

CECW-CE

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

EM 1110-1-2909

Manual
No. 1110-1-2909

1 September 2012

Engineering and Design
GEOSPATIAL DATA AND SYSTEMS

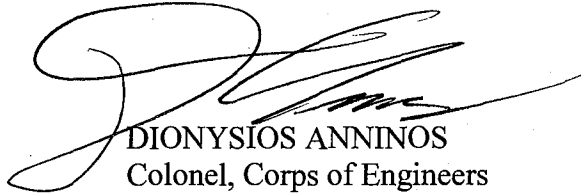
1. Purpose. This manual provides detailed technical guidance and procedures for compliance with the policy in Engineer Regulation (ER) 1110-1-8156, *Policies, Guidance, and Requirements for Geospatial Data and Systems*, which establishes general criteria for the use and development of geospatial technologies throughout the U.S. Army Corps of Engineers (USACE). This manual includes, but is not limited to, geospatial system development and utilization as well as the acquisition, processing, storage, distribution, and utilization of geospatial data and systems.
2. Applicability. This manual applies to all USACE Commands having civil works, military construction, and environmental restoration responsibilities. It specifically applies to functional areas having responsibility for regulatory investigations and studies, planning studies, real estate, emergency operations, and other functions that involve geospatial technologies and services for surveying (hydro and topo), mapping, Computer Aided Design and Building Information Modeling (CAD/BIM), remote sensing, database development, and modeling. It also applies to a variety of geospatial products, including river and harbor maps; navigation charts; inundation mapping; vulnerability and risk analysis; recreation and lake management activities; dredge site placement; real estate tract or parcel maps; engineering and construction drawings; survey reports; reconstruction, restoration and rehabilitation efforts; environmental stewardship; environmental studies; Hazardous, Toxic, and Radioactive Waste (HTRW) studies; shoreline studies; and channel condition reports.
3. Distribution. This publication is approved for public release; distribution is unlimited.
4. Discussion. This manual provides guidance for implementing the development and maintenance of a unified and comprehensive use of geospatial technologies across USACE. It outlines a corporate approach to implementing geospatial technology that meets functional business process requirements in harmony with state, local, and Federal agency programs to more efficiently produce geospatial products and serve customers. It promotes a holistic and integrated approach to managing geospatial data and information that supports both the comprehensive management of watersheds and military installation management. This manual outlines a framework for sharing geospatial data with other Federal, state, and local partners in

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concert with Executive Order (EO) 12906 (*Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure*). It promotes a life cycle management approach to geospatial data and information where data and information is defined as an asset that needs to be managed wisely using limited resources in a fiscally responsible environment.

FOR THE COMMANDER:

15 Appendices
(See Table of Contents)



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Colonel, Corps of Engineers
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CHAPTER 1

Introduction

1-1. Purpose.

a. Engineer Manual 1110-1-2909 provides detailed technical guidance and procedures for compliance with policy in Engineer Regulation (ER) 1110-1-8156, *Policies, Guidance, and Requirements for Geospatial Engineering Data and Systems*, which establishes general criteria for the use and development of geospatial technologies throughout the U.S. Army Corps of Engineers (USACE). This includes, but is not be limited to, geospatial system development and utilization as well as the acquisition, processing, storage, distribution, and utilization of geospatial data and systems. This manual outlines USACE compliance with:

(1) Executive Order (EO) 12906, *Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure (NSDI)*.

(2) Office of Management and Budget's (OMB) Circular A-16, *Coordination of Geographic Information and Related Spatial Data Activities*.

(3) Army Regulation (AR) 210-20, *Real Property Master Planning for Army Installations*, dated 16 May 2005.

(4) Army Regulation (AR) 115-11, *Geospatial Information and Services*, dated 10 December 2001.

(5) E-Government Act 2002, Title II, *Federal Management and Promotion of Electronic Government Services (as it pertains to Electronic Geospatial Government Services)*.

(6) OMB Circular A-130, *Management of Federal Information Resources (as it pertains to managing Geospatial Information and Data)*.

(7) Clinger Cohen Act of 1996 (as it pertains to Geospatial Technology).

(8) Department of the Army Memorandum, *Army Geospatial Enterprise (AGE) Policy*, dated 8 June 2010 (Appendix C).

(9) Office of Deputy Under Secretary of Defense for Installations and Environment, *Installation Geospatial Information and Services Guidance*, dated 31 March 2009 (Appendix D).

b. This manual provides guidance for implementing the development and maintenance of a unified and comprehensive set of geospatial technologies across USACE. It outlines a corporate approach to implementing geospatial technology that meets functional business process requirements in harmony with state, local, and Federal agency programs to more efficiently produce geospatial products and serve customers. It promotes a holistic and integrated approach

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to managing geospatial data and information that supports the comprehensive management of both watersheds and military installations.

c. This manual outlines a framework for sharing geospatial data with other Federal, state, and local partners in concert with EO 12906. It promotes a life cycle management approach to geospatial data and information by defining them as assets that need to be managed wisely using limited resources.

d. This manual aligns USACE geospatial policy with Army Geospatial Enterprise Policy as outlined by the Army Geospatial Information Officer (GIO) in Department of the Army Memorandum, *Army Geospatial Enterprise (AGE) Policy*, dated 8 June 2010 (Appendix C).

1-2. Applicability.

a. This manual applies to all USACE Commands having civil works, military construction, and environmental restoration responsibilities. It specifically applies to functional areas that involve geospatial technologies and services for Computer Aided Design and Building Information Modeling (CAD/BIM), Survey and Mapping (S&M), Site Information Modeling (SIM), Computer Aided Facility Management (CAFM), Geographic Information Systems (GIS), remote sensing, database development, and modeling.

(1) BIM functional areas generally encompass architectural, structural, mechanical, plumbing, fire protection, and electrical technologies and services for Military Construction and Civil Works facilities design, construction, and management.

(2) SIM functional areas generally encompass surveying (hydrographic and topographic), mapping, civil design, exterior utilities design, landscape architecture, and geotechnical technologies and services for MILCON and Civil Works facilities design, construction, and management.

(3) Operations and Maintenance (O&M) functional areas for MILCON and Civil Works facilities can generally be managed via CAFM systems.

(4) GIS functional areas generally encompass regulatory investigations and studies, planning, real estate, emergency operations, and engineering functions.

b. This manual also applies to a variety of geospatial products, including river and harbor maps; navigation charts; inundation mapping; vulnerability and risk analysis; recreation and lake management activities; dredge site placement; real estate tract or parcel maps; engineering and construction drawings; survey reports; reconstruction, restoration and rehabilitation efforts; environmental stewardship; environmental studies; Hazardous, Toxic, and Radioactive Waste (HTRW) studies; shoreline studies; and channel condition reports.

c. This manual applies to both in-house and contracted efforts.

d. USACE customers for reimbursable work who are required to comply with EO 12906, such as Department of Defense (DoD) installations, the Environmental Protection Agency, and the Federal Emergency Management Agency, will determine their method of compliance. These customers may choose to incorporate compliance with the EO into contracts with USACE, or they may accomplish compliance unassisted by USACE. The Army Chief of Staff for Installation Management (ACSIM) has outlined the Army's compliance through AR 210-20, dated 16 May 2005, and through AR 115-11, dated 28 December 2001. The ACSIM's office was in the process of staffing an update to AR 115-11 at the time of this writing.

e. Automated Information Systems (AISs) having or developing a geospatial component shall comply with policy outlined in this manual to ensure interoperability of AIS geospatial data with the USACE Enterprise Geospatial Engineering System (EGES) Program and the geospatial component of the Federal Enterprise Architecture.

1-3. Distribution. This publication is approved for public release; distribution is unlimited.

1-4. References. Required and related publications are listed in Appendix A.

1-5. Abbreviations and Acronyms. Abbreviations and acronyms used in this publication are listed in Appendix B.

1-6. Definitions.

a. Geospatial Information and Data: Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth. This information may be derived from, among other things, remote sensing, mapping, survey, and building facility modeling and data technologies. Statistical data may be included in this definition at the discretion of the collecting agency (EO 12906).

b. Geospatial Information and Services: The creation, collection, information extraction, storage, dissemination, and exploitation of geodetic, geomagnetic, imagery, gravimetric, aeronautical, topographic, hydrographic, littoral, cultural, facility-model, and toponymic data accurately referenced to a precise location on the surface of the Earth. Geospatial services include tools that enable users to access and manipulate data; they also include instruction, training, laboratory support, and guidance for the use of geospatial data (DODD 5105.60).

c. Geographic Information System (GIS): A computer system capable of capturing, storing, analyzing, and displaying geographically referenced information, which is information attached to a location, such as latitude and longitude, or street location (USGS).

d. Enterprise Geographic Information System (EGIS): A GIS that is integrated through an entire organization so that a large number of users can manage, share, and use spatial data and related information to address a variety of needs, including data creation, modification, visualization, analysis, and dissemination (Wikipedia).

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e. National Spatial Data Infrastructure (NSDI): The technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, the private and nonprofit sectors, and the academic community (EO 12906).

f. USACE Commands: All subordinate entities of the U.S. Army Corps of Engineers, including Districts, Divisions, research laboratories, and field offices.

1-7. Scope.

a. This manual defines the primary technical guidance from HQ to District Commands to initiate and fund an EGES program that is consistent with HQ and Division geospatial activities. This manual details some of the major tasks and issues associated with implementing an EGES, such as initiating program management practices, documenting geospatial technology investments, acquiring geospatial data using standards, staffing and training the USACE workforce, managing and archiving geospatial data, and procuring software and hardware to support geospatial activities.

b. This guidance also outlines the use of existing USACE EGES platforms to be used by USACE AISs. If a USACE AIS identifies the requirement to add a geospatial component to their system, they shall follow guidance established in this EM.

1-8. Exclusions.

a. Programs and systems that do not use geospatial information directly or indirectly referenced to a position on the Earth are not required to adhere to this regulation.

b. This regulation also excludes business systems, such as those that focus on textual and statistical information that is created, stored, manipulated, queried, displayed, and transferred differently than geospatial data.

c. This regulation also excludes tactical spatial data and associated computer systems, such as those used for fire control, targeting, and mission planning.

d. Users of excluded systems may find this document useful in implementing, organizing, or managing their particular type of automated system; in identifying applicable standards; or in creating and maintaining a database. Following procedures and policies outlined in this manual may enhance interoperability among geospatial and other data systems, and users of all automated systems are encouraged to coordinate, when appropriate, with users, managers, and administrators of other automated systems.

1-9. Waivers. For any mandatory requirement outlined in this document, a waiver can be requested. Waiver requests can be sent to HQUSACE-CW-CE.

1-10. Brand Names. The citation in this manual of brand names of commercially available products does not constitute official endorsement or approval of the use of such products. To facilitate interoperability, HQUSACE does not mandate specific GIS software or systems, but instead promotes interoperability through the use of data standards and processing procedures.

CHAPTER 2

Enterprise Geospatial Engineering Systems (EGESs)

2-1. Purpose.

a. The purpose of this chapter is to define the EGES Program, discuss its importance to the organization, and provide implementation guidance.

b. The term “geospatial” includes data, tools, technologies, and services used from GIS, remote sensing, survey and mapping, Site Information Modeling (SIM), Global Positioning System (GPS), Computer-Aided Design (CAD), Building Information Modeling (BIM), and Computer-Aided Facilities Management (CAFM) fields. GIS is singled out in an enterprise context because of its strong integration capabilities with spatial and non-spatial data sets, such as agency business data and real-time monitoring data. Data collected and/or derived from various geospatial information technologies are most effectively integrated by establishing a single geospatial engineering framework to promote interoperability among the various technologies. Any reference to EGES implies geospatial information collected and/or derived from networked geospatial technologies.

2-2. Geospatial Systems.

a. Traditionally, geospatial system components were discussed in terms of data, software, people, hardware/systems, and network communications and initially required specialized hardware and expensive software that only highly trained experts could operate. Those constraints no longer exist. Today, geospatial systems run on common personal computer hardware and operating systems, software and data are readily accessible, and integration with emerging technologies such as Service Oriented Architecture (SOA) and cloud computing provides cost-effective access to geospatial analysis at any organizational scale, or activity level. While workforce development will require continual investment, training on the use of the software is easily obtained.

b. While geospatial software and hardware have become less specialized and more mainstream, geospatial data management and systems integration have become much more complex. Not only have the complexity and variety of data formats increased, but data management and security issues have become more challenging, driven by the increase in the volume of the data (both the size of databases and/or files and the number of data sets available) and the variety of data formats, programming languages, and architectural approaches.

c. The data needed for geospatial analysis make up the most expensive part of a geospatial system. Geospatial data are an integral part of the USACE business process, from project planning to operation and maintenance. A huge potential for loss exists through data mismanagement. Data become easily outdated simply because they cannot be retrieved or may not have been documented properly at the time of collection. The importance of standardizing, documenting, and providing easy access to geospatial data cannot be overstated.

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d. The traditional use and availability of geospatial data, where there are many users accessing national data sets, are illustrated in Figure 2.1. These users may access these data through web browsers to answer general questions, or they may integrate these data with other information systems to answer agency-scale strategic questions. There are now a greater number of users accessing and manipulating data at a local level. Typically, these users are referred to as power users, and they are analyzing local and national data sets to answer questions.

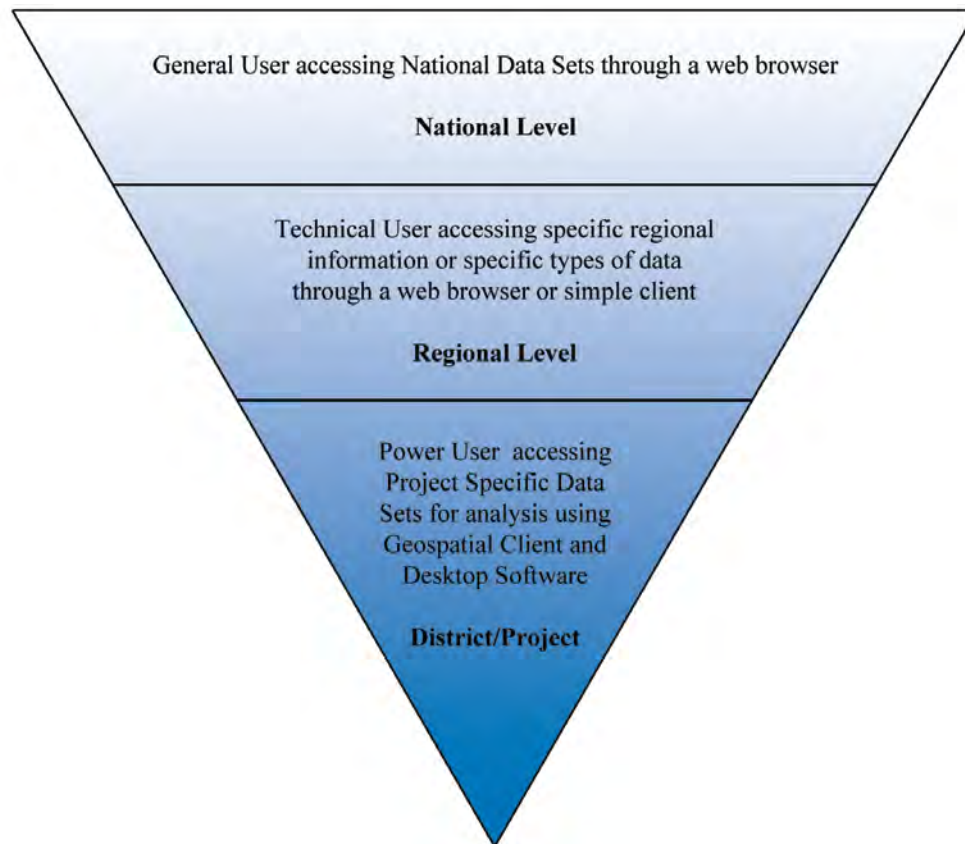


Figure 2-1. Traditional Geospatial User Distribution.

e. In USACE, the data availability and usage diagram is inverted (Figure 2.2). USACE has traditionally had fewer national data sets; instead, the vast majority of data holdings are at the project or local level. While national data sets are of use, the interest has generally been on project-level data, primarily because of mission requirements. One of the goals of EGES is to expose detailed level data through the enterprise to maximize the use of project level data.

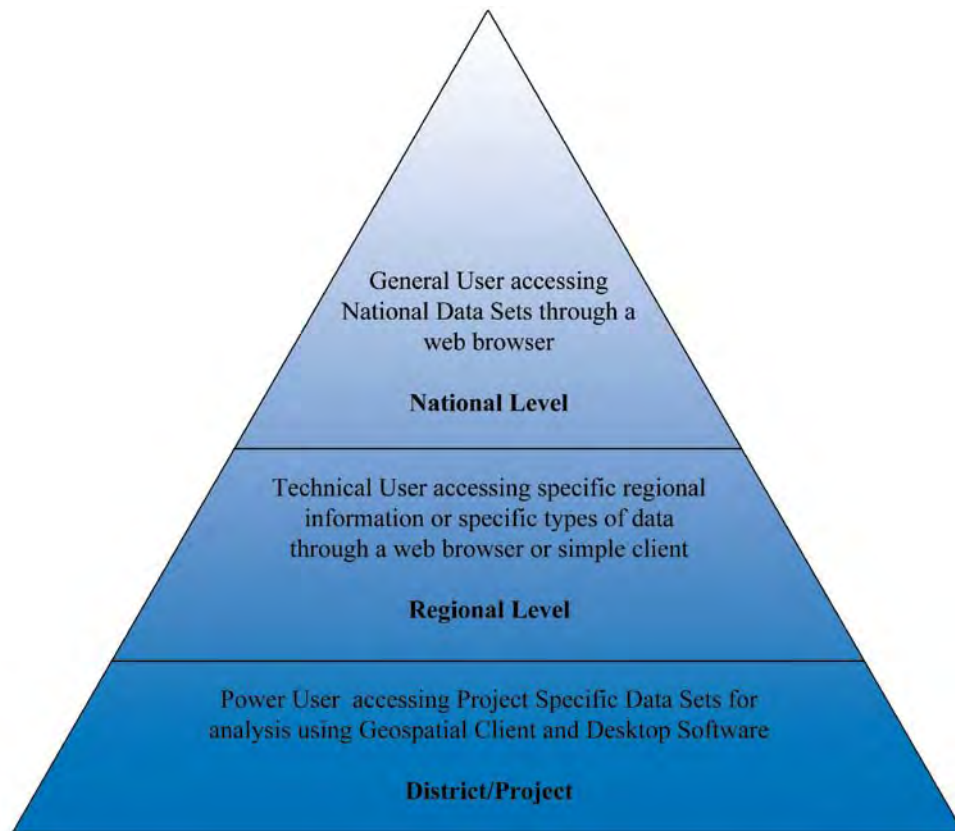


Figure 2-2. USACE District Geospatial User Distribution.

2-3. The USACE EGES Program.

a. The EGES vision is to develop a unified and comprehensive framework for geospatial technologies and applications throughout USACE. This vision includes building, standardizing, managing, maintaining, and resourcing USACE's geospatial infrastructure; setting policy and establishing guidance supporting the standard, efficient, and timely use of geospatial data across business areas; and ultimately establishing a fully integrated geospatial network of Field Offices, Districts, Divisions, and Headquarters, where geospatial data will flow seamlessly, while providing a transparent underlying infrastructure.

b. Successfully implementing EGES in USACE will require the standardization of geospatial terminology and databases across all business lines, with concurrent development of sound business processes and rules for maintaining and updating information. These information capital assets need to be maintained within a database structure serving multiple functional areas while providing easy access to diverse and dynamic user groups. Standardized interfaces and tools will need to be developed, providing varied functional communities with relevant, role-based access to authoritative information.

c. The benefits of implementing EGES across USACE are:

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- (1) Ability to leverage data investments to make sound decisions.
- (2) Reduced cost for data and systems.
- (3) Build data once and use it many times.
- (4) Exponential increase in availability of data to the EGES.
- (5) Increased responsiveness through the use and development of spatial analysis tools, models, design tools, and production capabilities (maps, plans, specs, etc.).
- (6) Repeatable and defensible decision support for mission activities.
- (7) Enhanced situational/spatial awareness within and across organizations.
- (8) Cost-effective technology implementation.
- (9) Support to Presidential and Office of Management and Budget (OMB) management agendas.
- (10) Resource conservation through the elimination of duplicative data generation.
- (11) Unified and consistent common operating picture across business lines.

2-4. EGES Goals and Objectives. Specific objectives and requirements defined as part of the EGES program include, but are not limited to:

- a. Reduce costs and increase capability.
- b. Make data available to people making decisions.
- c. Enhance and enable agency missions through geospatial support of all relevant business lines and corporate Automated Information Systems (AISs).
- d. Provide turn-key access to cost-effective geospatial software, systems, and platforms.
- e. Enable centralized data access using a combination of Service Oriented Architecture (SOA) model and centralized databases, with specifications defined in partnership with various business lines and functional groups.
- f. Minimize geospatial data redundancy across USACE business areas.
- g. Maximize the impact of USACE resources invested in geospatial technologies.
- h. Enhance geospatial business support throughout USACE.

- i. Standardize geospatial tools and capabilities across USACE.
- j. Support all levels of the organization, from the Field Offices to HQ.
- k. Network, develop, and coordinate with DoD and Federal geospatial systems.
- l. Implement and enforce geospatial data standards .
- m. Develop EGES capabilities to meet or exceed industry standards.
- n. Fully leverage commercial off-the-shelf software (COTS), including open source software, in USACE EGES development.
- o. Pioneer an integrated geospatial environment/solution where CAD, BIM, SIM, CAFM, survey and mapping, and GIS technologies/systems continuously merge into a unified business process.

2-5. EGES Program Integration. USACE has a single EGES program which has horizontal and vertical components. The vertical component addresses the integration between Field Offices, Districts, Divisions, and HQ (Figure 2-3). The horizontal component addresses the integration across business lines and partner organizations (Figure 2-4). Over time the horizontal and vertical components will become more transparent to the user community.

a. Vertical Integration and the Role of District EGES. To successfully implement EGES within the organization, Districts shall address the following:

(1) Identify an EGES Manager/Coordinator. This individual acts as the technical Program Manager for geospatial integration and implementation at the District (see Chapter 3).

(2) Funding. Each District is required to establish an RF502x account to fund EGES. Districts can determine the best way to resource the RF502x account using the RM guidance in Appendix E. Districts are required to establish an RF5021 account for CAD/BIM-specific activities, an RF5022 account for GIS-specific activities, and an RF5023 account for survey-specific work.

(3) Authoritative Source Repository (ASR). Each Districts shall establish and maintain a central data repository supporting District-level EGES requirements with an “Authoritative Source” of/for District geospatial data, ensuring that data sets support modeling, multi-dimensional (5D) analysis, and functional/production requirements. This should be accomplished by engaging all parts of the District with a Project Delivery Team (PDT) to determine shared District requirements. The District ASR should enable data sharing with Division and national EGES efforts using a combination of single-sign-on and role-based access control. This will minimize data calls and maximize the potential for information re-use. The ASR will not take the place of Auditable Source requirements for Real Estate documentation or similar requirements.

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(4) EGES Standard Operating Procedures. Each District shall establish procedures and criteria for what is to be integrated into the District's EGES. This should be done concurrently with ASR PDT scoping and should be fully developed in subsequent PgMP guidance.

(5) Connectivity. Each District shall provide linkages through Open Geospatial Consortium web services to CorpsMap and other GIS viewers, making District-level ASR data accessible via a database or file system link to other parts of the organization, as well as to external partners and customers.

b. To establish vertical integration capabilities, Districts have two options. They can either establish a local EGES program or choose to use regional or national capabilities to support the District's local geospatial requirements. If a District decides to not establish local EGES capability, that decision should be clearly addressed in the Division's EGES Five Year Plan (see Chapter 5).

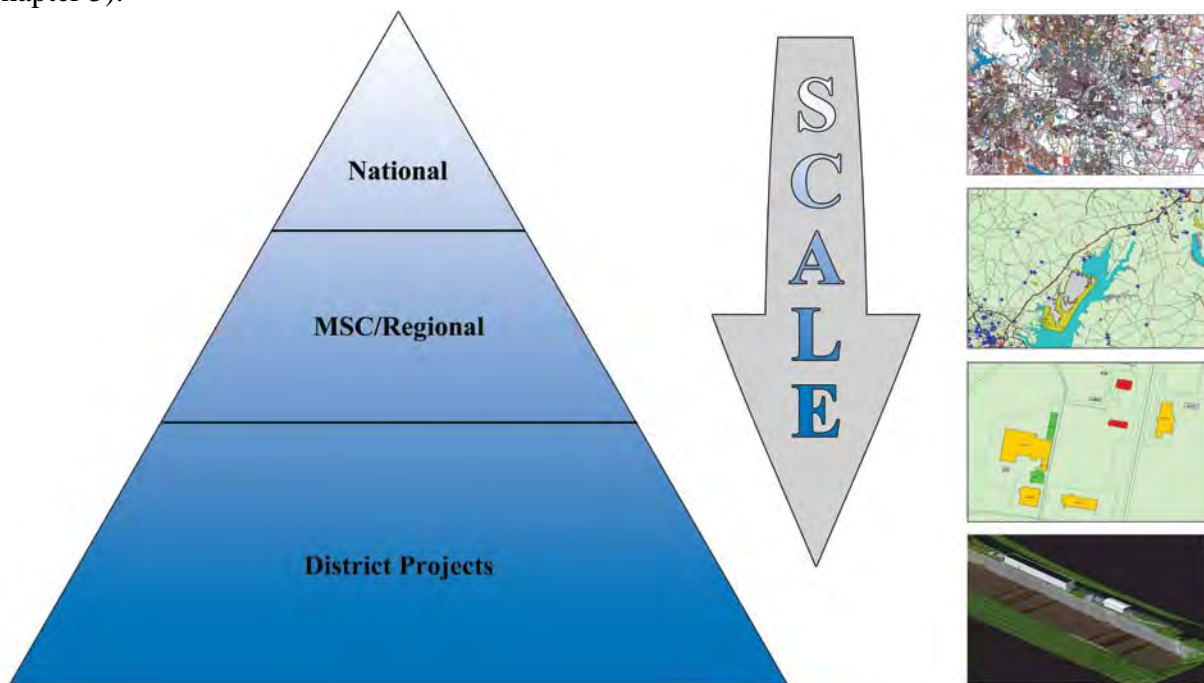


Figure 2-3. Enterprise Geospatial Engineering System Levels.

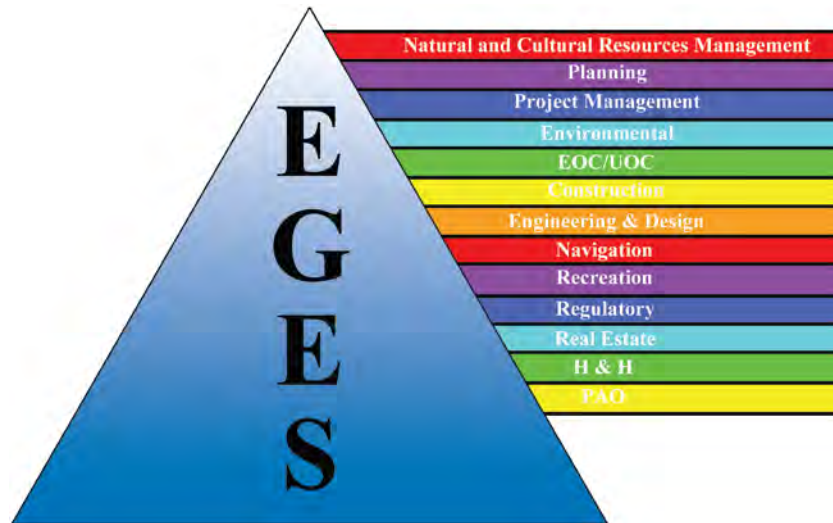


Figure 2-4. EGES and Business Mission Areas.

c. **Horizontal Integration and the Role of Business Lines.** To successfully implement EGES within a business line, HQ business line managers need to work actively with the geospatial community to develop a strategy for addressing their geospatial requirements. The strategy needs to address the following areas:

(1) Establishing the level of EGES needed to support the business mission, such as building capabilities into a national system or Automated Information System (AIS), as well as developing desktop tools, standard cartographic templates, program/PDT platforms, standard models/designs, etc.

(2) Identifying geospatial data requirements, i.e., identifying geospatial data (base data and mission-specific data) that are required to support the mission.

(3) Standardizing business processes to maintain data sets, using a life cycle approach.

(4) Providing the “Authoritative Source” of data to the enterprise.

(5) Establishing a policy addressing geospatial requirements and capabilities.

(6) Developing or augmenting PROSPECT training courses to address the workforce component of geospatial capabilities.

If a business line manager identifies the requirement to have a geospatial component incorporated into the business line’s AIS, the capability will be delivered through the USACE national geospatial system, CorpsMap (<https://corpsmap.usace.army.mil>).

2-6. **EGES Components/Enablers.** EGES enablers are technologies, policies, processes, and concepts that enable EGES to be fully implemented across USACE.

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a. Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE).

Geospatial data standards facilitate the structured development, sharing, and use of geospatial data. The USACE EGES Program is based on implementing the SDSFIE to define data content and structure (see Chapter 8). The SDSFIE is managed by the Defense Installation Spatial Data Infrastructure (DISDI) Working Group, composed of members from throughout DoD, including USACE. The goal of the SDSFIE is to create a DoD standard for facilities, infrastructure, environment, and civil works.

b. CorpsMap and Open Platform/Architecture to Support Interoperability. The USACE EGES Program will be based on a combination of a central database repository and an SOA supporting many avenues for accessing data sets (Figure 2-5).

(1) The open platform/architecture, along with the EGES Federated Data Architecture (Figure 2-6), provides the following capabilities:

(a) Adherence to Geospatial Profile guidelines found in the Federal Enterprise Architecture.

(b) Support of varied geospatial user groups with different access requirements (domain specialists, supervisors/managers, the general public, and remote users).

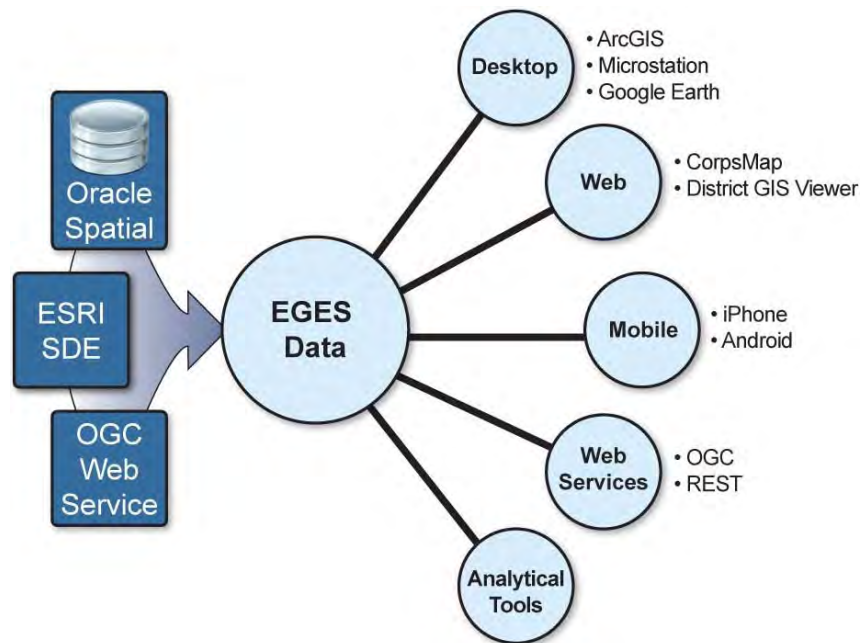


Figure 2-5. USACE EGES Program Architecture.

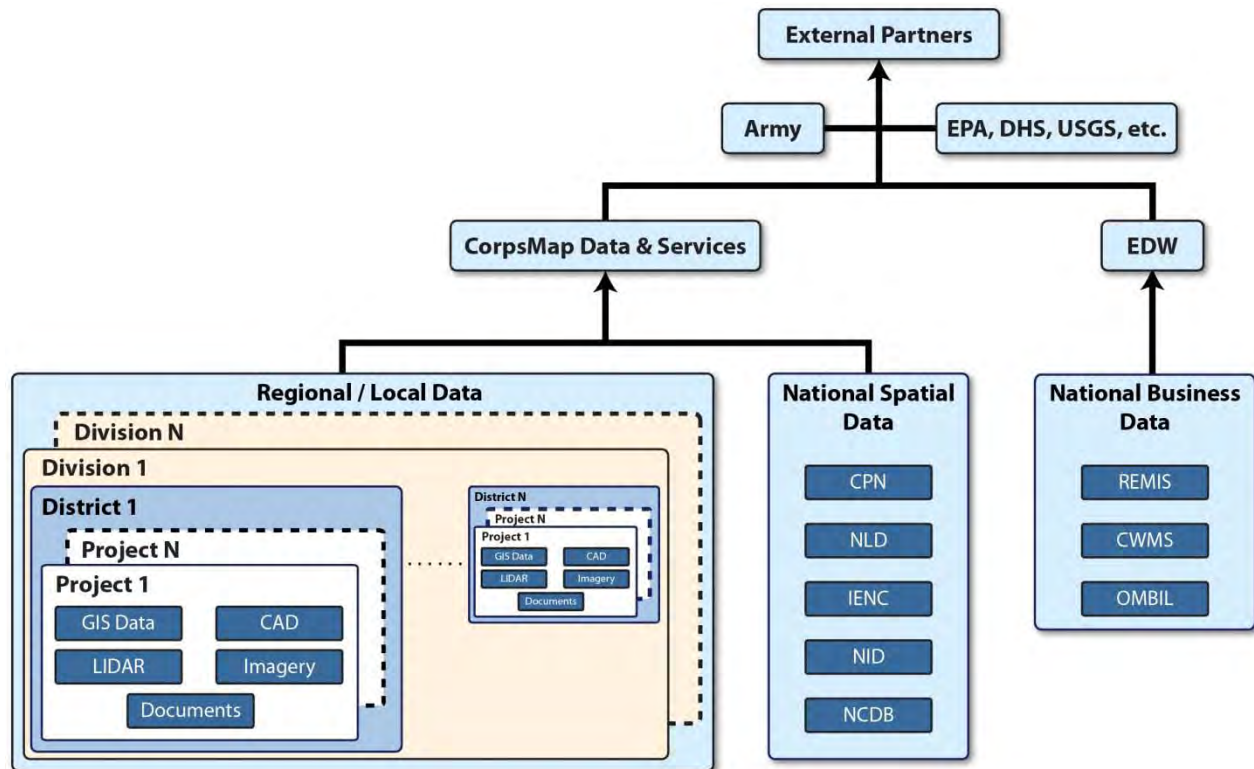


Figure 2-6. EGES Federated Data Architecture.

(c) Integrated operation with the USACE enterprise solution administered by ACE-IT, including standard security and UPASS access.

(d) Easy, open access to geospatial data through a central database repository or web services.

(e) Data editing using role-based permissions and versioning.

(f) Support for multiple users and user communities interacting with a single instance of the data in various applications.

(g) Support for standardized analyses and spatial simulations for alternatives testing.

(2) The variety of system architectures and configuration options available to support enterprise geospatial engineering has grown dramatically over the past 10 years. EGES system architecture must take into account budgets and expertise with a variety of technologies, support for internal and external customers, requirements to integrate geographically as well as across business lines, and multiple authentication and access control mechanisms. While the variety of technologies has made the design of EGES more complex, the focus on data sharing and data interoperability remains the primary concern of the USACE EGES architecture. The establishment of an ESRI enterprise license, and standardized support for GIS under ACE-IT,

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enables fully developed enterprise GES, especially in Districts with historically limited budgets and enterprise system management expertise.

(3) In the development of an EGES, it is recommended that data of regional or national significance be managed in Enterprise Geodatabase Systems (EGDS). Currently, these come in two varieties:

(a) ESRI enterprise geodatabases using a relational database engine (Oracle, PostGRES, or SQL Server) to store geometry, and a middle-ware application—a Spatial Database Engine (SDE)—to make the data available to ESRI software clients.

(b) Bentley ProjectWise databases that also use a relational database engine (Oracle or SQL Server), allowing users to manage engineering content and all the complex workspace resources that go along with the engineering content. The MicroStation workspace resources and other geospatial resources are managed in the ProjectWise database and delivered along with the engineering content.

Using a relational database to store GIS data, and an ESRI SDE to expose the data, maximizes opportunities for secure and efficient management, replication, and sharing of data assets. If a District does not have enterprise GES database (SDE) server capability, the District may partner with another District within the Division for data hosting or it may use the CorpsMap database housed at a USACE data center. ProjectWise workspaces establish detailed data portals into site/building designs, completing the life cycle management of mission-critical data assets.

(4) In addition to managing geospatial data within EGDS, it is recommended that data of regional or national significance be provided using Open Geospatial Consortium (OGC) data standards. These include web services (OGC:WMS, OGC:WFS, OGC:WCS, OGC:KML) and modeling services (GML, CityGML). The use of these open service protocols maximizes the reusability of geospatial data in a distributed/dynamic environment and is consistent with DoD NetCentric guidelines (<http://www.dtic.mil/whs/directives/corres/pdf/832002g.pdf>) and the Federal Geographic Data Committee (www.fgdc.gov). Vendor-specific web services such as ESRI REST services may also be used to enable quick and efficient integration of data when using the ESRI clients and servers. Note that the use of OGC web services, particularly OGC:KML, while necessary, is not sufficient to meet the range of data interoperability and analytical requirements. Direct access to agency data sources via file or database access is required.

(5) The use of emerging technologies such as cloud computing should be considered when appropriate for the audience and requirements at hand.

c. System Sustainment and Data Maintenance. Sustaining an EGES can only be accomplished through full integration with business process workflow. The geospatial data in an EGDS will quickly become dated if it is not maintained by appropriate business areas through their workflow. For example, Inland Electronic Navigational Charts (IENC) need to be maintained through the hydrographic survey community's workflow, while the data in the National Levee Database (NLD) must be maintained through the Periodic Inspection of

Completed Works and Levee Safety Program. The key to EGES sustainment is active engagement of all business areas, ensuring that their requirements are being met with the current EGES capabilities and level of service.

2-7. Organizational and Technical Issues.

a. Each Division needs to define its specific goals and objectives for EGES. Because of the various businesses that EGES will be supporting, agreement on specific objectives throughout the Division may be difficult. One of the most important organizational issues is addressing workflow and business process changes. In many cases, EGES will require Districts and Field Offices to standardize data collection and management processes. This is important because, while there may be an initial goal to convert important data to a standard format, it should be a one-time conversion. Changes in business processes and workflow need to be implemented to ensure that the EGES data remain current and that their integrity is maintained. Prior to business process and work flow changes, it is important to capture a baseline of performance. While measuring performance and calculating benefits have always been difficult tasks, they are needed to measure increases in performance and to support cost-benefit analyses. The biggest challenge to implementing an EGES continues to be dedicated EGES resources at the national, regional, and District levels. USACE receives very limited corporate funds, and at the time this manual was finalized, no line item funding existed for EGES.

b. Data stewardship and integrity are the biggest technical challenges to EGES. If information is going to be used by organizations that did not have direct input into its creation, these organizations need to have confidence that the underlying data are accurate and reliable and that derivative information products are reproducible. Only information products that are accurate and reliable should be integrated into EGES. If data sets of questionable quality are incorporated into the enterprise, users will lose confidence in the data. A quality control process, along with data stewardship responsibilities, needs to be established as part of an overall EGES program. Other technical issues relate to EGDS access and sharing, whether it be web access, speed and reliability, integration and linking with legacy information databases, or interoperability with emerging EGES such as ProjectWise. While much of the EGES concept is based on a distributed architecture (keeping data sets close to those units that are responsible for creating and maintaining the data), it is beneficial to centralize some data sets that are required by the entire organization. Deciding what data sets should be distributed versus centralized is also an issue that needs to be resolved.

c. This section is a general overview of organization and technical issues. Each Division needs to resolve how it will address these issues, and it must document them in their EGES Program Management Plan (see Chapter 5). Appendix F includes an example of a Division EGES Program Management Plan.

2-8. Aspects of Successful EGESs at Division and District Commands.

a. EGES implementation is likely to be most effective when EGDS infrastructure (enterprise data sets and viewer) and data development resources are segregated from the

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geospatial production and analysis resources. Generally, a focused deployment of the EGDS infrastructure is more efficient than blending tasking between infrastructure and production.

b. The movement toward an enterprise deployment of geospatial technologies within the Command will involve technical and organizational components. A Program Management Plan (PMP) needs to be developed to address both technical and organizational changes.

c. For a successful EGES implementation, each Command must address the following five major areas:

- (1) Workforce development (see Chapter 4).
 - (2) Data standards, data access and documentation (see Chapter 8).
 - (3) Data stewardship and integrity (see Chapter 9).
 - (4) Business process and work flow (see Chapters 4 and 5).
 - (5) Customer/stakeholder coordination, collaboration, and relations.
- d. Elements that support a successful EGES implementation include:

(1) Links to strategic and corporate initiatives, such as strategic plans, campaign plans, and Quality Management System (QMS).

- (2) Active technical and oversight committees.
- (3) Division-level coordination.
- (4) Oversight by a Regional Management Board (Division).
- (5) Oversight by a Corporate Board (District).
- (6) Strategic and tactical components.
- (7) Performance monitoring.
- (8) Geospatial Project Management Plan (PMP) and Geospatial Five Year Plans.
- (9) Cost estimates.
- (10) A well-defined funding strategy.

2-9. EGES Promotes Effective Partnering Opportunities. A fully sustained EGES program allows USACE to more effectively and efficiently coordinate and implement the geospatial activities outlined in Executive Order (EO) 12906. EO 12906 directs Federal agencies to

coordinate and work with state, local, tribal nation, and private sector partners on sharing geospatial data, emphasizing data acquisition and data access activities (Figure 2-7).

