Ramona GIS Inventory
Ramona is a GIS inventory tool designed to work in concert with the Geospatial One Stop Portal. Ramona is produced by the National States' Geographic Information Council (NSGIC) as a tool for States and their partners. Its primary purpose is to track the status of GIS in US State and local government to aid the planning and building of Spatial Data Infrastructures. (*http://www.gisinventory.net*)

FGDC Framework
GIS applications of many different disciplines have a recurring need for a select few themes of data. The framework is a collaborative community based effort in which these commonly needed data themes are developed, maintained, and integrated by public and private organizations within a geographic area. Local, regional, State and Federal government organizations and private companies see the framework as a way to share resources, improve communications, and increase efficiency. (*http://www.fgdc.gov/framework/framework.html*)

FGDC Standards
Standards facilitate the development, sharing, and use of geospatial data. The FGDC develops geospatial data standards for implementing the NSDI, in consultation and cooperation with State, local, and Tribal governments, the private sector and academic community, and, to the extent feasible, the international community. (*http://www.fgdc.gov/standards/standards.html*)

FGDC Metadata
Metadata or "data about data" describe the content, quality, condition, and other characteristics of data. FGDC approved the Content Standard for Digital Geospatial Metadata (FGDC-STD-001-1998) in June 1998. (*http://www.fgdc.gov/metadata/metadata.html*)

National Information Exchange Model
NIEM is an information sharing program driven by practitioner requirements from local, state and federal stakeholders. NIEM articulates a data dictionary of commonly agreed upon elements that are defined for use in information exchanges. The dictionary includes a "Core" and specialized domain-specific vocabularies for Geospatial, Infrastructure Protection, Maritime, Justice, Screening, Emergency Management, Immigration, CBRN, International Trade, Intelligence, and Family Services. (*http://www.niem.gov*)

Technologically, NIEM acts as a single standard Extensible Markup Language (XML) foundation for exchanging information both internal to and external from DHS including exchanges with other Federal, state, local, tribal and private sector partners.

NIEM is the primary standard for information sharing between stakeholders supporting critical homeland security, law enforcement and counterterrorism missions.

The intended uses of NIEM are:

- To apply NIEM to the broad NIEM stakeholder community within government and industry.
- To provide the NIEM model, schemas, tools, and training as a base for creating high-value information exchanges for homeland security projects.

- To allow information technology and standards experts and users to build new infrastructure and tools to accelerate the roll out of NIEM exchanges.
- To begin to identify additional Core and domain-specific data components that could be proposed as additions to future versions of the standard.

An important element in the use of NIEM is the development and reuse of NIEM-conformant Information Exchange Package Documentation (IEPD). Existing IEPDs may be discovered and shared through the NIEM IEPD Clearinghouse. More information regarding the Clearinghouse, NIEM training opportunities, and the further development of NIEM may be found on the NIEM website. (http://www.niem.gov/library.php)

D. Relevant Organizations

The following describe important organizations which support or oversee many of the relevant Federal initiatives described previously. Grantees are strongly recommended to consult with these organizations as needed regarding geospatial specifications, standards and/or related best practices in creating and maintaining open, interoperable solutions; especially those which involve publishing geospatial data.

The Geospatial Management Office (GMO)
The GMO is a program office serving the Department of Homeland Security's Chief Information Office and was formally established by the Intelligence Reform and Terrorism Prevention Act of 2004 (TITLE VII, Subtitle B, Section 8201, HOMELAND SECURITY GEOSPATIAL INFORMATION). Through its implementation of DHS Management Directive 4030 the GMO exercises executive leadership in establishing DHS geospatial information technology programs, directives, initiatives, and provides oversight for the integration of geospatial data and technology. Grantees may contact the GMO at *gmo@dhs.gov*. The e-mail should contain the requestor's name, organization, and description of need.

Federal Geographic Data Committee
The FGDC is a 19-member interagency committee composed of representatives from the Executive Office of the President, Cabinet-level and independent agencies. The FGDC is developing NSDI in cooperation with organizations from State, local and Tribal governments, the academic community, and the private sector. NSDI encompasses policies, standards, and procedures for organizations to cooperatively produce and share geographic data. (*http://www.fgdc.gov*)

National Geospatial Partnership Offices
Through partnerships that include cooperative arrangements for exchange of data, standards development, database development, web mapping services and applications, training, and technology exchange, the USGS has established a network of National Geospatial Partnership Offices and State Liaison positions across the Nation (*http://nationalmap.usgs.gov/partnerships.html*).

Open Geospatial Consortium

The Open Geospatial Consortium, Inc. (OGC™) is a nonprofit, international, voluntary consensus standards organization that is leading the development of specifications for geospatial and location based services. Through member-driven consensus programs, OGC works with government, private industry, and academia to create open and extensible software application programming interfaces for geographic information systems and other mainstream technologies. (*http://www.opengeospatial.org*)