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Supplemental Resource:
Geospatial Guidance

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Geospatial Guidance

G&T 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 data and systems improve the overall capability and information technology applications and systems to enhance public security and emergency preparedness and efficient response to all-hazards including both natural and man-made disasters.

With over 87,000 jurisdictions in the United States, there almost as many geospatial data models and database designs as there are geospatial programs. And although the issues are less complex, there are also 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 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 a standards-based geospatial data model that should serve as the baseline for whatever system you may choose to develop.

The DHS geospatial 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 model, your local geospatial programs will develop in concert with the standard view that is evolving within the Department as a whole. The model is published on the Federal Geographic Data Committee web site http://www.fgdc.gov for review and information purposes. For those users considering an implementation, the most current version of the model should be obtained directly from the DHS Geospatial Management Office.

Tax parcels and other local-source content produced at similar scales (water, sewer, power distribution, facilities information, telecommunications, etc.) are perhaps the most important geospatial assets for disaster response. 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 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.

Grantees are recommended to review the guidance provided below. 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 on RKB, http://www.rkb.mipt.org.
- 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?

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 access to a team of established 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 and efficient 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 geospatial resources that are planned or result from programs or projects as a means to avoid expenditures of time, effort, and funds on redundant acquisitions?
- 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 (www.llis.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: http://www.fgdc.gov/participation/working-groups-subcommittees/hswg/dhs-gdm/index_html

Minimum Essential Data Sets (MEDS)
Federal, State, local, and Tribal governments worked together to create Minimum Essential Data Sets (MEDS) over urbanized areas as part of the Nunn-Lugar-Domenici 120-city effort. Both sets of MEDS provide the geospatial foundation necessary for the Homeland Security Community to carry out the key national homeland security strategy objectives, as outlined by the White House on 16 July 2002 – (1) preventing terrorist attacks within the United States; (2) reducing the Nation's vulnerability to terrorism; and (3) minimizing damage, while speeding recovery from natural or terrorist-caused disasters.

The Information Content Subgroup of the FGDC Homeland Security Working Group (HSWG) developed Guidelines for Homeland Security Infrastructure Protection Geospatial Data Content in October, 2005. This guidance is based on previous work done by members of the FGDC HSWG. The HSWG has improved the data content by: 1) refining feature and attribute requirements based on input from homeland security sector experts; 2) revising features, feature classes and definitions to correspond more closely with infrastructure data requirements of the DHS; and 3) indicating general priorities for feature and attribute collection. At the time of this publication, the geospatial content guidance is For Official Use Only (FOUO) and can be obtained by

sending a request to the DHS Geospatial Management Office at gmo@dhs.gov. The e-mail should contain the requestor's name, organization, and description of need for this document.

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, and Currency

Data Theme	Urban Areas		Large Areas	
	Minimum Resolution or Accuracy[1]	**Minimum Currency**[2]	**Minimum Resolution or Accuracy**[3]	**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

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[1,4] 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.

[2,5] 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.)

[3] Data should be in the North American Datum of 1983; elevation data in the North American Vertical Datum of 1988.

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	

C.   Relevant Organizations and Initiatives

The following describes important organizations and those Federally-maintained, endorsed or adopted initiatives that grantees are strongly recommended to review:

Office of Budget and Management

The Office of Management and Budget (OMB) authored Circular A-16 for the coordination of geographic information and related spatial data activities. (http://www.whitehouse.gov/omb/circulars/a016/a016_rev.html) This Circular establishes a coordinated approach to electronically develop the National Spatial Data Infrastructure (NSDI) and establishes the Federal Geographic Data Committee (FGDC). OMB Circular A-16 applies to all geospatial data activities – financed directly or indirectly, in whole or in part, by federal funds to follow applicable geographic information standards developed and endorsed by standards-setting bodies including the FGDC, ISO and the Open Geospatial Consortium (OGC).

Federal Geographic Data Committee (www.fgdc.gov)

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.

> #### FGDC Standards (www.fgdc.gov/standards/standards.html)
> 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.

> > #### FGDC Metadata (www.fgdc.gov/metadata/metadata.html)
> > 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.

> > #### United States National Grid
> > (http://www.fgdc.gov/standards/status/usng.html)

The objective of this U.S. National Grid standard is to create a more interoperable 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 NSDI applications. The U.S. National Grid is based on universally defined coordinate and grid systems and can, therefore, be easily extended for use world-wide as a universal grid reference system.

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 (FGDC-STD-011-2001).

FGDC Framework (www.fgdc.gov/framework/framework.html)
GIS applications of many different disciplines have a recurring need for a 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.

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 at http://www.GeoData.gov.

Geospatial One Stop Portal (www.geodata.gov)
As a part of one of Office of Management and Budget's 24 Federal E-Gov initiatives (www.whitehouse.gov/omb/egov/), 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 (www.geodata.gov) 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.

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 (www.opengeospatial.org)
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.

Consulting with the OGC specifications and standards is highly recommended for grantees interested in open, interoperable solutions; especially those involving publishing geospatial data and resources as a service. Many of the specifications, documents, and guidance provided here have been adopted as industry standard. Others are fairly new and not mature. Grantees are encouraged to comply with these consensual guidance and standards wherever relevant to specific projects and objectives.

Ramona GIS Inventory (http://www.gisinventory.net)
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.

National Information Exchange Model
DHS, the Departement of Justice, and their associated domains released the National Information Exchange Model (**NIEM 1.0 rc 1**) in September 2006. The **NIEM 1.0 rc 1** establishes a single standard Extensible Markup Language (XML) foundation for exchanging information between DHS, DOJ, and supporting domains, such as Justice, Emergency Management, and Intelligence. The base technology for the NIEM is the Global Justice XML Data Model (Global
JXDM). The NIEM leveraged both the extensive Global JXDM reference model and the comprehensive Global JXDM XML-based framework and support infrastructure. The intended uses of this release are:
  • To introduce NIEM to the broad NIEM stakeholder community within government and industry.
  • To provide the NIEM model and schemas as a base for creating exchange messages for the initial pilot projects that will validate and augment the standard.
  • To allow information technology and standards experts and users to provide feedback on the standard.
  • To begin to identify additional Universal, Common, and Domain-Specific components that could be added to future versions of the standard.

Further information about NIEM specifications and guidelines is available at http://www.niem.gov.