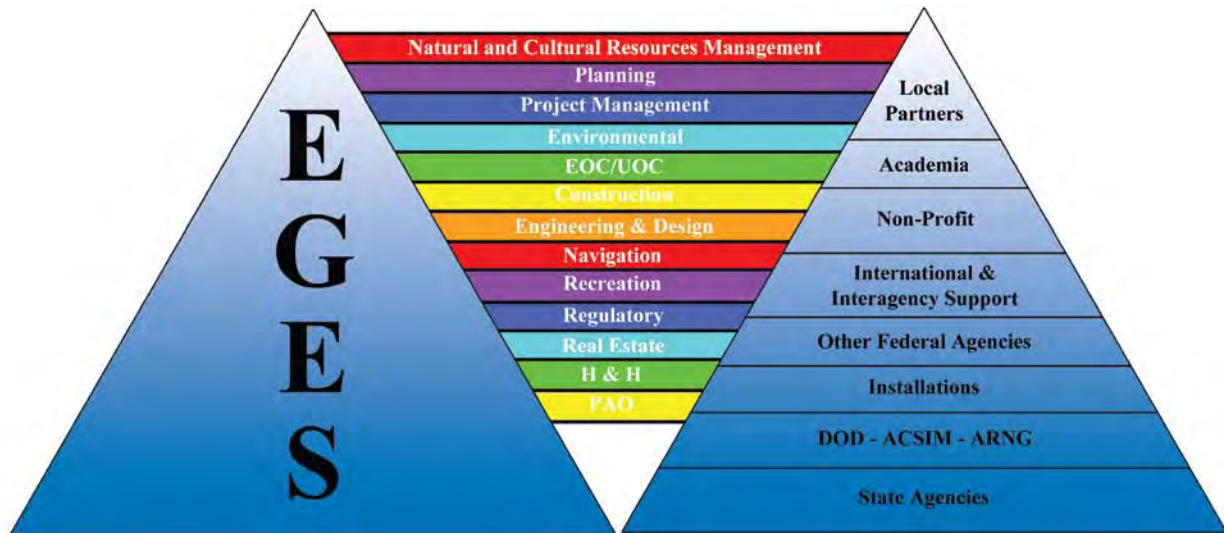


Figure 2-7. EGES and External Affiliations.

a. EGES and Watershed Management. Sharing technical information and data with sponsors and partners is the foundation of the USACE Watershed Management Approach as outlined in the Civil Works Strategic Plan. Using geospatial technologies as the foundation for managing water resources is the only viable solution for effectively integrating vast amounts of disparate data needed to manage the national water resources, and it will enable an entire watershed community to participate in watershed decisions.

b. EGES and the Installation Geospatial Information and Services (IGI&S) Community. Both the Office of Secretary of Defense (OSD) and the Office of Army Chief of Staff for Installation Management (OACSIM) promote and direct coordination of geospatial activities within DoD.

2-10. Required Elements.

a. Each District shall establish an EGES program by:

- (1) Establishing and resourcing RF502x accounts.
- (2) Identifying an EGES PM/District GIS Coordinator.

b. Each Division shall facilitate regional EGES coordination and integration by:

- (1) Identifying an MSC lead for EGES.
- (2) Holding regular meetings to coordinate EGES activities regionally.

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c. If a USACE AIS has a geospatial requirement, that AIS shall use the CorpsMap platform or a platform that can be easily integrated with CorpsMap.

CHAPTER 3

Enterprise Geospatial Engineering System (EGES) Organizational Structure

3-1. Purpose. The purpose of this chapter is to define the EGES organizational structure, the responsibilities of the coordinators, and the functions of the various teams within USACE. The chapter offers recommendations and requirements for a successful EGES at each level, suggested training venues, and sample geospatial job descriptions. Additionally, it can be used as a guide in determining the EGES functionality that is appropriate for each District.

3-2. Background, Responsibilities, Location of the EGES in a District.

a. Research conducted during the compilation of the USACE Geospatial Data and Systems Management report (November 2000; www.crrel.usace.army.mil/library/technicalreports/ERDC-TR00-9.pdf) concluded that Districts with the most evolved EGES programs have one funded individual with the responsibility to lead the initiative. The lead for the EGES initiative, or the Geospatial Coordinator, within a District is determined at the District level. This individual is responsible for the communication between business areas and management on all aspects of EGES, including data management and standardization, software and hardware needs, policy and procedures, etc. Additionally, the most successful EGES programs have a Geospatial Section or Branch to centralize the standardization and organization of geospatial data and the development of geospatial applications. While a decentralized model has served many Districts well, larger Districts might benefit from a centralized branch or section.

b. All business areas in USACE use geospatial technologies. Therefore, the District's Geospatial Project Delivery Team (PDT) should consist of representatives from all functional areas, such as Hydrology and Hydraulics (H&H), Survey, Emergency Management, Real Estate, Regulatory, Planning, Resource Management, Engineering (specifically, the CAD and/or BIM Manager), Construction, Operations, and ACE-IT (see Figure 2-4). An appointment letter, signed by the District's Corporate Board or Executive Committee, is a good way to formalize the establishment of the Geospatial PDT. In most Districts, this Geospatial PDT will evolve into a Geospatial Technical Committee, which will perform fewer "PDT" functions and will serve more as an advisory committee as well as a way to communicate directly with end users.

(1) Districts.

(a) Each District shall appoint a Geospatial Coordinator to serve as the primary point of contact for all technical and administrative matters concerning EGES. The Geospatial Coordinator is responsible for formulating, administering, managing, supervising, and coordinating the District's EGES activities.

(b) Each District shall establish a Geospatial PDT that will develop a District EGES Program Management Plan (PMP) that establishes an integrated infrastructure to support geospatial activities across the District. The EGES PMP is described in further detail in Chapter 5. The PDT will give the representatives from each functional area the opportunity to discuss the needs of their group with the Geospatial Coordinator to ensure that the system is useful to everyone.

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(c) The Districts are to have fully functional geospatial data systems to meet project needs and mission requirements, including data collection, creation, maintenance, tracking, and collaboration; geospatial analysis; and product generation. District geospatial data viewers shall be developed in coordination with Division and Headquarters' corporate viewing tools.

(d) It is recommended that each District have a Geospatial Champion (GS-14/15) who will be an advocate for the EGES initiative and who understands the goals of the Geospatial PDT, supports the geospatial vision, and serves as a voice among senior managers (Figure 3-1). The District Geospatial Champion will advise the Geospatial Coordinator and PDT with respect to the District missions and overall vision of the District leadership.

Figure 3-1. Geospatial Organization Chart.

(2) Divisions.

(a) Each Division shall appoint a Regional Geospatial Coordinator whose primary role is to foster coordination and communication among the Districts and to promote EGES within the Division. This coordinator may choose to conduct meetings through in-person meetings, teleconferences, video teleconferences, or web meeting tools. An in-person meeting once a year is advisable.

(b) Each Division shall establish a Geospatial Program Coordination Team (PCT) made up of District Geospatial Coordinators and headed by the Regional Geospatial Coordinator. The Geospatial PCT will develop a regional plan to integrate the geospatial infrastructure across the Division. The Regional Geospatial Coordinator will serve on a national Geospatial Program Management Team (PMT), headed by the USACE Geospatial Coordinator, to coordinate the regional plans and to integrate the geospatial infrastructure across USACE.

(c) The Divisions typically require less EGES functionality than the Districts. The functionality required by Divisions allows their staffs to use commercially available tools, such as ArcMap or an Internet based solution, to view geospatial data products created by the Districts. The Divisions can use these sources to make internal management decisions, conduct executive briefings, maintain an overview of Division activities, and coordinate EGES activities. Division geospatial viewers shall be developed in coordination with Headquarters' corporate viewing tools.

(d) It is recommended that each Division also have a Geospatial Champion to advocate for the initiative with senior management (Figure 3-1). The Division's Geospatial Champion is an individual who is on the Division's Executive Board or Committee.

(e) Each Division shall establish a Geospatial Steering Committee, which will consist of individuals from various backgrounds, such as Hydrology and Hydraulics (H&H), Survey, Emergency Management, Real Estate, Regulatory, Planning, Resource Management, Engineering (specifically, the CAD and/or BIM Manager), Operations, and ACE-IT to coordinate geospatial efforts throughout the Division.

(3) Headquarters.

(a) As defined in ER 1110-1-8156, HQ CECW-CE is the HQ proponent for geospatial technologies and will appoint a Geospatial Community of Practice (CoP) Lead and a CAD/BIM CoP Lead for USACE. The Geospatial CoP Lead develops policy and guidance on the use of geospatial technology in USACE and ensures that USACE adheres to Federal geospatial policy and complies with Army Geographic Information Officer (GIO) policies (as applicable). The Geospatial CoP Lead, also referred to as USACE Geospatial Coordinator, also represents USACE on numerous Federal geospatial working groups, such as the Federal Geographic Data Committee (FGDC), the Defense Spatial Data Infrastructure (DISDI) Working Group, and the National BIM Standard (NBIMS). CECW-CE is the HQ proponent for the Geospatial PROSPECT courses (Survey, GPS, GIS, Remote Sensing, etc.) and for the CAD/BIM Technology Center, the Remote Sensing/GIS Center, the Survey and Mapping Center of Expertise, the Photogrammetric Center of Expertise, and the Joint Airborne Coastal Mapping and Charting Center.

(b) The USACE Geospatial Oversight Committee Charter (See Appendix G) establishes a guidance body to address USACE Geospatial Engineering (GE) issues impacting USACE's mission. The objective is to effectively and efficiently support mission requirements by sharing geospatial data and knowledge seamlessly across USACE enterprise and with our international, Federal, state, and local partners as well as the public as appropriate. The USACE Geospatial

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Oversight Committee (GOC) acts as the highest level of geospatial authority in USACE. The GOC establishes strategic direction; reviews and monitors existing geospatial programs, activities, and policy implementation; and provides critical decisions about the implementation of geospatial technology across USACE.

(c) The USACE Geospatial Coordinator and the Business Line/Functional Managers are responsible for managing and maintaining USACE National Geospatial Data Sets and the CorpsMap Automated Information System (AIS). USACE National Geospatial Data Sets include National Inventory Dams (NID), National Levee Database (NLD), Inland Electronic Navigational Charts (IENC), District/Division Boundaries, Corps Reservoirs, Corps Recreation Sites, USACE Real Estate Boundaries, etc.

(d) USACE shall establish a Geospatial Program Management Team (PMT) made up of Division Geospatial Coordinators and headed by the USACE Geospatial Coordinator. The Geospatial PMT will work to integrate the geospatial infrastructure across USACE.

(e) The Geospatial Champion at HQ is the Chief of Engineering and Construction (see Figure 3-1).

(4) Corps research facilities.

(a) The Army Geospatial Center (AGC) provides timely, accurate, and relevant geospatial information, capabilities, and domain expertise for Army Geospatial Enterprise implementation in support of unified land operations. This includes providing geospatial support and products to the Army and mission partners, developing and fielding enterprise enabled geospatial systems, and providing domain expertise and support to Army's Mission Command Systems and acquisition community.

(b) The Engineer Research and Development Center (ERDC) is composed of seven laboratories. ERDC requires complete geospatial data and systems functionally to meet their research and customer needs. There is no center of geospatial technology research and development in ERDC, but each lab provides geospatial expertise on numerous levels and on a wide variety of practical applications.

- ERDC's Topographic Engineering Center (TEC) conducts research on techniques, equipment, and systems for the storage, retrieval, dissemination, and analysis of tactical geospatial data and services.

- ERDC's Geotechnical and Structures Laboratory (GSL) develops GIS-based tools and data sets and conducts studies using GIS for both civil and military applications in support of vehicle mobility, site characterization, and geologic, geotechnical, and geophysical studies of water resource structures.

- ERDC's Construction Engineering Research Laboratory (CERL) develops and applies remote sensing and geospatial tools and models for environmental, cultural resource, and facility

management on military installations and in direct support of the warfighter in operational environments.

- ERDC's Environmental Laboratory (EL) applies geospatial technologies to a wide array of civil and military research topics within ten focus areas: ecosystem restoration, ecological modeling and forecasting, contaminant remediation and munitions response, ecological resources, climate change, risk and decision science, environmental security, environmental sensing, systems biology, and environmentally sustainable materials.

- ERDC's Cold Regions Research and Engineering Laboratory (CRREL), in its Water Resources Geospatial Applications technical area, "develops software tools and methods to improve the use of geospatial technologies across the Corps business areas to effectively manage water resources, emergency situations, real estate, environmental restoration, regulatory activities, navigation, and operations projects and programs" (http://www.crrel.usace.army.mil/technical_areas/wrga/).

- ERDC's Coastal Hydraulics Laboratory (CHL) develops and applies remote sensing and geospatial tools and models for water resource planning, engineering, construction, and operation issues in direct support of the warfighter and civil works missions.

- ERDC's Information Technology Laboratory (ITL) "conducts research and development in Informatics and Computational Science and Engineering with particular emphasis on high-performance computing for scientific and engineering discovery; data acquisition, analysis, and management; geospatial analysis and informatics; software engineering and evaluation; automated information systems; and building information modeling" (http://itl.erdc.usace.army.mil/aboutUs_mission).

- ERDC's CAD/BIM Technology Center for Facilities, Infrastructure, and Environment offers a full range of technical and professional services for geospatial technologies including CAD, BIM, GIS, and computer-aided facility management (CAFM) systems. The Center also provides centralized procurement vehicles for products and services to agencies and users of these systems.

c. Additional GIS Capabilities.

(1) The Hydrologic Engineering Center (HEC) develops and applies GIS programs and data to support its hydrologic, hydraulic, economic, and ecosystem models. Products include georeferenced models, inundation maps, and location-specific structural, agricultural, and life-loss consequence analyses of floods.

(2) The Huntsville Center (HNC) provides GIS support to the Installation Support Program through Ordnance and Explosives (OE); the Range and Training Lands Program (RTLTP); Site Inspection (SI) for the Military Munitions Response Program (MMRP); and the Facilities Reduction Program (FRP), as well as smaller project-specific requirements.

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3-3. Geospatial Coordinator and the PDT (District Level).

a. The position of Geospatial Coordinator is a requirement of ER 1110-1-8156. USACE District Engineers will appoint a coordinator to serve as the liaison between their District, the Division, and HQUSACE (CECW-CE) on EGES issues. The Geospatial Coordinator is also responsible for disseminating information related to the enterprise system throughout their District's geospatial data community, including field offices. Districts may choose to maintain separate POCs for GIS, BIM, CAD, SIM, Remote Sensing, Surveying and Mapping, and ProjectWise, but the Geospatial Coordinator will be cognizant of ongoing and planned efforts in these areas and will be the focal point for information exchange between the District, Division, and HQUSACE. The Geospatial Coordinator, along with the District's Geospatial PDT, is responsible for providing guidance on integrating enterprise geospatial data standardization into project work flow. Standardized data are more easily incorporated into the District's data viewer. The Geospatial Coordinator should also provide initial, limited guidance to Project Managers and operations on the potential use of geospatial technologies for projects and operations. A database of Geospatial Coordinators can be accessed through the Geospatial CoP sharepoint site at <https://cops.usace.army.mil/sites/GEO/default.aspx>.

b. The Geospatial Coordinator may be asked to serve on committees or groups to develop EGES policy or implement the EGES strategic focus. The Geospatial Coordinator may also be asked to participate in state or local groups involved in coordinating regional EGES activities. Participation in such groups is highly encouraged but is ultimately at the discretion of the District leadership and the Geospatial Coordinator. However, funding for such participation is not provided by these groups or their members. Therefore, the District must determine whether funding is available. The District may authorize the use of project funding when there is a direct relationship between the coordination group's activities and the particular project. At the District level, Geospatial Coordinators should dedicate 100% of their time to geospatial initiatives.

c. In addition to other duties as assigned, the Geospatial Coordinator has the following primary responsibilities:

- (1) Serves as the geospatial point of contact for the District on all aspects of EGES.
- (2) Serves as the liaison between the District, the Division, and HQUSACE on EGES-related issues.
- (3) Provides technical guidance on implementing EGES technology into project work flow.
- (4) Serves as the lead for the District's Geospatial PDT.
- (5) Represents the District on the Division Geospatial PCT.
- (6) Verifies and updates project information in the Corps Project Notebook by 1 March every year (EC 1130-2-215).

(7) Coordinates submission of metadata to CorpsMap or the District metadata server (see Chapter 8), as appropriate.

(8) Prepares internal guidance on the implementation of geospatial data standards.

(9) Prepares and executes the District's geospatial annual budget through the RF502x facility accounts.

(10) Annually, submits the five-year strategic plan for the implementation of EGES and data management to the Division (see Chapter 5).

(11) Develops, reviews, and updates the District's EGES Project Management Plan (see Chapter 5), as needed.

(12) Approves and signs project DMPs (see Chapter 4).

(13) Serves as the primary POC for the District for all enterprise and blanket purchasing agreements for all geospatial software.

(14) Serves as the primary District POC to ACE-IT for all geospatial software and hardware needs and maintains a working relationship with ACE-IT.

(15) Serves as the PM for the creation and maintenance of the District's Geospatial Viewer.

(16) Recommends to the HQUSACE Geospatial Coordinator the individuals within the District's Geospatial CoP who need system administrator rights on the network in order to effectively complete their jobs (the z0 accounts).

(17) Appoints the ESRI Agency Central Support (ACS) for the District.

(18) Works with Contracting to develop contract language that will result in useable, well-defined, and properly documented geospatial deliverables.

(19) Serves as the primary POC to Emergency Management for geospatial support during an EM event.

(20) Coordinates data releasability with subject matter experts (SMEs), data stewards, Office of Counsel, Public Affairs Office, and whichever group is affected by or has input into releasable data (internal and external) to USACE or the District.

(21) Meets the HQUSACE EGES metrics as defined by the Consolidated Command Guidance (CCG).

d. Since the Geospatial Coordinator is responsible for providing technical guidance on implementing EGES technology into project work flow, a good to excellent understanding of

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geospatial technology and related technical issues (including integration issues) is required. To effectively represent the District, the Geospatial Coordinator should have education and experience in geospatial or related sciences and be knowledgeable about in-house and external customer mission and project requirements. Information on available education is provided in Section 3.6, Professional Qualifications and Training.

3-4. Regional Geospatial Coordinator and the PCT (Division Level).

a. The position of Regional Geospatial Coordinator is a requirement of ER 1110-1-8156. USACE Division Engineers will appoint a coordinator to serve as the liaison between the Districts, the Division, and HQUSACE (CECW-CE) on EGES issues. The Regional Geospatial Coordinator is also responsible for disseminating information related to EGES throughout the Division's geospatial data community. The Regional Geospatial Coordinator will be cognizant of ongoing and planned efforts for GIS, SIM, BIM, CAD, ProjectWise and Remote Sensing, and Surveying and Mapping in the region and will be the focal point for information exchange between the District, Division, and HQUSACE. The Regional Geospatial Coordinator is responsible for coordinating the District's EGES efforts and ensuring that Districts have a venue to discuss ideas for establishing a system that fits into a regional initiative as well as the USACE initiative.

b. The Regional Geospatial Coordinator may also be asked to serve on committees or groups to develop EGES policy or implement the EGES strategic focus at the regional level. The Regional Geospatial Coordinator, like the District Geospatial Coordinator, is encouraged to participate on teams that further the interoperability of geospatial data and tools. Networking, both internally within USACE and externally with Federal, state, and local agencies, is an important part of the job.

c. The Regional Geospatial Coordinator should have experience in the use, development, and implementation of geospatial technologies, as well as a clear understanding of the administrative and logistical challenges of EGES. This individual should also be knowledgeable about all the business lines that use geospatial technologies, including the potential for reuse and repurposing of geospatial tools and applications developed for one business line for use by another. The coordinator is the POC through all business lines for the integration and standardization of geospatial data. Regional Geospatial Coordinators are expected to dedicate a minimum of 50% of their time to geospatial issues and initiatives.

d. In addition to other duties as assigned, the Regional Geospatial Coordinator has the following primary responsibilities:

(1) Serves as liaison between the District, the Division, and HQUSACE on EGES-related issues.

(2) Serves as the lead for the Division's Geospatial PCT and mentors and supports the District Geospatial Coordinators, as necessary. Meets with the PCT virtually quarterly and meets face-to-face annually if funding for travel is available.

- (3) Ensures regional compliance with HQUSACE EGES metrics as defined by the CCG.
- (4) Represents the Division on the USACE Geospatial PMT and ensures regional compliance with regulations and guidance.
- (5) Annually, submits an updated Regional Five-Year Strategic Plan for the implementation of EGES. Develops an EGES PMP for the region with input from the PCT and the geospatial steering committee (see Chapter 5).
- (6) If the requirement for a regional data viewer exists, promotes the development and maintenance of a viewer as funding allows.
- (7) Promotes geospatial education (applications, policies, new tools, data standardization, etc.) within his/her region. Based on the availability of funding, organizes briefings, conferences, and workshops, as necessary and requested, to promote consistency among the Districts. If uniformity is not an absolute requirement among the Districts, coordination is necessary to ensure that integration of tools, data, etc. at the regional level is maintained.
- (8) Serves as a liaison between the Geospatial CoP and other CoPs to help gain access to other AISs.
- (9) Promotes regional inter-agency partnering and support.

3-5. Technical Skill Requirements to Implement an EGES.

a. USACE Districts are not required to create new positions to support the requirements of ER 1110-1-8156. As geospatial technology advances within the organization and becomes an integral part of conducting the mission, geospatial skills will become part of many job descriptions. Districts may want to establish new positions to effectively use geospatial technology. Although this section provides some guidance on EGES staffing, it does not mandate the establishment of specific positions.

b. While the Engineering/Geospatial Technician job series may include GIS/SIM/BIM/CAD skills, GIS-exclusive positions have no formal titles in the Federal Civil Service. However, specific GIS skills are included in some position descriptions, such as Geographer, and are even used in informal titles, such as GIS Specialist, in job announcements. Attempts to develop formal EGES titles in the past have not been successful and are unlikely to be successful in the current environment, which emphasizes general categories to promote staffing flexibility. How these functions are implemented and staffed is up to the District. Representative paragraphs for EGES-related positions are provided in paragraphs c(1)–(5) below. The job descriptions are not intended to be an exhaustive list of personnel or staffing requirements.

c. The Geospatial Coordinator must understand EGES technical and policy issues and be a senior-level employee who understands the USACE mission. To effectively coordinate EGES at a Corps District office, the Geospatial Coordinator should be a GS-12 or -13 Physical Scientist, Geographer, Civil Engineer, Computer Scientist, Hydrologist, or other qualified title. These are

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suggested job series for the Geospatial Coordinator position; these suggestions should not exclude a qualified individual from consideration or selection.

(1) Spatial analyst duties.

(a) Responsible for planning and executing studies relating to physical and cultural environments for use in USACE civil works projects and military activities/operations. Duties and responsibilities require knowledge of and experience with GIS, computers, the geographic sciences, and digital geospatial data processing. Must be able to design and build new GIS applications using commercial software tools. Provides expert knowledge to other engineers and scientists (e.g., geologists, geographers, hydrologists, mathematicians, ecologists, and physicists) in setting up and conducting programs and projects. Formulates conclusions from spatial analyses to supplement those of the lead scientist or program manager.

(b) Plans and directs field studies to collect data to determine the quantitative relationships between various environmental factors and components of structural and nonstructural alternatives for civil works and military projects. These studies include on-site data acquisition, airborne remote sensing missions, use of conventional surveying techniques, and use of automatic sensing and recording instrumentation.

(c) Participates in the directions of office studies. Negotiates with other offices (USACE Districts and Divisions, U.S. Department of Agriculture, U.S. Geological Survey, etc.) and organizations (universities, research institutions, and commercial concerns) for existing information or cooperative work. Relies on own professional skills to review, interpret, and analyze information; formulate approaches; reach conclusions; and make recommendations. Develops methods and performs studies involving the comparison of geographical regions and specific sites for the purpose of determining degrees of analogy.

(d) Performs administrative duties appropriate for the technical work described. Directs the work of professional and nonprofessional employees of lower grade and checks performance for quality and quantity of work. Responsible for knowledge and observance of all regulations applicable to the work described.

(2) Visualization skills. Responsible for preparing animations, models, digital terrain models (DTMs), maps, graphics, web pages, displays, and other visual devices for conveying information related to civil and military programs. Duties and responsibilities require knowledge of and experience with EGES, computers, the geographic sciences, graphic and cartographic design, and digital geospatial data processing. Must be able to lay out and produce hard copy and electronic output for presentation of various physical and cultural features. Provides expert knowledge to other staff (e.g., geologists, geographers, hydrologists, mathematicians, ecologists, and physicists), presenting information in an aesthetically and visually appropriate manner. Must have experience with using three-dimensional data for the purposes of visualization and presentation.

(3) Data distribution skills. Responsible for providing data to internal and external users. Duties and responsibilities require knowledge and experience with EGES, computers, the

geographic sciences, and digital geospatial data processing. Must be able to discern user needs from basic requests, use metadata to locate data sets, and generate appropriate formats (CD, DVD, compressed file, etc.) for the user. Advises other staff and external customers on accessing and distributing USACE data. Often works with other team members to distribute geospatial data to external customers. Works with Public Affairs Office to ensure compliance with data distribution policies and procedure.

(4) Data development/collection skills. Responsible for developing and acquiring geospatial data using appropriate tools and sources. The data development and collection responsibilities require experience with developing and maintaining database structure, database normalization, and indexing. A data developer must have first-hand experience with the specific database management software that the District uses. Must have first-hand experience with FGDC-compliant geospatial data documentation (metadata). Provides expert advice to other staff on the most effective and timely methods for data development, collection, and acquisition. May work with GPS, pen-based computers, and other field collection devices. Coordinates with counsel on data license and access issues related to data acquisition from external sources. Often works with external personnel and organizations to acquire existing data. May use the Internet and FTP for acquiring external data.

(5) Data custodian skills. Responsible for geospatial data organization and maintenance in coordination with geospatial users. Duties and responsibilities require experience similar to Database Development/Collection. Duties and responsibilities require experience with EGES, computers, the geographic sciences, various source materials, and digital geospatial data processing. Must be capable of converting data from various graphic and nongraphic formats to electronic formats and from various electronic and hard copy media. A data custodian must have first-hand experience with the specific database management software that the District uses. In consultation with EGES and non-EGES staff, develops data validation and certification routines and policies to ensure that data are ready for release to customers and the public. May work with data distribution staff to distribute geospatial data to external customers.

(6) The following job description is typical for a Geospatial Analyst position.

Geographer Job Series:

GS-5: Entry Level. Perform mapping and analysis tasks under the supervision of a senior-level analyst.

GS-7: Mid Level. Has experience performing mapping and analysis tasks and can execute basic GIS analysis supporting the USACE mission with little supervision.

GS-9: Project Lead. Under a senior analyst's supervision, represents the geospatial community/technology on project-level PDTs, working with PDT members to identify projects' geospatial requirements and develop solutions.

GS-11/12: Senior GIS Analyst. Has experience and routinely performs and leads complicated mapping and analysis supporting the USACE mission with no supervision.

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Has experience and routinely represents the geospatial community/technology on project PDTs, working with the PDTs to identify projects' geospatial requirements and develop solutions.

GS-12/13: District Geospatial Coordinator. Leads the District on implementing EGES throughout the District. Coordinates with Federal, state, and local offices within the region on the use of geospatial technology. Actively works with other District Geospatial Managers to develop common solutions. Coordinates with HQ to ensure that solutions are in line with Federal and DoD geospatial policy.

GS-14: Develops strategy and policy regionally and/or nationally for the use of geospatial technologies in USACE. Routinely coordinates with Federal, DoD, state, and local partners to develop policies and implementation strategies on the use of geospatial technologies.

GS- 14/15: Performs duties associated with the USACE Geospatial Information Officer (GIO). Functions as the Community of Practice lead. This is an HQ position.

(7) The following job description is typical for a position that also requires knowledge of CAD/BIM/SIM/GIS applications.

Engineering/Geospatial Technician Job Series: Functions in an organization that provides Computer Aided Design (CAD), Building Information Modeling (BIM), Site Information Modeling (SIM), and Geographic Information System (GIS) support, as well as a full range of standardized engineering drafting services to engineers, architects, and scientists engaged in the design and execution of projects in support of the District's mission. Projects include research supported by geospatial systems, as well as planning, design, construction of new facilities and the operation, modification, repair, and maintenance of existing facilities. Serves as a Geospatial Specialist supporting higher-graded engineers, architects, scientists, or technicians with the aspects of visual information as it pertains to a variety of geospatial projects. Activities encompass preparing project planning and design reports; acquiring survey, sounding, and topographic data; producing facility models and data, construction documents; and developing and maintaining geospatial and metadata files including the digital project notebook.

3-6. Professional Qualifications and Training.

a. In general, each geospatial professional should have a background in a discipline that relies on spatial/relational or geographic information. Such fields include geography, cartography, remote sensing, engineering, architecture, biology, oceanography, urban and regional planning, environmental science, archaeology, forestry, landscape architecture, and geology.

b. Course work in varied geospatial topics is also crucial to positions that support the EGES.

(1) The Geographic Information Science and Technology (GIS&T) Body of Knowledge, created by the University Consortium for Geographic Information Science and published by the Association of American Geographers, is a useful reference that outlines ten knowledge areas required for the general practice of the GIS profession. The U.S. Department of Labor has also developed a Geospatial Technology Competency Model (Figure 3.2) that expands on the GIS&T Body of Knowledge (<http://www.doleta.gov>). A number of sources exist for geospatial technology training, which makes entry into the area and continuing education readily available. For a list of GIS education and training resources, see <http://www.gis.com/content/learn-gis>.

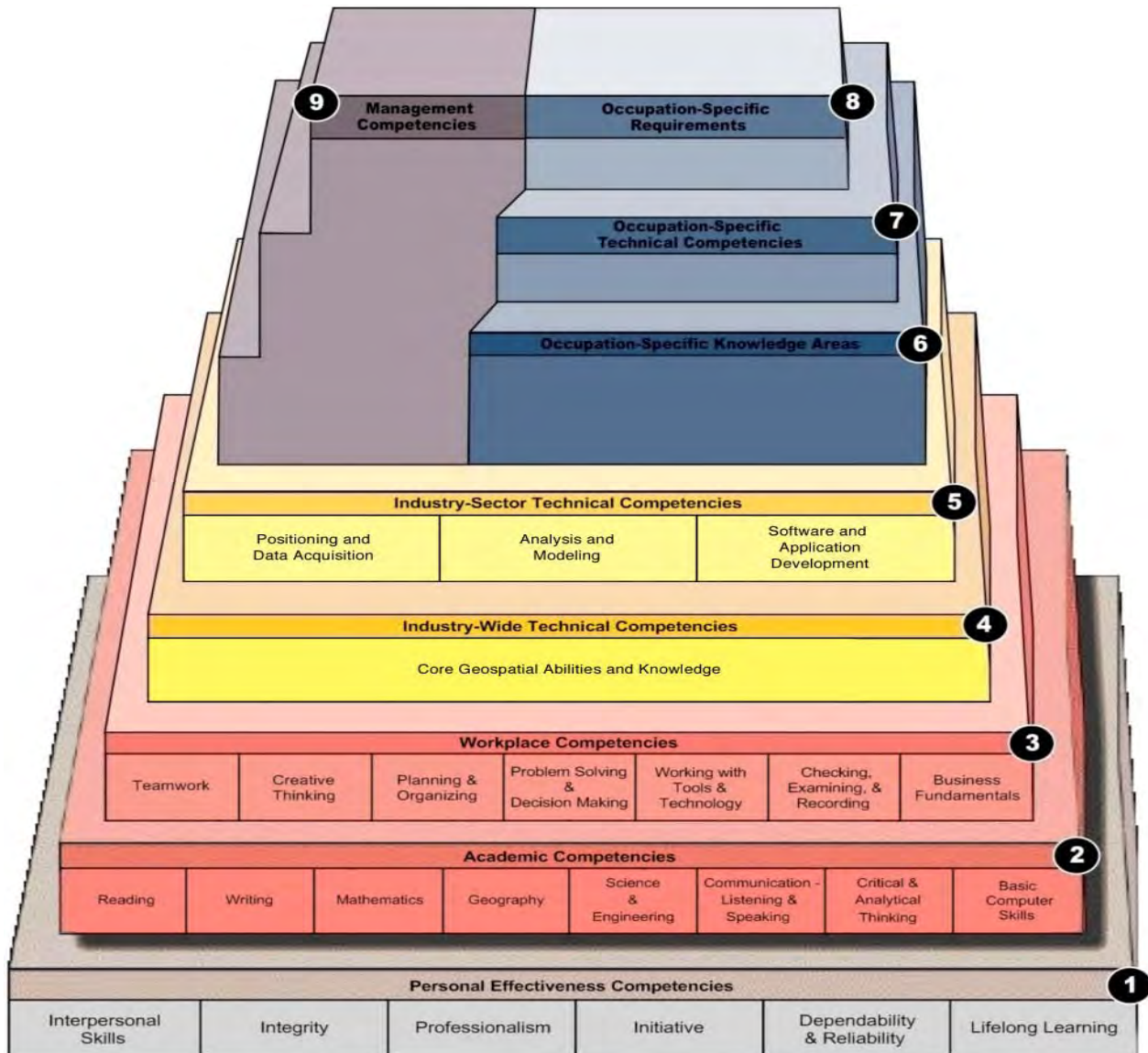


Figure 3-2. Geospatial Technology Competency Model.

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(2) FIATECH provides an outline of the skills, characteristics, and competencies of a “Technology and Knowledge-enabled Workforce.”¹ High-caliber departments exist at Stanford, the University of Pennsylvania, and Texas A&M (among others), and a sampling of graduate programs and certificates in relevant disciplines includes Civil and Environmental Engineering, Geosciences², Systems Science and Engineering, Engineering Systems Management³, Technology Management, and Advanced Software Systems.

(3) SIM. Autodesk University⁴ hosts regular webinars and lectures on leveraging their latest modeling platforms and tools. Autodesk and value-added resellers provide certification for Autodesk SIM products (Civil3D, Map, etc.) Bentley hosts subscription training modules, course materials, and the “Be Connected” infrastructure professional community through their on-line training site.⁵ The SITEOPS site planning platform offers professional (individual) and provider (AEC firm) certification in their products.⁶

(4) BIM. The Associated General Contractors of America (AGC) offer a BIM Education Program and CM-BIM certificate, available locally.⁷ As referenced above, training and certification for Autodesk’s Revit Suite, Ecotect, and GreenBuilding Studio are available through Autodesk University.⁴ Similarly, Bentley’s subscription training modules, course materials, and the “Be Connected” community offer BIM-specific courses and credentials through their on-line training site.⁵ Stanford’s Center for Integrated Facility Engineering offers Virtual Design and Construction (VDC) certification courses and webinars.⁸

c. In the present environment, the progression for a geospatial professional is similar to that of the apprentice or journeyman master sequence in the crafts. Districts should be aware that geospatial professionals require continuing education to maintain technical proficiency and currency with hardware and software.

(1) USACE training.

(a) The PROSPECT courses are developed to meet unique USACE training needs. These courses are taught by ERDC or HEC employees or by contractors, and some provide continuing education credits. Current geospatial PROSPECT courses include GIS Introduction, GIS Intermediate, GPS for GIS Applications, Remote Sensing Fundamentals, Flood Damage Analysis Tools w/GIS, Hydrographic Survey Techniques, USACE BIM Managers Workshop, Building Information Modeling for Project Construction and Facility Managers, Survey III (Mapping) and IV (GPS), and Hydrologic Engineering Applications for GIS. The point of contact (POC) for PROSPECT courses is:

¹ <http://fiatech.org/workforce-training/roadmap-summary>

² <http://takethenextstep.tamu.edu/takethenextstep>

³ <http://distance.tamu.edu/futureaggies/distance-degrees/master-of-science-engineering-systems-management.html>

⁴ <http://au.autodesk.com/>

⁵ <http://www.bentley.com/en-us/training/>

⁶ <http://www.siteops.com/connect/siteops-certified-firms>

⁷ http://www.agc.org/cs/building_information_modeling_education_program

⁸ <http://cife.stanford.edu/courses>

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Director
USACE Learning Center (ULC)
ATTN: CEHR-ULC-PMO (Registrar)
P.O. Box 1600
Huntsville, AL 35807-4301
256-895-7421/7469

(b) The USACE Infrastructure Systems Conference is sponsored by the CAD/BIM Technology Center to transfer new technology developments to USACE users. This symposium, held every two years, provides short courses, plenary sessions, and technical sessions. Exhibits of commercial and USACE capabilities are provided. Announcement of the symposium is made by a memorandum from HQUSACE.

(2) Other DoD training. The National Geospatial–Intelligence College (NGC) at Fort Belvoir, Virginia, has several courses related to geospatial technologies, including database production, remotely sensed imagery, GIS, cartography, and vendor-specific software training. The POC for NGC is:

NGC
College Administration and Policy
Office: 5855 21st Street, Suite 101
Fort Belvoir, VA 22060-5921
703-805-3266
<http://earth-info.nga.mil/nga-bin/td/db.cgi?db=td>

(3) Academia. Hundreds of colleges and universities offer CAD, BIM, survey/mapping, and GIS programs and certifications. These programs are often integrated with well-established academic departments such as geography, environmental science, geology, forestry, engineering, architecture, or agronomy. Some colleges and universities now offer undergraduate and graduate Certificates in Geographic Information Systems. The certificate programs provide introductory and in-depth study in the design and application of GIS technology. Numerous community colleges offer hands-on training in specific software, and many universities offer BIM and GIS short courses.

(4) Vendors. Vendors provide training in the operation of geospatial software (as opposed to universities, which emphasize concepts and applications to problems). This training may be acquired as part of a geospatial procurement through user groups and workshops, the USACE ESRI, Bentley or Autodesk Enterprise License Agreements (ELAs), and other contracts.

(5) On-line courses. Many vendors and societies offer on-line training at affordable prices. Through the USACE ESRI, Bentley, and Autodesk ELAs, unlimited use of on-line training is available.

(6) Professional meetings, conferences, and symposia. Many professional organizations conduct technical meetings and offer workshops and training in EGES technology:

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ESRI

www.esri.com

380 New York Street, Redlands, CA 92373

Autodesk, Inc.

www.autodesk.com

111 McInnis Parkway, San Rafael, CA 94903

Bentley Systems

www.bentley.com

685 Stockton Drive, Exton, PA 19341

The American Congress on Surveying and Mapping (ACSM)

www.acsm.net

6 Montgomery Village Avenue, Suite #403, Gaithersburg, MD 20879

The American Society for Photogrammetry and Remote Sensing (ASPRS)

www.asprs.org

5410 Grosvenor Lane, Suite 210, Bethesda, MD 20814-2160

The Geospatial Information Technology Association

www.gita.org

14456 East Evans Avenue, Aurora, CO 80014-1409

The Association of American Geographers (AAG)

www.aag.org

1710 Sixteenth Street, NW, Washington, DC 20009-3198

The Urban and Regional Information Systems Association (URISA)

www.urisa.org

701 Lee Street, Suite 680, Des Plaines, IL 60016

The American Institute of Architects (AIA)

www.aia.org

1735 New York Ave., NW, Washington, DC 20006-5292

Associated General Contractors of America (AGC)

www.agc.org

2300 Wilson Blvd., Suite 400, Arlington, VA 22201

Some Federal and state government conferences and meetings are also dedicated to geospatial technologies. ESRI sponsors the ESRI Federal Users Conference every February in Washington, DC, and the ESRI International Users Conference every July in San Diego, CA. ESRI also has regional user group conferences. Autodesk has events such as Autodesk University, workshops, seminars, and demonstrations throughout North America and Canada in various industries, including mapping, civil engineering, and infrastructure management. Bentley Systems has

regular events such as the BE Together conferences, seminars, on-line seminars and training, and user groups.

(7) Professional certification. Professional certifications are usually earned from a professional society or educational institute and must be renewed periodically. USACE encourages professional certification. There are currently three certifications available to GIS professionals.

(a) Certified GIS Professional (GISP). A GISP is a certified GIS professional who has met the minimum standards for ethical conduct and professional practice as established by the GIS Certification Institute (GISCI). GISCI offers a complete certification program based on educational achievement, professional experience, and contributions to the profession (<http://www.gisci.org>).

(b) Certified Mapping Scientist, GIS/LIS. The American Society for Photogrammetry and Remote Sensing (ASPRS) offers a certification program for professionals involved in GIS systems design and/or systems application of database management and computer programs that allow for the utilization of spatially referenced databases for solving user analysis requirements. The requirements for this certification include education, professional experience, and a passing score on a written test.

(c) Certified Mapping Scientist, Remote Sensing. The ASPRS also offers a certification program for professionals involved in the analysis of remotely sensed images using visual or computer-assisted technology. This certification also requires educational and professional qualifications and a passing score on a written test. Details on both ASPRS certifications are available from <http://www.asprs.org/>.

(d) Certified SIM Management and Application. Autodesk and value-added resellers provide certification for Autodesk SIM products (Civil3D, Map, etc.)⁹

(e) Certified BIM Management and Application. The Associated General Contractors of America (AGC) offer a BIM Education Program and CM-BIM certificate, available locally.¹⁰ Autodesk and value-added resellers provide certification for Autodesk BIM products (Revit Suite, Ecotect, GreenBuilding Studio).⁹

3-7. Required Elements.

a. District Geospatial Coordinators shall serve as the liaison between the District, the Division, and HQUSACE for EGES issues.

b. Division Geospatial Coordinators shall serve as the liaison between the Districts, the Division, and HQUSACE for EGES issues.

⁹ <http://usa.autodesk.com/adsk/servlet/index?id=14238652&siteID=123112>

¹⁰ http://www.agc.org/cs/building_information_modeling_education_program

CHAPTER 4

USACE Project Management Business Process (PMBP) and Data Management Plan (DMP)

4-1. Purpose.

a. The purpose of this chapter is to give specific guidance on how geospatial technologies integrate into the PMBP and how the PMBP can be applied to EGES. General guidance covering the PMBP is available in ER 5-1-11 and the PMBP Portal (<https://pmbp.usace.army.mil>).

b. This chapter will also provide guidance on the DMP, which is a required component of the PMBP, including its purpose within the life cycle of the project. The approved and signed DMP is submitted to HQUSACE via the Division's Regional Geospatial Coordinator by each District's Geospatial Coordinator.

4-2. Definitions.

a. Project Management Business Process (PMBP): The fundamental USACE business process used to deliver quality projects. It reflects the USACE corporate commitment to providing "customer service" that is inclusive, seamless, flexible, effective, and efficient. It embodies communication, leadership, systematic and coordinated management, teamwork, partnering, effective balancing of competing demands, and primary accountability for the life cycle of a project.

b. Project Delivery Team (PDT): The group or groups assembled by USACE to make the PMBP work. USACE draws on its diverse resources to assemble strong multidiscipline PDTs that are unlimited by geographic or organizational boundaries. The PDT is responsible and accountable for delivering a quality project to the customer.

c. Project Management Plan (PMP): A guide for quality project delivery for the PDT. The purpose is to help maintain a constant focus on project delivery and customer service.

d. Data Management Plan (DMP): The data management plan provides an organized, proactive approach to reduce data redundancy in the District and to use existing, available data. The intent is to organize and standardize data to maximize its use during the life cycle of the project and in the District by evaluating data needs and how those needs change as a project progresses. Data have life cycles of their own, which extend beyond the project itself, and the DMP addresses management of data beyond a project's life cycle. The DMP is an appendix or addendum to the PMP. Specific DMP guidance is included in Appendix H and is also available through the PMBP portal.

4-3. Applications and Analysis.

a. General applications and analysis. EGESs are successful when they are implemented using a corporate approach and when they meet the needs of users. EGESs are scalable;

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therefore, their role in project execution can be minimal or significant, depending on the scope and depth of the project. Plan Formulation and Alternative Analysis is a required part of most projects. An EGES can support both components of a study, as well as help illustrate existing conditions. For regional or watershed projects, the EGES is central to the integration of science and engineering data. The use of spatial analysis in the planning process is important because it allows more scenarios to be explored inexpensively. Using EGES throughout the life cycle of a project has the potential to:

- (1) Access and integrate more data.
- (2) Support better and more defensible decisions.
- (3) Result in a more comprehensive study.
- (4) Support environmental assessments.
- (5) Be more efficient because data are collected once but used many times.

b. Examples of using geospatial technologies to support USACE traditional work. USACE has a great diversity of geospatial applications, including Dredge Disposal Permitting and Analysis, Environmental Restoration, Resource Management, Habitat Analyses, Environmental Change Detection, Aquatic Plant Tracking, Historical Preservation, Hydrology and Hydraulics, Channel/Inland Waterways Maintenance, Emergency Response, Flood Plain Mapping, Real Estate/Cadastral, Master Planning, Architecture/Engineering, Survey and Mapping, District/Construction Management, Socioeconomic Analysis, and Geologic/Geomorphic Analysis. These applications support the USACE civil and military missions.

4-4. Role of Geospatial Technologies in the Project Management Business Process (PMBP) Project Delivery Team (PDT).

a. Geospatial technologies play a key role in the life cycle of a project and therefore need to be addressed throughout the duration of the project in the PMP, specifically detailed in the DMP. Data are integral to the process. Without accurate, reliable data, the resulting output may be insufficient, unreliable, and indefensible. Data acquisition and management are the most expensive parts of any project. Planning properly for data acquisition may reduce overall project costs during the current project as well as in the future.

b. At the project initiation, it is highly recommended that the PDT include the services of a geospatial specialist. As a member of the PDT, the geospatial specialist will help to determine how large a role geospatial technologies will play in the life cycle of the project (Figure 4-1). If this role is to be significant, the geospatial specialist is required to remain on the PDT beyond the initial reconnaissance phase. This team member has the following responsibilities:

- (1) Educate the project managers and the PDT members on which they serve.
- (2) Identify the geospatial data requirements of the project and ensure that the guidelines in Chapter 8 of this manual are followed for metadata and geospatial standards and that the

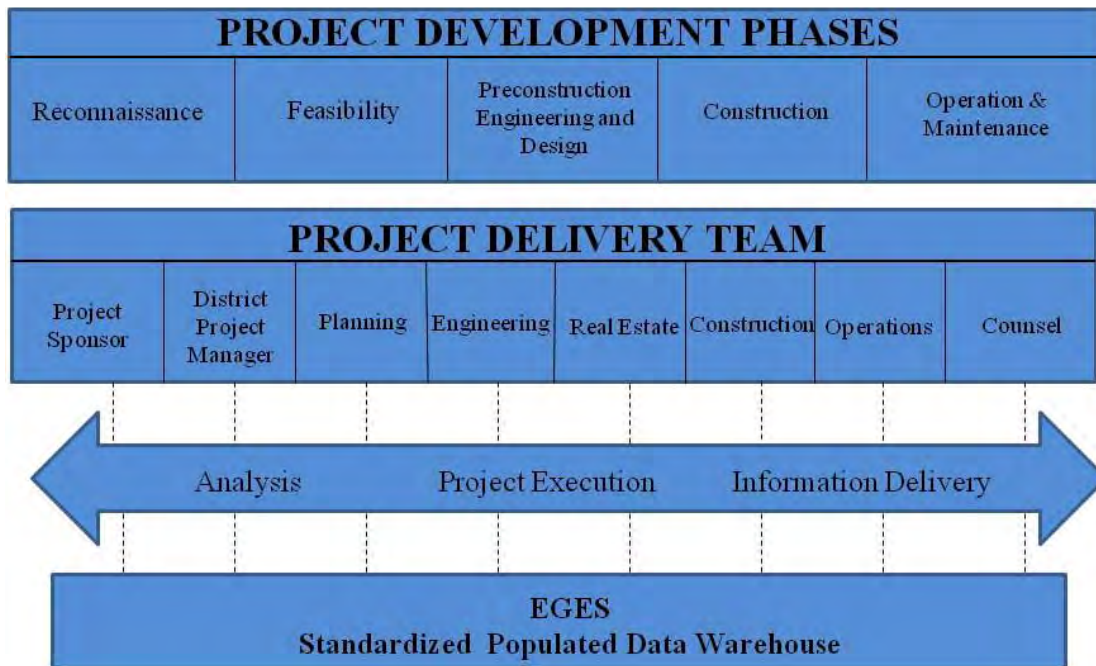


Figure 4-1. Project Life Cycle and Geospatial Project Data.

guidelines in Chapter 9 of this manual are followed for using existing data and for collecting new data. Additionally, the geospatial specialist needs to promote the importance and use of the District central repository for accessible data.

(3) Identify geospatial application and model requirements for the project. If a geospatial technology application needs to be developed, development should follow the guidelines outlined in Chapter 9 of this manual.

(4) Ensure that the DMP is initially prepared and maintained throughout the life cycle of the project.

c. The extent of project resource requirements depends on whether data and tools already exist. Environmental and planning studies typically require small-scale data; these studies can use public domain data or data obtained through USACE licenses. Construction and Engineering projects typically require large-scale data that must be gathered or purchased. Regional studies require both large- and small-scale data that are integrated with non-geospatial data.

d. Civil works projects that cover large spatial areas require organized coordination specifically related to collection and mapping activities. In accordance with ER 1110-2-1150, the PDT for each civil works project is required to coordinate with the non-Federal sponsor with regard to the types, availability, and usability of the sponsor's geospatial data. The PDT should coordinate among their membership to ensure that data required for the project are collected and managed as defined in the DMP.

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e. Geospatial data developed and created to support Military Construction (MILCON) projects need to adhere to Installation and Environment (I&E) policy and guidance. It is expected that USACE and ACSIM will publish joint guidance requiring Architectural and Engineering (A&E) contractors and USACE in-house design shall deliver geospatial data sets (CAD/BIM/GIS) that comply with data standards. These standard data sets will update both the IMCOM ArmyMapper program and installation enterprise GIS Programs.

4-5. Required Elements. As defined in the PMBP, a DMP is required for each new project that has a geospatial component as determined by the District's Geospatial Coordinator.

CHAPTER 5

EGES Management Plans

5-1. Purpose. The purpose of this chapter is to define the Districts' EGES Project Management Plan (PMP), the Divisions' EGES Program Management Plan (PgMP), and the EGES Five Year Plan. The EGES PMP and EGES PgMP are intended to fulfill the Mission Needs Statement and Concept Studies Decision requirements of the Life Cycle Management of Information Systems (LCMIS), as described in Section 6-4. All USACE Districts are required to develop and maintain an EGES PMP, and all USACE Divisions are required to develop and maintain an EGES PgMP. Both management plans are general plans of direction through which the organization may implement EGES, detailing the vision, establishing the team, describing success, and itemizing the tools available to accomplish the desired end result (i.e. the RF502x account, DMPs). The key difference between the PgMP and the PMP is that the PgMP provides an overall vision and goals for the region, spelling out the general approach for EGES development, coordination, and management among the Districts within the Division. The PMP addresses the more detailed requirements and objectives of the individual Districts, focusing on the specific requirements, challenges, and approaches at the District to fulfill the vision of the Division. The EGES Five Year Plan is the District's plan detailing how the goals of the EGES PMP will be met over the next five years. An examples of a Division EGES Plan is included in Appendix F, and an example of a District Plan is included in Appendix I.

5-2. Introduction.

a. Developing a corporate strategy for implementing geospatial technologies is the first step to implementing an comprehensive solution. The execution of an EGES PMP or PgMP is necessary to guarantee the successful and effective operation and maintenance of the system. The EGES PMP or PgMP is not a new requirement; it was originally defined as the GD&S Implementation Plan in the August 1996 edition of this manual.

b. Annually, each District is required to update its EGES Five Year Plan, which serves as an implementation plan for the EGES PMP. Some of the considerations used by the Districts and Divisions in developing their Five Year Plans include an outline of the specific tasks that are expected to be accomplished in the next fiscal year, along with a broader concept of the tasks to be completed in the following four fiscal years. The District details the areas of concern or potential obstacles that must be overcome, as well as the tools that will help the District reach its goals for the next fiscal year. The Five Year Plan also includes an implementation schedule for the next five years.

5-3. EGES PMP/PgMP Development.

a. The EGES PMP/PgMP is intended to be a flexible document that provides the conceptual framework and coordinating principles for developing the EGES. The EGES PDT at the District and the Regional Program Coordination Team (PCT) have important responsibilities in developing the EGES PMP and EGES PgMP.

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b. As stated in Chapter 3, it is recommended that the EGES PDT at the District consist of representatives from Hydrology and Hydraulics (H&H), Survey, Emergency Management, Real Estate, Regulatory, Planning, Resource Management, Engineering (specifically, the CAD and/or BIM Manager), Construction, Operations, and ACE-IT. The teams must ensure that each part of the organization has an opportunity to influence the management plan and take ownership of both the process and the document. Because the plans affect almost the entire organization, it is recommended that the Corporate Board at the District and Regional Management Board at the Division review and approve the appropriate document. This raises visibility and commits managers to the plan.

c. EGES efforts support both enterprise-wide and project-specific initiatives. Project-specific activities help build the EGES. The data from each project become part of local enterprise geospatial database systems (EGDS), and through EGES, platform and model integration is made available for future projects to leverage and build upon.

5-4. EGES PMP/PgMP Contents. The contents of the EGES PMP and EGES PgMP should be kept simple.

a. The following list is a recommended guide for the elements of the EGES PMP:

- (1) Reference to ER 1110-1-8156 and EM 1110-1-2909.
- (2) Project title and overview.
- (3) Team members and stakeholders.
- (4) Staffing and roles and responsibilities. In this section the role of ACE-IT with regard to managing and standing up the EGES needs to be defined.
- (5) Scope of the EGES (functions to be supported by EGES, description of products, unique requirements, and system architecture).
- (6) Funding [source, budget, reporting of expenditures, and establishment of Revolving Fund Account (RF502x)].
- (7) Quality objectives (District and customer expectations, applicable criteria, and regulations).
- (8) Acquisition strategy (identification of in-house and external resources to be used to develop the EGES).
- (9) Changes to management guidelines (how and when the EGES PMP might change and who approves changes).
- (10) Communication plan.
- (11) Issue resolution process.

- (12) Assumptions inherent in the plan.
- (13) Measures of success.
- (14) Management control plan.
- (15) Reporting requirement.
- (16) PMP coordination (signatures of EGES PDT members and senior leadership).

b. The following list is a recommended guide for the elements of the EGES PgMP:

- (1) Scope.
- (2) Goals and objectives.
- (3) Team members and stakeholders.
- (4) Critical assumptions and constraints.
- (5) Funding.
- (6) Tasks and schedules.
- (7) Quality management.
- (8) Acquisition strategy.
- (9) Risk management.
- (10) Change management guidelines.
- (11) Communication plan.
- (12) Value management.
- (13) Closeout plan.
- (14) PgMP coordination and signatures.

5-5. Implementing the EGES PMP through the Five Year Plan.

a. Once the approval is granted to the EGES Program, each organization must address how the EGES will be supported and managed within the organization. Since each District and Division is distinctive in its culture and management, the EGES will also be a unique

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implementation that works within the constraints in each District and Division. However, critical among these decisions in every District are the following:

(1) There is a critical need for upper management support; therefore, a Geospatial Champion should be appointed in each District and Division. Geospatial Champions, as a member of the upper management, support the Geospatial Coordinator and the Regional Geospatial Coordinator, understand the importance and benefit of an enterprise system, and advocate for the initiative to the commanders and executive staff.

(2) USACE District management must address the need for funding to support the plan described in the PMP. An RF502x facility account has been established for funding the EGES. This facility account can be funded in four ways: direct charge, standard rate, job order, or actual cost. Details on establishing and funding a revolving fund account are presented in ER 37-2-10, Chapter 16. Each District will determine how the RF502x account and the project geospatial work will be funded (see Appendix E).

b. The following list is a recommended outline for the EGES Five Year Plan:

(1) Goals (specific for the next fiscal year; general goals for the remaining four fiscal years).

(2) Areas of concern (potential problems that may delay the expected outcome for the year), for example:

(a) Modifications to existing hardware/software configuration.

(b) Network implementation or modifications.

(c) Data storage.

(d) Funding/feasibility.

(e) Bandwidth to Field Offices.

(3) Tools for success (potential advantages that will lead to successfully meeting the year's goals), for example:

(a) Funded RF502x.

(b) Process developed for DMP request and submittal.

(c) Adequate staff.

(4) Training needs and plan.

(5) Implementation schedule (general schedule for the next five years)

(6) Emergency management appendix.

c. An important initial goal of an EGES initiative is to deliver a tangible product, such as a District data viewer (possibly CorpsMap), designed to demonstrate geospatial capabilities and the importance of the availability of geospatial data. This serves to show the capabilities in a USACE environment while delivering on a functional requirement, and it demonstrates a first success, which should solidify management support. At the same time, it allows the beginning of staff training and provides a set of lessons learned for the larger implementations to follow.

5-6. Required Elements.

a. Each District shall develop and update, as appropriate, an EGES PMP and annually update its EGES Five Year Plan.

b. Each Division shall develop and update, as appropriate, an EGES PgMP and annually update its Five Year Plan.

CHAPTER 6

Technology Investment and Life Cycle Management of EGES

6-1. Purpose. The purpose of this chapter is to address EGES investments and activities that need to be entered into the Information Technology Investment Portfolio (ITIPS) and go through the Life Cycle Management of Information Systems (LCMIS) process.

6-2. Introduction.

a. According to ER 25-1-2, Information Management - Life Cycle Management of Information Systems (LCMIS), an Automated Information System (AIS) is a combination of computer hardware and software, data, or telecommunications that performs functions such as collecting, processing, transmitting, and displaying information. Excluded are computer resources, both hardware and software, that are physically part of, dedicated to, or essential in real time to the mission performance of weapon systems. According to this definition, EGES is considered an AIS.

b. LCMIS is an analysis and control process that is applied throughout all phases of the life of an AIS or AIS modernization. It bases all programmatic decisions on the anticipated mission-related and economic benefits derived over the operating life of an AIS (Table 6-1).

Table 6-1. EGES Activity and Requirement for ITIPS and LCMIS.

Activity	ITIPS Data Entry	LCMIS Process
EGES Software Purchase	Yes – Code AET	For COTS, no
Customization and Application Development	Yes, if >\$100K	Yes, if >\$100K
Enterprise Geospatial Data Development	Licensed/Purchased Data - AET	Yes, if being done for EGES
Surveying and Mapping Data Collection	No	No

Note: AET means Automated Engineering Tool, COTS means Commercial Off-The-Shelf.

6-3. Information Technology Investment Portfolio System (ITIPS).

a. Background.

(1) The ITIPS provides an automated tool for producing USACE's IT investment portfolio as required by the Clinger-Cohen Act. The purpose of the portfolio is to identify USACE's IT investment initiatives in its planning, development, and/or operations phases. USACE's decision authority to determine what IT initiatives should be funded, continued, or terminated uses information from ITIPS.

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(2) Information in the portfolio is arrayed to make it usable vertically and horizontally at every organizational level throughout USACE. IT investments are divided into broad categories that include AISs, Programs, WANs/LANs, Office Automation, and Automated Engineering Tools. ITIPS provides the functionality to enter detailed budget information and generate an IT investment portfolio budget report for all USACE organizations. It supports the decision process for selecting, evaluating, and controlling IT investments. ITIPS serves as an integral component in developing the USACE IT budget.

(3) IT acquired and maintained by USACE activities, regardless of costs, must be entered and kept current in ITIPS. This includes IT for all Corps functional areas, including business, scientific, technical, administrative, and engineering applications. Also included is IT acquired in support of Research and Development (R&D) projects, i.e., office automation hardware and software in support of the mission and functions of the organization. Exceptions are as follows:

(a) Systems being developed or maintained or IT being acquired on a reimbursable basis for the sole use of customers outside of USACE.

(b) Any system developed as an integral part of internal R&D projects, when the system is not targeted for a production environment.

(4) The ITIPS terms “GIS” and “CADD” are legacy terms that do not necessarily reflect the current thinking with respect to technology at the enterprise level. However, until the terms are updated, users should apply the legacy terms as if they do refer to enterprise geospatial and CAD/BIM/SIM technology.

b. Categorizing EGES in ITIPS.

(1) The guidance and definitions for ITIPS, which are reissued each year, define GIS as the COTS hardware and software used for mapping and analyzing things that exist and events that happen on Earth. GIS technology integrates common database operations such as queries and statistical analyses with the unique visualization and geographic analysis benefits that can be portrayed by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies. All GIS initiatives will be linked in ITIPS to the Headquarters initiative EGES, ITIPS number HCW04387, as follows:

(a) Headquarters-level GIS initiatives will use the IT classification in ITIPS *Geographic Information System*.

(b) Field-level GIS initiatives will use the IT classification *Support to Standard System Geographic Information Systems*, ITIPS number HCW04387.

c. Categorizing CAD/BIM/SIM in ITIPS. The ITIPS guidance and definitions define CADD as COTS software that enables engineers and architects to develop designs and associated graphics, including such items as three-dimensional models and views at any angle and any level of zoom, as well as tracking design dependencies and automatically changing dependent values when one value is changed.

d. The intent of this guidance pertaining to geospatial information systems is that each District and laboratory should coordinate its entries for GIS and CAD/BIM so that the entries provide a consolidated approach to implementing EGES throughout the Command, the Command EGES financial requirements, and IT plans.

6-4. Life Cycle Management of Automated Information Systems (LCMIS).

a. Background.

(1) LCMIS is a management process applied throughout the life of an AIS that bases all programmatic decision on the anticipated mission-related and economic benefits derived over the life of the AIS. Part of the LCMIS process includes the technology proponent conducting a mission analysis and revising its work processes prior to making IT investments. In USACE, the levels of oversight for LCMIS rest with the Chief Information Officer (CIO), the regional IT Chief, and the local IT Chief. The level of oversight is driven by the estimated cost of the effort.

(2) According to ER 25-1-2, LCMIS does not apply to:

(a) AIS development for non-USACE customers.

(b) AIS specifically designed as integral parts of USACE-owned Facility Support Systems.

(c) Any systems developed as an integral part of internal R&D projects, when the system is not targeted for a production environment.

b. LCMIS and EGES.

(1) While EGES is considered an information system, USACE relies heavily on Commercial Off-The-Shelf (COTS) software to perform geospatial information analysis, design and reporting. COTS products being used without customization or application development do not need to go through the Corps LCMIS process.

(2) There are two areas where EGES development needs to go through LCMIS: customization and/or systems and software development for internal USACE use, and USACE EGES development.

(a) LCMIS Phases Applied to Customization of COTS Geospatial Software. Customization and/or application software development of commercial geospatial systems for internal USACE use costing more than \$100,000 shall go through the LCMIS process. Since the customization or application is based on COTS systems/software, many of the LCMIS milestones are not necessary or can be minimized. This section outlines a tailored LCMIS process for customizing COTS geospatial systems and software, as indicated in ER 25-1-2.

IT having developmental and deployment costs of less than \$500,000 or total life cycle costs estimated to be less than \$1,000,000 are classified as IV C systems, and LCMIS oversight will be the responsibility of the local IT Chief. The majority of USACE's application development falls

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in the IV C category. If the customization effort is under \$100,000, it should be considered an AET, and the effort does not need to go through the LCMIS process but does need to be entered into ITIPS (see Section 6-3.b.1).

For geospatial applications being developed by the Engineer Research and Development Center (ERDC) for the Civil Works R&D Program, the oversight is not the responsibility of the local IT Chief but is instead the responsibility of the appropriate HQ technical monitor or area manager. R&D software is developed corporately; therefore, it must have corporate oversight. The HQ technical monitor or area manager can delegate oversight authority to local IT Chiefs as needed.

For EGES software development using COTS geospatial software, the program strategy is to acquire COTS systems and software and customize them using either an incremental or an evolutionary process. This program strategy has a low development risk and a relatively high return on investment (ROI). The ROI may include decreased labor costs or increased productivity. However, more often the ROI includes things that are not as easily measured, such as more accurate or comprehensive decisions, a better product, or a more consistent corporate approach to solving a problem.

According to ER 25-1-2, ITIPS can and should be used as a tool to capture and meet the requirements of LCMIS.

- **Mission Need Justification.** This phase is intended to focus primarily on functional business requirements without specifically addressing technical solutions.

- Can the need be satisfied by a streamlined or improved manual process?
- Can the need be accommodated through an existing IS?
- Is there an existing IS outside of the Command that has already been developed?
- Is a new/modified IS cost effective?

Mission Needs Statements can be entered into ITIPS using the description tab.

- **Phase 0 – Concept Exploration and Definition Phase.** The goal of Phase 0 is the development of a valid and optimized system concept that supports the required business process(es) and defines alternative functional and technical solutions for supporting those processes. The milestones for Phase 0 include:

- Presenting a brief concept of the EGES to Command's senior leadership. If an Integrated Product Team (IPT) is needed, the EGES PDT can serve this purpose.

- Identifying the Project Manager (PM), System Manager (SM), and Functional Proponent (FP). Since COTS is being used heavily, these titles may all belong to one person.

- Developing an initial Systems Decision Paper (SDP) as outlined in Section IV of Appendix C in ER 25-1-2. ITIPS can be used for capturing the necessary information that goes into an SDP. Again, since COTS is heavily used, software and architecture issues only need to be addressed as they apply to interfacing with an overarching EGES architecture. Probably the most important part of the SDP is to identify geospatial data requirements and address data generation standards issues. Will the IS be using existing geospatial data? Will the IS be

generating geospatial data? If so, how do metadata get produced for the data and will the data be SDSFIE compliant?

An IS being developed that requires geospatial data that are not already being collected or do not already exist is a high-risk IS, which is an issue that needs to be addressed in the SDP. If the IS is generating geospatial data, the geospatial data must be documented (metadata) and SDSFIE compliant, facilitating interoperability and life cycle management objectives.

- **Phase I – Demonstration and Validation Phase.** The purpose of this phase is to establish the basis and rationale for migrating from documented requirements and concepts to actual development and implementation of the IS. The activities for Phase I include:

- Identifying server requirements.
- Identifying where the software and data will physically be housed.
- Identifying the impacts of the application to the network.
- Developing a test/demonstration approach.
- Developing the prototype application.
- Addressing data integrity issues if the application is generating data.
- Further refining the SDP.

- **Phase II – Development Phase.** The development phase is the Life Cycle Management segment used to complete code generation and successfully conduct system tests and evaluation of the IS configuration. Since COTS is heavily used, software testing of the COTS is not necessary. Software testing is restricted to testing the application (user-level testing) and network testing (how does running the application affect the network?). Activities for Phase II include:

- Customizing the software.
- Conducting application and network testing.
- Modifying the software based on test results.
- Modifying and converting legacy systems as appropriate.
- Planning the operational and deployment phase.
- Planning training.

- **Phase III – Production and Deployment Phase.** The purpose of this phase is to complete deployment of the IS. In many cases, this entails establishing a web site where the geospatial IS can be accessed or downloaded. If the deployment strategy is to load software, then a more rigorous deployment plan is needed.

- **Phase IV – Operations and Support Phase.** The purpose of this phase to shift from development and deployment to operations and support. Again, because many geospatial applications are web enabled, this may only entail maintaining a web site with documentation and current executables.

(b) **USACE EGES Development.** Developing an EGES solution shall go through the LCMIS process. HQ (CECW-CE) is responsible for developing overarching LCMIS documentation for enterprise GISs and entry in ITIPS. At the time this EM was updated, an

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LCMIS for enterprise GISs did not exist. Until HQ has developed the LCMIS documentation for enterprise GISs, Commands should focus their efforts on the development of an EGES PMP as outlined in Chapter 5.

6-5. Required Elements. Each Command needs to execute ITIPS and LCMIS for geospatial data and technologies as outlined in this chapter.

CHAPTER 7

Software and System Procurement and ACE-IT

7-1. Purpose. The purpose of this chapter is to explain the legislative mandate for documenting IT planning, to describe the role of ACE-IT in EGES software and hardware procurement and implementation, and to identify the primary means for acquiring EGIS components.

7-2. General.

a. Information Technology (IT) is defined in Public Law (PL) 104-106, Section 5002 Definitions (3b). IT includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources.

b. The passage of the Clinger-Cohen Act of 1996 shifted the responsibility for management and oversight of IT from the General Services Administration to the Office of Management and Budget (OMB). OMB is required to issue guidance for conducting IT acquisitions. Each District's Director or Chief of Information Management provides guidance and direction in defining and developing the appropriate documentation to justify initiating the acquisition process. Requirements should be identified in the Information Mission Area Modernization Plan, and the IT assets should be stated in the Requirement Statements Management System. If a solicitation or contract is deemed to not require IT, then the following brief statement must accompany the request: "The specification for this contract does not contain any requirement for IT."

c. Documentation is required to justify initiating the acquisition process. This documentation must state the specific mission for which IT resources are needed, and it must indicate measurable benefits to be derived from the investment.

(1) The planning for IT resource requirements starts with establishing the mission need. The needs identified at program initiation must be periodically reexamined to assure that they reflect the most current program conditions and IT. The following are major elements in the acquisition process: determining mission needs, structuring an acquisition strategy, developing producible and affordable designs, making decisions, and assessing program status as it applies to LCMIS.

(2) As part of the requirement justification, the requested IT resource must be identified so that the local IT Chief can certify that it is consistent with Army Technical Architecture. An updated written statement of justification is required, and a financial analysis under LCMIS may be required.

7-3. Enterprise License Agreements.

a. HQUSACE has negotiated an Enterprise License Agreement (ELA) with each of three vendors of geospatial applications. The Bentley ELA may be used for Bentley products such as Microstation, InRoads, and ProjectWise; the ESRI ELA may be used for ESRI products

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including the standard suite of ArcGIS software (ArcInfo, ArcView, Server, IMS, etc.); and the Autodesk ELA may be used for Autodesk products such as AutoCAD Civil 3D, the various AutoCAD Revit products, and AutoCAD Map3D. These ELAs are funded through the Fee-for-Service payments, which every District pays annually. The standard procedure for acquiring ELA software offerings is to submit an Enterprise Service Desk (ESD) ticket requesting installation of specific software titles available under the ELAs.

b. Details about each ELA and technical support for the specific software applications are available through the respective ELA websites.

(1) For Bentley offerings, information about the ELA is available at <https://cadbim.usace.army.mil/bentleyela>. The web site includes links for information about training and implementation support, software licenses, web-based training, and technical support.

(2) For Autodesk software applications, users can find information at the USACE Technical Excellence Network site: <https://ten.usace.army.mil/techexnet.aspx?p=s&a=cops;138>.

(3) For ESRI software applications, end users should contact the Agency Central Support (ACS) POC for their location. The ACS POCs will evaluate the issue and determine the appropriate course of action, which may involve walking the user through an issue or, for more complex matters, contacting ESRI. The ACS POCs and the ACS Guide are available at the USACE Knowledge Management Environment (KME) site: <https://kme.usace.army.mil/CoPs/IT/Geospatial/default.aspx>.

(4) For any of the vendors' applications, if the issue involves software that is not operating correctly, software that needs to be upgraded, or some other software installation issue, users must submit an ESD ticket on-line or via telephone.

c. Districts are not required to use these ELAs. However, the Fee-for-Service accounts will still be assessed as if they were using them. Further, any District that chooses to acquire and implement other software will need to coordinate the purchase, installation, and maintenance with their local Chief of Information Management as described above in 7-2c.

7-4. Local Implementation of CorpsMap.

a. As defined in Chapter 2 of this EM, the USACE Enterprise geospatial system is CorpsMap, which is centrally administered by ERDC's Cold Regions Research and Engineering Laboratory (CRREL). Some Districts and Divisions have implemented CorpsMap at the local and regional levels. This is an acceptable means of providing some basic GIS view, query, and other capabilities to users that require them. It is a web-based application, so neither special software nor hardware is required for desktop machines. CorpsMap does not replace the more robust analytical capabilities of the software available through the ELAs.

b. Local implementations of CorpsMap require an OpenSource Component (MapServer) and COTS component (Oracle) in order to provide the necessary services to the web-based client

browsers. District or Divisions wishing to implement CorpsMap locally should contact ERDC-CRREL for technical guidance and support. ERDC will be able to direct local implementers to the appropriate software resources and provide some general direction about the system requirements and software installation.

7-5. ProjectWise. ProjectWise is the USACE-mandated engineering document management system. ProjectWise provides extensive project document workflow controls and supports all documents and files in their native file formats. It is very well integrated with Bentley CAD product lines and also integrates with ESRI geodatabases. Autodesk is also supported. With its CADD integration, all CADD design projects should be actively managed within ProjectWise.

7-6. ACE-IT.

a. The Geospatial Community of Practice (CoP), CAD/BIM CoP, Strategic Sourcing Program Office (CESS), and ACE-IT have established a Memorandum of Agreement (MOA): CEIT-ZA/CW-CEPDT, Subject: *Support of Geospatial and CAD/BIM Communities under the IM/IT Competitive Sourcing Letter of Obligation*. Appendix J provides a copy of the MOA, which defines the roles and responsibilities of ACE-IT and the Geospatial CoP for the implementation of geospatial technologies.

b. With respect to EGES components, except for very specialized EGDS hardware, hardware procurements are the responsibility of ACE-IT. Therefore, standard desktop and notebook systems, printers, and plotters should be acquired through the local ACE-IT office. Specialized hardware purchases must be coordinated with the local IT Chief and may require LCMIS documentation, a Requirements Analysis, and Analysis of Alternatives. Specialized hardware is generally equipment that is not available through the ACE-IT OrderTrak system. Examples of specialized hardware include non-HP plotters and large-format scanners. Survey-grade GPS units and accessories are not available through ACE-IT.

c. As described above, installation of software on end-user machines requires submittal of an ESD ticket. Additionally, some Geospatial CoP staff at the Districts have completed System Administrator (SA) training and have been granted SA privileges. These individuals may be available to assist with end-user software installation and troubleshooting, depending on local procedures and policies.

7-7. Required Elements.

a. Each District shall coordinate EGES acquisition with its local IT Chief to ensure compliance with the Clinger-Cohen Act.

b. Each District shall coordinate with ACE-IT for software installations and with both the local IT Chief and ACE-IT for acquisition of any non-standard hardware.

CHAPTER 8

Geospatial Data Standards

8-1. Purpose. The purpose of this chapter is to provide an overview of the geospatial data standards and identify those used by USACE. USACE has not mandated any particular geospatial hardware or software platforms. Instead, USACE has focused on standardizing data and data life cycle management to meet the many challenges of today and tomorrow. This focus on standards and life cycle management enables interoperability and provides an effective tool for USACE to manage the investments made in geospatial technologies. Developing and maintaining geospatial data are the most expensive and crucial parts of implementing geospatial strategies. Standardization enables the data collected by District or field offices to be used throughout the organization in an enterprise implementation. In addition, strict adherence to Federal, national, and international standards will extend their usefulness to local, state, national, and international agencies. Strict compliance will also ensure that the data these other agencies collect will be compatible and interchangeable with USACE data sets. USACE programs that fall under the authority of the Army GIO shall follow the standards identified in Appendix L of the Common Operating Environment (COE) Implementation Plan.

8-2. Importance of Geospatial Data Standards (GDSs).

a. The development of GDSs is adaptive and flexible in meeting the technological advances of today. GDSs make possible the processing of greater volumes of shared data, and they enable a much larger audience to interpret and understand the data, whether for geospatial or other uses. Keeping GDSs current and relevant requires regular refreshing in anticipation of emerging technologies. The maturation of geospatial technologies has resulted in the potential for wide use by many organizations. Standards provide the interoperability and flexibility that allow users to adapt them to their specific environments.

b. The adoption of standards provides a multitude of benefits, such as the following:

(1) Easier data exchange. Standards enhance geospatial data exchange and sharing. The exchange mechanisms for the transfer of geospatial data between dissimilar systems are addressed by standards.

(2) Improved data quality and configuration management. Standards provide metadata to help organize and maintain the organization's internal spatial data.

(3) Increased user confidence. Standards provide confidence in the quality of the data, and they define data structure and content.

(4) Greater access to geospatial data. Standards widen the spectrum of available data, resulting in a broad range of choices available to the user community.

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(5) Improved integration of systems. Standards enable the use of data across a wide spectrum of applications, maximizing the effective use of systems.

(6) Improved data collection. Standards reduce duplication and the overall costs of geospatial data collections.

(7) Greater public access. Standards extend the use of geospatial data in the public sector, resulting in an increase in the GDS user base due to greater data availability, with an attendant diffusion of knowledge.

8-3. Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE).

a. All vector data sets produced by, for, or in partnership with USACE shall be compliant with SDSFIE. SDSFIE is the single DoD spatial standard that supports common implementation and maximizes interoperability for Installation, Environment, and Civil Works missions. SDSFIE will also become an integral part of the data standards used in the National System for Geospatial-Intelligence (NSG), as required by DoD Directive 5105.60, *The National Geospatial-Intelligence Agency*. SDSFIE is focused on the geospatial representation of features and attempts to maintain a minimum number of attributes. It is intended to link to business databases for attribute data and not duplicate attributes found in business databases. SDSFIE resides in the public domain to the extent possible by DoD regulations. It is vendor neutral and provides a data model that is scalable from local to global and from site mapping up to District and Headquarters levels. If a relevant data content standard already exists, SDSFIE incorporates it into the model rather than developing new content. SDSFIE standard development follows a nationally recognized development process. The intent is for the standard to be responsive to the business needs of data creators and end users. SDSFIE is governed and managed by the Defense Installation Spatial Data Infrastructure (DISDI) Group, of which the USACE is a voting member.

b. SDSFIE is a Logical Data Model (LDM). An LDM is a structured logical representation of business requirements validated and approved by business representatives; it contains entities and relationships of importance within an organized framework, as well as business textual definitions and examples. It becomes the basis of physical database design. To utilize the standard with real-world data, however, the LDM must be converted to a Physical Data Model (PDM). A PDM is the representation of a data design typically derived from a logical data model that takes into account the character and constraints of a given database management system; it includes all the database artifacts required to create relationships between tables or achieve performance goals, such as indexes, constraint definitions, linking tables, and partitioned tables or clusters.

c. SDSFIE is supplemented by a full suite of web-based tools, including database creation tools, model registry and repository tools, database migration and sharing tools, and database validation tools. The model and the tools can be accessed at www.SDSFIE.org.

d. Adaptation allows authorized users or organizations to tailor the SDSFIE to their mission needs while remaining compliant. Adaptations are formalized alterations to the LDM

resulting in a data schema that is tailored to the particular business requirements of an implementing organization. Adaptation involves profiling and extension through the web-based tools. Profiling is the generation of a strict subset of a model to form another model. Extension is the addition of model elements to one model to form another model. The implementation flexibility afforded by adaptation must be sufficiently constrained to ensure the integrity of the standard. Therefore, all adaptation will be performed in accordance with DUSD (I&E) guidance, including the SDSFIE Implementation White Paper (http://www.sdsfie.org/Downloads/SDSFIE%203.0/SDSFIEImplementationWhitePaper_FINALwithRevision1.PDF).

8-4. CAD/BIM Workspace and Standards.

a. Tri-Services BIM Workspace. Development of the Tri-Services Workspace is led by Tri-Service CAD/BIM Technology Center (<https://cadbim.usace.army.mil/BIM>). To establish consistency in the creation of Building Information Models (BIM), the CAD/BIM Technology Center has developed a systematic workflow for executing USACE BIM projects within a standard environment. Known as the Tri-Service BIM Workspace, this standardized environment minimizes the compliance checking process of BIM models and ensures that all necessary resources are included with the contractual requirements upon delivery of the final model. Workspaces for both the Autodesk and Bentley BIM platforms have been created and are required for Centers of Standardization (CoS) projects.

b. Architecture Engineering Construction (AEC) CAD Standard. Use of the Tri-Services Workspace in non-CoS projects is highly recommended for AEC compliance. All CAD/BIM work developed for, by, or in partnership with USACE shall conform to the latest ratified version of the AEC CAD standard.

8-5. National Building Information Modeling Standard (NBIMS) – United States. Refer to <http://www.buildingsmartalliance.org/index.php/nbims/> for information and to ERDC TR-06-10, *Building Information Modeling (BIM) - The U.S. Army Corps of Engineers Roadmap for Life-Cycle Building Information Modeling* for implementation guidance.

8-6. Positional Accuracy. The positional accuracy of geospatial data is determined by the project accuracy requirements and outlined in EM 1110-1-1005, *Control and Topographic Survey*. Most project accuracy requirements are stated as a local or relative accuracy and are defined relative to local control points determined through repeated measurements on topographic features. Local accuracy is sometimes referred to as engineering or construction accuracy. If a project is large or combined with other projects in a GIS, the project accuracy may be defined relative to the National Spatial Reference System (NSRS) (see Section 8-6) control points to provide a consistent framework to connect project data. Data should be collected at the accuracy level required for the project. The National Standard for Spatial Data Accuracy (NSSDA) was developed by the Subcommittee for Base Cartographic Data of the Federal Geographic Data Committee and is published as FGDC-STD-007.3-1998. It omits accuracy metrics and threshold values and instead is more of a statistical report. It requires that 95% of the positions in the data set will have an error with respect to true ground position that is equal to or less than the reported accuracy value. The report can be accessed in its entirety at <http://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy/part3/chapter3>. It is

important that the positional accuracy of the geospatial data product be included with the metadata.

8-7. Horizontal and Vertical Datum.

a. Guidance provided in ER 1110-2-8160 requires that all USACE geospatial project data (including georeferenced CAD, BIM and survey data) clearly state the horizontal reference datum (with the appropriate epoch), the vertical geodetic reference datum, and, if appropriate, the water level reference datum.

b. A datum typically represents a terrestrial or earth-based surface to which geospatial coordinates (such as elevations, heights, or depths) are referenced. A project's horizontal (e.g., x, y or Lat, Long) and vertical (e.g., elevation, water level) control are tied to a particular datum and form the foundation for nearly all civil and military design, engineering, and construction projects in USACE. Elevations or depths may be referred to local or regional reference datums. These reference datums may deviate spatially over a region for a variety of reasons. They may also have temporal deviations due to land subsidence or uplift, sea level changes, crustal or plate motion, or periodic readjustments to their origin or to defined points on the reference surface.

c. To ensure that data layers align, it is critical that data be accurately defined with the correct horizontal and vertical datum. All project data, documents, drawings, etc. should clearly indicate the horizontal reference datum (e.g., NAD 83) with the appropriate datum epoch (e.g., NAD 83/XX or NAD 83 NSRS 2007), the vertical geodetic reference datum (e.g., NAVD 88), and, if applicable, the vertical water level reference datum (e.g., LWRP, LMSL). The vertical water level reference datum is the water level reference surface used by H&H for modeling and analysis. All projects should indicate the relationship between this water level reference datum and the geodetic datum. In some areas of the country the geodetic vertical reference datum may contain a datum epoch (e.g., NAVD88 2004.65, with 2004.65 being the datum epoch) because of the temporal deviations discussed above. Guidance provided in ER 1110-2-8160 requires that all USACE project vertical control be tied to the National Spatial Reference System (currently NAVD 88) to provide for consistency of elevations with the map modernization efforts of other Federal agencies such as FEMA and USGS. Prior to final approval, checks should be made to ensure that all planning projects are tied to the current NSRS horizontal and vertical control and that all documents are marked appropriately.

d. Transforming geospatial data from one geodetic reference or coordinate system to another can be done in various ways. The methodology used to shift historical or legacy survey data (e.g., NGVD29) to NAVD88 (the current vertical datum in CONUS) or NAD27 to NAD83 will vary depending on many factors, such as time, funds, and accuracy requirements. One method for transforming geospatial data is by using the NGS-developed transformation programs NADCON, which yields consistent coordinate transformation results over a regional area for horizontal coordinates, and VERTCON, which yields consistent transformation results over a regional area for elevations or heights. Both NADCON and VERTCON are incorporated into Corpscon, which includes both datum and coordinate transformations. These transformation methods should be used with caution, especially for vertical conversions, since these methods are approximate and accuracy can vary depending on location and proximity to common stations used in these models. See Chapter 3 in the EM 1110-2-6056, *Standards and Procedures for*

Referencing Project Elevation Grades to Nationwide Vertical Datum, and EM 1110-1-1004, 1 June 2002, USACE, *Geodetic and Control Surveying*, for more information on transforming or re-projecting coordinates and/or elevations from one datum to another.

8-8. Metadata.

a. Metadata are critical to geospatial data because they document the quality of the data, and their development is required by DODD 8320.02 and EO 12906. Executive Order 12906 requires that all Federally funded geospatial data must have compliant metadata and be discoverable on the National Spatial Data Infrastructure (NSDI). Metadata must be either submitted to the USACE Metadata Catalog (<https://metadata.usace.army.mil>) or registered for harvesting to the USACE Metadata Catalog. DoDD 8320.02, *Guidance for Implementing Network-Centric Data Sharing*, http://jtc.fhu.disa.mil/jtc_dri/pdfs/d83202p.pdf states that data are essential enablers of Network-Centric Warfare (NCW) and shall be made visible, accessible, and understandable to any potential user in the Department of Defense as early as possible in the life cycle to support mission objectives. When posted or registered to the USACE Metadata Catalog, USACE metadata are registered to data.gov and geo.data.gov, therefore complying with Federal and DoD directives for publishing metadata.

b. The International Organization for Standardization (ISO) has developed ISO 19115, which defines the schema required for describing geographic information and services. It provides information about the identification, extent, quality, spatial and temporal schema, spatial reference, and distribution of digital geographic data. As much of DoD data are utilized by an international community, it is becoming more critical to follow international standards. The DoD IT Standards Registry (DISR) requires the use of ISO 19115. The DISDI Office is working with the National Geospatial Agency (NGA) (the executive agent of Geospatial Intelligence as per EO 12333) and the Federal Geographic Data Committee (FGDC) (which is directed, under EO 12906, to develop Federal geospatial standards) to develop a DoD metadata profile that meets the ISO 19115 standard. The FGDC Metadata Standard has many outdated elements, and FGDC has indicated that they will not be supporting it in the future but will instead promote the ISO 19115 North American Profile (NAP).

c. There are multiple authoring tools available for use by the Districts and labs. The main tools include ESRI's ArcGIS Server Geoportal Extension (available through the Enterprise License Agreement) and the two open source tools, GeoNetwork and the Environmental Protection Agency (EPA) Metadata Editor. Geoportal and the EPA metadata editor both run inside the ArcGIS desktop platform, whereas GeoNetwork is a stand-alone web application that allows for authoring and maintaining metadata files.

d. All USACE-developed (collected or created, by contract or in-house) geospatial data sets (including CAD, BIM, and survey data) shall have an ISO 19115-compliant metadata file associated with it. For large data collections with separate data files, it is acceptable under ISO 19115 to have a single "data set" metadata file. These metadata files can be posted to <https://metadata.usace.army.mil>, or District metadata catalogs can be linked to <https://metadata.usace.army.mil> (See Appendix K).

8-9. WebMapping and Interoperability Standards.

a. Open Geospatial Consortium (OGC) standards are technical documents that detail interfaces or encodings. Software developers use these documents to build open interfaces and encodings into their products and services. These standards are the main “products” of the OGC and have been developed by the membership to address specific interoperability challenges. Ideally, when OGC standards are implemented in products or on-line services by two software engineers working independently, the resulting components “plug and play,” that is, they work together without further debugging. OGC standards and supporting documents are available at no cost to everyone (<http://www.opengeospatial.org>).

b. Programs producing nationally significant geospatial datasets (such as National Levee Database, IENC and Mapping, Modeling and Consequence, reservoir gages) are required to make those data available to USACE and others using OGC web mapping protocols and standards. Data should be available using OGC:WMS, OGC:KML, and, where appropriate, OGC:WFS, OGC:WCS, and OGC:SLD. There is no restriction on the use of additional vendor-specific protocols for interoperability. In accordance with law, policy, and security classification, and in coordination with the Undersecretary of Defense for Intelligence (USD(I)) and the Under Secretary of Defense for Policy (USD(P)), USACE will share data across security domains with other Federal agencies, state and local governments, and the public in accordance with DODD 8320.02.

c. Internal USACE interoperability can only be achieved through a disciplined approach to data management and a recognition that standard nomenclature needs to be coordinated across the organization. There is currently an inconsistency of data among several of the AISs being used to try to pull Asset Management and budget data. There are numerous data elements that are inconsistently defined, resulting in multiple elements that mean essentially the same thing. Currently, Asset Management is working with numerous AISs to define a common set of elements that can be shared among all AISs to force a level of interoperability. The Corps Project Notebook (CPN) not only holds the authoritative location of USACE project locations but also has many links to other AISs so that project data can be shared between the systems.

8-10. Emergency Response and Recovery Symbolology Standard.

a. The GIS Cadre (a group of geospatial specialists who deploy during EM events) developed a symbolology standard to enhance emergency response and recovery operations. The product is a result of a Product Development Team formed by GIS Cadre members in 2009 to address the need to provide consistency and standardization for GIS in emergency management. The standard is Appendix A of the Emergency Management GIS Subject Matter Expert (SME) guide and is titled *Emergency Management Deployment Standardized Symbolology*.

b. Materials were produced to assist in implementing the standard and are included on all the GIS Cadre data bricks, which are delivered to cadre members in the field. All materials are also available on Englink, at the Shared Documents page. The available materials include the Appendix A document, which describes the implementation process. Also available and integral to the symbolology standard are seven ESRI style sheets, one for each major disaster type. These

style sheets are the files that contain all the actual symbols to be used within the ArcGIS software. The “how-to” guide makes up the final pages of the appendix and defines the process for attaching the new Corps standard symbols to existing ArcMap default style sheets.

c. The primary purpose of the symbology standard is to define the use of cartographic mapping symbology for emergency response and recovery operations and to provide consistency and standardization across USACE. Although the features have defined symbology, it is still up to GIS analysts to use their best judgment, combined with the needs of the customer and best cartographic practices, to produce GIS and cartographic products useful for a potentially very wide audience. Modifications to the standardized symbol size, color, halo effect, etc. are acceptable to clearly define the map’s intent, with the GIS analyst striving for standardization to increase their product’s application across a potentially national audience.

d. The current symbology standard is under the folder *Standardized Symbology for Emergency Management* at <https://kme.usace.army.mil/CoPs/Emergency-Management/EngLink/gis/Shared%20Documents/Forms/AllItems.aspx>.

8-11. Required Elements.

a. All non-raster data developed for, by, or in partnership with USACE must be SDSFIE compliant.

b. Metadata are required for all geospatial data developed for, by, or in partnership with USACE.

c. Programs producing nationally significant geospatial data sets are required to make those data available to USACE and others using Open Geospatial Consortium (OGC) web mapping protocols and standards.

d. All design work (in-house and contract) shall be compliant with AEC CAD Standard and National CAD Standard.

e. Workspaces for both the Autodesk and Bentley BIM platforms have been created and are required for Centers of Standardization (CoS) projects.

CHAPTER 9

Geospatial Data Development and Management

9-1. Purpose. This chapter is intended to identify and discuss the various sources of data, methods of geospatial data development, and related data management requirements.

9-2. General. The design, development, and long-term maintenance of a comprehensive geospatial database and the associated data features are sizable investments. To obtain maximum benefits from these investments, many issues discussed in this chapter must be considered.

9-3. Geospatial Data Development Methods.

a. Several methods are available for developing geospatial data, each with benefits and challenges. The choice of which method to use depends on the answers to the following questions:

(1) Data purpose and intended use. Why do we need these data? How will we use them? These questions will help to define the requirements for scale, features to be captured, data feature structure (line, point, polygon), and non-null attribute fields. If existing data are being acquired, what was the original purpose of those data and will they fulfill our current need?

(2) Data sources. What base maps, imagery, photography, horizontal and vertical control, etc., are available to develop new data? In the case of contract data development, do we need to include these items in the scope of work?

(3) Time constraints. How soon do we need these data? How current do they need to be? Do we need historic data for comparisons over time?

(4) Staff capability. Does the in-house staff have the necessary knowledge, skills, and ability to develop the necessary data? Does the proposed contractor have the experience with projects of this type? Is this work within the contractual statement of work?

(5) Technical capacity. Does staff have the time to devote to developing the necessary data? Do we have the necessary equipment, hardware, and software to complete the work?

(6) Standards. For existing data, what, if any, standards have been followed in developing the data? For new data, what standards will need to be followed?

b. To reduce the costs of developing and maintaining geospatial data, GIS professionals typically rely on one of three methods—acquiring existing data (including ordering data from NGA), in-house development, or contract development—for establishing a geospatial database. When appropriate, all three methods (discussed below) can be combined so that acquired existing data can be supplemented with data developed in-house and through contracts.

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(1) Acquiring existing data.

(a) Generally, obtaining existing data is the least costly method of data development. The major obstacle in acquisition is finding data that will meet the needs of the user. Existing data have usually been developed to meet a specific need and may not satisfy the requirements of USACE, particularly requirements for large-scale or detailed topographic data. Moreover, the original developers of the data may want to recover some of their costs by charging for the data or for the delivery media. Nevertheless, it may be worthwhile to investigate the availability of data from various sources such as the following:

- Internal USACE Sources.

- CorpsMap. CorpsMap is USACE's EGES. This application and data solution incorporates a number of useful layers from various sources, including the National Inventory of Dams, the Defense Installations Spatial Data Infrastructure (DISDI), and the Department of Homeland Security (DHS). Many of the CorpsMap layers are small- or mid-scale layers that can be used as base layers for District-level EGESs.

- Other USACE Districts. Because of the watershed-based organization of USACE, other Districts may have developed data for a region (e.g., a county or municipality) that overlaps an area of interest.

- Federal Agencies.

- National Atlas. The National Atlas provides a number of data layers that may prove useful to District EGES databases for very small scale uses. The data are generally collected at 1:2,000,000 scale. The categories of data are Agriculture, Environment, People, Biology, Geology, Transportation, Boundaries, History, Water, Climate, and Map Reference. The site also provides an interactive map maker (<http://www.nationalatlas.gov>).

- National Digital Elevation Program (NDEP) and National Elevation Dataset (NED). The NDEP was established to promote the exchange of accurate digital land elevation data among the government, private, non-profit, and academic sectors. The NED is a raster data set assembled by the U.S. Geological Survey. NED is designed to provide national elevation data in a seamless form with a consistent datum, elevation unit, and projection (<http://www.ndep.gov/> and <http://ned.usgs.gov/>).

- National Digital Orthophoto Program (NDOP) and Earth Resource Observation Science (EROS) Center. The NDOP is a consortium of Federal agencies whose purpose is to maintain national orthoimagery coverage in the public domain through partnerships among all levels of government, tribal governments, and the public sector. The EROS Center maintains an archive of aerial photographs; satellite imagery; land cover, elevation, digitized maps; and image collections (<http://www.ndop.gov> and <http://eros.usgs.gov>).

- Geospatial One Stop (GOS) and Data.gov. These Federal web sites provide access to a number of geospatial data sets from across the Federal government. Additionally, GOS includes geospatial data from state and local governments and the commercial and academic sectors. GOS includes downloadable data and live data content, such as Web Mapping Services (<http://gos2.geodata.gov/wps/portal/gos>). Data.gov serves only Federally developed data sets but includes both geographic and non-geographic data. Data.gov accesses GOS to present the

Federal geospatial data that it does provide (<http://www.data.gov>). Districts are required to search the GOS for data before expending any funds on data acquisition or procurement.

- Natural Resources Conservation Service (NRCS) Data Gateway. The NRCS Data Gateway allows users to search for a range of geospatial data and imagery. The data sets are searchable by state, county, latitude/longitude, and interactive map. Users are able to order and download data via ftp (<http://datagateway.nrcs.usda.gov/GDGHome.aspx>).

- DHS Geospatial Concept of Operations (GeoCONOPS). The DHS Federal Interagency GeoCONOPS document includes an Authoritative Data Matrix (ADM) with data themes, sources, and URLs. The ADM is a useful resource for discovery and acquisition of existing data. The GeoCONOPS document is available through the USACE Technical Excellence Network ([https://ten.usace.army.mil/Files/3/9/6/2/DHS_Geospatial_CONOPS_v2.0_8.5x11\[1\].pdf](https://ten.usace.army.mil/Files/3/9/6/2/DHS_Geospatial_CONOPS_v2.0_8.5x11[1].pdf)).

- Non-Federal Sources.

- State governments. Most, if not all, states have developed some sort of GIS capabilities. Different state agencies collect or develop a variety of geospatial data. Contacting individual agencies is possible but likely inefficient. It may be more effective to contact the state GIS coordinator for advice or assistance. Contact information for GIS coordinators is available from the National States Geographic Information Council (<http://www.nsgic.org/>).

- Municipal governments. County, city, township, and borough governments maintain geospatial data for a range of purposes, including infrastructure maintenance, planning, engineering, and real estate assessments. Contact the individual governments to request data.

- Tribal governments and organizations. Some Native American tribes have established GISs for their lands. These tribal agencies should be contacted directly.

(b) In some cases, Districts or Divisions may find it helpful to enter into agreements with non-Federal agencies to share and exchange data. These agreements would be outside of the normal Project Partnership Agreement (PPA) that initiates many Civil Works project. See Appendix L for a Sample Memorandum of Agreement for Interagency Cooperation and an example of a data use agreement.

(c) Numerous private sector firms also have existing data. These data may meet the needs of the District better than some of the publicly available data sets. Some private sector organizations may be willing to sell data or license data (with or without a fee). However, a concern with licensing data is the license requirements of the data provider. Before licensed data are acquired or any license agreements are signed, the agreements must be reviewed by the District's Office of Counsel to ensure the legality of the agreement. Such agreements may require negotiation and modification to bring them in line with legal requirements. If the license involves a fee, it is effectively a purchase and is subject to procurement laws. Under these circumstances, Contracting must be consulted in addition to Counsel.

(d) The National Geospatial-Intelligence Agency (NGA) maintains a number of data sets that are not available to the general public. Because USACE is a DOD agency, the data sets may be available to Districts. NGA data sets are ordered via the DLA map catalog portal (<https://dmc.dlis.dla.mil/>). Users are required to register at the portal site and to have supervisory certification that access is required and that they have been properly trained to handle the data.

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(2) In-house development. Developing geospatial data in-house can be a long, arduous process. The key factors in evaluating in-house development are the capability of in-house staff, available source materials, and time constraints.

(3) Contract development. Although existing data may be available, they are usually not of sufficient scale or accuracy to meet the needs of the users. Sometimes, the fastest method of developing accurate, useful geospatial data sets is through an A-E contract or delivery order. The private sector generally has the necessary staff resources and equipment to complete such an effort in a timely manner. Specific contract-related issues are discussed in Chapter 10 of this EM. The key to a contracted effort is a clear scope of work. See Appendix M for a sample scope of work for contracted geospatial data development.

9-4. GIS Data Specification.

a. After the methods to develop a geospatial database are selected, a specification should be established to serve two purposes: provide a firm set of rules for data collection and database construction, and describe the database in sufficient detail to permit application development. This specification will permit the use of the database inside and outside of the producing organization, resulting in a substantial cost savings to users. At a minimum, the specification should include the following sections:

(1) Scope: a concise abstract of the coverage of the specification.

(2) Applicable documents: a bibliographic listing of the standards and references used in developing the specification.

(3) Database description or collection criteria: a summary of the information contained in the database, the structure and format of the database, and the intended use of the data; a list of the features or entities that need to be collected; and a reference to the appropriate data content standard (SDSFIE or AEC CAD standard).

(4) Metadata: a listing of the static metadata elements, including accuracy, datum, scale and resolution, source, and projection (if applicable), along with a reference to the FGDC Geospatial Content Standard or ANSI/ISO standard as applicable.

(5) Data format: a detailed description of the data format, including the specific software data format and version.

(6) Data accuracy: the appropriate accuracy standard (see paragraph 8-4).

(7) Data symbology: any specific markers, line styles, colors, text fonts, and other graphic details to be used.

(8) Data dictionary: a dictionary of the feature and attribute codes to be used in the database, including a reference to the appropriate data content standard.

b. The data sets should be built to meet the requirements of the data specification. Before

the design of a database is finalized, it is advisable to create a prototype database and distribute it to potential users, along with a copy of the draft data specification. This procedure is valuable, even if only for internal use.

9-5. Commercial Satellite Imagery Data Sources. Several commercial satellite systems are available and may provide useful data sources for a geospatial database. Army Regulation AR115-11, Geospatial Information and Services, has designated the AGC Imagery Office (AIO) as the Commercial and Civil Imagery (C2I) Acquisition Program Manager for the U.S. Army. The AIO is well established and has acquired a great deal of imagery in support of the topographic, intelligence, and space communities. The AIO acts as the acquisition agent in the Army for commercial satellite imagery, and it ensures that imagery is purchased only once, thus conserving precious resources for the Army. Districts are required to coordinate with the AIO before purchasing satellite imagery. The AIO will be able to determine if commercial imagery is already available through the NGA for the District's area and time period of interest. The AIO can be contacted at <http://www.agc.army.mil/operations/programs/aio/index.html> or at DLL-AGC-AIO@usace.army.mil. See Appendix N for detailed information about the AIO and instructions for requesting a search for C2I (http://downloads2.esri.com/resources/arcgisdesktop/layers/World_Imagery.lyr).

9-6. Quality Assurance.

a. The primary goal of data quality assurance is to ensure consistent and measurable accuracy throughout the database and for each data set therein. Consistency is achieved through the use of documented, approved production procedures. Following production, the quality of the data set should be assessed to ensure that the expected result has been achieved.

b. The level of production control and the rigor with which the assessments must be made will vary among the data classes, and they should be consistent with the requirements for the database. For example, the data in a cadastral database will generally have exacting accuracy requirements and equally stringent requirements for consistency. This type of data will need to have detailed procedural documentation, a completion signature for each production step, and a comprehensive assessment of accuracy. These requirements significantly increase the cost of production. Conversely, a small-scale database intended only as a background map for geographic orientation (e.g., Digital Chart of the World from NGA) may have only a cursory accuracy assessment and less stringent requirements for production documentation. The method used to measure accuracy can have an impact on the result. Therefore, this quality assessment should be made using standard measurement techniques, such as those described in the National Map Accuracy Standard or local techniques that are well documented.

9-7. Geospatial Data Security.

a. As of 2011, no guidance exists from the Department of the Army or the Department of Defense addressing the security of geospatial data. General guidance is difficult to develop because of the many factors that must be accounted for. Data owners should review all data before releasing or posting the data to a public web site. This review should account for not only the data, but also the size of the population the data is to serve. As a general rule, the higher the resolution or spatial accuracy, the greater the security risk and the less of an impact in

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withholding the data from the public. National data sets (smaller scale/lower resolution) have little risk associated with release, and they can serve a much greater population. This review should be done in partnership with the District's Information Assurance Manager.

b. The posting of metadata onto a public web site, such as the NSDI Clearinghouse, is not a security issue because metadata are only documentation about a data set. However, the following categories of security concerns must be considered when deciding whether geospatial data should be released or posted to a public web site.

(1) Spatial information.

(a) Specific information concerning the position of critical sites can be a security concern. However, maps or geospatial data showing the positions of critical sites (locks, dams, military installations, etc.) are usually easily obtained from a multitude of sources. Because these locations of local or regional landmarks are well known, showing the sites on a USACE public map or web GIS is not necessarily a security violation.

(b) There is potential for misuse of locational, reference grid, or elevation data in conjunction with a critical site or critical infrastructure. The geospatial reference information could be useful to individuals planning disruptions of such sites. The resolution of the data under review should be considered. If the data are compiled from a small-scale source, the chances are low that the information would aid in targeting. If the data are from highly accurate sources, such as GPS or LiDAR, and disruption of the site or related structures would impact a significant population, the spatial information should not be released. For example, many of USACE's CAD, BIM, and SIM files are very accurate and show critical parts of a structure or utility system, so they should not be released. Unless there is a statutory requirement to release the data, Districts should err on the side of caution when considering whether to release highly accurate data.

(c) An additional consideration is the intended audience of the data. Posting highly accurate engineering data on a public site is probably only serving a small, specialized population. Therefore, it is worthwhile to identify more secure methods of providing such data. As a general rule, CAD files of operational structures and facilities should not be on a public web site. However Districts should coordinate data release with their Offices of Counsel.

(2) Attribute information. Attribute information is the basis for all spatial analysis. Because this information can be of interest to various parties in analyzing potential targets, all attribute information must be reviewed before release. Sensitive attributes should be removed or blocked from a public site. Sensitive attributes include emergency management plans for a site, populations at risk, force protection methods, and vulnerability information. The resolution of the data set is not a factor when reviewing attribute information.

(3) Combining data from various sources. The possibility of radical organizations accessing and combining geospatial data from unrelated U.S. sources is considered a serious security threat to our Nation. It is difficult to protect against this potential because of the lack of universal coordination. While USACE may be blocking some sensitive information from the

public, this same information may not be determined to be sensitive by another agency and, therefore, may have been released to the public. Removing the data from a USACE web site will not ensure that the data are unavailable. The RAND Corporation published a study sponsored by NGA and the U.S. Geological Survey (USGS), *Mapping the Risks: Assessing the Homeland Security Implications of Publicly Available Geospatial Information*. In addition to detailing some of the complexities associated with security and releasing data publicly, the study provides an analytical process that can be used to identify and evaluate potentially sensitive geospatial information (<http://www.rand.org/publications/MG/MG142>).

9-8. Geospatial Data Access.

a. Data and metadata produced by USACE, including those produced by commercial firms under contract to USACE, shall be made available to the public to the extent permitted by law, current policies, and relevant OMB policies, including OMB Circular A-130, *Management of Federal Information Resources*. Districts shall make metadata and data accessible for any geospatial data they collect or acquire that are related to studies, projects, or efforts for which funds are appropriated to USACE, with consideration for data security discuss above in 9-7. To comply with this requirement, Districts and labs may post their metadata to the CorpsMap Metadata Portal or publish their metadata for harvesting by the Corps' Geonetwork, which serves as the USACE central geoportal accessible through GOS. Appendix K provides details on the COTS/Geonetwork method.

b. Each District is responsible for establishing procedures for responding to requests from the public for geospatial data. The mechanics of ensuring public access to data holdings should be optimized for the unique missions of each USACE District. Some Districts may choose to have all requests for geospatial data managed through a single office. Others may choose to have internal divisions respond to requests for the data they collect or produce. Some requestors may submit Freedom of Information Act (FOIA) petitions for data. In response to these petitions, the District should coordinate with the Office of Counsel for help in addressing specific legal issues related to fees, timeliness of response, data under review, and data format. For data that are releasable, Districts may share data through state clearinghouses.

c. Data acquired through a license agreement may not be subject to USACE access requirements. The Office of Counsel at the District level must review the licenses to determine accessibility and limitation requirements. Data for which a project sponsor has received in-kind credit must be made accessible unless the negotiated, signed Project Partnership Agreement (PPA) includes a waiver for accessibility. If such a waiver is negotiated as part of the sponsorship agreement, the in-kind credit should be reduced appropriately.

d. Under some circumstances, data may be restricted from release for security reasons. Restrictions include some data that are categorized as Sensitive But Unclassified or Public But Classified in Aggregate. These and other restrictions may be in place to protect sensitive information such as cultural resources or endangered species sites or to prevent redistribution of data acquired from third parties. In the latter situation, Districts should refer any requests for the data to the data originator or owner.

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9-9. Geospatial Data Discovery.

a. Data discovery is the complementary process to data access. While the data access process involves making data available, this process also involves finding data that are available. The data discovery process entails performing the appropriate searches for existing data and exploring potential data-gathering partnerships.

b. Each District shall conduct searches of the NSDI Clearinghouse for each project, program, or study for which the District is responsible. The District is responsible for determining if data found through such searches meet the needs of the project, program, or study. Only after the Clearinghouse has been searched should data development be initiated.

c. If data development is warranted, the District should identify potential data partnerships. Useful data might already exist at other organizations such as state and local agencies or universities. If so, these organizations may be willing to share the existing data, as well as sharing the effort to jointly fund further data development.

9-10. Geospatial Data Archive.

a. Geospatial data represent a significant national asset. USACE Districts must protect against the permanent loss of data by establishing an effective central data archive. This archive must contain a copy of all data sets produced within USACE, either in-house or on contract. It must have an effective cataloging system to ensure that data sets can be retrieved in a reasonable time. The data archiving process (manual, automatic, or a combination) and frequency must be appropriate for the application and sensitivity of the data.

b. The Federal Geographic Data Committee's Historical Data Working Group has developed a draft brochure, *Managing Historical Geospatial Data Records: A Guide for Federal Agencies* (Appendix O), which provides guidance on the responsibilities of geospatial data developers and custodians. It lists 12 circumstances under which geospatial data sets should be archived. Any geospatial data set that has current or potential future value to a District or another government agency and cannot be easily replicated must be considered for archiving. This guidance has the effect of including nearly all geospatial data.

9-11. GIS Data Maintenance.

a. Because of the changing nature of geospatial phenomena, GIS data can become obsolete quickly. A geospatial database represents only a snapshot of the features represented at a particular point in time. Therefore, ongoing maintenance is often critical. This is especially true for geospatial efforts where the same data are used by multiple parts of the organization. Data should be maintained as needed to support USACE applications. As a data set is updated, its metadata must also be updated and made available to the Clearinghouse.

b. The update cycle should be determined during the requirements analysis based on currency requirements and budgetary constraints. Ongoing data maintenance at geospatial

expense can be costly, but it is necessary. Data maintenance is a cost multiplier that must be considered as part of the overall geospatial expense.

9-12. Geospatial Data Liability. Data liability is an issue that requires expert legal attention. USACE liability for data covers four legal areas discussed below.

a. Liability for incorrect data. The Federal government is protected from being sued for providing “misinformation” under the Federal Tort Claims Act. However, the government is not protected from “malpractice.” Although a few legal precedents exist in this area, the best solution for USACE Districts is to develop sound procedures for data collection, handling, and processing and to adhere to those procedures. No USACE District shall knowingly provide data that do not meet its stated accuracy or data that contain undocumented or incorrect lineage. Every effort must be made to ensure that users understand the capabilities and limits of the data sets made available to them.

b. Liability for misuse. *Geographic Information Systems: A Management Perspective* (Aronoff 1989) provides examples of how advanced geospatial systems can be employed to misuse public data in a manner that would not be possible via hard copy. Because no legal precedents exist in this area, a USACE-wide policy on restricting access to certain types of data has not yet been developed. To compensate for this, important protective measures are essential. All data provided through the Clearinghouse should be properly documented as to its intended use, as required by the metadata standard. Metadata files should include a statement similar to the following: “The data described by this metadata file were generated for a specific purpose and use. Any use beyond that intended by the data owner is strictly at the risk of the user. USACE assumes no responsibility for misapplication or misuse of the data.”

c. Liability for inaccessibility. USACE has a responsibility for collecting certain data, specifically hydrographic survey data. These data are critical to traffic on the Nation’s waterways and must be made available and accessible to the public. Again, the proper documentation is essential, especially with the potential for loss of life and property that any misinformation can cause.

d. Liability for release of partner-restricted data. USACE PPAs often include data sharing as an element. If a PPA includes any restrictions from release of data, it is important that such restrictions be honored. Districts may be held liable for any release of data that has been restricted by a project sponsor. Requests for such restricted data should be sent to the project sponsor or partner who provided the source data.

9-13. CAD, BIM, SIM Data Development and Management Sections.

a. All components follow the same unified organizational data strategy:

(1) Avoid duplication in data acquisition. Share data wherever possible via networks and partnership.

(2) Look for existing datasets before collecting data.

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(3) Adhere to existing government and industry data content, access, and delivery standards.

(4) Manage data to maximize their use by multiple processes.

(5) Manage data at the owner level and negotiate access arrangements.

(6) Require the use of metadata for every dataset.

b. While the AEC industry and disciplines have lagged the standardization, service-oriented architecture, and open data/collaboration trends dominant in the information technology and GIS sectors, proactive adoption of these (and future) models and innovations¹ is a critical path for cost-effective mission execution.²

c. AIA Integrated Project Delivery (IPD)³ and ConsensusDOCS⁴ contract models and process guidance shall direct USACE project teams in AEC data procurement, management/sharing, project execution, and life cycle maintenance.

d. ACE-IT policy and personnel will determine appropriate hardware requirements and network configurations, with the (incentivized) expectation that services rendered will meet or exceed IPD objectives and performance metrics.

e. IPD team members shall utilize software vendor documentation, development communities, industry resources, and agency technical documents for guidance on data development and management as it relates to project execution:

(1) Whole Building Design Guide (WBDG) New Construction and Major Renovations.⁵

(2) WBDG Construction Criteria Base.⁶

(3) WBDG USACE Tools.⁷

(4) WBDG BIM Libraries.⁸

(5) Autodesk and Bentley Services and Support.⁹

(6) AGC Instructor Resources.¹⁰

¹ <http://fiatech.org/tech-roadmap/lifecycle-data-management-information-integration.html>

² <http://www.fire.nist.gov/bfrlpubs/build04/PDF/b04022.pdf>

³ <http://www.aia.org/aiaucmp/groups/aia/documents/document/aia085539.pdf>

⁴ <http://consensusdocs.org/>

⁵ http://www.wbdg.org/references/fhpsb_new.php

⁶ <http://www.wbdg.org/ccb/ccb.php>

⁷ http://www.wbdg.org/tools/tools_use.php?u=8

⁸ http://www.wbdg.org/bim/bim_libraries.php

⁹ <http://usa.autodesk.com/support/documentation/>, <http://selectservices.bentley.com/en-US/>

¹⁰ http://www.agc.org/cs/education/bimep/instructor_resources

(7) AACE Professional Resources.¹¹

(8) Design-Build Institute of America (DBIA) Publications and Resources.¹²

(9) Building Cost and Performance Metrics: Data Collection Protocol.¹³

(10) Penn State CIC BIM Project Execution Planning Guide.¹⁴

(11) ERDC TR-06-10 BIM Road Map¹⁵ and Supplements.¹⁶

f. A typical AEC IPD data-design workflow is shown in Figure 9-1.

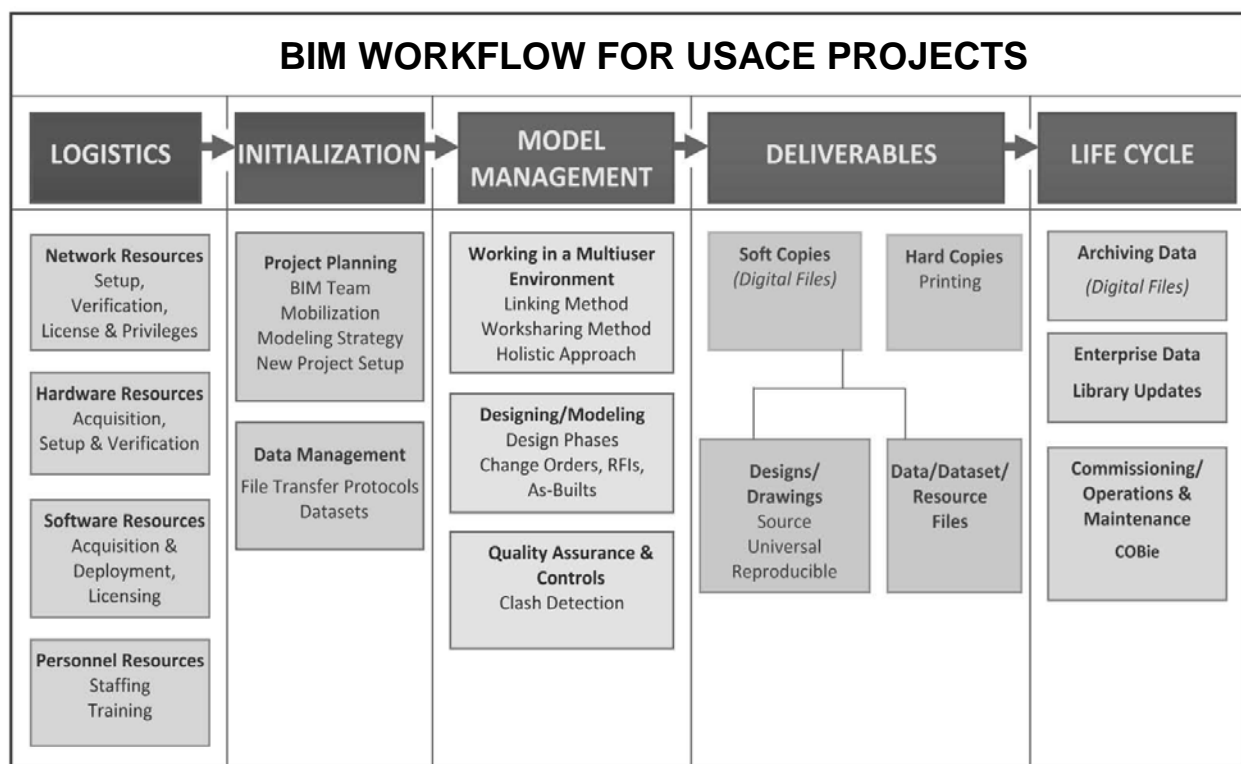


Figure 9-1. BIM Workflow for USACE Projects.

9-14. Geospatial Data Management with ProjectWise. Data and document management is a critical complementary function to project planning tracking and execution. Traditional file

¹¹ <http://www.aacei.org/resources/>

¹² <http://www.dbia.org/pubs/>

¹³ <http://www.dbia.org/pubs/>

¹⁴ <http://bim.psu.edu/Project/resources/default.aspx>

¹⁵ https://cadbim.usace.army.mil/MyFiles/1/1/7/ERDC_TR-06-10.pdf

¹⁶ <https://cadbim.usace.army.mil/MyFiles/1/2/0/ERDC-TR--06-10,%20supplement%201.pdf>,
<https://cadbim.usace.army.mil/MyFiles/1/2/1/ERDC-TR-06-10,%20supplement%202.pdf>

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systems lack the business intelligence and bi-directionality to meet IPD objectives and performance standards. ProjectWise (PW) delivers an effective solution in this respect, with a collaboration system and features designed for geographically distributed and professionally diverse AEC project teams. While future Document-Data Management Systems (DDMS) will evolve and eventually eclipse PW's capabilities, the platform has already established a successful record within USACE of saving time with preconfigured, centralized project workspaces; ensuring consistency with standards enforcement and data-design templates; improving quality via streamlining of QA/QC/review processes; and reducing rework and duplication of effort with versioning. These DDMS benefits result in the IPD model objectives of increasing productivity and decreasing RFIs, field conflicts, waste, and project schedule delays. Consequently, USACE has joined a growing group of firms nationally and globally in establishing Full Use (Autodesk) and Enterprise License Agreements (Bentley) with AEC industry platform leaders, aligning industry standards development while shifting vendor priorities towards service and infrastructure/platform reliability.

ProjectWise guidance and resources are available through ERDC's PCM document (<http://itl.erdc.usace.army.mil/FactSheets/ProjectWiseCollaborationModelProduct.pdf>).

9-15. Required Elements.

- a. For imagery purchases, the District must coordinate with the AIO (see paragraph 9-5).
- b. When licensing geospatial data, the District must coordinate with the District's Office of Counsel [see paragraph 9-3b(1)(c)].
- c. USACE-funded geospatial data collections must be made available to the public (see paragraph 9-8).
- d. Before USACE funds are expended for geospatial data collections, a search of the NSDI Clearinghouse must be executed for existing data that will meet mission requirements (see paragraph 9-9).

CHAPTER 10

Contracting for Geospatial Data and Services

10-1. Purpose. The purpose of this chapter is to identify issues and define the requirements for contracting for geospatial data and services. Contracting for geospatial data and services can help Districts with the development, application, and maintenance of EGESs. There are technical and contractual concerns that must be considered when contracting for these elements.

10-2. Introduction.

a. Geospatial data and services include collection, development, and delivery of data; geospatial analysis; EGES database and system planning, operation, and management; and geospatial application development. Districts are encouraged to evaluate regional resources to determine if other Districts may be able to provide support. Once Districts have determined that internal and regional resources are insufficient, they may decide to contract for these data and service products.

b. Districts are required to comply with all laws and regulations in contracting for geospatial data or services. The laws and regulations include, but are not limited to, the Federal Acquisition Regulations (FAR), the Defense FAR (DFAR), the Engineering FAR Supplement (EFARS), DoD Instruction 4000.19, the Anti-Deficiency Act (ADA), the Economy Act, and the Brooks Act. Additionally, each District is required to comply with Department of the Army and USACE policy, as well as any implementing guidance provided from HQUSACE and Division Commands.

10-3. Geospatial Data.

a. Geospatial data that are acquired by purchasing from a vendor are similar to an order for other goods such as office supplies but with more specific technical requirements. Generally, these purchases will be handled through the District's Contracting Division or Office following normal purchasing procedures. The exception would be purchases that can be handled by a government credit card holder. This is not the same as the credit card used for TDY travel by staff, and there are certain limitations and requirements for making data purchases in this manner. Authorized District credit card holders are able to explain the limitations and requirements.

b. The organization seeking to acquire geospatial should work with the District EGES Coordinator to ensure that data deliverables will meet the requirements and comply with applicable standards. The organization should also ensure that a search of the NSDI Clearinghouse has been conducted. The Geospatial Coordinator should have reviewed the data specification before initiating a purchase to verify that the data will meet the District's needs and are in compliance with applicable standards. Counsel should be contacted to provide a legal review of any vendor-required license agreements.

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c. Geospatial data that are acquired through contracting for data development are usually collected using field surveying, photogrammetry, or a combination of these methods. These methods fall under the Brooks Act (P.L. 92-582). This law applies to Federal agencies and requires that architect-engineer (A-E) services contracts be selected through a qualifications-based process rather than simply a lowest cost criterion. Detailed guidance and procedures for A-E contracts are available in Engineer Pamphlet (EP) 715-1-7.

d. EM 1110-1-1000 provides technical guidance on photogrammetric mapping and aerial photography; in particular, Appendix C of that EM provides a guide specification for these services.

e. EM 1110-2-1150 provides technical guidance on surveying and mapping.

10-4. Geospatial Services.

a. Geospatial services provided via contracts are often necessary to supplement geospatial staff and capabilities that exist in-house. Such services may involve hiring contract staff as on-site geospatial technical staff, tasking a geospatial services firm to perform geospatial analysis of data and provide the results as either a new data set or as a technical report, or tasking a private entity to develop geospatial tools or to customize existing software.

b. EFARS 36.601-4 includes geospatial services as a type of A-E service. Therefore, contracts services that involve "...measuring, locating and preparing maps, charts, or other graphical or digital presentations depicting natural and man-made physical features, phenomena, and legal boundaries of the earth..." must follow qualifications-based selection procedures. This requirement applies to procurement of photogrammetric services. Raw, unrectified aerial photography may be acquired through methods that do not fall under EFARS 36.601-4 or the Brooks Act. Any orthorectification or photogrammetry done using the raw aerial photography would have to be contracted through EFARS 36.601-4 processes.

c. Contracts or task orders for customizing COTS software do not necessarily fall under the definition of geospatial services presented in EFARS 36.601-4. Non-A-E contractors may be used to provide some geospatial services. Nevertheless, Districts should still select qualified firms or individuals to provide such services. The ELAs discussed in Chapter 7 of this EM include services for customization that Districts can purchase separately from the ELA software.

d. Services that involve analyzing geospatial phenomena may or may not fall under the requirements of EFARS 36.601-4 and EP 715-1-7, depending on the nature of the work and the required deliverables. When the results are presented as maps, charts, or new geospatial features, the EFARS and EP are applicable.

e. The local Contracting organization will be able to advise the requesting organization about the contracting requirements. The District should also coordinate with their Office of Counsel to ensure compliance with any other applicable laws, regulations, or policy.

10-5. Independent Government Estimates.

a. For data purchase, the costs are usually predetermined by the vendor. However, when contracting for geospatial services, the Federal government must determine the level of effort and associated costs that a contract or task order Statement of Work (SOW) will involve. This determination is documented in an Independent Government Estimate (IGE). The IGE is based on the government's evaluation of the work to be accomplished and the labor and resource requirements to fulfill the SOW. The government then applies locally appropriate unit costs (e.g., hourly rates) to the labor and resource. The PROSPECT course "AE Contracting" includes some discussion about preparing the IGE. There is also a course offered through Management Concepts, a private sector firm that provides a variety of training to government and non-government organizations. Information about the course can be found at the following URL: https://www.managementconcepts.com/portal/server.pt/community/training/301/course_detail?mcTarget=course&mcTargetID=1125.

b. Staff preparing IGEs should strive to develop a realistic forecast of the expected cost and effort. The IGE should consider the staff resources, expertise, and labor rates required to complete each task. In addition, the IGE should include costs for non-labor resources such as field equipment, copies, large-size plots, postage, CD or DVD media, computing time, and any other non-labor direct costs.

c. See Appendix L for an example SOW and IGE that illustrate the elements that make up these types of documents. Consult with the local Contracting office for any local policy or guidance regarding contracting for geospatial services and preparation of IGEs.

10-6. Required Elements.

a. Each EGES Coordinator shall comply with all laws and regulations relating to contract actions for geospatial data and services, including FAR, DFAR, EFARS, and the Brooks Act.

b. Each EGES Coordinator shall coordinate any contract actions for geospatial data and services with their local Contracting Division and Office of Counsel.

APPENDIX A

References

A-1. Public Laws.

- a. PL 107-347, E-Government Act of 2002.
- b. PL 104-106, Clinger Cohen Act of 1996.
- c. PL 92-582, Brooks Act.

A-2. Executive Orders.

- a. EO 12906, *Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure*.
- b. EO 12333, *United States Intelligence Activities*.

A-3. Federal Acquisition Regulations.

EFARS 36.601-4, *Implementation*.

A-4. Department of Defense Directives and Instructions.

- a. DoD Directive 5105.60, *National Geospatial-Intelligence Agency (NGA)*.
- b. DoDD 8320.02, *Data Sharing in a Net-Centric Department of Defense*.
- c. Office of Deputy Under Secretary of Defense for Installations and Environment, *Installation Geospatial Information and Services Guidance*, dated 31 March 2009 (Appendix D)
- d. Army Geospatial Center, *Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) 3.0 Implementation Guidance*, dated 2 December 2011.

A-5. Department of the Army Publications.

- a. AR 210-20, *Real Property Master Planning for Army Installations*.
- b. Army Regulation 115-11, *Geospatial Information and Services*.

A-6. USACE Publications.

- a. ER 5-1-11, *U.S. Army Corps of Engineers Business Process*.

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- b. ER 25-1-2, *Life Cycle Management of Information Systems (LCMIS)*.
- c. ER 1110-1-8156, *Policies, Guidance, and Requirements for Geospatial Data and Systems*.
- d. ER 1110-2-8160, *Engineering and Design: Policies for Referencing Project Evaluation Grades to Nationwide Vertical Datums*.
- e. EP 715-1-7, *Architect-Engineer Contracting*.
- f. EM 1110-1-1000, *Photogrammetric Mapping*.
- g. EM 1110-1-1004, *USACE, Geodetic and Control Surveying*.
- h. EM 1110-1-1005, *Control and Topographic Surveying*.
- i. EM 1110-1-2909, *Geospatial Data and Systems*.
- j. EM 1110-2-1150, *Engineering and Design for Civil Works Projects*.
- k. EM 1110-2-6056, *Standards and Procedures for Referencing Project Elevation Grades to Nationwide Vertical Datum*.
- l. EC 1130-2-215, *Corps Project Notebook: A Database of USACE Project Geographic Locations*.
- m. ER 37-2-10, *Financial Administration - Accounting and Reporting - Civil Works Activities*.
- n. Greeley, N.H., K.M. Dilks, C.M. Adams, and G.C. Hoge (2000) *U.S. Army Corps of Engineers Geospatial Data and Systems Management*. ERDC TR-00-9. USACE, Engineer Research and Development Center, Vicksburg, MS. <http://www.crrel.usace.army.mil/library/technicalreports/ERDC-TR00-9.pdf>.

A-7. Publications Originated by Other Federal Agencies and the Private Sector.

- a. Aronoff, S. (1989) *Geographic Information Systems: A Management Perspective*. WDL Publications, Ottawa, Ontario, Canada.
- b. Baker, J.C., B.E. Lachman, D.R. Frelinger, K.M. O'Connell, A.C. Hou, M.S. Tseng, D.T. Orletsky, and C.W. Yost (2004) *Mapping the Risks: Assessing the Homeland Security Implications of Publicly Available Geospatial Information*. RAND Corporation. <http://www.rand.org/publications/MG/MG142>.
- c. Federal Geographic Data Committee, Historical Data Working Group (1998) *Managing Historical Geospatial Data Records: A Guide for Federal Agencies*. Federal Geographic Data Committee, Reston, VA.

- d. International Organization for Standardization (2003) *Geographic Information – Metadata*. ISO 19115:2003. International Organization for Standardization, Geneva, Switzerland.
- e. International Organization for Standardization (2009) *Geographic Information – Metadata – Part 2: Extensions for Imagery and Gridded Data*. ISO 19115-2:2009. International Organization for Standardization, Geneva, Switzerland.
- f. Office of Management and Budget Circular A-16, *Coordination of Geographic Information and Related Spatial Data Activities*.
- g. Office of Management and Budget Circular A-130, *Management of Federal Information Resources (as it pertains to managing Geospatial Information and Data)*.
- h. Subcommittee for Base Cartographic Data, Federal Geographic Data Committee (1980) *Geospatial Positioning Accuracy Standards. Part 3: National Standard for Spatial Data Accuracy*. FGDC-STD-007.3-1998. Federal Geographic Data Committee, Reston, VA.

APPENDIX B

Abbreviations and Acronyms

A-E	Architect-Engineer
ACE-IT	Army Corps of Engineers Information Technology
ACS	Agency Central Support
ACSIM	Army Chief of Staff for Installation Management
ADM	Authoritative Data Matrix
AEC	Architecture Engineering Construction
AET	Automated Engineering Tool
AGC	Army Geospatial Center
AGE	Army Geospatial Enterprise
AIO	AGC Imagery Office
AIS	Automated Information Systems
AR	Army Regulation
ASPRS	American Society for Photogrammetry and Remote Sensing
BIM	Building Information Modeling
C2I	Commercial and Civil Imagery
CAD	Computer Aided Design
CDP	Commercial Data Provider
CECI	Corps of Engineers Corporate Information
CERL	Construction Engineering Research Laboratory
CHL	Coastal Hydraulics Laboratory
CIO	Chief Information Officer
CoP	Community of Practice
COTS	Commercial Off-The-Shelf
CRREL	Cold Regions Research and Engineering Laboratory
DFAR	Defense Federal Acquisition Regulation
DHS	Department of Homeland Security
DISDI	Defense Installation Spatial Data Infrastructure
DISR	DoD Information Technology Standards Registry
DMP	Data Management Plan
DoD	Department of Defense
EFARS	Engineering Federal Acquisition Regulation Supplement
EGES	Enterprise Geospatial Engineering System
EGIS	Enterprise Geographic Information System
EL	Environmental Laboratory
ELA	Enterprise Licensing Agreement
EO	Executive Order
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
EROS	Earth Resource Observation Science
ESD	Enterprise Service Desk
FAR	Federal Acquisition Regulation

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FGDC	Federal Geographic Data Committee
FOIA	Freedom of Information Act
FP	Functional Proponent
FQDN	Fully Qualifying Domain Name
FRP	Facilities Reduction Program
GDS	Geospatial Data Standard
GeoCONOPS	Geospatial Concept of Operations
GIO	Geospatial Information Officer
GIS	Geographic Information System
GIS&T	Geographic Information Science and Technology
GISP	GIS Professional
GOS	Geospatial One Stop
GPS	Global Positioning System
GSL	Geotechnical and Structures Laboratory
H&H	Hydrology and Hydraulics
HEC	Hydrologic Engineering Center
HNC	Huntsville Center
HQSACE	Headquarters, U.S. Army Corps of Engineers
HTRW	Hazardous, Toxic, and Radioactive Waste
IENC	Inland Electronic Navigation Charts
IGE	Independent Government Estimate
IGI&S	Installation Geospatial Information and Services
IPT	Integrated Product Team
ISO	International Organization for Standardization
IT	Information Technology
ITIPS	Information Technology Investment Portfolio
ITL	Information Technology Laboratory
KME	Knowledge Management Environment
LCMIS	Life Cycle Management of Information Systems
LDM	Logical Data Model
MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
MSC	Major Subordinate Command
NDEP	National Digital Elevation Program
NDOP	National Digital Orthophoto Program
NED	National Elevation Dataset
NGA	National Geospatial-Intelligence Agency
NGC	National Geospatial-Intelligence College
NID	National Inventory Dams
NLD	National Levee Database
NRCS	Natural Resources Conservation Service
NSDI	National Spatial Data Infrastructure
NSG	National System for Geospatial-Intelligence
NSRS	National Spatial Reference System
NSSDA	National Standard for Spatial Data Accuracy
O&M	Operation and Maintenance

OACSIM	Office of Army Chief of Staff for Installation Management
OE	Ordnance and Explosives
OGC	Open Geospatial Consortium
OMB	Office of Management and Budget
OMBIL	Operation and Maintenance Business Information Link
OSD	Office of Secretary of Defense
PCT	Program Coordination Team
PDM	Physical Data Model
PDT	Project Delivery Team
PgMP	Program Management Plan
PM	Project Manager
PMBP	Project Management Business Process
PMP	Project Management Plan
PMT	Program Management Team
POC	Point of Contact
PPA	Project Partnership Agreement
QMS	Quality Management System
R&D	Research and Development
ROI	Return on Investment
RTLP	Ranges and Training Lands
SA	System Administrator
SDE	Spatial Database Engine
SDP	Systems Decision Paper
SDSFIE	Spatial Data Standards for Facilities, Infrastructure, and Environment
SI	Site Inspection
SM	System Manager
SME	Subject Matter Expert
SOA	Service Oriented Architecture
SOW	Statement of Work
TEC	Topographic Engineering Center
ULC	USACE Learning Center
URISA	Urban and Regional Information Systems Association
USACE	U.S. Army Corps of Engineers
USD(I)	Under Secretary of Defense for Intelligence
USD(P)	Under Secretary of Defense for Policy
USGS	U.S. Geological Survey

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APPENDIX C

Army Geospatial Enterprise (AGE) Policy



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ARMY GEOSPATIAL INFORMATION OFFICER
2600 ARMY PENTAGON
WASHINGTON, DC 20310-2600

DAEN-ZC

8 June 2010

MEMORANDUM FOR SEE DISTRIBUTION


SUBJECT: Army Geospatial Enterprise (AGE) Policy

1. As directed by the Geospatial-Enterprise Governance Board (GGB) and under charter as the Army Geospatial Information Officer (GIO), enclosed is the approved policy for the AGE.
2. The enclosed policy was coordinated with the Deputy Chief of Staff (DCS) G-2, DCS G-3/5/7, DCS G-4, CIO/G-6, DCS G-8, ASA (ALT), US Army Training and Doctrine Command, and the Office of General Counsel via the formal HQDA Staffing process.
3. This policy contains supporting annexes for the Army Geospatial Data Model, AGE Profile of Geospatial Standards and Formats, AGE Architecture, AGE Authoritative Data Source, AGE Common Applications/Services, and the AGE Certification Criteria.
4. These annexes are "living documents" and will be revised as necessary and coordinated with appropriate organizations prior to any re-publication.
5. An update to Army Regulation 115-11, "*Geospatial Information and Services*", is underway, and this revised regulation will provide the regulatory foundation for this policy.
6. My POC for this action is Mr. David Lilley, Army Geospatial Program Coordinator, GGB-Staff, 703-693-6734, david.lilley@conus.army.mil.

AUTHORITY LINE:

1 Enclosure

1. AGE Policy, 2 June 10


ROBERT W. BURKHARDT
Army Geospatial Information Officer

1 Sep 12

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SUBJECT: Army Geospatial Enterprise (AGE) Policy

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DEPUTY CHIEF OF STAFF, G-8
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DIRECTOR, U.S. ARMY ACQUISITION SUPPORT CENTER

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CHIEF, INFORMATION OFFICER/G-6

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SIMULATION, TRAINING, AND INSTRUMENTATION SOLDIER

COMMAND:
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US ARMY INSTALLATION MANAGEMENT COMMAND
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NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY MILITARY EXECUTIVE
NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY ENABLING GEOSPATIAL-
INTELLIGENCE
NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY NATIONAL SYSTEM FOR
GEOSPATIAL-INTELLIGENCE INTEROPERABILITY ACTION TEAM
OFFICE OF THE ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT

ARMY GEOSPATIAL ENTERPRISE POLICY

1. **Purpose:** The Army Geospatial-Enterprise Governance Board (GGB) chartered the Army Geospatial Information Officer (GIO) to coordinate, assess, and synchronize all Army policies and requirements to successfully develop and implement an Army Geospatial Enterprise (AGE). As authorized by the GGB, this policy provides guidance for achieving an AGE that delivers enhanced Situational Awareness (SA) across all echelons and improves the decision-making model for the Army.
2. **References:** See Annex 1.
3. **Definition:** The AGE is an integrated system of technologies, standards, data, and processes that delivers a standard and sharable geospatial foundation, which facilitates a Common Operational Picture (COP) to the Warfighter at all echelons. This geospatial foundation for the COP results from storing all operationally relevant spatial and temporal data from all six warfighting functions (movement and maneuver, fires, intelligence, sustainment, command and control, and protection) across the Army, in standardized, distributed, interoperable geospatial data stores. This enables the synchronization, sharing, portrayal, awareness, fusion, and correlation of geospatially referenced warfighting data.
4. **Scope:** This policy applies to all producers and consumers of geospatially referenced information, and specifically includes all Army Staff, Commands, Activities, and Units that are responsible for the acquisition, collection, management, storage, development, fielding, sustainment, training, modeling and simulation, production, exploitation, visualization, and dissemination of geospatially referenced information within the generating and operating forces. This policy also encompasses all Army Programs of Record (POR) and non-POR that have inherent geospatial capabilities within their systems. NOTE: Non-POR refers to systems/activities addressed by Operational Needs Statements, Joint Urgent Operational Needs Statements, Theater Provided Equipment and Quick Reaction Capabilities.
5. **Policy:** To implement and manage the AGE, applicable Army organizations and personnel shall comply with the following as appropriate and allowed by operational requirements:
 - a. AGE Roles and Responsibilities (Annex 2).
 - b. Current Army Regulation (AR) 115-11, *Geospatial Information and Services (GI&S)*.
 - c. Current Chairman of the Joint Chiefs of Staff Instruction 3901.01B, *Requirements for Geospatial Information and Services*.
 - d. Core Implementation Area Guidance (See Annex 3), the *AGE Concept of Operations for Battle Command -Operational Use* (Published Separately), and the *AGE Concept of Operations for Generating Force Enterprise Activities* (Published Separately, in development).
 - e. AGE Profile of Geospatial Standards and Formats (See Annex 5).
 - f. AGE Architecture (See Annex 5).

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- g. AGE Authoritative Data Source (See Annex 6).
 - h. Army Geospatial Data Model (See Annex 7).
 - i. AGE Common Applications/Services (See Annex 8).
 - j. AGE Certification Criteria (See Annex 9).
6. **Responsibilities:** Applicable Army POR, non-POR, units, organizations are required to comply with the roles and responsibilities outlined in Annex 2.
7. **Linkages:** The AGE is a component of the Army Enterprise Architecture (AEA) as described in AR 25-1, Army Knowledge Management and Information Technology. As such, all AGE processes shall conform to and be included within the overall AEA, the CIO/G-6 Army Data Strategy, and the LandWarNet/Battle Command (BC) Strategy. Additionally, the AGE shall synchronize with the National System for Geospatial-Intelligence. Therefore, this policy shall be consistent with, and comply with established National, Department of Defense (DoD), and Joint policies pertaining to GI&S and standards shall synchronize with the DoD Information Technology Standards Registry requirements.
8. **Benefit:** Successful implementation of the AGE will improve mission planning, rehearsal, execution, modeling, simulation, and training by eliminating the need to repeatedly collect and produce multiple geospatial data sets over the same geographic area. This improves the transfer of data between unit rotations and produces tangible cost savings to the Army due to increased data reuse and data sharing through more effective and efficient information business processes. Ultimately, the AGE will improve the Commanders Military Decision Making Process, leading to Information Superiority, enhanced soldier SA, and will be a fundamental tool for assuring a common understanding between the Army, the Intelligence Community, and other pertinent Joint, Interagency, Intergovernmental, and Multinational partners.
9. **Proponent and Exception Authority:** The proponent for this policy is the Army GIO, who is responsible for the operational, administrative, and daily management of the AGE, as well as the Army Geospatial Governance Process. AGE issues that cannot be adjudicated by the Army GIO will be considered and resolved by the GGB. The proponent has the authority to approve exceptions or waivers to this policy that are consistent with controlling law and regulations. Army PORs, non-PORs, units, organizations recommending modifications to the AGE core implementation areas or seeking a waiver, must submit a request utilizing the AGE Configuration Control Process (See Annex 4).
10. **Effective Date:** This policy is effective immediately upon approval of the GGB. AGE compliance shall be aligned with LandWarNet/BC Capability Set capability management process timelines and requirements. Systems fielding to a capability set must comply with the geospatial requirements associated with that capability set, as specified in or derived directly from approved requirements documents, including Joint Capabilities Integration and Development System documents, the US Army Training and Doctrine

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Command Directed Requirements Memorandum for a Standard and Sharable Geospatial Foundation or other approved requirements documents, in or from Army and Joint regulations and instructions, or in applicable laws. Assignment of a geospatial requirement to a particular capability set will take into account unified battle command strategies, Weapon Systems Review direction, and an overall cost-benefit analysis.

11. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGE policy to the Army GIO, through the GGB Staff, Office of the Chief of Engineers, 2600 Army Pentagon, Room 2E667, Washington, DC 20310-2600, or by calling (703) 693-6734.



ROBERT W. BURKHARDT
Army Geospatial Information Officer

ANNEX 1
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*All publication dates reflect the dates available at the time of this version of the policy and its associated annexes. Dates will be revised, if necessary, per revision.

ANNEX 2

ARMY GEOSPATIAL ENTERPRISE ROLES AND RESPONSIBILITIES

1. **Purpose:** This annex is intended to supplement the Army Geospatial Enterprise (AGE) policy by assigning roles and responsibilities to applicable Army Programs of Record (POR), non-POR, units, and organizations that, when satisfied, enable an effective and efficient AGE.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army POR, non-POR, units, and organizations within the scope of the AGE policy.
4. **Responsibilities:** The following integrated roles and responsibilities have been identified to enable the AGE:
 - a. **The Army Geospatial Information Officer (GIO) is responsible for:**
 - (1) Developing strategic direction and guidance for all geospatial issues across all Army warfighting functions and operational domains.
 - (2) Providing technical and programmatic coordination of the AGE.
 - (3) Assessing the impact of emerging geospatial standards, technologies, and policies on current and future Army operations and systems. Making geospatial recommendations to appropriate proponents.
 - (4) Synchronizing Headquarters Department of the Army (HQDA) AGE issues by coordinating with the Geospatial-Enterprise Governance Board (GGB) and associated Army staff and decision forums. The mission of the GIO to synchronize geospatial capabilities across many domains requires that the GIO and the Director of G-3 LandWarNet/Battle Command collaborate in developing processes to ensure geospatial enterprise capabilities are completely integrated within the Army's Battle Command system of systems. Also, synchronization of data, services, networking, and physical processing support is required with HQDA CIO/G-6.
 - (5) Coordinating with the Director, Army Modeling and Simulation (M&S) to synchronize AGE issues across M&S communities.
 - (6) Establishing and maintaining alignment between the AGE and broader Department of the Army and of Department of Defense (DoD) enterprise architectures.
 - (7) Synchronizing the incorporation of AGE capabilities and processes into Army and Joint Doctrine, Operations, Training, Materiel, Leadership, Personnel and Facilities (DOTMLPF).
 - (8) Providing system engineering interface at the enterprise level to ensure AGE alignment of requirements and programs with LandWarNet.
 - (9) Synchronizing the system engineering for the Geospatial Enterprise Office with other system engineering activities conducted at enterprise level.

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- (10) Ensuring AGE capabilities and activities are synchronized with those of the National System for Geospatial-Intelligence (NSG) and meet applicable standards and doctrine.
- (11) Coordinating with HQDA DCS G-2 and the CIO/G-6 on proposed standards recommended for inclusion in the DoD Information Technology Standards and Profile Registry (DISR) for coordination through the Geospatial-Intelligence Standards Working Group (GWG). The GIO also works through G-2 and the GWG for changes to standards already documented in the DISR. The GIO will fully consider all impacts and ramifications prior to recommending substantive deviations, or departures from DoD standards.
- (12) Reviewing, approving, and recommending priorities of AGE and Geospatial Information and Services (GI&S) requirements and forwarding to HQDA DCS G-2 for submission to National Geospatial-Intelligence Agency (NGA) or Army Geospatial Center (AGC) as appropriate.
- (13) Assisting the Army Service Component Commands (ASCCs) with the coordination of the Combatant Command requirements to ensure that they align with the AGE.
- (14) Coordinating with NGA's School of Geospatial Intelligence and with Army Capabilities Integration Center (ARCIC) for appropriate US Army Training and Doctrine Command (TRADOC) Centers that provide the training necessary for the efficient functioning of the AGE.
- (15) Resolving all AGE issues at the lowest possible level. If an issue cannot be satisfactorily resolved, present all sides of the issue with a recommendation to the GGB, which will be the deciding authority.

b. The GGB Staff is responsible for:

- (1) Ensuring geospatial integration within Army policies, regulations, and Joint DOTMLPF.
- (2) Coordinating, integrating, and analyzing of all geospatial issues across the Army, Special Operations, Reserve/National Guard, Joint, Interagency, and Coalition agencies.
- (3) Coordinating geospatial standards development, promulgating and enforcing them within the Army, and synchronizing geospatial standards with the National System for Geospatial-Intelligence (NSG).
- (4) Coordinating network engineering, system architecture, and system engineering for the AGE within the Army, and synchronizing networks and systems with the NSG.
- (5) Strategic communications for the AGE, including the planning and execution of a strategic engagement plan.
- (6) Providing financial, manpower, resource, and investment opportunity analysis and oversight of geospatial programs across the Army, and coordinating geospatial resource investment with DoD and NSG.

c. The AGC's Geospatial Acquisition Support Directorate (GASD) is responsible for:

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- (1) Developing and maintaining an AGE Profile of Geospatial Standards and Formats to ensure system interoperability and the exchange of geospatially-referenced information to facilitate a Common Operating Picture (COP).
 - (2) Creating and maintaining an Army Geospatial Data Model (AGDM) that synchronizes with the NSG standards that support topographic terrain visualization, terrain analysis, and data production for the Warfighter, including modeling and simulation terrain databases, for Army GI&S.
 - (3) Developing and maintaining a DoD Architecture Framework compliant AGE Architecture.
 - (4) Establishing and maintaining AGE integrated geospatial interoperability certification criteria and ensuring memorandums of agreement are in-place with the Army Test and Evaluation Command (ATEC) and Central Technical Support Facility (CTSF) to ensure criteria are incorporated into applicable test and evaluation procedures.
 - (5) Developing and maintaining a list of AGE-compliant Common Applications/Services that operates on standards, protocols, specifications, and common engineering principles that support geospatial foundation management, geospatial analysis, visualization, exploitation, and dissemination.
 - (6) Developing an AGE System Implementation Plan template and submission process; and coordinating with applicable Army POR and non-POR to build realistic and achievable implementation plans that lead to AGE compliance.
- d. **The Army Geospatial-Intelligence Office is responsible for:**
- (1) Serving as the Army point of contact at NGA for all NSG efforts.
 - (2) Coordinating all policy, programming, doctrine and training issues with G-2, TCM-G, GIO and other HQDA elements as appropriate.
 - (3) Providing an embedded presence within NGA to advance Army geospatial issues and positions relating to common imagery and geospatial data standards, processes and procedures.
 - (4) Assisting the Army GEOINT functional leads in the management and submission of GEOINT requirements in support of Army's Title 10 responsibilities.
- e. **The Geospatial Standing Task Force (GSTF) members are responsible for:**
- (1) Providing strategic and operational level guidance, oversight, and direction to other GSTF members on geospatial issues as they apply to and affect their respective organizations, including:
 - (a) Participating in GSTF meetings, or if unavailable, the appointment of a representative to participate on their behalf.
 - (b) Reporting issues of significance from their organizations which are relevant to the AGE or GGB to the GSTF.

- (c) Providing inputs for defining and maintaining AGE standards, policies, and regulations, for alignment with organizational domain strategies and goals.
 - (2) Providing strategic and operational level guidance, oversight, and direction to their respective organizations on geospatial issues, including:
 - (a) Reporting issues of significance or relevance from the GSTF to their organizations.
 - (b) Ensuring AGE-related documents are staffed throughout their organization to ensure alignment with organizational domain strategies and goals.
 - (c) Knowledge management of geospatial aspects of the processes and procedures of their organizations.
 - (d) Ensuring the proper integration of AGE standards, policies, and regulations within their organizations.
 - (3) Working closely with the GGB staff and other GSTF members to:
 - (a) Ensure the effective risk management and mitigation of issues.
 - (b) Ensure the completion of GSTF assigned tasks:
 - 1. Identify and nominate new GSTF tasks.
 - 2. Provide status reports on assigned GSTF tasks.
 - 3. Complete and assist the completion of GSTF assigned tasks.
 - 4. Provide peer reviews of products resulting from GSTF tasks.
 - (c) Ensure the effective and efficient standardization, proper integration, and consistent implementation of AGE policies, processes, procedures, standards, and regulations in their respective organizations.
- f. **The Army Geospatial Enterprise Configuration Control Board (CCB) is responsible for:**
- (1) Configuration management of the AGE core implementation areas and associated documentation, workflows, etc.
 - (2) Establishing baselines for each of the following AGE Implementation Areas:
 - (a) AGDM no later than 180 days after the effective date of this policy.
 - (b) AGE Profile of Geospatial Standards and Formats no later than 180 days after the effective date of this policy.
 - (c) AGE Architecture no later than 180 days after the effective date of this policy.
 - (d) Authoritative Data Sources no later than 180 days after the effective date of this policy.
 - (e) AGE Common Applications/Services no later than 180 days after the effective date of this policy.
 - (f) AGE Certification Criteria no later than 1 year after the effective date of this policy.

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- (3) Considering change and waiver requests, and submitting a recommendation to the Army GIO for decision.
- g. **The Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) is responsible for:**
 - (1) Providing policy, directives, and guidance to the Army acquisition community, for execution of research, development, testing and evaluation, procurement and fielding of programs, with respect to the appropriate geospatial standards and protocols to ensure successful integration of the AGE and interoperability among Army Programs.
 - (2) Directing Army Program Executive Officers (PEOs) to establish a continuing relationship with the GIO throughout the acquisition life cycle of all programs requiring GI&S.
 - (3) Directing PEOs to certify, through the GIO, and in coordination with CTSF, the net readiness and geospatial enterprise synchronization of geospatial data between systems. Programs will fund certification testing and show subject tests in their schedules prior to Milestone B, and as a continuing component of their Acquisition Strategies.
- h. **Chief Information Officer/G-6 is responsible for:**
 - (1) Providing architectural standards and policies that ensure synchronization and integration of the AGE with the overall LandWarNet-Global Information Grid (GIG) requirements to ensure joint system interoperability.
 - (2) Providing guidance on future architectural and enterprise requirements and solutions as they affect the AGE.
 - (a) Providing guidance during the Internet Protocol (IP) Version 4 (IPv4) to IPv6 transition to support AGE operability.
 - (b) Providing guidance on Net-Centric service and data management to ensure AGE interoperability with Network Service Centers.
 - (3) Advancing the effectiveness of the operations and providing guidance for the most cost-effective solution set.
 - (4) Coordinating decisions and actions between the GGB and the Enterprise Guidance Board.
- i. **The Deputy Chief of Staff (DCS) G-2 is responsible for:**
 - (1) Updating Army Regulation (AR) 115-11, *Geospatial Information and Services*, with current AGE and Geospatial Support policies.
 - (2) Voting as the Army core member on GEOINT standards under the National Center for GEOINT Standards (NCGIS) GWG.
 - (3) Prioritizing AGE and GI&S requirements and forwarding them to NGA or AGC as appropriate.
- j. **The DCS G-3/5/7 is responsible for:**
 - (1) Prioritizing all materiel systems enabled by the Geospatial Enterprise architecture, in coordination with, ASA (ALT) and G-8.

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- (2) Developing and implementing the AGE through the integration of Geospatial Enterprise capabilities in Battle Command, Intelligence, Networks, Training, and M&S to ensure interoperability.
 - (3) Providing Army Staff oversight of prioritization, development, synchronization, and approval of architecture in support of warfighting capabilities determination.
 - (4) As lead for prioritization, execute Army implementation of Joint Capabilities Integrated Development System documents, in coordination with, ASA(ALT), DCS G-8, CG, TRADOC, and CG, U.S. Army Medical Command.
 - (5) Developing Army policy and procedural guidance for the capabilities determination process, prioritization, resourcing, and integration of materiel and non-materiel warfighting capabilities.
 - (6) Coordinating force modernization activities and monitor the impact of force modernization planning and execution for the total Army, in coordination with, ASA (ALT) and G-8.
 - (7) Documenting force modernization through development of tables of organization and equipment and basis of issue plans.
 - (8) Establishing HQDA policy and guidance for the Operational Needs Statements (ONS) and directing the requirement process and validate and approve ONS from commanders.
- k. **The DCS G-8 is responsible for:**
- (1) Developing, independently assessing, integrating, and synchronizing materiel solutions in order to achieve the AGE.
 - (2) Developing and implementing the AGE through the integration of Geospatial Enterprise capabilities in M&S policy and standards to ensure interoperability.
- l. **The TRADOC Capability Manager, Geospatial is responsible for:**
- (1) Publishing an AGE Concept of Operations (CONOPS) that concentrates on implementing the AGE within Battle Command systems.
 - (2) Publishing an AGE CONOPS for Generating Force Enterprise Activities. This CONOPS will describe the considerations for implementation of the AGE as required by non-operational units.
 - (3) Centralized management for the coordination, integration, interoperability, and synchronization of all GI&S in TRADOC developed capabilities and requirements in support of the current and future forces.
 - (4) Ensuring geospatial solutions are compatible, compliant, and interoperable to enable and extend the AGE in cooperation and coordination with the GIO, the AGC, ARCIC and other TRADOC Capability Managers (TCMs).
 - (5) Through the Director of ARCIC, TCM Geospatial (TCM-G) will provide policy and guidance to TRADOC capability developers for Joint Capability Integrated Development System documentation to articulate

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geospatial capabilities for Army systems and programs that incorporate a geospatial component.

m. **Army POR and Non-POR within the scope and applicability of this policy are responsible for:**

- (1) Reviewing their systems to determine the impact of this policy on their program and submitting an impact statement to the Army GIO, through GASD, within 90 days after the AGE CCB establishes the AGE core implementation area baselines applicable to their system/activity.
- (2) Submitting a completed GASD PEO/Program Manager (PM) Data Call Questionnaire within 90 days after the AGE CCB establishes the AGE core implementation area baselines applicable to their system/activity.
- (3) Submitting an AGE System Implementation Plan to the Army GIO, through GASD, within 180 days after the AGE CCB establishes the AGE core implementation area baselines applicable to their system/activity.
- (4) Demonstrating successful compliance to this policy by achieving AGE Certification through ATEC and CTSF evaluation procedures by the PEO/GASD agreed upon milestones listed in the AGE System Implementation Plan.
- (5) If applicable, submitting an AGE CCB form requesting a change or waiver to the AGE core implementation areas to the Army GIO, through the Army Geospatial Programs Coordinator.

n. **Emerging Army programs that have geospatial requirements are responsible for:**

- (1) Coordinating with the GASD prior to Milestone B of the Army acquisition management process as described in AR 70-1, *Army Acquisition Policy*. This coordination shall continue throughout the system acquisition life-cycle to ensure continual compliance to this policy and procedures.
- (2) PEO/PMs with systems past Milestone B, but not yet in the sustainment cycle, are responsible for coordinating with GASD to determine the most effective and cost efficient AGE implementation strategy.

5. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGE Roles and Responsibility annex to the Army GIO, through the Army Geospatial Program Coordinator, Office of the Chief of Engineers, 2600 Army Pentagon, Room 2E667, Washington DC 20310-2600, or by calling (703) 693-6734.

ANNEX 3

CORE IMPLEMENTATION AREA GUIDANCE

1. **Purpose:** The Army Geospatial Enterprise (AGE) requires implementation of, and adherence to, a uniform set of information business process requirements and protocols that will ensure the separation of geospatial data/information from software applications and promote achieving a standard, sharable geospatial foundation. By integrating with the Army Chief Information Officer (CIO)/G-6 requirements for the overall Army Enterprise Architecture (per Army Regulation 25-1), the AGE will also define the Global Network Enterprise Construct (GNEC) for the geospatial functional area within the Army, and will encourage geospatial interoperability and collaboration with mission partners. This annex is intended to supplement the AGE policy with high-level guidance on the core implementation areas.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army Programs of Record (POR), non-POR, units, and organizations within the scope of the AGE policy.
4. **Core Implementation Area Guidance:**
 - a. **AGE Concept of Operations.** The AGE Concept of Operations (CONOPS) for Battle Command (BC) -Operational Use – published separately – describes in detail the implementation of the AGE, which will facilitate the delivery of a geospatial foundation upon which data from all warfighting functions can be fused to display the Common Operating Picture (COP).

The AGE CONOPS for Generating Force Enterprise Activities (GFEA) – published separately (in development) – describes the considerations for implementation of the AGE as required by non-operational units; and will all apply to all Army organizations whose primary mission is to generate and sustain the operational Army's capabilities for employment by Joint Forces commanders. Applicable activities include, but are not limited to, such important functions as communications, construction and maintenance, engineering, equipping, installations support, modeling and simulation (M&S), and training. This CONOPS will describe the role of M&S programs, such as Synthetic Environment Core, and community of interest standards such as High Level Architecture and the International Organization for Standardization /International Electrotechnical Commission 180xx series of standards. After the AGE CONOPS for GFEA is finalized, the supporting annexes of the AGE Policy will be revised as necessary and coordinated with appropriate organizations prior to publication.

NOTE: The proponent for these documents is the US Army Training and Doctrine (TRADOC) Capability Manager Geospatial (TCM-G). All comments, suggestions, questions, and/or requests for clarifications related to these documents can be sent to TCM-G, 320 U.S. Army Maneuver Support Center, Suite 104, Ft. Leonard Wood, MO 65473, or by calling (573) 563-8275.

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- b. **AGE Profile of Geospatial Standards and Formats.** Standards ensure current and future systems/processes are compatible, compliant and interoperable across the AGE. Standards also ensure geospatial data are visible, accessible, and understandable among all producers and consumers of geospatial information, and pertain to metadata for geospatial data/products necessary to enable the cataloging, discovery, sharing and updating of the geospatial foundation. The AGE will operate on a core set of standard geospatial data types and formats, covering geospatial features, imagery (still and motion), and elevation data. Additionally, standards will govern the AGE architecture, CONOPS, Army Geospatial Data Model (AGDM), and its authoritative data sources. The AGE Profile of Geospatial Standard will be aligned with LandWarNet/BC Capability Set capability management process timelines and requirements and synchronized with the National System for Geospatial-Intelligence (NSG) baseline and the Department of Defense Information Technology Standards Registry (DISR) applicable standards. (See Annex 5).
- c. **AGE Architecture.** The AGE Architecture is an extension of the Army Enterprise Architecture providing a framework for relationships between producers, consumers and integrators for their extension of geospatially referenced information and services to meet their common needs and comply with the AGE Profile of Geospatial Standards and Formats. The AGE Architecture shall also guide systems development and data management processes to produce a standard, sharable geospatial foundation for Unified Battle Command, while enabling all other relevant BC information to be tied to this foundation via temporally-relevant layers of geospatially referenced information. Where applicable, other organizational architectures will be components of the AGE Architecture as well. The AGE Architecture will be managed by the Army Geospatial Center's (AGC) Geospatial Acquisition Support Directorate (GASD) and Geospatial-Enterprise Governance Board (GGB) staff. The AGE Architecture will be version-controlled and adjudicated by the AGE Configuration Control Board (CCB) with representation across the AGE Community of Interest. (See Annex 5).
- d. **Authoritative Data Sources.** Authoritative Data Sources (ADS) for various categories of geospatial information (to include geospatial data, still and motion imagery, and elevation data) by geographic coverage, temporal coverage, and geospatial data categories, will be identified and registered in an Enterprise Authoritative Data Source (EADS) Registry for AGE utilization. The Army shall utilize an Army or Joint EADS Registry as directed by the CIO/G-6 Chief Data Officer to identify authoritative geospatial data sources, which have been reviewed and approved by the Army Data Board (ADB). Where applicable, Memoranda of Understanding will be established that specify geospatial ADS availability, quality, and define processes to ensure that corrections and additions made in the field are incorporated into baseline data products. During operations, the geospatial ADS for a unit owned battle space will change during the six

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phases of operations in the Joint Framework (i.e., Shape, Deter, Seize the Initiative, Dominate, Stabilize, and Enable the Civil Authority), and over Relief in Place/Transfer of Authority (RIP/TOA) unit rotations of tactical geospatial ADS.

Prior to deployment, units (down to platform level) receive initial geospatial data loads from their servicing local Army Geospatial Engineer Team (GET). The Geospatial Foundation Data Manager at the Brigade Combat Team, Division, Corps, and Army Service Component Command echelons through rotational deployments and unit transfers are the ADS for their respective battle space. As operational phases change, units transfer, and deployments are completed, geospatial ADS authority, along with the authoritative geospatial data collected for each battle space, is transferred to the designated geospatial ADS. GETs may receive an initial geospatial data load either directly from The National-Geospatial Intelligence Agency or indirectly from the respective Geospatial Planning Cell. (See Annex 6).

- e. **Army Geospatial Data Model.** The AGDM is a component of the NSG and the NSG Application Schema and leverages common definitions and relationships between elements to facilitate the use of geospatial data across the Army, Other Services and Department of Defense (DoD) organization, and Coalition partners. Future versions of the AGDM may include updates based on generating force enterprise activities, including modeling and simulation, installations, and updates based on common geospatial data requirements across the Army and other Ground Forces components. The AGDM will be managed in perpetuity by AGC's GASD. The AGDM will be version-controlled and adjudicated by the AGE CCB with representation across the AGE Community of Interest. (See Annex 7).
- f. **AGE Common Applications/Services.** The AGE will make use of common suites of geospatial software that operate on standards, protocols, specifications, and common engineering principles described above to support geospatial foundation management, geospatial analysis, visualization, exploitation, and dissemination. The AGE Common Applications/Services are a portfolio of Net-Centric capabilities following the DoD Net-Centric guidelines that establish a more accurate and efficient access to the Army's geospatial assets and capabilities. Many currently available viewers render most known data types and formats and adhere to multiple geospatially related standards. BC systems require viewers that support common/sharable geospatial data and service standards for visualization, analysis, and data update. The Distributed Common Ground System-Army is the main tool used by geospatial engineers to manage the geospatial foundation, and as such will be discoverable and accessible. Systems, including "disadvantaged users," within the AGE must connect with applicable geospatial services within the GNEC and BC environments. The use of common applications/services, built around common representations and formats of the data, will result in a consistent presentation of geospatial data and geospatial analysis to the Warfighter, increasing interoperability. (See Annex 8).

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- g. **AGE Certification Criteria.** To ensure the most effective and cost efficient integration of enterprise Geospatial Information and Services capabilities within all Army acquisition programs, the Army Geospatial Information Officer, as directed by the Assistant Secretary of the Army for Acquisition, Logistics and Technology, will work, via AGC's GASD, will collaborate with the U.S. Army Test and Evaluation Command and Central Technical Support Facility to develop integrated geospatial interoperability certification criteria for systems. Then the GASD will work with PEO/PMs to develop realistic, achievable, and integrated AGE System Implementation Plans that identify the most effective and cost efficient implementation for each specific system. AGE System Implementation Plans will align system implementation with LandWarNet/BC Capability Set capability management process timelines and requirements. Systems fielding to a capability set will comply with the geospatial requirements associated with that capability set, as specified in or derived directly from approved requirements documents, including Joint Capabilities Integration and Development System documents, the TRADOC Directed Requirements Memorandum for a Standard and Sharable Geospatial Foundation or other approved requirements documents, in or from Army and Joint regulations and instructions, or in applicable laws. Assignment of a geospatial requirement to a particular capability set will take into account unified battle command strategies, Weapon Systems Review direction, and an overall cost-benefit analysis. (See Annex 9).

ANNEX 4

ARMY GEOSPATIAL ENTERPRISE CONFIGURATION CONTROL BOARD

1. **Purpose:** The Army Geospatial-Enterprise Governance Board (GGB) assigned the Army Geospatial Information Officer (GIO) responsibility for coordinating, assessing, and synchronizing all Army policies and requirements to successfully develop and implement an Army Geospatial Enterprise (AGE). This annex describes the AGE Configuration Control Board (CCB) and provides Army Programs of Records (POR), non-POR, units, and organizations guidance on submitting change and waiver requests related to the AGE policy.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army POR, non-POR, units, and organizations within the scope of the AGE policy.
4. **Configuration Control Board Process:** The AGE CCB establishes and manages the AGE core implementation area baselines. The AGE CCB follows formal processes to evaluate proposed change requests and waivers, related to the AGE, to the Army GIO for review. The GIO has the authority to approve/reject changes to the core implementation area baselines and approve/reject waivers related to the AGE policy.

At a minimum, the AGE CCB will convene on a quarterly basis to review and approve change requests to the AGE core implementation area baselines and waivers. However, the AGE CCB may convene more frequently if needed.

Once an organization has submits an AGE CCB change request or a waiver, the review process is:

- a. The Army Geospatial Program Coordinator reviews the AGE CCB form and supporting documents for completeness within 10 business days of submittal. If complete, the request is validated. If incomplete, the AGE CCB form will be returned to the submitting organization for correction.
- b. Once validated, the request will be scheduled for review at the next AGE CCB. The CCB is comprised of:
 - (1) Army Geospatial Center Senior Staff Officer
 - (2) Army Geospatial Program Coordinator (Chair, non-voting member)
 - (3) National Geospatial Program Coordinator
 - (4) Army Chief Information Officer/G-6 Representative
 - (5) Assistant Secretary of the Army for Acquisition, Logistics, and Training Representative
 - (6) Deputy Chief of Staff (DCS), G-2 Representative
 - (7) DCS, G-3/5/7 Representative
 - (8) DCS, G-8 Representative
 - (9) Director of the Geospatial Acquisition Support Directorate (GASD)
 - (10) US Army Training and Doctrine Capability Manager, Geospatial Representative

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- c. Once a CCB recommendation is reached, the AGE CCB form and the board recommendation will be sent to the Army GIO for final review, and any adjudication. The Army GIO will reject/approve the application within 30 business days of receiving the AGE CCB form and board recommendation.
 - d. The Army Geospatial Program Coordinator, or designated alternate, will notify the submitting organization once a decision is made within 1 business day. All decisions will be recorded for official purposes.
- 5. **Guidance:** Army POR, non-POR, units, and organizations submitting a change request or waiver shall:
 - a. Contact the Army Geospatial Program Coordinator for information regarding the AGE CCB form submittal process.
 - b. Submit a completed AGE CCB form with:
 - (1) Justifications explaining in detail the rationale for recommending a change request or requiring a waiver.
 - (2) Analysis that describes in detail the:
 - a. Affect on the integrity of the AGE
 - b. Impact to the Warfighter
 - c. Quantity and content of data that will be lost to the Army and geospatial community
 - d. Loss of interoperability within the Army and Unified Battle Command strategy
 - (3) Commander or senior leader endorsement.

NOTE: An AGE CCB form is provided at the end of this annex.

- 6. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGE CCB annex, as well as completed AGE CCB forms, to the Army GIO, through the Army Geospatial Program Coordinator, Office of the Chief of Engineers, 2600 Army Pentagon, Room 2E667, Washington DC 20310-2600, or by calling (703) 693-6734.

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Army Geospatial Enterprise Configuration Control Board Form		
CONTACT INFORMATION		
Last:	First:	Organization:
Rank:		
Date:		
Request Type:	<input type="checkbox"/> Change Request <input type="checkbox"/> Waiver	
JUSTIFICATION		
IMPACT STATEMENT		
<p>(a) Affect on integrity of AGE:</p> <p>(b) Impact to the Warfighter:</p> <p>(c) Quantity and content of data that will be lost to the Army and geospatial community:</p> <p>(d) Loss of interoperability within the Army:</p>		
ENDORSEMENT		
	<input type="checkbox"/> Approve <input type="checkbox"/> Reject	
Senior Officer / Commander Signature		Date
ARMY GEOSPATIAL ENTERPRISE CONFIGURATION CONTROL BOARD		
	<input type="checkbox"/> Approve <input type="checkbox"/> Reject	
Configuration Control Board Chair Signature		Date
ARMY GEOSPATIAL INFORMATION OFFICER		
	<input type="checkbox"/> Approve <input type="checkbox"/> Reject	
Army GIO Signature		Date

ANNEX 5

ARMY GEOSPATIAL ENTERPRISE ARCHITECTURE AND PROFILE OF
GEOSPATIAL STANDARDS AND FORMATS

1. **Purpose:** The Army Geospatial Information Officer (GIO) assigned the Geospatial Acquisition Support Directorate (GASD) the responsibility to develop and maintain an Army Geospatial Enterprise (AGE) Architecture and Profile of Geospatial Standards and Formats to ensure system interoperability and the exchange of geospatially referenced information to facilitate a Common Operating Picture. This annex is intended to supplement the AGE policy with specific guidance for Army programs, units, and organizations to identify applicable standards, formats, and architecture profiles for their systems and/or geospatially referenced information and to ensure that they are implemented correctly and consistently across the AGE. NOTE: This annex is in development and intended for initial planning purposes; it will be revised as necessary and coordinated with appropriate organizations prior to publication.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army Programs of Record (POR), non-POR, units, and organizations within the scope of the AGE policy.
4. **Guidance:** Community Geospatial-Intelligence (GEOINT) standards are maintained for the National System for Geospatial-Intelligence (NSG) by the National Center for Geospatial-Intelligence Standards (NCGIS). NCGIS uses the GEOINT Standards Working Group (GWG) as the GEOINT Community of Interest to provide governance and procedures for documenting and maintaining GEOINT Standards in the Department of Defense (DoD) Information Technology Standards Registry (DISR). The AGE Profile of Geospatial Standards is a subset of the GEOINT standards documented in the DISR. The GIO will fully consider all impacts and ramifications of the AGE Profile of Geospatial Standards and Formats prior to recommending substantive deviations from DoD standards. The GIO will coordinate with Headquarters Department of the Army Deputy Chief of Staff (DCS) G-2 for coordination through the GWG on proposed standards recommended for inclusion in the DISR. The GIO will work through G-2 and the GWG for changes to standards already documented in the DISR. Additionally, the GIO will coordinate with DCS, G-3/5/7 to align the AGE Profile of Geospatial Standards with LandWarNet/Battle Command Capability Set capability management process timelines and requirements.
 - a. Existing Army POR, non-POR, units, and organizations shall:
 - (1) Review the AGE Profile of Geospatial Standards and Formats and AGE Architecture products, as needed. The profile and architecture products are available with a Common Access Card or Defense Information Systems Agency Public Key Infrastructure certificate at the following link: <https://cac.agc.army.mil/Programs/GASD/index.cfm>
 - (2) If the current system or activity does not adhere to the AGE-approved standards, coordinate with GASD prior to selecting/implementing

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- standards to ensure that applicable standards and interfaces are implemented correctly and consistently across all activities/systems within the scope of the AGE.
- (3) Coordinate with GASD to build an AGE System Implementation Plan that leads to the successful utilization of AGE-approved standards. (See Annex 9).
 - (4) Achieve AGE Certification through U.S. Army Test and Evaluation Command and Central Technical Support Facility. (See Annex 9).
- b. Any Army POR, non-POR, unit, and/or organization requiring a standard that is not in the AGE Profile of Geospatial Standards and Formats must request authorization.
- (1) Submit a change request via an AGE CCB form (See Annex 4) to the Army GIO, through the Army Geospatial Program Coordinator, to have an alternative standard added to the AGE Profile of Geospatial Standards and Formats, or an alternative interface added to the AGE Architecture.
 - (2) Submit a waiver request via an AGE CCB form (See Annex 4) to the Army GIO, through the Army Geospatial Program Coordinator, to utilize an alternative standard.
 - (3) If the change/waiver request is denied, the standard and/or interface must be changed to utilize standards from the AGE Profile of Geospatial Standards and Formats and/or AGE Architecture to ensure interoperability. NOTE: The GASD will work with the submitting Program Executive Office (PEO)/Program Manager (PM) to create a realistic and achievable AGE System Implementation plan (See Annex 9).
- c. Emerging Army programs that have geospatial requirements are responsible for coordinating with the GASD prior to Milestone B of the Army acquisition management process as described in AR 70-1, Army Acquisition Policy. This coordination shall continue throughout the system acquisition life-cycle to ensure continual compliance to this policy and procedures.
5. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGE Architecture and Profile of Geospatial Standards and Formats annex to the Army GIO, through GASD, 7701 Telegraph Road, ATTN: CEAGC-GA, Alexandria, VA 22315, or by calling (703) 428-6734.

ANNEX 6

ARMY GEOSPATIAL ENTERPRISE AUTHORITATIVE DATA SOURCE

1. **Purpose:** This annex is intended to supplement the Army Geospatial Enterprise (AGE) policy with Authoritative Data Source (ADS) guidance and direction for improving combat effectiveness and efficiencies when geospatial data and information is used throughout the Army, and when shared with the other Services, Combative Commands, and National Agencies, by ensuring the authority of geospatial data. NOTE: This annex is in development and intended for initial planning purposes; it will be revised as necessary and coordinated with appropriate organizations prior to publication.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army Programs of Record (POR), non-POR, units, and organizations within the scope of the AGE policy.
4. **Benefit:** To improve interoperability and synchronization, the Army shall utilize the Enterprise ADS (EADS) Registry recognized by the Army's Chief Information Officer/G-6 Chief Data Officer for the identification of authoritative sources of geospatial information approved by the Army Data Board (ADB). A common EADS Registry is needed to:
 - a. Preclude operational utilization of unofficial (i.e., non-authoritative) geospatial data.
 - b. Provide a single source for the identification of authoritative data sources.
 - c. Facilitate the location of authoritative data produced by authoritative data sources.
 - d. Enable processes for data management of authoritative geospatial data.
 - e. Enable a consistent Common Operation Picture of authoritative geospatial data.
5. **Guidance:** The Army's Geospatial Information Officer (GIO) and his/her staff shall identify ADS of geospatial data for the EADS Registry. The Army's GIO will submit the geospatial ADS to the ADB for approval and registration in the EADS Registry. Existing Army POR, non-POR, units, and organizations shall:
 - a. Identify the geospatial data required and/or utilized by their system and/or activities.
 - b. Identify the sources and/or providers of this geospatial data.
 - c. Review the EADS Registry to determine if sources are listed as ADS.
 - (1) The EADS Registry is available with a Common Access Card or Defense Information Systems Agency Public Key Infrastructure certificate at the following link:
<https://falcon.sspl.disa.mil/eads/homepage.htm>
 - d. If the geospatial data source is not listed in the EADS Registry, request a review for determination of authority.
 - (1) (Submit an AGE Configuration Control Board (CCB) form (See Annex 4) with a change request for review and determination of authority for the geospatial data source. The request must include identification of each of the following:

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- (a) The Army program requiring geospatial data from the proposed ADS.
- (b) The geospatial data required from the proposed geospatial ADS.
- (c) The organization responsible for the proposed geospatial ADS.
- (d) The system providing the proposed geospatial authoritative data.
- (2) The request must include an impact statement, identifying the impact should the determination of authority be denied, including:
 - (a) Affect on integrity of the AGE
 - (b) Impact to the Warfighter
 - (c) Quantity and content of data that will be lost to the Army and geospatial community
 - (d) Loss of interoperability within the Army

Submit the change request to the Army GIO via the submittal procedures defined in Annex 4. If approved by the AGE CCB, the change request will be reviewed by the GIO, in his role as the Army Geospatial Data Steward, for approval. If the geospatial ADS is determined to be authoritative, it will be registered as a candidate ADS in the EADS Registry, and submitted for review and approval by the ADB via the Army Data Council. Following this process, the proposed geospatial ADS will either be determined to be an ADS or an unofficial data source.
- (3) If the data source is determined to be unofficial (i.e., non-authoritative), the submitter will be notified so that an AGE CCB form can be submitted requesting a waiver to utilize an unofficial data source. (See Annex 4).
- (4) If a change/waiver request is denied, the organization requesting the change/waiver must change the source to utilize an ADS identified in the EADS Registry.

6. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGE ADS annex to the Army GIO, through the GGB Staff, Office of the Chief of Engineers, 2600 Army Pentagon, Room 2E667, Washington DC 20310-2600, or by calling (703) 693-6734.

ANNEX 7

ARMY GEOSPATIAL DATA MODEL IMPLEMENTATION

1. **Purpose:** The Army Geospatial Information Officer (GIO) assigned the Geospatial Acquisition Support Directorate (GASD) the responsibility to develop and maintain an Army Geospatial Data Model (AGDM) that contains common geospatial concepts required to share data and support common geospatial application services across the Army Geospatial Enterprise (AGE). The intent is to ensure consistent, efficient and sharable use of geospatial data across battle command systems (including operations, intelligence, mission rehearsal, and training). Implementation of this guidance is essential to achieve the AGE and for management of geospatial information to support an interoperable Common Operational Picture for battle command. This annex is intended to supplement the AGE policy with specific guidance related to the AGDM. **NOTE:** This annex is in development and intended for initial planning purposes; it will be revised as necessary and coordinated with appropriate organizations prior to publication.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army Programs of Record (POR), non-POR, units, and organizations within the scope of the AGE policy.
4. **Guidance:** To ensure compliance with the Department of Defense Information Technology Standards Registry-approved AGDM Army POR, non-POR, units, and organizations shall:
 - a. Contact GASD to verify correct version of AGDM.
 - b. Coordinate with GASD to build an AGE System Implementation Plan that leads to the AGDM compliance (See Annex 9).
 - c. Coordinate with GASD to ensure that AGDM is implemented correctly and consistently implemented across all activities/systems within the scope of the AGE.
 - d. Submit a change request for additional geospatial concepts to Army GIO, through the GASD, for consideration of inclusion in the next version of the AGDM. Requests for additions are processed using the AGE Configuration Control Board process (See Annex 4).
 - e. Submit a waiver request form to the Army GIO through the Army Geospatial Program Coordinator (See Annex 4).
 - f. If a change/waiver request is denied, the organization requesting the change/waiver must change and comply with the appropriate version of the AGDM.
5. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGDM Implementation annex to the Army GIO, through GASD, 7701 Telegraph Road, ATTN: CEAGC-GA, Alexandria, VA 22315, or by calling (703) 428-6505.

ANNEX 8**ARMY GEOSPATIAL ENTERPRISE COMMON APPLICATIONS/SERVICES**

1. **Purpose:** The Army Geospatial Information Officer (GIO) assigned the Geospatial Acquisition Support Directorate (GASD) the responsibility to develop and maintain a listing of AGE-compliant Common Applications/Services (i.e., Commercial Joint Mapping Toolkit, ESRI ArcGIS, FalconView, etc.) that operate on standards, protocols, specifications, and common engineering principles that support geospatial foundation management, geospatial analysis, visualization, exploitation, and dissemination. This annex is intended to supplement the AGE policy with specific guidance for Army Programs of Record (POR), non-POR, units, and organizations to identify applications/services that are AGE-compliant. **NOTE:** This annex is in development and intended for initial planning purposes; it will be revised as necessary and coordinated with appropriate organizations prior to publication.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army POR, non-POR, units, and organizations within the scope of the AGE policy.
4. **Guidance:** To ensure compliance with the AGE:
 - a. Existing Army POR, non-POR, units, and organizations shall:
 - (1) Review the AGE Common Applications/Service listing. The listing is available with a Common Access Card or Defense Information Systems Agency Public Key Infrastructure certificate at the following link: <https://cac.agc.army.mil/About/GASD.cfm>
 - (2) If the current system or activity does not use an AGE approved application/service, coordinate with GASD to identify alternative AGE-approved applications/services.
 - (3) Coordinate with GASD to build an AGE System Implementation Plan that leads to the successful utilization of AGE approved applications/services (See Annex 9).
 - (4) Achieve AGE Certification through U.S. Army Test and Evaluation Command and Central Technical Support Facility (See Annex 9).
 - b. Any Army POR, non-POR, unit, and/or organization requiring an application/service that is not in the AGE Common Applications/Service listing must request authorization.
 - (1) Submit a change request to the Army GIO, through the Army Geospatial Program Coordinator, to have an alternative geospatial service/application added to the AGE Common Applications/Service listing (See Annex 4).
 - (2) Submit a waiver request form to the Army GIO, through the Army Geospatial Program Coordinator, to utilize an alternative application/service (See Annex 4).
 - (3) If the change/waiver request is denied, the application/service must be changed to utilize applications/services from the AGE Common

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Applications/Service listing to ensure interoperability. **NOTE:** The GASD will work with the requesting organization to create a realistic and achievable AGE System Implementation plan (See Annex 9).

- c. Emerging Army programs that have geospatial requirements are responsible for coordinating with the GASD prior to Milestone B of the Army acquisition management process as described in AR 70-1, Army Acquisition Policy. This coordination shall continue throughout the system acquisition life-cycle to ensure continual compliance to this policy and procedures.

Generally, emerging programs are to follow the Employ the Adopt before Buy, Buy before Create (ABC) model when implementing geospatial capabilities (e.g., systems, applications, and/or web services). Under this model, “adopt” means that applicable Army programs are required to investigate if existing geospatial capabilities within the AGE can be adopted or adapted. “Buy” means that if no existing geospatial capabilities can be adopted or adapted to meet cost, schedule, and performance requirements, Army programs are required to explore options to buy the geospatial capability as a Commercial, off-the-shelf solution from a commercial vendor. “Create” means that if no existing geospatial capability can be adopted or bought, then the last option is to create (develop) the geospatial capability. **NOTE:** This requirement pertains only to new, not existing geospatial capabilities.

5. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGE Common Application/Services annex to the Army GIO, through GASD, 7701 Telegraph Road, ATTN: CEAGC-GA, Alexandria, VA 22315, or by calling (703) 428-6734.

ANNEX 9

ARMY GEOSPATIAL ENTERPRISE CERTIFICATION CRITERIA

1. **Purpose:** To ensure the most effective and cost efficient integration of enterprise Geospatial Information and Services capabilities within all Army acquisition programs, the Army Geospatial Information Officer (GIO), as directed by the Assistant Secretary of the Army for Acquisition, Logistics and Technology, will work, via Army Geospatial Center's Geospatial Acquisition Support Directorate (GASD), will collaborate with the U.S. Army Test and Evaluation Command (ATEC) and Central Technical Support Facility (CTSF) to develop integrated geospatial interoperability certification criteria for systems. This annex is intended to provide guidance to Program Executive Offices/PMs on achieving integrated geospatial interoperability certification for their system(s).
NOTE: This annex is in development and intended for initial planning purposes; it will be revised as necessary and coordinated with appropriate organizations prior to publication.
2. **References:** See Annex 1.
3. **Scope:** The scope of this annex encompasses all Army Programs of Record (POR), non-POR, units, and organizations within the scope of the AGE policy.
4. **Certification Criteria/Process:** The GASD will work with PEO/PMs to develop realistic, achievable, and integrated AGE System Implementation Plans that identify the most effective and cost efficient implementation for each specific system. Specifically, the testing and certification team shall:
 - a. Define system-specific test/evaluation criteria for AGE certification by Capability Set (CS) tied to the individual AGE System Implementation Plan.
 - b. Support the development of AGE-related test threads to support AGE certification.
 - c. Participate in Army's software blocking process to ensure AGE criteria and concepts do not adversely impact battle command threads.
 - d. Support developmental, operational, and system integration tests as they relate to the AGE.
 - e. Support CTSF and ATEC in application of GASD-developed AGE certification materials.
 - f. Create a certification report for each system being certified, stating overall result and criteria met and not met. If certification is denied, the report will list the steps needed to achieve certification.
5. **Guidance:** To ensure compliance with the AGE:
 - a. Existing Army programs, units, and organizations shall:
 - (1) Review their systems to determine the impact of this policy on their program and submit an impact statement to the Army GIO, through GASD, within 90 days after the AGE Configuration Control Board (CCB) establishes the AGE core implementation area baselines applicable to their system/activity.

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- (a) Contact GASD for Impact Statement template and submission process.
 - (b) Impact Statement includes:
 - 1. Cost impact
 - 2. Schedule impact
 - 3. If applicable, identification of technical constraints
- (2) Submit a completed GASD Program Executive Office (PEO)/Program Manager (PM) Data Call Questionnaire within 90 days after the AGE CCB establishes the AGE core implementation area baselines applicable to their system/activity. Contact GASD for questionnaire and submission process.
- (3) Coordinate with GASD to build and publish an AGE System Implementation Plan within 180 days after the AGE CCB establishes the AGE core implementation area baselines applicable to their system/activity that leads to AGE certification. AGE System Implementation Plans will align with LandWarNet/Battle Command CS capability management process timelines and requirements. Systems fielding to a capability set must comply with the geospatial requirements associated with that capability set, as specified in or derived directly from approved requirements documents, including Joint Capabilities Integration and Development System documents, US Army Training and Doctrine Command Directed Requirements Memorandum or other approved requirements documents, in or from Army and Joint regulations and instructions, or in applicable laws. Assignment of a geospatial requirement to a particular capability set will take into account unified battle command strategies, Weapon Systems Review direction, and an overall cost-benefit analysis.
 - (a) Contact GASD prior to creating an AGE System Implementation Plan for template and submission process.
 - (b) Collaborate with GASD throughout the AGE System Implementation Plan creation process to ensure that it supports full AGE compliance as quickly as possible, recognizing technical/budget constraints.
 - (c) POR/non-POR may be asked to provide geospatial specifications found in A/B specifications; and any system documents that verify and validate specifications are met.
- (4) Demonstrate successful compliance to this policy by achieving AGE Certification through ATEC and CTSF evaluation procedures by the PEO/GASD agreed upon milestones listed in the AGE System Implementation Plan. The certification criteria will address the following areas:
 - (a) Geospatial Data Standardization
 - 1. Adopt AGE Profile of Geospatial Standards and Formats
 - 2. Data Exploitation
 - 3. Data Production
 - 4. Metadata

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- (b) Geospatial Services Standardization
 - (c) Procedures compliant with *AGE Concept of Operations (CONOPS) for Battle Command – Operation Use and/or AGE CONOPS for Generating Forces*
 - (d) Geospatially-enabled tools and applications, where applicable
 - (e) Interfaces compliant with the AGE Architecture, where applicable
- (5) If applicable, submitting an AGE CCB form recommending a modification to the AGE core implementation areas or requesting a waiver to the Army GIO, through the Army Geospatial Programs Coordinator. (See Annex 4).
- b. Emerging Army programs that have geospatial requirements shall:
- (1) Coordinate with the GASD prior to Milestone B of the Army acquisition management process as described in Army Regulation (AR) 70-1, Army Acquisition Policy. This coordination shall continue throughout the system acquisition life-cycle to ensure continual compliance to this policy and procedures.
 - (2) PEO/PMs with systems past Milestone B, but not yet in the sustainment cycle, are responsible for coordinating with GASD to determine the most effective and cost efficient AGE implementation strategy.
6. **Point of Contact:** Submit all comments, suggestions, questions, and/or requests for clarifications related to the AGE Certification Criteria annex to the Army GIO, through GASD, 7701 Telegraph Road, ATTN: CEAGC-GA, Alexandria, VA 22315, or by calling (703) 428-6734.

ANNEX 10**DEFINITIONS**

Army Data Board - The Army Data Board is the primary coordination body for Army data issues. In the event the Army Data Board is unable to come to an agreement, the Chair will serve as the final adjudication authority. The Army Data Board will ensure that standardized Army data processes and procedures are executed and consistently used across the Army enterprise. The Army Data Board will direct, coordinate and oversee the activities of the Army Data Council, as well as review and approve Army Data Council products and recommendations. (Army Data Board Charter)

Army Data Stewards - Army Data Stewards are nominated by their organization or the Chief Data Officer, and confirmed by appointment letters from the Army Chief Information Officer. Army Data Stewards are government positions generally held by individuals at the Senior Executive Service or General Officer level. Army Data Stewards are experts in their area's operational requirements and processes. As members of the Army Data Board, Army Data Stewards represent their designated area on subjects identified by the Army Data Board as data-related, and exercise the responsibilities of Chief Data Officer for their organizations. (Army Data Board Charter)

Army Geospatial Enterprise - The Army Geospatial Enterprise (AGE) is an integrated system of technologies, standards, data, and processes that delivers a standard and sharable geospatial foundation, which facilitates a Common Operational Picture (COP) to the Warfighter at all echelons. This geospatial foundation for the COP results from storing all operationally relevant spatial and temporal data from all six warfighting functions (movement and maneuver, fires, intelligence, sustainment, command and control, and protection) across the Army, in standardized, distributed, interoperable geospatial data stores. This enables the synchronization, sharing, portrayal, awareness, fusion, and correlation of geospatially referenced warfighting data.

Organizing Principle: The AGE is a comprehensive framework for systematically exploiting and sharing geospatial information and services (including associated spatial and temporal data) to enable Army Full Spectrum Operations to be conducted with maximum situational awareness. Specifically, it is comprised of the people, organizations, technologies, policies, doctrine, and materiel solutions involved in the acquisition of geospatial data, the production of geospatially referenced information, and related discovery, integration, and distribution services. At its core, the AGE is a set of data stores, within a supporting infrastructure, based upon a common suite of interoperable software, open standards, data formats, and data models that allow the efficient collection, generation, storage, management, analysis, use, visualization, and dissemination of geospatially referenced information from peer to peer, echelon to echelon, Army to Joint, Army to Coalition and Army to Intelligence community. (Army Geospatial Information Officer [GIO])

Army Geospatial Data Model - The Army Geospatial Data Model (AGDM) is a standard set of geospatial feature types and their relationships to other feature types, and attributes

types associated with each feature that includes prescribed enumeration values for each attribute. The AGDM consists of a geospatial Logical Data Model and reference implementation(s) in common geospatial database technologies utilized by Army Battle Command Systems (as well as fires, sustainment, protection and intelligence systems) supported by the AGE. (Army GIO)

Authoritative Data Source - A recognized or official data production source with a designated mission statement or source/product to publish reliable and accurate data for subsequent use by customers. An authoritative data source may be the functional combination of multiple, separate data sources. (Department of Defense [DoD] Directive Number 8320.02, 12 April 2006 and DoD Directive Number 8320.03, March 23, 2007)

NOTE: For the AGE, authoritative data sources will include as a minimum, geospatial feature data, imagery, digital map display, and elevation data.

Army Geospatial-Intelligence Office - The Army Geospatial-Intelligence Office (AGO) is the designated Army-level element that provides integrated and coordinated liaison for the functional managers within the Army responsible for the key components of Army GEOINT (Imagery Intelligence, Advanced Geospatial Intelligence, and Geospatial Information and Services) as a focal point for specific Service-related GEOINT activities. The AGO represents the Service GEOINT Element to National Geospatial Agency (NGA) for GEOINT policy, operations, capabilities, and resourcing. (Army G-2)

Common Operational Picture - A single identical display of relevant information shared by more than one command. A common operational picture facilitates collaborative planning and assists all echelons to achieve situational awareness. Also called COP. (Joint Publication [JP] 3-0)

A single display of relevant information within a commander's area of interest tailored to the user's requirements and based on common data and information shared by more than one command. (Field Manual [FM] 3-0)

NOTE: In this document, COP refers to a common spatially-referenced picture. It does not modify the entity characteristics or behavior of reporting systems in the Blue Force Tracking Network.

Data Model - A graphical and textual representation of data needed by an organization to represent achievement of its mission, functions, goals, objectives, and strategies. A data model is represented by its entities, attributes, and relationships among its entities. In the relational model of data, entities are tables, attributes are columns, and relationships are primary and foreign key pairs. Data models may be enriched beyond data structures with both constraints and embedded processes. (Army Regulation [AR] 25-1)

Data Store - A data store is a permanent storehouse of data. The term is often used to lump the storage of all types of data structures (files, databases, text documents, etc.) into one generic category. (PC Magazine Encyclopedia)

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NOTE: In the context of Geospatial Foundation, this would include all relevant data and data structures (files, databases, schemas, models, text documents, overlays, etc.).

Department of Defense Architecture Framework - The DoD Architecture Framework (DoDAF) offers guiding principles in the development of architectures that transcend the tier, level or purpose of the architecture development, and a logical method for executing architecture development for supporting decisions within DoD. (DoD Architecture Framework)

Generating Force - The Generating Force consists of those Army organizations whose primary mission is to generate and sustain the operational Army's capabilities for employment by Joint Force commanders. (FM 1-01)

Geospatial Engineering - Those engineering capabilities and activities that contribute to a clear understanding of the physical environment by providing geospatial information and services to commanders and staffs. Examples include: terrain analyses, terrain visualization, digitized terrain products, nonstandard tailored map products, precision survey, geospatial data management, and baseline survey data. See also geospatial information and services. (JP 3-34, *Engineer Doctrine for Joint Operations*)

Geospatial Foundation - The Geospatial Foundation layer for the COP results from storing, managing, and collecting all operationally relevant spatial and temporal data in a standardized, distributed geospatial databases which then enable sharing, correlation, and fusing of data across the Army. (AGE Concept of Operations for Battle Command - Operational Use)

Geospatial Information - Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth, including: statistical data and information derived from, among other things, remote sensing, mapping, and surveying technologies; and mapping, charting, geodetic data and related products. (JP 2-03, *Geospatial Intelligence Support to Joint Operations*)

Geospatial Information and Services (GI&S) - The concept for collection, information extraction, storage, dissemination, and exploitation of geodetic, geomagnetic, imagery (both commercial and national source), gravimetric, aeronautical, topographic, hydrographic, littoral, cultural, and toponymic data accurately referenced to a precise location on the earth's surface. These data are used for military planning, training, and operations including navigation, mission planning, mission rehearsal, modeling, simulation and precise targeting. Geospatial information provides the basic framework for battle space visualization. It is information produced by multiple sources to common interoperable data standards. It may be presented in the form of printed maps, charts, and publications; in digital simulation and modeling data bases; in photographic form; or in the form of digitized maps and charts or attributed centerline data. Geospatial services include tools that enable users to access and manipulate data, and includes instruction, training, laboratory support, and guidance for the use of geospatial data. (JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*)

Geospatial-Intelligence (GEOINT) - The exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence, and geospatial information. (JP 2-03)

High level Architecture (HLA) - Major functional elements, interfaces, and design rules, pertaining, as feasible, to all DOD simulation applications and providing a common framework within which specific system architectures can be defined. (AR 5-11)

Interoperability -

1. The ability to operate in synergy in the execution of assigned tasks.
2. The condition achieved among communications-electronics systems or items of communications electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. The degree of interoperability should be defined when referring to specific cases. (JP 1-02)

National System for Geospatial-Intelligence - The combination of technology, policies, capabilities, doctrine, activities, people, data, and communities necessary to produce Geospatial-Intelligence in an integrated, multi-intelligence environment. Also called NSG. (Approved for inclusion in the next edition of JP 1-02.)

Net-Centric - Information-based operations that use service-oriented information processing, networks, and data from the following perspectives: user functionality (capability to adaptively perform assigned operational roles with increasing use of system-provided intelligence/cognitive processes), and enterprise management (net operations). (CJCSI 6212.01E, *Interoperability and Supportability of Information Technology and National Security Systems*)

Model - A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. (DoD 5000.59-M)

Modeling and Simulation - The development and use of live, virtual, and constructive models including simulators, stimulators, emulators, and prototypes to investigate, understand, or provide experiential stimulus to either (1) conceptual systems that do not exist, or (2) real life systems that cannot accept experimentation or observation because of resource, range, security, or safety limitations. This investigation and understanding in a synthetic environment will support decisions in the domains of research, development, and acquisition (RDA) and advanced concepts and requirements (ACR), or transfer necessary experiential effects in the training, exercises, and military operations (TEMO) domain. (AR 5-11)

Operating Force - Operating forces consist of those forces whose primary missions are to participate in combat and the integral supporting elements thereof. (JP 1-02)

Simulation - A method for implementing a model over time. (DoD 5000.59-M)

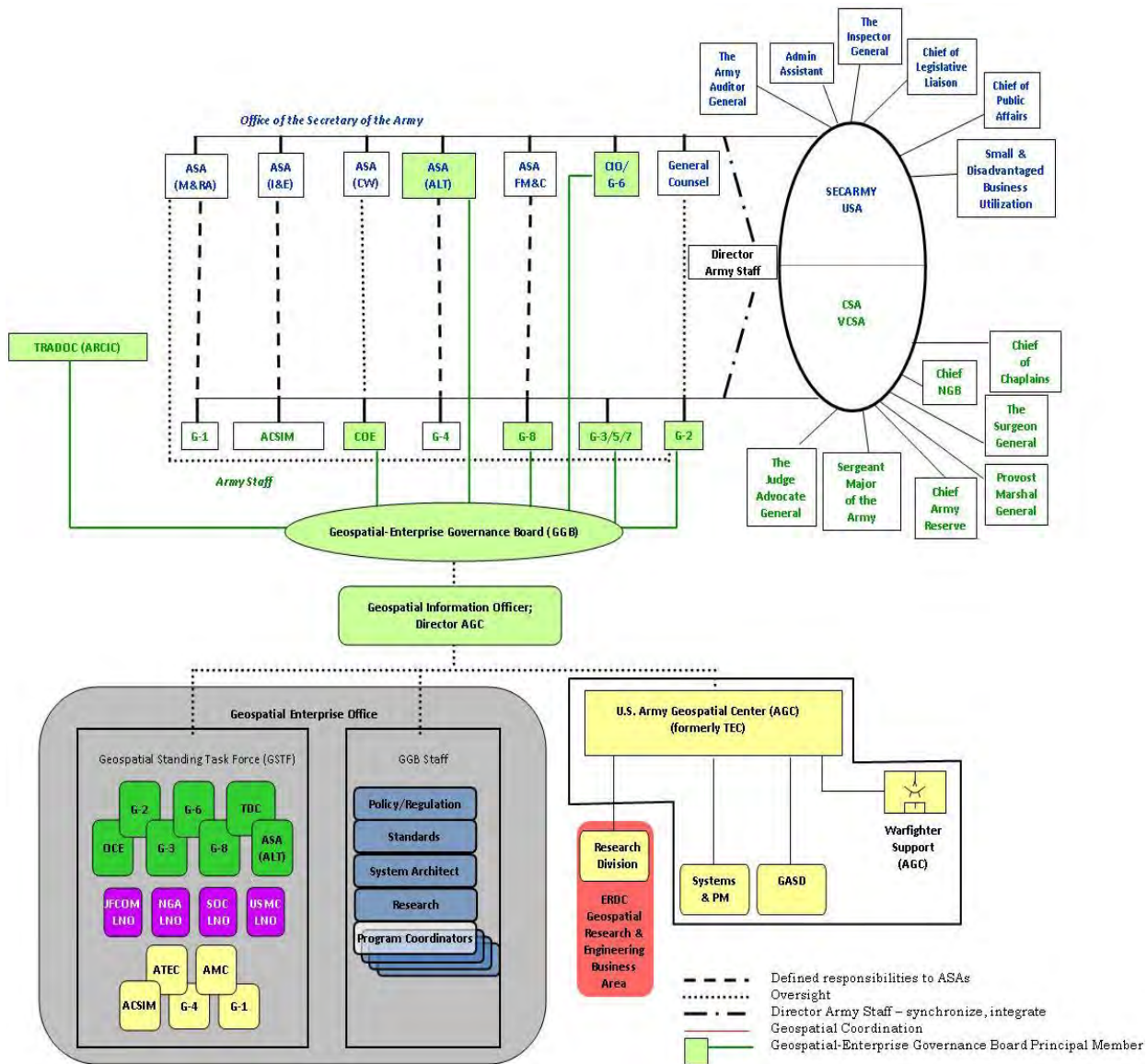
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Situational Awareness - Situational Awareness is immediate knowledge of the conditions of the operation, constrained geographically and in time. (FM 3-0)

Synthetic Environments (SE) - Internettted simulations that represent activities at a high level of realism from simulations of theaters of war to factories and manufacturing processes. These environments may be created within a single computer or a vast distributed network connected by local and wide area networks and augmented by super-realistic special effects and accurate behavioral models. They allow visualization of and immersion into the environment being simulated. (Ref.DOD 5000.59-P; CJSI 8510.01).

War Fighting Functions - A Warfighting Function is a group of tasks and systems (people, organizations, information, and processes) united by a common purpose that commanders use to accomplish missions and training objectives. The six functions are: Movement and Maneuver, Fires, Intelligence, Sustainment, Command and Control, and Protection. (FM 3-0)

ANNEX 11
ARMY GEOSPATIAL ENTERPRISE RELATIONSHIP CHART



ANNEX 12

ACRONYM LIST

ABC

Adopt before Buy, Buy before Create

ADB

Army Data Board

AEA

Army Enterprise Architecture

AGC

Army Geospatial Center

AGDM

Army Geospatial Data Model

AGE

Army Geospatial Enterprise

AOI

Area of Interest

AR

Army Regulation

ARCIC

Army Capabilities Integration Center

AROC

Army Requirements Oversight Council

ASA (ALT)

Assistant Secretary of the Army for Acquisition, Logistics and Technology

ASCC

Army Service Component Commands

ATEC

Army Test and Evaluation Command

ADS

Authoritative Data Source

BC

Battle Command

BCEC

Battle Command Essential Capabilities

CCB

Configuration Control Board

CIO

Chief Information Officer

CJCSI

Chairman of the Joint Chiefs of Staff Instruction

CONOPS

Concept of Operations

COP

Common Operating Picture

CS

Capability Set

CTSF

Central Technical Support Facility

DAGO

Department of the Army General Officer

DCS

Deputy Chief of Staff

DoD

Department of Defense

DoDAF

Department of Defense Architecture Framework

DOTMLPF

Doctrine, Operations, Training, Materiel, Leadership, Personnel and Facilities

DISR

Department of Defense Information Technology Standards Registry

EADS

Enterprise Authoritative Data Source

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FM

Field Manual

FSA

Functional Solutions Analysis

GASD

Geospatial Acquisition Support Directorate

GEOINT

Geospatial-Intelligence

GGB

Geospatial-Enterprise Governance Board

GIG

Global Information Grid

GI&S

Geospatial Information and Services

GIO

Geospatial Information Officer

GSTF

Geospatial Standing Task Force

GWG

Geospatial-Intelligence Standards Working Group

GNEC

Global Network Enterprise Construct

HQDA

Headquarters Department of the Army

ICD

Initial Capabilities Document

ISP

Information Support Plan

IP

Internet Protocol

JCIDS

Joint Capabilities Integrated Development System

JIIM

Joint, Interagency, Intergovernmental, and Multinational

JP

Joint Publication

JROC

Joint Requirements Oversight Council

LWN/BC

LandWarNet/Battle Command

MC&G

Mapping, Charting, and Geodesy

M&S

Modeling and Simulation

NCGIS

National Center for Geospatial-Intelligence Standards

NGA

National Geospatial-Intelligence Agency

NSG

National System for Geospatial-Intelligence

ONS

Operational Needs Statement

PEO

Program Executive Office

PM

Program Manager

POR

Program of Record

SA

Situational Awareness

TCM

EM 1110-1-2909

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TRADOC Capability Manager

TCM-G

TRADOC Capability Manager Geospatial

TRADOC

Army Training and Doctrine Command

UID

Unique Identification

USACE

US Army Corps of Engineers

WFF

War Fighting Functions

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APPENDIX D

Memorandum from Deputy Under Secretary of Defense (Installations and Environment) on
Installation Geospatial Information and Services GuidanceACQUISITION,
TECHNOLOGY
AND LOGISTICSOFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

APR 14 2009

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY
(INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE
(INSTALLATIONS, ENVIRONMENT AND
LOGISTICS)
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE
(INSTALLATIONS AND ENVIRONMENT)
DIRECTOR, DEFENSE LOGISTICS AGENCY
DIRECTOR, DEFENSE FACILITIES, WASHINGTON
HEADQUARTERS SERVICES
ARMY ASSISTANT CHIEF OF STAFF FOR
INSTALLATION MANAGEMENT
MARINE CORPS ASSISTANT DEPUTY COMMANDANT
FOR INSTALLATIONS AND LOGISTICS (FACILITIES)
AIR FORCE CIVIL ENGINEER

SUBJECT: Installation Geospatial Information and Services Guidance

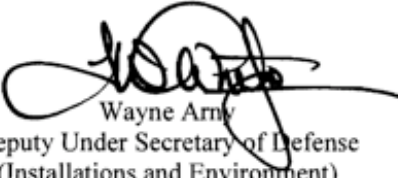
Installation Geospatial Information and Services (IGI&S) have become an important capability, integral to nearly all aspects of Real Property and Installation Lifecycle Management (RPILM). The IGI&S programs have successfully demonstrated that they are an effective resource for improving management of installations, environment, safety, and occupational health in the Department. At the March 25, 2009, meeting of the Installations and Environment Domain Governance Board, participants agreed that the IGI&S programs have now reached a point of maturity requiring greater coordination and unity of effort, as described in the attached guidance.

This guidance defines the IGI&S capability, and directs DoD Components to take steps which will ensure their IGI&S programs conform to the Department's Business Enterprise Architecture and other applicable Federal and DoD standards. It clarifies how strategies and standards for IGI&S will be coordinated across DoD, including harmonization with the National System for Geospatial Intelligence (NSG). The guidance also requires that IGI&S data conform to the Spatial Data Standards for Facilities, Infrastructure, and Environment, and have

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appropriate metadata. The initial implementation goal of the IGI&S capability shall be to establish a baseline authoritative geospatial feature dataset supporting real property accountability.

My point of contact for IGI&S is Mr. David LaBranche, 703-604-5764, David.LaBranche@osd.mil.



Wayne Army
Deputy Under Secretary of Defense
(Installations and Environment)

Attachments:
As stated

DEPARTMENT OF DEFENSE
INITIAL GUIDANCE FOR
INSTALLATION GEOSPATIAL INFORMATION AND SERVICES
CAPABILITY IMPLEMENTATION

- References:
- (a) Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure," April 1994
 - (b) Executive Order 12333, "United States Intelligence Activities," December 4, 1981, as amended
 - (c) Joint Publication 1-02, "Department of Defense Dictionary of Military and Associated Terms," August 2008
 - (d) DoD Directive 5105.60, "National Imagery and Mapping Agency (NIMA)," October 11, 1996
 - (e) through (m), see enclosure 1

1. PURPOSE

- a. Establish roles and responsibilities for governance of the Installation Geospatial Information and Services (IGI&S) capability.
- b. Ensure all IGI&S investments are created principally for and conformal with established requirements of the Real Property and Installation Lifecycle Management (RPILM) core business mission. Nothing in this guidance shall be construed as limiting the ability of any organization to provide support to organizations in other core business mission areas, the warfighter, or intelligence mission areas.
- c. Establish the goal of implementing net-centric solutions to link IGI&S capabilities with RPILM business systems, and with other authorized federal users through the DoD enterprise architecture.
- d. Establish guidelines for implementing a lifecycle management strategy for IGI&S to address:
 - (1) Maintenance of existing IGI&S data.
 - (2) Collection and quality parameters for new IGI&S data.
 - (3) Staffing and resourcing of IGI&S programs.

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- e. Encourage the Components to focus planned investments in IGI&S on supporting current enterprise priorities, e.g., geospatially enabling the entire Real Property Asset Database.

2. GUIDANCE

- a. The Installations and Environment Domain Governance Board (I&E DGB) shall continue to exercise oversight and direction of IGI&S investments through the Defense Installation Spatial Data Infrastructure Group (DISDIG), as described in reference (m).
- b. The DISDIG will review the coordinated strategies and implementation plans described in this guidance, then forward them to the I&E DGB for approval.
- c. IGI&S programs will be technically reviewed, as appropriate, by the RPILM Investment Review Board to ensure conformance with enterprise initiatives, capabilities, and standards. Technical reviews will include DoD Components' plans, investments, and business systems that are part of, or rely significantly on, IGI&S. Reviews will ensure use of authoritative data sources and prevention of duplicate IGI&S capabilities.
- d. All IGI&S data shall conform to the Spatial Data Standard for Facilities, Infrastructure, and Environment (SDSFIE). All IGI&S data shall have appropriate metadata, conformal with the DISDI Geospatial Metadata Profile (DGMP). The data and metadata shall conform to the current version of the respective standards; migration of data or metadata from old to new versions shall be implemented according to timelines proposed by the Components, reviewed by the DISDIG, and approved by the I&E DGB.
- e. The DISDIG shall ensure that IGI&S standards are fully coordinated with the GEOINT Functional Manager. IGI&S standards should harmonize the geospatial concepts, to the greatest extent practicable, with the components of the GEOINT Structure Implementation Profile (GSIP) and should be integrated with the GSIP where beneficial.
- f. The initial implementation goal of the IGI&S capability shall be to establish a baseline authoritative geospatial feature dataset supporting real property accountability. Further guidance shall be established by the Deputy Under Secretary of Defense (Installations and Environment) (DUSD(I&E)) as to the storage, handling, and classification of such data pursuant to reference (k).

3. RESPONSIBILITIES

- a. The Deputy Under Secretary of Defense (Installations & Environment) shall:

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- (1) Develop further policy and direction to implement the objectives of this guidance.
 - (2) Assist the Components in developing the processes and implementation plans required by paragraphs 3.d.2 through 3.d.4.
- b. The Director, Business Enterprise Integration shall:
- (1) Establish a capability in the DoD Business Enterprise Architecture to enable net-centric connections across all Component IGI&S capabilities.
 - (2) Designate the DISDI program manager (DISDI PM).
- c. The DISDI PM shall:
- (1) Chair the DISDIG and assist the Components with implementing the goals of this guidance.
 - (2) Provide oversight, policy, and guidance of geospatial information and services within ODUSD(I&E).
 - (3) Coordinate with the GEOINT Functional Manager on behalf of DUSD(I&E) in accordance with reference (d).
 - (4) Develop a concept of operations (CONOPS) for the DISDI Portal, to be reviewed by the DISDIG and approved by the I&E DGB.
- d. The Assistant Secretaries of the Military Departments for Installations and Environment shall:
- (1) Develop plans for maintaining existing geospatial investments (personnel, data, and systems), in accordance with this guidance.
 - (2) Develop processes that ensure all IGI&S investments, especially data, are created principally for and conformal with established Business Mission Area requirements.
 - (3) Develop a strategy for expanding existing data sets to create a geospatial feature for every asset in the DoD Real Property Assets Database.
 - (4) Establish net-centric solutions for linking IGI&S mapping, discovery, and data sharing capabilities at the Component level to the Department level (the DISDI Portal).

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- (5) Establish proponent guidance for geospatial data. The intent of this guidance shall be to ensure functional proponents take primary responsibility for defining geospatial data requirements, to include data collection and data quality guidelines.

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E1. ENCLOSURE 1REFERENCES, continued

- (e) DoD Directive 8000.1, "Management of DoD Information Resources and Information Technology," March 20, 2002
- (f) DoD Directive 8115.01, "Information Technology Portfolio Management," October 10, 2005
- (g) DoD Directive 8320.02, "Data Sharing in a Net-Centric Department of Defense," December 2004
- (h) DoD 8320.02 G, "Guidance for Implementing Net-Centric Data Sharing," April 12, 2006
- (i) DoD Directive 8320.03, "Unique Identification (UID) Standards For A Net-Centric Department of Defense," March 2007
- (j) DoD Directive 8500.01E, "Information Assurance," October 24, 2007
- (k) DoD Instruction 5200.01, "DoD Information Security Program and Protection of Sensitive Compartmented Information," October 9, 2008
- (l) DoD Instruction, 5210.52, "Security Classification of Airborne Sensor Imagery and Imaging Systems," May 18, 1989
- (m) DoD Instruction 4165.14, "Real Property Inventory and Forecasting," March 31, 2006
- (n) Deputy Under Secretary of Defense (Installations & Environment) Memorandum, "Establishment of the Defense Installation Spatial Data Infrastructure Group," March 21, 2007

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GLOSSARY

Geospatial Intelligence (GEOINT). The exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. Geospatial intelligence consists of imagery, imagery intelligence, and geospatial information.

Geospatial Information and Services (GI&S). A capability consisting of the collection, information extraction, storage, dissemination, and exploitation of geodetic, geomagnetic, imagery (both commercial and national sources), gravimetric, aeronautical, topographic, hydrographic, littoral, cultural, and toponymic data accurately referenced to a precise location on the Earth's surface. Geospatial services include tools that enable users to access and manipulate data, and also include instruction, training, laboratory support, and guidance for the use of geospatial data.

Installation Geospatial Information and Services (IGI&S). The subset of GI&S activities that enhance the DoD Business Mission Area and support DoD business transformation by addressing business enterprise priorities as defined in the DoD Business Enterprise Architecture. IGI&S are considered complimentary to but different from GEOINT, and shall be managed as DoD information resources and information technology as defined in references (a), (c), (f), and (g).

Geospatially Enable (Geo-enable). To apply geospatial capabilities to a business process in order to establish the authoritative spatial location of business data, and enable contextual spatial analysis. Business data which represent real world phenomena are not complete without a geospatially correct representation. The DoD Business Enterprise Architecture contains the correct references necessary to structure geospatial data (representations or "features").

Geospatial Feature. As defined in the DoD Business Enterprise Architecture (BEA), "An abstraction of a real world phenomenon that physically places the phenomenon via an implicit or explicit reference to a specific location relative to the Earth." The BEA entity called "geospatial feature" can be expressed as a point, line or polygon, or even textually (e.g. address) provided that it conforms to pertinent standards referenced in the BEA.

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APPENDIX E

Memoranda for Resource Managers and Finance and Accounting Officers:
 Cost Accounting for Enterprise Geographic Information Systems (GIS)
 and
 Clarification of Cost Accounting for Enterprise Geospatial Information Systems (EGIS)



DEPARTMENT OF THE ARMY
 U.S. ARMY CORPS OF ENGINEERS
 441 G STREET NW
 WASHINGTON, D.C. 20314-1000

CERM-F (37)

DEC 16 2005

MEMORANDUM FOR ALL Resource Managers and Finance and Accounting Officers

SUBJECT: Cost Accounting for Enterprise Geographic Information Systems (GIS)

1. Reference Memorandum CECW-CE, dated 2 July 2004, subject: Watershed Management and the Implementation of Enterprise Geographic Information Systems (EGIS) in the United States Army Corps of Engineers (USACE) 2012 Environment.
2. The EGIS Revolving Fund (RF) was to be established at each district to ensure that geographic information systems funds are spent supporting the entire district geographic information systems (GIS) requirements, rather than a single project or mission. For example, the GIS infrastructure supporting Operations would be leveraged to support project specific activities, or the Real Estate Mission.
3. The following procedures apply to EGIS costs and distributions from the RF5022 Facility Account for GIS Operations (ER-37-2-10).
 - a. Costs.
 - (1) Operational expenses such as hardware/software ownership expenses, hardware/software, maintenance, hardware repair, software site licenses, expendable equipment, software and supplies, labor, training, and travel should be recorded in RF5022. These are the additional incremental costs of having a general-purpose GIS capability at the district level, independent of a specific project. It allows the districts' investment in spatial data to be preserved for use by other teams and future projects.
 - (2) Costs associated with developing tools and collecting and processing historical data that benefit a single project should be charged directly to that project or study.
 - (3) Costs associated with developing tools, collecting and processing historic data where the data benefit cannot be attributed to a single organization, project or study should be recorded in RF5022.
 - b. Distribution should be made directly to projects "if the costs contribute exclusively to the accomplishment of a single project", EC 37-1-261. Distributions should be made monthly.

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CERM-F (37)

SUBJECT: Cost Accounting for Enterprise Geographic Information Systems (GIS)

(1) When the costs in 3.a.(1) and 3.a.(3) above can be attributed to a single department, the cost should be distributed to the department technical overhead accounts. If a license holder works exclusively on one project, or a piece of hardware is dedicated to a project, the project should be charged directly.

(2) The remaining costs in RF5022 from 3.a.(1) and 3.a.(3) above cannot be attributed to a specific project, study or department. They comprise the programmatic cost of preserving the much larger district investment in spatial data and tools for reuse by future projects, partners and sponsors and other USACE components. The benefits accrue to the district as a whole and should be fairly and consistently distributed proportionately to departmental accounts of the users.

4. In order to verify that EGIS RF 5022 accounts have been established by each district and are being resourced, each district is requested by 1 January to:

- a. Establish ordering work items for EGIS, if work items do not currently exist.
- b. Link the new command indicator code (CIC) EGISP (EGIS Program) to all applicable work items. This CIC has been established in the Corps of Engineers Financial Management Systems (CEFMS) database tables.
- c. Transfer all costs associated with this initiative to the applicable work items where necessary. This would only need to be performed if costs are currently accounted for in another work item representing work.

5. EGIS RF accounts should be closely coordinated with Computer-aided Drafting and Design (CADD) RF 5021 accounts to maximize investments across (CADD) and Geographic Information Systems (GIS) platforms. If a district office intends to use regional GIS assets and does not require an EGIS RF 5022 account, please notify Headquarters (HQ) of this intent through Division EGIS points of contact.

6. If you have any questions about this action, please contact Nancy Blyler, 202-761-7755.

FOR THE COMMANDER:


STEPHEN COAKLEY
Director of Resource Management

1 Sep 12



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET NW
WASHINGTON, D.C. 20314-1000

CERM-F

JUL 27 2007

MEMORANDUM FOR All Resource Managers and Finance and Accounting Officers

SUBJECT: Clarification of Cost Accounting for Enterprise Geospatial Information Systems (EGIS)

1. Reference CERM-F Memorandum, 16 Dec 05, subject: Cost Accounting for Enterprise Geographic Information Systems.
2. This memorandum provides FY08 budget guidance for Revolving Fund RF5022 accounts and clarifies their use during the U.S. Army Corps of Engineers Information Technology (ACE-IT) transition year. The RF5022 account serves two purposes--it provides districts a mechanism to fund their EGIS program and provides Headquarters budget and expenditure data to support Office of Management and Budget reporting requirements. Over time, hardware and software purchases for Computer Aided Design & Drafting (CADD) and Geographical Information Systems (GIS) will be served through ACE-IT. For the ACE-IT transition year, FY08, districts are directed to budget for all EGIS activities through their RF5022 account. It is expected that in FY09 hardware/software costs will be transferred to ACE-IT but it would be premature at this time to move them from the RF5022 account. Equipment that is shared with non-geospatial activities does not have to be funded through the RF5022; it can be funded by the Information Management (IM) Facility Account budget (IM RF5031 or RF5032).
3. As stated in the reference, CADD (RF5021) and GIS (RF5022) accounts should be closely coordinated to maximize investments across both platforms but they are not to be combined into a single account. Purchasing shared equipment/software and labor for maintaining systems should be shared equitably by both accounts. The RF5021 account is to be used for District Building Information Model (BIM) expenses that cannot be directly billed to a project. The RF5022 account should capture all EGIS program costs. Enclosed is a list of work item codes to be used. These codes will maximize consistency and provide Headquarters budget and expenditure data to support OMB reporting requirements.
4. Individual district departments are not to fund their GIS activities through their own operating accounts; they should support the overall district's Enterprise GIS program by using the RF5022 account. These costs should be fairly and consistently distributed proportionately to district departmental accounts. A district-wide strategy of distributing

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CERM-F

SUBJECT: Clarification of Cost Accounting for Enterprise Geospatial Information Systems (EGIS)

these costs should be developed and reviewed annually. Costs for geospatial activities that support only specific projects, such as data acquisition, tool/application development or analysis/decision support activities, shall be charged to that project using the Command Indicator Code (CIC) EGISP.

5. This memorandum has been coordinated with the Directorate of Civil Works (CECW-CE) and Directorate of Corporate Information (CECI-BB). If you have questions, please contact Nancy Blyler, 202 761-7755.

FOR THE COMMANDER:



Encl

Wesley C. Miller
Director of Resource Management

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Attachment - Work Item Codes

Hardware-Dedicated to CADD or GIS

	Purchase	Maintenance
Servers	ITEQUIPEXP	ITEQPMaint
Plotters	ITEQUIPEXP	ITEQPMaint
Peripherals (scanners, printers, hard drives, etc.)	ITEQUIPEXP	ITEQPMaint
Plot Servers	ITEQUIPEXP	ITEQPMaint
Workstations (Laptop or Desktop)	ITEQUIPEXP	ITEQPMaint
GPS Units	ITEQUIPEXP	ITEQPMaint
Hardware Maintenance	ITEQUIPEXP	ITEQPMaint
Leased Hardware	ITEQPLEASE	
Depreciation	DEPRE	
Increment	INCREMENT	
Shipping/Freight	TRANHNGS	
Installation	OTHCONSVC	

Software Dedicated to CADD or GIS

	Purchase	Maintenance
Site Licenses	AILICST	
Enterprise Software	ITSFTWREXP	ITSFTMAINT
Stand Alone Software	ITSFTWREXP	ITSFTMAINT
Software Leases	ITSOFTLEAS	
Custom Software Configurations/Intalls GOV.	ITCONTSPT	
Custom Software Configurations/Installs Non GOV.	OTHCONSVC	

Training Specific for CADD/GIS

Support of CADD and/or GIS Program	TRAINING
	GSEDAN
	LABOR
	TRANSPER

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Misc. Expenses Specific for CADD/GIS

IMO Automation Services - IE Help Desk	ADPCST
IMO Telecommunication Services - IE Programming Services	TELECOM
Travel Expenses	TRANSPER
Supplies	SUPMATRL
IT Supplies	ITSUPPLIES
Data (not project specific, basemap data)	SUPMATRL
Floor space not captured in Org Overhead (see space cost guidance)	REPAYSLUC
Rental Space for storage - GSA	REPAYSLUC

AIS License Expenses Specific for CADD/GIS

CADD ELA	AISLICST
eGIS (HQ Bill for TANA Data & TIO)	AISLICST

Labor

In-House Labor	LABOR	Non-Project Specific
Contracted Labor Federal - GSA or other Federal	ITCONTSPT	
Contracted Labor - AE Services or other Contract	OTHCONSVC	

APPENDIX F

Sample Program Management Plan (PgMP) for an Enterprise Geographic Information System (EGIS)

Great Lakes & Ohio River Division Enterprise Geographic Information System (EGIS) Program Management Plan (PgMP)



30 June 2010

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1. Bottom Line Up Front

In order to successfully implement EGIS [enterprise geographic information system] in USACE, we need to develop and maintain standard geospatial data across business lines, provide easy access to geospatial data, and identify/fund geospatial requirements within the USACE business processes. (USACE Enterprise Geographic Information Systems Vision Document [Draft] dated 8 February 2008.)

2. Scope

This program management plan (PgMP) provides direction for the Great Lakes and Ohio River Division Enterprise Geographic Information Systems (EGIS) program for the period FY10-14. The intent is to continue to develop and implement an EGIS that supports the effective execution of established missions and business lines. The EGIS will conform to the USACE Enterprise Geospatial Vision document and will strive to achieve compatibility across District and regional boundaries. General guidance and direction are also provided in ER 1110-1-8156 and EM 1110-1-2909.

3. Goals & Objectives

LRD will implement an EGIS that provides relevant geospatial data to users to enhance business activities across the Regional Business Center. The primary goal is to provide easy, reliable access to essential geospatial data to help users work more effectively.

4. Regional EGIS Team

The Regional EGIS Program Team (PDT) members are shown in Table 1.

Roles and responsibilities are as follows:

- a. Program Manager - serve as team leader and program administrator; publish and update the program management plan; provide overall technical direction and consultation; assist Districts with implementation and issue resolution; develop and implement quality management activities; represent the region in USACE activities; and report progress regularly to senior leaders.
- b. District Team Members - serve as District EGIS coordinator and implement program requirements at the District level; lead implementation of hardware, software, and standards per the regional and national guidance; develop and implement related training programs; and report District progress to the Program Manager.
- c. Division Team Members - work with the Program Manager to implement EGIS activities within their respective Communities of Practice or other assigned areas.

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- d. EGIS Champions – provide senior level guidance and direction for the District and Regional EGIS programs; review and approve EGIS program management plans; and facilitate conditions for program success.

Table 1. Regional EGIS Program Team	
Program Delivery Team Members	
Program Manager	Lyn Richardson, Chief, CELRD-RBT
Regional GD&S Manager	Frank Appelfeller, CELRD-RBT
Buffalo District GIS Coordinator	Keith Koralewski
Chicago District GIS Coordinator	J.D. Ennis
Detroit District GIS Coordinator	Bill Kempisty
Huntington District GIS Coordinator	Jim Vassar
Louisville District GIS Coordinator	Mark Real
Nashville District GIS Coordinator	Bobby Sells
Pittsburgh District GIS Coordinator	Melissa Aguglia
Emergency Management	Terry Siemsen, LRL
Planning	Ronny Sadri, LRD
Operations	Denise LaDue, GIS RTS, LRL
Real Estate	Vice-Edwardo, LRD
Regulatory	Suzanne Chubb, LRD
Resource Management	Devorah Waesch, LRD
Water Management	Trent Schade, LRD
EGIS Champions	
Regional	Rich Hancock, SES, CELRD-RB
Buffalo District	Tom Switala
Chicago District	Linda Sorn
Detroit District	Mike O'Bryan
Huntington District	John Jaeger
Louisville District	David Dale
Nashville District	Barney Davis
Pittsburgh District	Jeanine Hoey

5. Critical Assumptions and Constraints

Critical assumptions and constraints for the EGIS program are described below. Changes to any critical assumptions or constraints may affect plan implementation.

Assumptions

Critical assumptions are ideas, activities, and conditions considered true at the time the PMP is written or updated. Some key critical assumptions are:

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- a. Every District will commit to the regional EGIS program and effectively implement specific recommendations as they apply to their programs.
 - (1) Each District will train personnel in use of hardware and software applications to maximize the capabilities of individuals and their District as a whole.
 - (2) Each District will maintain GIS hardware and software technology appropriate for its work responsibilities.
 - (3) Districts with more extensive GIS capability will support other Districts by sharing expertise and technology (within limits of license agreements).
- b. Every District will fully implement any regional standards published under this program.
- c. Adequate funding for EGIS technology, training and support will be available.
- d. Efficiency may be gained by sharing hardware and geospatial data regionally.

Constraints

Critical constraints are ideas, activities and conditions that may limit the effectiveness of the planned activities. Some key critical constraints are:

- a. Limited funding for necessary activities may impede program implementation.
- b. Employees' regular workload requirements may limit time availability for GIS training and support.
- c. Hardware availability may adversely impact implementation of some programs.
- d. Network infrastructure may impact performance of collaborative efforts and data sharing.
- e. Contracting of ACE-IT support for EGIS hardware and software will require additional coordination and effort.

6. Tasks and Schedule

- a. Implement Regional Flex Viewer. The Division will continue to develop a regional geospatial data viewer using ArcGIS API for Flex on top of ArcGIS Server (URL: <http://155.80.100.57/LRD/index.html>). The LRD Flex Viewer displays map services published on District ArcGIS Servers. The regional GIS team will work with Division office and District users to expand the viewer to support essential regional

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business process needs. Map services can be shared with CorpsMap to support HQUSACE mission needs.

- b. Manage Regional EGIS Program. LRD will perform necessary activities to effectively manage the regional EGIS program.

Table 2. Task s and Schedule		
No.	Task Description	Finish Date
1	Implement Regional Geospatial Data Viewer	
1.1	Demonstrate prototype LRD Flex Viewer to HQUSACE.	Feb 10
1.2	Conduct workshop with key Division office users to demonstrate the Viewer and discuss requirements, including program management, planning, dam safety, levee safety, operations, and emergency management.	30 Sep 10
1.3	Develop base geospatial map services for Division office users.	30 Sep 11
1.4	Conduct annual review of the LRD viewer with the Districts and LRD users to assess viewer capabilities and identify new map services and functionality; develop improvements to the regional viewer.	Ongoing
2	Manage Regional EGIS Program	
2.1	Update the Regional EGIS Program Management Plan.	Draft 31 Mar 10; Final 30 Jun 10
2.2	Update District EGIS Plans.	30 Sep 10
2.3	Publish Data Management Plans for projects.	LRP – 30 Apr 10; Other Districts – 31 Mar 10
2.4	Conduct regional EGIS conference calls.	Quarterly
2.5	Monitor and report performance on HQUSACE EGIS metrics. Recommend improvements as required.	Quarterly

7. Funding

The regional EGIS program will use, to the maximum extent possible, geospatial data available in the public domain through national programs (e.g. National Levee Database) as well as regional program and project efforts. EGIS program management and development activities necessary beyond what is already available will be performed using regional overhead funds.

EGIS benefits accrue across all organizational elements and each District as a whole by providing the resources to support PDT's in the execution of programs and projects. EGIS expenditures related to the incremental costs of having a general purpose GIS

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capability at the District level may be paid for with EGIS funds. Legitimate expenditures for EGIS include: hardware and software purchases; hardware and software maintenance; data maintenance for commercial GIS data; hardware repair; labor (e.g. project management, data management, providing access to data); supplies, travel, and training.

Each District will establish and use a revolving fund account (RF5022) for distribution of EGIS costs. RF5022 costs will be distributed to technical offices (i.e. Program Management, Planning, Real Estate, Engineering and Construction, Operations, Regulatory, Emergency Management, etc). The distribution of costs shall be made in a fair and equitable manner. The distribution will be formulated in accordance with input from the EGIS manager and responsible supervisors. EGIS managers will monitor to ensure that only legitimate expenditures are applied to the RF5022 account. EGIS managers will work with the District Resource Manager to ensure that EGIS costs are distributed to departmental overhead accounts on a monthly basis as required by ER 37-2-10 [paragraph 16-4u(3b)].

Further guidance on EGIS cost accounting is published in USACE Memorandum Subject: Cost Accounting for Enterprise Geographic Information Systems (EGIS), CERM-F, dated 16 December 2005.

In May, 2010 HQUSACE executed a 5-year Enterprise License Agreement (ELA) with ESRI to provide GIS software products and maintenance for all of USACE. Annual ELA costs to the Division office and Districts during the 5-year contract period are shown in Table 3. The total ESRI ELA cost for USACE is 59% more than the total for FY10. The 59% increase was applied to the Districts' FY10 ESRI maintenance costs to determine the cost values in Table 3.

Table 3. 5-Year ESRI ELA Annual Cost Allocation	
Organization	Amount (\$)
Division Office	15,000
Buffalo District	47,700
Chicago District	23,850
Detroit District	52,470
Huntington District	68,370
Louisville District	76,320
Nashville District	65,190
Pittsburgh District	39,750
Total	388,650

HQUSACE published a fact sheet that discusses some key benefits of the ESRI ELA. These benefits are restated below.

- Integrate Corps operations, enable collaboration with other key organizations, and improve the effectiveness and efficiency of Corps analysis and management.
- Promote continued growth in the Corps mission capabilities, afford cost savings for the Corps, and help ESRI better target advances in GIS technology that respond to the Corps's demanding requirements.
- Improve Corps access to and management of ESRI software, software maintenance, training and professional services.
- Decrease Project and Program Timelines and start-up costs (software already in place) and eliminate the need for local contract offices to procure software and pay annual maintenance fees.
- Increase Geospatial Technical Competency throughout the Corps and support new hires that are increasingly more proficient in Geospatial technologies.

In addition, the ELA is expected to produce value to the Division and Districts as described in the points below.

- The ELA provides much increased access to GIS software at a relatively modest fixed price increase over what Districts have been paying through their separate maintenance accounts.
- Districts can significantly expand their GIS capabilities in a potentially more cost effective manner, being able to acquire an unlimited number of the most common GIS software tools for their fixed annual cost.
- The ELA simplifies the GIS software budgeting and acquisition process. Rather than paying for all software licenses, maintenance and training services on a unit price basis, Districts can procure any required number of products for the set fixed price, giving the opportunity for substantial savings. Increases for Districts annual cost increases under the ELA were in the range of about \$9,000 to \$28,000. The annual single license fee for various ESRI products commonly used by Districts range individually from about \$500 to \$10,000. Thus, depending on the type and number of GIS products required, each District may begin to realize cost savings after acquiring a relatively small number of additional products.
- With the ELA providing greater access to additional software and technology, Districts have the opportunity to stretch their thinking and approach to applying GIS to their business activities. With cost being much less of a controlling factor, there is significantly greater opportunity for creativity and expansion of each District's EGIS program. Rather than as before being in the position of minimizing its "buck for the bang", Districts are now in a position to maximize GIS "bang for the buck".
- The ELA will help increase geospatial technical competency through increased access to the technology and associated training. New hires are increasingly proficient with GIS. With the ELA, Districts can more easily provide new hires with the tools needed to apply their geospatial skills.

- With the ELA and the greater access to software products, the Division is now in a better position to integrate its EGIS program across the region. Districts can now more easily structure their GIS capabilities to a common framework and standards, creating the opportunity for greater collaboration of GIS technology and operations.

8. Quality Management

District GD&S Managers are responsible for ensuring that each District implements appropriate quality control and quality assurance for geospatial projects and products. The LRD GD&S Manager will facilitate overall quality assurance across the region.

Each District will publish a Program Management Plan for its EGIS program, which will include a Quality Management Plan that stipulates quality control and quality assurance requirements for EGIS activities. The quality plans will address requirements for preparation of project Data Management Plans and will establish District geospatial data standards that comply with Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) attribute structure and naming conventions.

Updated District PgMPs will be submitted to the Regional GD&S Program Manager for review by 31 August each year.

9. Acquisition Strategy

Acquisition of all system hardware and software will be coordinated regionally and implemented per the design requirements developed. Lead Districts may be designated for the acquisition and installation of system components and for responsibility to serve regional data to the LRD and CorpsMap viewers. Acquisitions and installations will be coordinated with the USACE CIO, ACE-IT, and others as required.

10. Risk Management

Risk will be managed at each organizational level. At the regional level, the GD&S Program Manager will assess risks and initiate appropriate mitigation actions. At the District level each GD&S Manager will work with supervisors and project managers to manage risk, to include that associated with requirements in the Project and Data Management Plans. The risk management plan is detailed in Table 4.

11. Change Management

Recommended and required changes to this plan will be submitted to the Program Manager for review and execution. This PgMP will be updated at least annually before the end of the second quarter to incorporate program changes.

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Table 4. Risk Management Plan

Risk Factor	Probability	Impact	Mitigation Approach
Constrained funding	Medium	Cannot execute all necessary program activities.	Maintain high priority with senior leaders, EGIS champions, and regional overhead budget process.
Ineffective involvement of GIS users	Low	Low value GIS products	Effectively train users on the technology and benefits; develop a clear understanding of user business processes and associated geospatial data needs.
Improper fielding of new GIS software versions	Low	Unforeseen system incompatibilities and GIS faults.	Upgrades will be coordinated regionally and tested thoroughly before installation.
Inadequate integration with CRREL & ACE-IT support	Medium	Failure to install needed GIS hardware, software, and data layers.	Coordinate early and communicate often; fully understand support agency requirements.

12. Communications

Team communications will be accomplished by regular conference calls and scheduled meetings of the PDT. The Program Manager will publish a list of conference call dates and administer the calls. However, any GD&S coordinator that has a critical issue to be discussed can request that the Program Manager schedule a call. The Program Manager will also publish a monthly written progress report to the PDT and the EGIS Champions. This report will be published by the last business day of each month.

13. Value Management

The Program Manager will coordinate with the Districts and support organizations to achieve cost effective GIS implementation while meeting applicable technical standards.

14. Closeout Plan

Upon completion of each major program task and at the end of each FY, the PDT will conduct a formal After Action Review and document and share Lessons Learned. The Program Manager will publish a closeout report to the Regional Engineering and Construction Board (RECB) and PDT members.

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15. Signature Approval

	
LYNDON C. RICHARDSON, PE Chief, Business Technical Division	JOHN C. ZIMMERMAN, PE, PLS Chief, Planning Division
	
DEVORAH L. WAESCH Chief, Resource Management Division	CHRISTINA M. BAYSINGER Chief, Real Estate Division
	
PHILLIP M. JOHNSON Chief, Business Management Division	WILLIAM R. CHAPMAN III, PE Chief, Operations Division
	
DEBORAH H. LEE, PE, PH, D.WRE Chief, Water Management Division	HIROSHI ETO, PE Chief, Civil Works Integration Division
	
ROBERT P. BURNSIDE Division Emergency Manager	GARY A. MOSTELLER Acting Chief, Military Integration Division
	12 July 2010 Date
RICHARD A. HANCOCK, PE Director of Regional Business	
	07/13/10 Date
MICHAEL B. WHITE, PE Director of Programs	

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Appendix - Emergency Management GIS

1. Introduction. This appendix presents a Division concept plan to execute geospatial functions during an emergency event where the Division has been designated as the lead or the event occurs within the Division operating area. As required by Reference 2e, the following statements relating to the Division GIS emergency management plan are provided in this appendix:

- a. The Division Chief of Business Technical Division (BTD) is primarily responsible for GIS data and activities during an emergency event. He will be a member of the Division Crisis Management Team (CMT). The Chief BTD will typically delegate operational responsibilities to the Division Geospatial Data Systems (GDS)/Enterprise Geographic Information System (EGIS) coordinator who will be the GIS member of the Division Crisis Action Team (CAT).
- b. By 30 September 2010 each District will update its Continuity of Operations Plan (COOP) with regard to GIS data and its EGIS program management plan to include an emergency management appendix.
- c. USACE EGIS EM Standard Operating Procedures (draft) [Reference 2d] were reviewed and considered in the preparation of this appendix. The Division currently has adequate GIS resources to support emergency operations. The Division will request support from the USACE GIS cadre as mission activities require.
- d. During an emergency event the Division will distribute geospatial data using Division's Emergency Management Flex Viewer and will share pertinent map services with CorpsMap, including inland electronic navigation charts (IENC) and dredging site data for operations.

2. References.

- a. ER 500-1-1, Emergency Employment of Army and Other Resources Civil Emergency Management Program.
- b. ER 500-1-28, Response Planning Guide (Emergency Employment)
- c. EP 500-1-1, Emergency Employment of Army and Other Resources Civil Emergency Management Program - Procedures
- d. EGIS Emergency Management (EM) Standard Operating Procedures (SOP) and Recommendations (Draft), January 2009.

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e. CECW-CE Memorandum, Subject: Clarification on Enterprise GIS (EGIS) Directorate Management Review (DMR)/Command Management Review (CMR) Metrics dated 10 February 2009.

3. Responsibilities.

a. District Commanders and Division Chief of Emergency Management will:

- (1) Publish supplemental emergency management (EM) guidance and procedures for GIS support to preparedness, response and recovery activities.
- (2) Designate, resource and train GIS staff to support Division and District EM activities.
- (3) Integrate and exercise GIS staff with Crisis Management Teams (CMT) and Crisis Action Teams (CAT).
- (4) Coordinate with the USACE Remote Sensing/Geographic Information (GIS) Center for direct support to EM planning, training and operations.
- (5) Program funding necessary for effective GIS support to EM activities.

b. Division Chief of Business Technical Division will:

- (1) Be primarily responsible for GIS data and activities during an emergency event.
- (2) Provide GIS technical expertise to EM activities, including while serving as a member of the Crisis Management Team (CMT).
- (3) Collaborate with the Division Chief of Emergency Management and serve as the technical lead to organize, train and exercise GIS staff and resources in support of EM preparation and execution.
- (4) Coordinate with the USACE Remote Sensing/Geographic Information (RS/GIS) Center to access national GIS cadre, capabilities, resources, and standard operating procedures for EM.
- (5) Collaborate with emergency managers to design data products to effectively support EM operations and emergency operations center (EOC) activities.
- (6) Provide for quality assurance and continuous improvement of GIS EM support.

4. EM GIS Concept. Louisville District has developed an emergency management geospatial data viewer using ESRI technology – ESRI Flex Viewer and ArcGIS Server. The Louisville District viewer is located at the following URL:
<http://155.80.60.81/flexviewer/lrd-cop/index.html>. Nashville District also developed a

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Flex Viewer for the recent Nashville flood event. The Nashville District flood viewer is located at the following URL: <http://155.80.100.57/mayflood/index.html>. The regional EGIS team will work with the EM managers to develop a regional EM viewer for the Division Emergency Operations Center. The viewer will provide geospatial data for both routine and emergency operations.

5. Action Plan. For emergency management GIS the Division will implement the tasks in the table below.

Emergency Management GIS - Action Plan and Schedule			
Task	Description	Lead(s)	Finish Date
1	Deploy prototype emergency management (EM) geospatial data viewer for Louisville District area of operations.	CELRL-OP-E	28 Feb 10
2	Publish draft regional EM GIS program management plan (PgMP).	CELRD-RBT	31 Mar 10
3	Conduct workshop to demonstrate prototype EM viewer to Division and District EM Managers; discuss requirements to expand the viewer for regional application.	CELRD-DD-E	30 Apr 10
4	Publish final regional EM GIS PgMP.	CELRD-DD-E	30 Jun 10
4	Develop scope, budget and execution plan to expand EM viewer to regional application.	CELRL-OP-E District GIS staff	31 Jul 10
5	Demonstrate prototype EM viewer to Division senior leaders and seek approval to implement for regional application.	CELRD-RBT	31 Dec 10
6	Expand regional EM viewer (LRD Common Operating Picture).	CELRL-OP-E District GIS staff	31 Dec 11
7	Deploy regional EM viewer; train EM users.	CELRD-RBT	31 Jan 10
8	Implement regional EM viewer for actual emergency events.	CELRD-DD-E CELRD-RBR Districts	Ongoing
9	Continuously improve the viewer based on field experience.	CELRD-RBT	Ongoing

APPENDIX G

USACE Geospatial Oversight Committee (GOC) Charter

US ARMY CORPS OF ENGINEERS (USACE) GEOSPATIAL
OVERSIGHT COMMITTEE (GOC) CHARTER

1. Name of Committee. USACE Geospatial Oversight Committee (GOC).
2. Date Established. 1 November 2011.
3. Date to be Terminated. As outlined in Army Regulation (AR) 15-1, "*Committee Management*," this charter requires renewal two years from signature of authorization.
4. Category and Type of Committee. This committee is an Intra-command Committee, Departmental Committee, as defined in Section 4-2, paragraph a of AR 15-1.
5. Mission or Purpose. Establish a USACE guidance body to address USACE Geospatial Engineering (GE) issues impacting USACE's mission. The objective is to effectively and efficiently support mission requirements by sharing Geospatial data and knowledge seamlessly across USACE enterprise and with our Federal, State and Local partners as well as the public as appropriate. The USACE Geospatial Oversight Committee (GOC) acts as the highest level of Geospatial Authority in USACE. The GOC establishes strategic direction; reviews/monitors existing geospatial programs, activities and policy implementation; and provides critical decisions with regards to the implementation of geospatial technology across USACE. Approved GOC goals are described within Enclosure A, "*Geospatial Oversight Committee Goals*."
6. Direction and Control. The committee reports directly to the Deputy Commanding General (DCG), USACE.
7. Authority.
 - a. Engineer Regulation 1110-1-8156; Geospatial Engineering Data and Systems
 - b. Engineer Manual 1110-1-2909; Geospatial Engineering Data and Systems
8. Responsibilities. ER 1110-1-8156 outlines the duties and responsibilities necessary to successfully implement a functioning Enterprise Geospatial Engineering System (EGES). The following responsibilities, by exception or in addition, will be incorporated into the next revision of ER 1110-1-8156.
 - a. The Chief of Engineers (COE), in his role as Topographer of the Army, will establish the EGES Vision and Mission and set policy for EGES implementation.
 - b. The Deputy Commanding General (DCG) for Military and International Operations and DCG for Civil Works and Emergency Operations will co-chair the GOC. The DCG MIO and DCG for CWEO will task the USACE business line leads to support EGES implementation as necessary.
 - c. The Chief Information Officer (CIO), Army Geospatial Information Officer (GIO), and the Director Research and Development/Engineer Research and Development Center (R&D/ERDC) will provide technical direction and advice to the GOC in support of EGES implementation.
 - d. The Chief of Engineering and Construction will provide policy and guidance coordination and lead interagency EGES coordination.

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9. Administrative Support. Chief, USACE Engineering and Construction is responsible for providing administrative support such as scheduling meetings, establishing relevant and timely agendas, distributing minutes and tracking assigned actions until closure.
10. Composition. The membership composition of the GOC, defined in Enclosure B "*GOC Composition*". GOC membership is open to modification based upon the expertise needed to address specific issues, as directed by a consensus of the primary members.
11. Committee Operations.
 - a. Any voting member unable to attend a GOC meeting may send a senior-level representative or delegate his or her vote to another voting GOC member.
 - b. A simple majority of voting members is considered a quorum.
 - c. Invitees are expected to provide strategic and operational level guidance, oversight, direction, and expertise to the GOC on geospatial issues as they apply to and affect their respective organizations.
 - d. Decisions made by GOC will be communicated through policy directives or Operations Order (OPORD).
12. Funding. Funding for implementing GOC initiatives or action items will be handled on a case by case basis but must be included as part of any approved initiative or action item.
13. Correspondence. The correspondence and communication channel to and from the GOC are summarized below:
 - a. The Chief of Engineering and Construction, or designee, will schedule, at a minimum, quarterly GOC meetings. When coordinating meetings, the GOC will leverage technology, where possible and appropriate, to reduce the costs associated with travel and ensure issues that require attention more frequently than quarterly are elevated for review, guidance, and decision by the committee.
 - b. The GOC Chair will facilitate GOC meetings and provide a status, obtain guidance, and receive direction from the DCG as needed on implementing an Enterprise Geospatial Engineering Program.
 - c. The GOC Chair is responsible for all actions directed by the GOC and has tasking authority over subordinate bodies that directly support the GOC.


MERDITH W.B. TEMPLE
Major General, USA
Acting Commander

ENCLOSURE A
GEOSPATIAL OVERSIGHT COMMITTEE GOALS

1. Deliver a managed geospatial infrastructure supporting discovery and reuse of geospatial data at all scales
2. Enable horizontal and vertical access to geospatial data and information across all business lines.
3. Facilitate/Promote sharing of geospatial data and information between International, Federal, State, Local and DoD partners.
4. Build, sustain and manage a Geospatial Portfolio to effectively and efficiently manage USACE Geospatial Investment.
5. Rapidly adopt new Geospatial Technology that reduces cost, increases collaboration and improves efficiency.
6. Foster a geospatial engineering workforce empowered and recognized for deep technical knowledge and experience across the organization.

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ENCLOSURE B
GEOSPATIAL OVERSIGHT COMMITTEE COMPOSITION

Responsibility	Membership	Official Title	Office
Co-Chairperson	Primary	DCG for Military and International Operations	CEMP-ZA
Co-Chairperson	Primary	DCG for Civil Works and Emergency Operations	CECW-ZA
Member	Primary	Director of Civil Works	CECW-ZB
Member	Primary	Director of Military Programs	CEMP-ZB
Member	Primary	E&C Chief	CECW-CE
Member	Primary	MSC Commander (1)	TBD
Member	Primary	MSC Commander (2)	TBD
Member	Primary	Army Geospatial Information Officer	AGC
Member	Primary	USACE Chief Information Officer	CECI
Member	Primary	Director R&D/ERDC	ERDC
Executive Secretary	Advisory	USACE Geospatial Coordinator	E&C Staff

NOTES:

1. MSC Membership rotates every 2 years at the discretion of the DCG for Civil Works and Emergency Operations and DCG for Military and International Operations.

APPENDIX H

Data Management Plan

PMBP Manual

Data Management Plan

REF 9270G

Scope

This reference documents data management procedures appropriate to the size, complexity, and nature of the project. The Data Management Plan (DMP) is an integral part of the Project Management Plan (PMP), along with Quality Management – REF8008G, Risk Management – REF8007G, Communications – REF 8006G, Safety and Occupational Health – REF8016G, Change Management – REF8009G, and the Value Management Plan – REF8003G. Plans are developed concurrently in the iterative Program/Project Planning Phase.

Data Management (DM) is a process and standard for the collection and life cycle maintenance of data used by the PDT members, partners, customers, and stakeholders. Data Management is also a key component to Value and Quality Management. Data Management utilizes the concept of an enterprise District repository for data with manager(s) responsible for maintenance/storage of data from all projects. This concept reduces the collection of redundant data and provides a central location for PDT members to determine available information for a project. The concept of data management extends outside the time frame of a single project PDT. Geospatial data management for one project spans from initial data searches/collection, supplemental data collection, use of data, database management, and storage of data after completion of the project.

Process Overview

The Geospatial Data Management Plan (GDP) integrates geospatial data management into the Project Management Business Process (PMBP) and facilitates the implementation of enterprise data management. This data collection and management plan covers Computer Aided Design and Drafting (CADD/Building Information Model (BIM) and Geographic Information System (GIS) products. Implementation of this plan will allow project delivery teams (PDTs) comprised of experts from various districts to work collaboratively on a project. For this collaboration to become a reality, the U.S. Army Corps of Engineers (USACE) must follow established criteria, policy and guidance for the acquisition, processing, storage, distribution, and use of geospatial data. Project delivery team members who are responsible for collecting spatial data and producing Computer Aided Design and Drafting (CADD/

BIM) and Geographic Information System (GIS) products have a major role to play in the success of this effort.

Responsibilities

- The Project Manager (PM) is responsible for:
 - Including the DMP and with the Geospatial Data Manager, responsible for designating a GD&S representative as the Data Coordinator member of the PDT
 - Assuring the PDT incorporates a Data Management Plan into the PMP for the project and assigns data coordinator.
 - Ensuring that Data Management policies are integrated into the project delivery process to optimize overall value
 - Ensuring that DM activities are scheduled, conducted, and resourced
 - Ensuring schedules are developed and adequate funds are budgeted for all DM activities, including review by District, partners, and customers
 - Ensuring that the PDT is responsible for project/program quality
- The Project Delivery Team's (PDT) Data Specialist/Coordinator is responsible for the following:
 - Supporting the PDT in the efficient execution of civil, military construction, IIS and environmental restoration projects.
 - Helping protect the investment in CADD/BIM, geospatial data, applications and institutional knowledge.
 - Facilitating the sharing of CADD/BIM and geospatial data among civil, military, IIS and environmental projects.
 - At the project initiation phase, determining how large of a role CADD/BIM and geospatial technologies will play.
 - Educating the project managers and PDT members on how CADD/BIM and geospatial technology can be used to add value to the project.
 - Identifying CADD/BIM and geospatial data requirements and ensure that the appropriate CADD/BIM, geospatial, and data standards are followed. This includes following the current A/E/C CADD/BIM standard, Spatial Data Standards

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for Facilities, Infrastructure and Environment (SDSFIE) and development of FGDC metadata.

- Acquiring existing geospatial datasets from federal, state, local agencies, the public domain and available through USACE licenses agreements.
- Reformating data as required for use with the geospatial technologies.
- Creating new data layers through the integration of existing and acquired data.
- Integrating CADD/BIM and GIS data.
- Identifying CADD/BIM and geospatial application requirements needed for the project.
- Developing geospatial technology applications in accordance with applicable guidelines and standards.
- Performing spatial analysis and data modeling.
- Providing data visualization and mapping products.
- Developing and maintain a geospatial data management plan for the life cycle of the project.
- Developing and maintain a spatial DMP for the life cycle of the project
- Coordinating with District and Division Geospatial Data Managers on policy requirements.
- The District Geospatial Data Manager is responsible for:
 - Reviewing/approving of individual DMP(s)
 - Integrating, managing, and documenting of project data
 - Data standards compliance & USACE policy compliance
 - Storing of all PDT data derived from individual projects

Policy References

- *ER 1110-1-8156, Policies, Guidance, and Requirements for Geospatial Data Systems*
- *ER 1110-2-1150, Engineering and Design for Civil Works Projects*
- *CECW-CE MEMORANDUM FOR MAJOR SUBORDINATE COMMANDERS, 2 July 2004, Subject: Watershed Management and the Implementation of Enterprise Geographic Information Systems (EGIS) in the USACE 2012 Environment, reference 3.*

Distribution

- Same as Distribution of PMP
- District Geospatial Data Manager

Ownership

The PMBP Program Manager is responsible for ensuring that this document is necessary and that it reflects actual practice.

Effective: May 2010

REF 9270G

May 2010

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Geospatial Data Management Plan

Division	
District	
Date	
Project	
Location	
P2 Number	
Project/Program Manager:	
Approval Signature:	Date:
Geospatial Technical Lead :	
Approval Signature:	Date:
<i>[] Cover Sheet Copy Sent to Division eGD&S Manager</i>	
<i>by District Geospatial Technical Lead</i>	
<i>Date:</i>	

Introduction

The Geospatial Data Management Plan (GDP) integrates geospatial data management into the Project Management Business Process (PMBP) and facilitates the implementation of enterprise data management. This data collection and management plan covers Computer Aided Design and Drafting (CADD/BIM) and Geographic Information System (GIS) products. Implementation of this plan will allow project delivery teams (PDTs) comprised of experts from various districts to work collaboratively on a project. For this collaboration to become a reality, the U.S. Army Corps of Engineers (USACE) must follow established criteria, policy and guidance for the acquisition, processing, storage, distribution, and use of geospatial data. Project delivery team members who are responsible for collecting spatial data and producing Computer Aided Design and Drafting (CADD/BIM) and Geographic Information System (GIS) products have a major role to play in the success of this effort.

Applicability

This plan shall apply to all district civil and military projects that will have a geospatial component at any phase of the project. Scopes of work and project management plans shall address the geospatial data component of the project to make sure that data is being collected, used and managed in such a way as to maximize its value throughout the life-cycle of the project and the related programs.

Funding

Funding for the preparation and implementation of this plan shall be provided by the individual project to which it applies.

Geospatial Responsibilities of the PDT

The PDT needs to define:

- Data objectives and quality requirements
- Data format

Data collection methods and what data are available, in development, or stored (both on- and off-site). Timeliness of data availability.

- Data analysis and access - the uses of the data.
- How to incorporate this data into the project decision process.
- Data access, storage and control - how the data will be managed over time.

Role of the Geospatial and CADD/BIM Specialists on the Project Delivery Team (PDT)

- Support the PDT in the efficient execution of civil, military construction, IIS and environmental restoration projects.
- Help protect the investment in CADD/BIM, geospatial data, applications and institutional knowledge.
- Facilitate the sharing of CADD/BIM and geospatial data among civil, military, IIS and environmental projects.
- At the project initiation phase determine how large of a role CADD/BIM and geospatial technologies will play.
- Educate the project managers and PDT members on how CADD/BIM and geospatial technology can be used to add value to the project.
- Identify CADD/BIM and geospatial data requirements and ensure that the appropriate CADD/BIM, geospatial, and data standards are followed. This includes following the current A/E/C CADD/BIM standard, Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) and development of FGDC metadata.
- Acquire existing geospatial datasets from federal, state, local agencies, the public domain and available through USACE licenses agreements.
- Reformat data as required for use with the geospatial technologies.
- Create new data layers through the integration of existing and acquired data.
- Integrate CADD/BIM and GIS data.
- Identify CADD/BIM and geospatial application requirements needed for the project.
- Develop geospatial technology applications in accordance with applicable guidelines and standards.
- Perform spatial analysis and data modeling.
- Provide data visualization and mapping products.
- Develop and maintain a geospatial data management plan for the life cycle of the project.

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Geospatial Data Checklist

This checklist will be completed by project geospatial technical leads to ensure project efforts to collect geospatial and geotechnical data meet required configuration, system, and data quality requirements.

All projects that include tasks to use or produce geospatial data must clearly state what will be collected, what will be delivered, the format it will be delivered in, and who will be responsible for updates and maintenance. This is necessary whether the work is done by contract or by District staff. This checklist is designed to aid project team members with writing geospatial data collection and management portions of the Project Management Plan (PMP). This checklist is to be filled out by the Project Manager and the project's geospatial data technical lead. This checklist becomes a permanent part of the project's geospatial data plan and subsequently the project's PMP.

Contract Specific Information

1. Project Title: _____
2. Proposed Contractor/In house: _____
3. USACE Project Manager: _____
4. Geospatial data technical lead: _____
5. P2 Project Number: _____

Identify Project Geospatial Data Requirements

(Do not automatically assume that there is a geospatial or geotechnical data requirement. These questions are intended to develop a rationale for identifying such a requirement.)

1. Why is this effort being undertaken and why is there a geospatial or geotechnical data aspect?

2. What types of data will be collected? (e.g. soil samples, acquire aerial photographs, well construction information, etc.) _____

3. How will this data be used now and in the future? (e.g. generate annual reports)

4. Check the following that apply to proposed data:

☐ Data will not contain location (geospatial) or (geotechnical) information. Does not require inclusion in the District's GIS.

☐ Data contains location (geospatial) or (geotechnical) information. This information will not be altered in the future (i.e., is temporary in nature, such as proposed well locations). This information will not need to be accessible for use in other mapping projects in the future.

☐ Data contains location (geospatial) or (geotechnical) information. All or a portion of the data may be used on future maps but the graphic attributes will never need to be queried. Data may be stored as electronic graphic files (i.e., CAD or GIS or image files) without database connection in the District GIS, to allow creation of new maps (e.g. report showing work site boundaries).

☐ Data contains location geospatial or geotechnical information. Will require queries and modeling to be performed on the data and its attributes in the future. This is a potential District GIS data set (e.g. location and concentration of contaminants at a cleanup site). Deliverables must conform to the specifications of the District's GIS.

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<https://PMBP.usace.army.mil>**5. HQUSACE standards compliance reporting database requirements.**

Project must be entered into HQ USACE GIS/CADD/BIM standards compliance website and the database must be updated at major project milestones.

☐ Completed

☐ Not Completed, Reason: _____

Identify proposed datasets using above information:

1. Which data sets should be included in the District GIS? Does data structure (tables, etc) for this data already exist in the District GIS or will new tables, GIS layers, etc. need to be developed and added to accommodate this new data?

Geospatial/Geotechnical Data Set(s) & Their SDSFIE feature class:

Data Set	Dist. GIS Data Level (1,2,3)*	SDSFIE or A/E/C Category	SDSFIE or A/E/C Category	New	Update

*1 – Corporate data, must be SDSFIE or A/E/C-compliant if produced by USACE, stored in geodatabase, FGDC compliant metadata required

2 – Project data, must be SDSFIE or A/E/C-compliant if produced by USACE, stored on file server, some metadata required

3 – Interim data, must include metadata if stored on file server more than 30 days

2. Include the appropriate CADD/BIM/GIS standards and specifications in the SOW (for contracted work) or reference them in the PMP (for in house work).

Data Acquisition:

Is the data already available: ☐ Yes ☐ No

☐ Geo - 1- Stop checked for available data

☐ NSDI geospatial clearinghouse search completed

☐ Satellite data coordination coordinated

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Data acquired from Other Federal, State or Local Agencies, Stakeholders, Partners, etc.

The geospatial specialist and applicable PDT members shall insure that the data obtained from external sources is used appropriately with regard to any licensing or security issues. Data acquired from these sources are not required to be converted to SDSFIE.

Data Use Category: ☐ "For General Use" ☐ Sensitive ☐ Confidential ☐ "Official Use Only" ☐ Other

Data Collected by In-House or Contract Labor

If the data does not exist, PDT members requiring the data shall be responsible for writing the scope of work for collection and delivery. The geospatial specialist shall assist with the scopes as needed and/or review them to insure that the data is collected and delivered as follows:

- In accordance with the standards specified in reference 15, Technical Report CADD/BIM-03-, dated July 2003, Subject: Contract Language Guidelines for Acquiring Geospatial Data (CADD/BIM, GIS, CAFM) System Deliverables from Architect-Engineer (A-E) Consulting Firms.
- In accordance with the guidelines provided in reference 9, Engineer Manual 1110-1-2909 Geospatial Data and Systems, 30 September 05
- In compliance with the latest version of the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE).
- Provided with FGDC metadata.
- Provided in proper digital format.

When the data is received the geospatial specialist and/or PDT member shall review the deliverables for compliance with the requirements above.

Data Purchased from Vendor

- ☐ Data needs to be purchased
- ☐ Source & Associated cost _____
- ☐ Licensing and sharing agreements for data reviewed

CADD/BIM and Geospatial Data Delivery and Management

CADD/BIM Data Mgmt: ☐ ProjectWise ☐ Other _____

GIS Data Mgmt: ☐ ProjectWise ☐ FTP ☐ Other _____

CADD/BIM Data Delivery: District PDT is to determine if CADD/BIM data that is geospatial in nature such as site plans, channel boundaries and depths, utilities, building locations, etc. will be converted into a GIS geodatabase format by either the geospatial specialist or provided as a deliverable from contractor. This will ensure the District has data in a GIS format for future use/analysis.

Geospatial Applications, Analysis and Modeling Needed for the Project:

- ☐ Website ☐ Geodatabase ☐ Database integration with GIS
- ☐ Surface Generation ☐ Hydrographic Models ☐ 3D Models
- ☐ Site Selection Analysis ☐ Area/Volumetric computations ☐ Sediment transportation
- ☐ Flood plain delineation ☐ Other _____

Deliverable Format:

Note: All geospatial and geotechnical data deliverables must comply with the standards and specifications of the District's CADD/BIM/GIS Enterprise Geospatial Data System (eGDS). Included in this are standards for complete metadata regarding the data collection and processing of the data.

1. What file format(s) will be used to prepare the project's geospatial data deliverables?

Geospatial data (shape file or personal geodatabase for GIS, Microstation for CADD/BIM, is preferred, must conform to the SDSFIE for GIS or A/E CADD/BIM Standard for CADD/BIM)

Data format: ☐ ASCII text comma delimited file (tables with column headings and point data only)
☐ ESRI shape file
☐ ESRI coverage
☐ ESRI personal geodatabase
☐ ESRI SDE geodatabase
☐ Microstation/AutoCAD
☐ Other: _____

Horizontal Datum: ☐ WGS 84
☐ NAD 83 (Preferred)
☐ NAD 27
☐ Other: _____

Vertical Datum: ☐ NAVD 88 (Preferred)
☐ NAVD 29
☐ Other: _____

Coordinate System/Zone: ☐ Stateplane
☐ _____ North
☐ _____ South
☐ _____ East
☐ _____ Central
☐ _____ West
☐ Other: _____
☐ Universal Transverse Mercator (UTM)
☐ Zone ____
☐ Zone ____
☐ Zone ____
☐ Other: _____
☐ Other: _____
☐ Other: _____

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Projection: ☐ Geographic
☐ Transverse Mercator
☐ Lambert Conformal Conic
☐ Albers
☐ Other: _____

Horizontal measure: ☐ Feet
☐ Meters
☐ Latitude/Longitude
☐ Other: _____

Vertical measure: ☐ Feet
☐ Meters
☐ Other: _____

2. Will the contractor/PDT members produce a completed data package or will the project's geospatial data technical lead complete the deliverable? In most instances, the geospatial data technical lead at minimum will need to review that data and load it into the District's GIS. If the contractor is to complete the data package, please indicate why this option is necessary.

☐ Contractor/PDT

Justification: _____

☐ Project geospatial data technical lead

3. Does the contractor/PDT require a copy of or access to the existing applicable District CADD/BIM/GIS data? If not, please provide justification. _____

4. Will the contractor/PDT be responsible for ensuring the data is compatible with the current District CADD/BIM/GIS data standards? If not, please provide justification. _____

☐ Contractor/PDT has been provided with a current copy of the Data Standard

☐ Contractor/PDT will contact the USACE POC regarding Data Standard requirements

5. Where will the GIS work be accomplished (location)?

6. Will the contractor/PDT be using their own or Geospatial Data Section-furnished GPS equipment and GIS workstations?

GPS source: ☐ NA ☐ Contractor/PDT ☐ COE ☐ COE to provide training

7. Will the contractor perform post-processing on GPS data?

Post-Processing: ☐ NA ☐ Contractor/PDT ☐ COE ☐ COE to provide training

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<https://PMBP.usace.army.mil>**8. Metadata:**

☐ Contractor/PDT will provide sufficient documentation regarding the electronic deliverable files as delineated in the District's CADD/BIM/GIS data standard.

Geospatial Support to Customers

Customer was contacted to determine compatibility of project data with their systems/policies?

☐ Yes ☐ No Notes _____

Data is complete and compatible with customer's CADD/BIM system and eGIS:

☐ Yes ☐ No Notes _____

Data Maintenance**1. Maintenance and Updates:**

☐ This is a one-time data delivery.

☐ Contractor/PDT will provide regularly scheduled data updates to be added to existing files and tables.

☐ Contractor/PDT will provide maintenance and regularly scheduled complete updates of the entire table contents and associated graphics.

☐ The project's geospatial data technical lead will provide required maintenance and updates to data.

2. ☐ Project deliverables must be cataloged in the District's geospatial data inventory database.

Approval**1. Project Manager:**

Name: _____

Signature: _____

Date: _____

2. Geospatial Data Technical Lead:

Name: _____

Signature: _____

Date: _____

APPENDIX I

Sample Five-Year Development Plan



FIVE-YEAR DEVELOPMENT PLAN

FY 2011

Enterprise Geographic Information System (EGIS)

Philadelphia District
September 2010

Philadelphia District***Five Year EGIS Development Plan*****1.0 Goals of the Enterprise GIS**

The goal of the enterprise GIS in the Philadelphia District is to organize data, improve/increase data sharing between branches, standardize data formats, and help people work more efficiently.

The proposed EGIS will meet the needs of the District and fulfill its requirements if the following long-term goals are met or exceeded.

1. Develop as a Learning Organization in accordance with the Project Management Business Practices.
2. Avoid the loss of data and the derived information from the turnover of personnel (keep knowledge base within the organization).
3. In accordance with Engineering Regulation 1110-1-8156, need 100% compliance with the Spatial Data Standards.
4. Increased efficiency and improved dissemination of data between the divisions and offices of the District.
5. All data available through Corpsmap to all scientists, engineers, and project managers. Additionally, raw data will also be available through the Internet to the public (in accordance with FOIA guidelines and proper security measures to protect sensitive information).
6. Data in a central repository or controlled catalog of data sources that can be accessed through CADD (AutoDesk and Bentley products) and GIS (ESRI and MapInfo products). Need to ensure that future software updates, new software, or changes in product lines do not affect access to data.

This plan outlines the necessary steps to be undertaken throughout the district in the upcoming fiscal year to accomplish regional and national objectives in support of the overall EGIS goals.

1. Continue to meet HQ EGIS Metrics
 - Expend the RF5022 account in 2nd, 3rd and 4th quarters of 50, 75 and 100 %, respectively.
 - Update the Five Year Development Plan and submit to NAD annually.
 - Create Data Management Plans for FY11 new starts and submit front page of DMPs to NAD.
2. Participate in Bentley, ESRI and Google Earth Enterprise Licensing Agreements and obtain training, as available and appropriate.
 - Serve as the Agency Support Center contact for the ESRI ELA.
3. Maintain System Admin Rights through ACE-IT. Complete all necessary training. Follow guidelines of ACE-IT MOA for the geospatial CoP.
4. Add functionality to the Philadelphia District Geospatial Portal (Corpsmap). Coordinate with other districts to share code for tools.

Philadelphia District***Five Year EGIS Development Plan***

- Ability to save/send a view.
 - Ability to find P2 data more easily.
 - Ability to search on data without selecting a specific dataset, for example, the ability to provide all datasets within a given parameter, like a town name or project name.
5. Standardize and add data to the Corpsmap database and the central data repository.
 - Continue to move data from the current geodatabase to the new (Oracle) geodatabase.
 - Incorporate NCDB and Cultural Resources data into Corpsmap database, create a Corpsmap Layer (added to the Corpsmap database).
 - Fix Philadelphia Boundary line, if CRREL does not update.
 - Decide storage options. Ideally, data will be duplicated as little as possible. Duplication of data may be necessary on either side of the firewall, but not within the district.
 - Decide which data should be compiled and which data should remain distributed.
 - Require metadata for all datasets to be included in the geodatabase as well as any data connected through the web application. Formalize the rules and guidelines for data, images, maps, etc to be accessible within the Corps.
 6. Work with HQUACE and NAD to make Corpsmap available outside the firewall to our partners and other local, state, and federal agencies
 7. NAP EGIS PDT will meet quarterly to update one another on the status of GIS (new tools, etc) and data collection around the district. Add an EM representative this FY. Added an ACE-IT representative at the end of FY10.
 8. Keep the Senior Level Champion informed of the status of the EGIS Initiative.
 9. Update Corps Project Notebook.

2.0 Areas of Concern

There are several key areas that present a potential impediment to accomplish the goals listed above. These are described as follows:

1. *Data Storage* – Data storage remains a problem. There is no available storage on the network. The GIS folder on nap-fs2phl is full. Although the GIS and CADD communities have been asked by ACE-IT to clean off the server, there is still limited storage. From the perspective of the GIS community, moving data is not a viable option. If data is moved without the knowledge of the GIS Analyst, project files will be useless if the new location of the data is unknown to the Analyst. Analysts and engineers are busy with project deliverables and unable to spend

Philadelphia District***Five Year EGIS Development Plan***

adequate time to delete outdated data. New data storage needs to be closely monitored by the EGIS Coordinator and the District EGIS team, with limited access to the entire district. In the past, space on the server has been used for large documents and images that are not connected to a project GIS, cluttering the server.

2. *DOD Network Security Requirements* – While the security needs are necessary, they do create and will continue to create hurdles as we try to work around our network. For instance, opening a port through the firewall would be preferable, but due to security restrictions, we can not. The work around is duplicate datasets inside and outside the firewall, which creates more work.
3. *Insufficient number of staff dedicated to the EGIS Initiative* – Presently, there are only two staff members dedicated to the enterprise effort. There is a growing need for a database expert, specifically someone that fully understands how Oracle and ArcSDE work together.
4. *Learning Curve with Corpsmap* – Corpsmap was developed at CRREL and is a tool that relies on many different components to function properly. Since the tool was not developed in the district, it will take some time to troubleshoot problems and to become familiar with the environment.
5. *Upgrade to ArcMap 10 and ArcGIS Server 10 and adjusting changes initiated by the ESRI ELA* – Typically, upgrades have created significant disruption to the workflow so any upgrades are regarded as potential problems. Additionally, USACE recently signed an Enterprise Licensing Agreement with ESRI; therefore, there are changes to the way ESRI handles service calls regarding problems with software. The Agency Central Support (ACS) in each district (there are two) are the only contacts with ESRI. As yet, there are still problems with the process and some districts have been experiencing problems.

3.0 Tools for Success**Communication/Awareness**

Continue district EGIS PDT meetings. Update the corporate board as requested. Meet regularly with the Senior Level Champion. Continue to coordinate district activities with regional and national initiatives. Plan short seminars to build awareness, garner support, and educate on regulations.

Metadata and Data Standards Compliance

Continue to require metadata on all datasets acquired via a contract or created in house. Input metadata into a searchable database. Implement current SDSFIE standards on all new projects while updating the data from older projects over time.

Standardized Business Process

Several business processes need to be standardized, formalized and approved by the Corporate Board to promote the necessary cultural changes in the District.

Philadelphia District***Five Year EGIS Development Plan***

Philadelphia District needs a standard process to submit metadata, acquire maps, request data, create mapping for project web sites, review contracts (for geospatial content), and conduct data searches. Standard processes establish a new way of doing business, encouraging employees to think beyond the limits of the project and consider the potential uses of data for other projects and studies.

Admin Rights/Hardware/Software

EGIS staff will continue to open the lines of communication with ACE-IT, using the ACE-IT MOA. All pertinent permissions, rights and access have been granted. End users need to be added to the GIS Active Directory container. The most challenging IT issues for the next FY is learning the new ESRI ELA process as well as developing the NAP Geospatial Portal (NAP's Corpsmap) into a useful tool. Staff needs to be aware that the ESRI tools and training are available to them. There will be a balance between ESRI software needs and the way the costs will be redistributed back to the district in FY12. Finally, GeoCortex Essentials software training was cancelled in FY10; it is scheduled in early FY11. GeoCortex is essentially an extension for ArcGIS Server, which will help in the development in a more robust web application, using out of the box tools.

Data Management Plans

Implementation of Data Management Plans for the Project Management Plan or Program Management Plan for all FY11 new starts to ensure projects budget and schedule for their GIS requirements. EGIS Coordinator will be working with PPMD to develop a list of projects for which DMPs are required.

Philadelphia District**Five Year EGIS Development Plan****4.0 Implementation Schedule**

Philadelphia District					
Schedule - 5 Year Implementation Plan					
	Fiscal Year				
	2011	2012	2013	2014	2015
EGIS Program Development					
Increase awareness internally	XXXXXXXXXX				
Edit strategic plans	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Create Project DMP's	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Develop Internet project maps and data	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Meet HQ/NAD 5022 metric requirements	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Metadata Standards Compliance/Central Repository					
Populate searchable database for metadata	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Investigate options for a metadata viewer	XXXXXXXXXX				
Contract Review	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Training on Metadata Compliance	XXXXXXXXXX				
Integrate NCDB Data, Cultural Data, LIDar	XXXXXXXXXX				
Data Stewardship					
Update Corps Project Notebook as needed	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Business Process/Work Flow					
Standardize Geospatial Business Processes	XXXXXXXXXX				
Establish a workflow for the addition of data layers to the geospatial portal	XXXXXXXXXX				
Create literature and diagrams describing Process and work flow		XXXXXXXXXX			
Implement Business Processes with approval of Corporate Board			XXXXXXXXXX		
Web Applications					
Create project websites (as requested by PMs)	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX
Add data and functionality to Corpsmap	XXXXXXXXXX				

Philadelphia District***Five Year EGIS Development Plan*****Emergency Management Appendix**

The Philadelphia District will follow the plan as outlined in the Continuity of Operations Plan 2008, dated 14 October 2008, Section 9.1.2.9 Information Management Office and Section 15.0 Vital Records and Databases as they pertain to geospatial data. The district will also follow guidelines outlined in the Five Year EGIS Development Plan for the North Atlantic Division.

Approved by:

Kathleen A. Mulvenna
Chief, Emergency Management

Colleen D. Rourke
GIS Coordinator

Philadelphia District

Five Year EGIS Development Plan

Presented for Approval by:

Colleen D. Rourke
GIS Coordinator

Approved by:

EGIS Senior Level Champion

Charles P. MacIntosh, P.E.
Assistant Chief, Planning Division

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APPENDIX J

Memorandum of Agreement between USACE Strategic Sourcing Program Office (CESS),
USACE Information Technology (ACE-IT), USACE Geospatial Community of Practice, and
USACE CAD/BIM Community of Practice



CEIT-ZA
CW-CEPDT

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS INFORMATION TECHNOLOGY
3909 HALLS FERRY ROAD
VICKSBURG MS 39180-6199

MEMORANDUM OF AGREEMENT
BETWEEN

U.S. ARMY CORPS OF ENGINEERS STRATEGIC SOURCING PROGRAM OFFICE (CESS),
U.S. ARMY CORPS OF ENGINEERS INFORMATION TECHNOLOGY (ACE-IT),
U.S. ARMY CORPS OF ENGINEERS, GEOSPATIAL COMMUNITY OF PRACTICE,
AND
U.S. ARMY CORPS OF ENGINEERS, CAD/BIM COMMUNITY OF PRACTICE

SUBJECT: Support of the Geospatial and CAD/BIM Communities under the IM/IT Competitive Sourcing Letter of Obligation (LOO)

1. References.

- a. EM 1110-1-2909 - Geospatial Data and Systems
- b. EP 715-1-7 - Procurement - Architect-Engineer Contracting
- c. EM 1110-2-2907 - Engineering and Design - Remote Sensing
- d. EM 1110-1-1003 - NAVSTAR Global Positioning System Surveying
- e. EM 1110-1-1000 - Photogrammetric Mapping
- f. EM 1110-1-1004 - Geodetic and Control Surveying
- g. EM 1110-2-1003 - Hydrographic Surveying
- h. AR 25-1 - Army Knowledge Management and Information Technology
- i. AR 25-2 - Information Assurance
- j. USACE A-76 Information Management and Information Technology Performance WorkStatement (IM/IT PWS) Letter of Obligation (LOO)
- k. ERDC TR-06-10 - Building Information Modeling (BIM): A Road Map for Implementation to Support MILCON Transformation and Civil Works Projects within the U.S. Army Corps of Engineers
- l. DoD 8570.01-M - Information Assurance Workforce Improvement Program, Change 2
- m. 05-PR-M-0002 - Information Assurance Training and Certification Best Business Practice (IA BBP)

2. Purpose.

This Memorandum of Agreement (MOA) is entered into by and between the U.S. Army Corps of Engineers Strategic Sourcing Program Office (CESS), the U.S. Army Corps of Engineers Information Technology (ACE-IT), the U.S. Army Corps of Engineers Geospatial Community of Practice (Geospatial CoP), and the U.S. Army Corps of Engineers CAD/BIM Community of Practice (CAD/BIM CoP) for the purpose of establishing a mutual framework governing the respective responsibilities of the parties for the provision of USACE IT-related support and services.

Because geospatial technologies rely heavily on Information Technology (IT) infrastructure, it is important that members of the Geospatial community work in accordance with U.S. Army Corps of Engineers Corporate Information (CECI) and ACE-IT frameworks to execute mission

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requirements. Conversely, it is important to recognize the Geospatial Community is responsible for delivering geospatial services to many business lines and functions across USACE. In order to successfully deliver these services, the Geospatial community requires a robust IT infrastructure to include; adequate server and local disk storage capacity; a fast network; and a standard, yet flexible, operating environment.

3. Scope.

This MOA details roles and responsibilities related to the implementation of geospatial technologies in executing Geographic Information System (GIS), Survey and Mapping and Remote Sensing (RS), and Computer-Aided Design/Building Information Modeling (CAD/BIM) work throughout USACE. Specifically, it delineates roles and responsibilities of ACE-IT, CECI, and the Geospatial and CAD/BIM communities (hereafter referred to as the Geospatial community). This includes management, administration, acquisition, information assurance, and issue resolution for activities associated with Geospatial systems.

Goods and services that USACE may provide under this MOA include IT systems, configuration, management, acquisition, information assurance, systems administration, technical support, and such other related goods and services as may be agreed upon in future. Provision of goods or services outside the existing ACE-IT LOO SLAs will be set forth in non-standard support agreements (See Appendix B).

4. Support Agreements.

The current Letter of Obligation (LOO) signed by ACE-IT and CECI provides Service Level Agreements (SLAs) governing provision of standard IT-related products and services within USACE. This MOA recognizes that other service levels may be needed to meet mission requirements of the Geospatial Community, and authorizes the establishment of Support Agreements (SAs) between ACE-IT and members of the Geospatial Community to meet specific site or project needs.

To ensure the needs of the Geospatial communities are met, three types of support agreements are established and are detailed in the following:

- a. Appendix A. This details the basic support that is covered under the LOO with respect Geospatial technologies. There is no additional cost for this support level.
- b. Appendix B. This describes two types of Non-Standard Support Agreements which may or may not have additional costs associated with them. These support agreements can be established to apply to particular machines (e.g., a site's geospatial servers), particular projects, for a particular site, and for a specified duration. These type agreements include:
 - 1) Higher SLA Support Levels – Request for service that exceeds the existing LOO SLAs. Sites may obtain dedicated on-site ACE-IT geospatial staff for OSBL support.
 - 2) Alternate SLA Support Levels – Request to self-perform work (lower ACE-IT service levels).

5. Roles and Responsibilities.

The roles and responsibilities of ACE-IT and the Geospatial and Computer-Aided Design/Building Information Modeling Communities (hereinafter referred to as the "Geospatial Community") may vary with the type of Support Agreement selected.

General roles and responsibilities common to all SAs are provided below. A detailed list of roles and responsibilities associated with the standard SLDs is given in Appendix A. Service Level Descriptions (SLDs) documenting the already available standard support and services to the U.S. Army Corps of Engineers by ACE-IT are published at:

SLD Library

Roles and responsibilities for SLA levels outside the standard pre-established levels may be defined in new Support Agreements. A description of roles and responsibilities associated with a Support Agreement for self-performed work on geospatial servers and databases is provided in Appendix B.

a. Responsibilities of ACE-IT. ACE-IT shall:

- (1) Provide the Geospatial Community with goods and services in accordance with the purpose, terms, and conditions of this MOA and with specific requirements set forth in SAs.
- (2) ACE-IT shall ensure only authorized ACE-IT representatives sign SAs.
- (3) ACE-IT shall use its best efforts to provide goods or services either by contract or by in-house effort.
- (4) ACE-IT shall provide detailed periodic progress as agreed to in an SA.
- (5) ACE-IT shall inform the designated District Geospatial Coordinator of all contracts entered into under each SA to ensure continuity between these parties.

b. Responsibilities of the Geospatial Community Ordering Agency Signatory. The Geospatial Community shall:

- (1) Draft SAs.
- (2) Ensure that only authorized Geospatial Community representatives sign SAs.
- (3) Obtain for ACE-IT all needed access to work sites and support facilities and systems required under an SA.
- (4) Unless existing agreements or Army regulations otherwise provide for the status of Geospatial Community personnel, Geospatial Community personnel shall maintain accreditation for Geospatial personnel, including contractor personnel, at the same level that would be required by CECI of ACE-IT personnel performing similar functions and duties. In the event the Geospatial Community is unable for any reason to secure necessary accreditation for required personnel, including contractor personnel, ACE-IT and the Geospatial Community may terminate the applicable SA.

6. Funding.

The Geospatial Community shall be responsible for funding ACE-IT's provision of goods or services for Non-Standard Support that exceeds the requirements of the standard support level. If ACE-IT forecasts its actual costs under an SA to exceed the amount of funds available under the SA, it shall promptly notify the Geospatial Community signatory to the SA of the amount of additional funds necessary to complete the work under that SA. The Geospatial Community shall either provide the additional funds to ACE-IT, or require that the scope of work be limited to that which can be paid for by then-available funds, or direct termination of the work under that SA.

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7. Dispute Resolution.

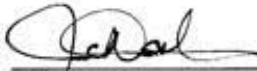
The parties agree that, in the event of a dispute between the parties, the Geospatial Community, CESS, and ACE-IT shall use their best efforts to resolve that dispute in an informal fashion through consultation and communication, or other forms of non-binding alternative dispute resolution mutually acceptable to the parties. The parties agree that, in the event such measures fail to resolve the dispute, they shall refer it for resolution to the appropriate entity directed by CESS for resolution.

8. Miscellaneous.

- a. Background and description of the organizational structure of the USACE Geospatial Community, ACE-IT, and the USACE Corporate Information Office is provided at Appendix C: Organizational Structure for Provision of USACE Geospatial Services.
- b. A detailed description of roles and responsibilities under the existing ACE-IT LOO is given in Appendix A: Basic Support Agreement - Roles and Responsibilities.
- c. A description of roles and responsibilities available by signing a Support Agreement, requesting self-performance of some IT functions on geospatial servers and databases needed to implement geospatial technologies, is given at Appendix B: Non-Standard Support Agreement - Roles and Responsibilities.

9. Controls and Effective Date.

This MOA shall be annually reviewed on the anniversary of signing by all parties to take into consideration changes in the information technology enterprise architecture and governance. If all parties are in agreement that no changes are required, it does not have to be resigned. Elevated system administration rights granted under this MOA are contingent and will be immediately withdrawn from individuals granted them should and if they violate the established guiding principles or cause system problems (purposely or accidental) that result in degradation of service or an information assurance issue or incident. Decision to revoke these rights resides at the discretion of the ACE-IT Director, CESS Chief or CECW-CE Chief. This MOA shall become effective when signed by CESS, ACE-IT, and CECW-CE.



JAMES C. DALTON, P.E., SES
Chief, Engineering and Construction
Directorate of Civil Works

27 Sep 2010
Date

YORK YARBRO
Director, ACE-IT

Date

G. RAY NAVIDI, P.E.
Chief, Strategic Sourcing Program Office

Date

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Appendix A: Standard Support Agreement (Base) – Roles and Responsibilities.

1. **Standard Support Agreement Roles and Responsibilities.** Detailed roles and responsibilities of the parties to this MOA and associated with the standard SLAs given in the existing IM/IT Competitive Sourcing LOO are given below. See Appendix B for non-Standard SLA Support Agreements.

SAs must detail:

- a. Scope of Work
- b. Required Deliverables
- c. Period and Place of Performance
- d. Government-Furnished Resources
- e. Procedures for Administering and Modifying the SA
- f. Methods for Coordination and Communication
- g. Such other particulars as are necessary to describe clearly the obligations of the parties with respect to the requested goods and services
- h. Points of Contact

a. **Elevated Privileged Access to USACE Systems.**

- (1) The Geospatial Community will specify their business requirements for privileged access to CECI and ACE-IT and specify the nature, extent and duration of needed access.
- (2) The Geospatial Community shall identify individuals needing privileged access and provide information on the training and certification of such individuals.
- (3) The Geospatial Community shall maintain required CECI security, training and certification levels for individuals authorized by CECI for elevated privileged access.
- (4) CECI and ACE-IT will designate procedures and requirements for obtaining privileged access and shall publish SOPs for obtaining and maintaining privileged access.
- (5) CECI and ACE-IT will formulate a list of approved users for each of the categories of privileged access below.
 - (a) **Desktop Elevated Privileged Access.** Desktop elevated rights may be required by the designated Geospatial community members to load mission critical software in a timely manner and to support computer equipment that is used in the field (i.e., disconnected from the network for a period of time).
 - (b) **Server Elevated Privileged Access for Geospatial Application and File System Administration.** Server elevated rights may be required on specific District application servers by designated Geospatial community members to manage the data content and applications to support Enterprise GIS, collaborative engineering, and mission critical data sets being hosted on servers. Under the existing IM/IT LOO, the Geospatial Community may need and request elevated privileges on geospatial servers to:
 - 1) Install/upgrade/remove certain approved application software;
 - 2) Login to the system remotely;

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- 3) Connect remotely to system file shares;
- 4) Examine application log files;
- 5) Establish local print queues;
- 6) Load and unload device drivers;
- 7) Leave remote jobs running after remote disconnection;
- 8) Manage publication of approved geospatial datasets and tools.

Where other privileged access is required, the Geospatial Community shall execute a local Support Agreement with ACE-IT (see Appendix B).

(c) **Server Elevated Privileged Access for Geospatial Database Administration.**

Server elevated rights may be required on specific District application servers by designated Geospatial community members to manage the data content and applications to support Enterprise GIS, collaborative engineering, and mission-critical data sets being hosted on servers. Systems-level DBA tasks (e.g., tasks that involve database files and processes -- such as create/administer databases, installing/patching Oracle software, starting/stopping databases, owner of 'oracle' O/S account and have the ability to sudo to oracle, owner of SQL Server 'sa' and Oracle 'sys' database accounts, inclusion in oracle 'ORA_DBA/DBA' group, etc) will be performed by the ACE-IT DBA Team. These tasks will not be shared with Geospatial community members in order to support "separation of duties" and single accountability as defined by ITIL principles. If the Geospatial community members require the ability to perform these types of tasks, see local Support Agreements (Appendix B). Applications-level DBA tasks (e.g., tasks that involve elevated privileges *within* the database like having the 'dba' role, creating schemas, user access, etc.) will be performed by Geospatial community members.

Under the existing IM/IT LOO, in the absence of a separate Support Agreement (such as described in Appendix B), the following caveats are given for Database Privileges.

- 1) **Install/Upgrade/Remove Software Privilege:** Excludes installation/removal of database software. Depending on the product being installed, the ACE-IT DBA team should be notified to make sure there is a full backup of the database available, that the database is compatible with the version of GIS software being installed/upgraded, and to determine if there are one-off patches that need to be applied.
- 2) **Create, Stop, and Start Services and Processes Privileges:** Excludes Database Server Processes.
- 3) Only the ACE-IT DBA Team should create "databases".
- 4) **Service Account creation and management Privileges:** The ACE-IT DBA Team should maintain Oracle "oracle" O/S account and "SYS" database account and SQL server "sa" database account.
- 5) **Modify Application Configuration Files Privilege:** Excludes the Oracle Database parameter files (init.ora/spfile). All database work should be coordinated through the ACE-IT DBA Team.

- 6) **Modify Memory Quotas and Prioritization of Processes Privileges:** The ACE-IT DBA Team should be involved with configuration of Windows memory resources to verify that the database(s) are accurately tuned and have enough resources to run.
- 7) **System Restart and Shutdown Privileges:** Notification should be made to all parties involved for a server to verify that the server is not being restarted during maintenance activities (database backups, imports, etc.). The ACE-IT DBA Team should provide necessary scripts for clean database shutdown and startup for use at system boot.
- 8) **Establish and Manage Directory Shares and Permissions Privileges:** For database servers, there should be absolutely no user data stored on the file systems; exceptions being GIS data that is served out by web services or data that will be loaded into a database. This should not be a working file server.
- 9) **Restore Files and Directories Privileges:** Excludes database files and O/S; database file restores should be done by SAs in close coordination with DBA Team for possible database recovery.
- 10) **Database Schema Creation/Management Privileges:** Geospatial users own the data and should be able to perform this function, along with controlling user access.
- 11) **Database Tablespace Creation / Management Privileges:** This task should only be done by the ACE-IT DBA Team, who will coordinate with SAs on storage requirements. Tablespace creation has the potential to cause major problems with the database if storage requirements have not been considered.

NOTE: The ACE-IT DBA Team will be responsible for all systems-levels DBA tasks (e.g., tasks that involve database files and processes -- such as create/administer databases, installing/patching Oracle software, starting/stopping databases, owner of 'oracle' O/S account and ability to sudo to oracle, owner of SQL Server 'sa' database account, inclusion in oracle 'ORA_DBA/DBA' group, etc). GIS Applications personnel will be responsible for applications-level DBA tasks -- such as tasks that involve elevated privileges within the database like having the 'dba' role, creating schemas, user access, etc.) .

- 12) **Database Performance Tuning Privilege:** OK for Geospatial Community to perform this, but should perform in coordination with ACE-IT DBA team.
- 13) **Database Specialized Patching (spatial / text / xmidb) not due to IAVAs Privileges:** One-off patches should also be installed by the ACE-IT DBA Team.

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- 14) Database Application Loading / Development / Programming Privileges: OK for Geospatial Community to perform these functions.
- 15) Emergency responsiveness / off-hours access Privileges: If such a requirement exists it shall be addressed within local Support Agreements (see Appendix B).

Any privilege elevation by designated Geospatial Community members is subject to CECI and ACE-IT security and information assurance requirements. Under the Standard LOO, ACE-IT maintains responsibility for pushing OS and software patches to the Geospatial servers. If additional privileged access is required by Geospatial community members, then the Geospatial team is responsible for performing these duties in strict compliance with all applicable governance and policy to maintain the security and accreditability of the server. As USACE moves to consolidate servers and Geospatial servers become part of a larger enterprise server solution, this will need to be addressed in a way that retains the ability of the Geospatial CoP to execute geospatial management functions. Geospatial Administrators shall request and obtain a separate system account to perform any system administration tasks requiring privilege elevation (e.g., "z0" accounts). Geospatial Administrators shall request and obtain administrative alternate smart cards where available and where required. The Geospatial Community shall follow ACE-IT procedures for installing, updating, removing, and configuring software. Geospatial administrators will fully coordinate actions that might result in system impact or downtime with the lead site ACE-IT SA and designated ACE-IT application and database leads prior to its execution.

b. Software Acquisition, Access and Management It is in the joint interest of ACE-IT, CECI, and the Geospatial Community to support standardization of geospatial software versioning across USACE where this does not adversely impact system functionality. Standard versioning: facilitates the ability to execute regional geospatial work, supports software and data interoperability, and leverages training.

- (1) **The Geospatial community is responsible for:**
 - (a) Defining user requirements for geospatial software and providing this information to CECI and to ACE-IT.
 - (b) Planning, budgeting, and funding required geospatial software.
 - (c) Functionality testing and validating software requirements.
 - (d) Determining policy on the distribution of licenses among sites based on formulae developed by the Geospatial community in consultation with CECI and ACE-IT. Licensing agreements shall not eliminate the ability of local site Geospatial Coordinators to directly contact vendors for technical support issues that are not addressable by ACE-IT technical staff.
 - (e) Ensuring that a national EGIS Team annually reviews current GIS license versions needed to support USACE emergency management efforts.
 - (f) Ensuring that Site Geospatial Coordinators:

- 1) Internally coordinate geospatial software releases and proposed changes with affected site users.
- 2) Provide feedback and recommendations to ACE-IT on proposed software changes.
- 3) Manage legacy systems requiring earlier versions of software if not covered within the LOO or a separate Support Agreement (SA).
- 4) Prepare plans to migrate to and maintain use of supported software versions.
- 5) Participate in functionality testing of new software in coordination with CECI and ACE-IT.

(2) **ACE-IT is responsible for:**

- (a) Verifying software releases are coordinated through the Change Management process. The Change Authority is determined by the impact, risk, and cost of the upgrade. Requests are evaluated for any costs and/or potential benefits and whether it is within service level agreements or requires additional funding/resources. This includes individual site and enterprise wide changes that affect the entire geospatial community of users.
- (b) Recommending and procuring software that has been ordered by the user and which meets user technical and funding requirements.
- (c) Reviewing and testing new geospatial software versions within agreed upon timeframes to include determining whether to recommend authorization of the software for site installation. All efforts will be made to conclude the required actions within the shortest time possible.
- (d) Maintaining and publishing the USACE Master Software Library and information about current software version(s) authorized for site installation.
- (e) Making authorized software available through a central repository (e.g., site NetApp servers) to the site GD&S Coordinator, CAD Manager, BIM Manager and/or ProjectWise Manager (hereafter referred to collectively as the Geospatial Coordinator). Software authorized for widespread distribution will be identified as such on the central repository. Emergency pushes of critical updates may be deployed sooner, depending on need, but will be coordinated with sites.
- (f) Coordinating all geospatial software releases at a specific site with the designated site Geospatial Coordinator.
- (g) Technical management of Enterprise licenses for geospatial software (such as ESRI and ERDAS) across USACE. For software that is managed, ACE-IT is responsible for managing and maintaining license key servers where users can check in and out software modules.
- (h) Working directly with the geospatial community to assist software vendors in meeting USACE IT security requirements.
- (i) Tracking acquisition service and delivery, maintaining and updating ITIPs data for all local investments, and developing MOA's between local command and ACE-IT and/or other service providers as needed.

- c. **Geospatial Data Server Management and Data Management** To support Enterprise GIS, CAD, BIM, and collaborative engineering, the Geospatial Community requires a variety of geospatial data and systems to be hosted on data servers. Under the

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standard Support Agreement, installation and maintenance of hardware, operating systems, and database management system software shall be managed by ACE-IT; however, the content (datasets) of the servers (e.g. GIS data layers, elevation data, imagery, engineering drawings, geospatial applications) shall be managed by the Geospatial community.

(1) **The Geospatial Community will:**

- (a) Coordinate with CECI and ACE-IT Records Management and perform appropriate records management activities in support of data management.
- (b) Coordinate with CECI and ACE-IT to improve the ability to make use of historical geospatial data.
- (c) Ensure Site Geospatial Coordinator(s):
 - 1) Determine who should have local access to district geospatial datasets. Elevated rights shall be assigned to designated individuals who satisfy security requirements and are designated by the appropriate site Geospatial Coordinator. Details on database administration roles are given in the "Elevated Privileged Access to USACE Systems" section above unless otherwise specified in local Support Agreements.
 - 2) Are responsible for managing the geospatial data at each site. To execute this function the Geospatial Coordinator requires access to databases and systems (e.g., web servers) maintained by other parts of the organization in order to display non geospatial data on a map. To perform such work, designated site geospatial administrators (e.g., GIS, CAD, BIM, or ProjectWise administrators) also may require the ability to administer databases and geospatial tools, and may require secure clients to safely access these systems remotely. Details on database administration roles are given in the "Elevated Privileged Access to USACE Systems" section above unless otherwise specified in local Support Agreements.

d. **Hardware Access, Acquisition, Management, and Maintenance.** Acquisition of Geospatial hardware that is "IT" in nature will follow processes established by CECI and ACE-IT. Some of the specialized engineering equipment used by the Geospatial community is not intrinsically "IT" in nature and is outside ACE-IT's scope. Management and tracking of Geospatial hardware will follow processes established by CECI and ACE-IT.

(1) **The Geospatial community is responsible for:**

- (a) Defining user requirements for geospatial hardware and providing this information to CECI and ACE-IT.
- (b) Planning, budgeting, and funding required spatial hardware to include maintenance.
- (c) Development of specifications and procurement of survey instrument/equipment to include GNSS/GPS receivers, total stations, data collectors, fathometers, and other survey data collection and storage equipment which is not primarily "IT" in nature.
- (d) In the case where the data collector is a personal/laptop computer used to drive surveying operations such as hydrographic surveys, it will be configured to operate as a stand alone system with no ability to connect to the USACE

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network unless otherwise approved by ACE-IT or through SAs. These systems shall allow the remote user full administrative privileges.

(2) ACE-IT is responsible for:

- (a) Coordinating with the Geospatial community and CECI to ensure that hardware meeting geospatial requirements is able to be acquired and used by the USACE Geospatial community as quickly as possible.
- (b) Ensuring the site IT Chief and relevant CECI representative receive hardware maintenance funding requests.
- (c) Putting maintenance contracts in place that are approved and for arranging with technicians for execution of maintenance as it is required.
- (d) Making available, and updating at least quarterly, a list of hardware items that it has tested and approved for use.
- (e) Coordinating with CECI addition of new hardware items and standards to the CECI maintained approved hardware list.

e. **Field Survey and Data Collection Activities.** Appropriate processes are needed to ensure that field collection devices are usable by the Geospatial community off-network in the field and that FOA data collection devices can be connected to the USACE network as quickly as possible after the devices have been off the network for extended periods of time and are returned from the field. A SOP shall be developed between the Geospatial community and ACE-IT to ensure that data collection devices are scanned by ACE-IT prior to being allowed on the network. The target goal for connection of these devices is established as within 3 business days from submission of an ESD ticket and a successful scan of the device.

f. **Contracting for Geospatial Deliverables.** Geospatial data and services, including engineering design and data development are normally distinct from the IT products and services used to support geospatial product delivery. Contracting and procurement for these services falls within the Science, Engineering, Operations, and Planning communities of practice (See EP 715-1-7, Procurement - Architect-Engineer Contracting).

g. **Routing and Resolution of Requests for Geospatial Support.** Provision of technical support to the Geospatial community is a shared interest of ACE-IT and (non-ACE-IT) site Geospatial Coordinators. Depending on the USACE district program focus a Geospatial Coordinator may be a GIS, CAD, BIM, or ProjectWise subject matter expert.

(1) The Geospatial community is responsible for:

- (a) Ensuring geospatial users open a ticket with the ACE-IT Enterprise Service Desk (ESD) for each new request for geospatial support.
- (b) Ensuring Site Geospatial Coordinators:
 - 1) Provide users of geospatial applications with training on the user configuration and use of application software.
 - 2) Prioritize local geospatial service requests to assure timely execution of geospatial mission requirements.

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- 3) Route specific local geospatial requests for which the local site Geospatial Coordinator is shown as responsible to the local Geospatial Coordinator for resolution. Where this has potential to impact ACE-IT SLA metrics, a separate Support Agreement should be established for such routing. See Appendix C.
- 4) Keep the site's ACE-IT lead tech abreast of local geospatial issues and service requirements.

(2) ACE-IT is responsible for:

- (a) Providing users with IT technical support needed to ensure functioning of required geospatial application hardware and software.
- (b) Ensuring the Lead site tech will keep the site Geospatial Coordinator abreast of local service issues in the geospatial program arena.
- (c) Ensuring the ESD copies all calls requesting geospatial support to the ACE-IT Application Support/Services Branch, and provision is made for a mechanism through which to notify the Geospatial Coordinator at the affected District.
- (d) Ensuring the Application Support/Services Branch monitors urgent or mission impacting ESD calls and their resolution through completion of these issues.

h. **External Access to USACE Geospatial Data and Systems.** USACE has a mission essential requirement to make certain geospatial data and systems accessible to state and local sponsors, other federal agencies, project partner/sponsors, and the public. The ACE-IT designed CorpsMap public face located at [\[https://corpsmap.usace.army.mil/\]](https://corpsmap.usace.army.mil/) will serve as the model architecture for providing external access to data and services in a secure environment. This security model can be implemented at the national level (like CorpsMap itself), or can be implemented by sites at the local or regional levels. Importantly, it is more efficient, secure, and cost-effective to centralize and implement such requirements at the Corps' processing centers.

(1) The Geospatial community is responsible for:

- (a) Coordinating with HQUSACE and Office of Council to determine what data should be public and what data should be restricted.
- (b) Determining the appropriate user identification and access control requirements for each user community and data set.
- (c) Managing access to geospatial data (i.e., serve as data managers for internal and external USACE geospatial datasets).
- (d) Ensuring Site Geospatial Coordinators include in the subject line the words "EMERGENCY OPERATIONS SUPPORT" on all critical ESD tickets during a presidentially declared disaster.

(2) ACE-IT is responsible for:

- (a) Ensuring that technology, where approved and funded by CECI or individual sites, is in place to enable secure access by approved users to geospatial systems.
- (b) Managing access to USACE systems and networks to support the geospatial mission requirements.

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- (c) Ensuring that when during an emergency event the ESD receives a critical request with the words "EMERGENCY OPERATIONS SUPPORT" in the subject, the ticket will be elevated to a response and resolution time established for these type events. (See Service Level Descriptions). Other SAs may also be established to request higher SLAs for such events.

Appendix B: Non Standard Support Agreements – Roles and Responsibilities.

Support Agreements (SAs) developed between ACE-IT and the Geospatial Community may stipulate service level agreements different than those given in the standard IM/IT Competitive Sourcing LOO. Such agreements may apply to specific geospatial servers or project at a site, for a specified project duration, and may specify higher or lower levels of ACE-IT support.

SAs must detail:

- a. Scope of Work
- b. Required Deliverables
- c. Period and Place of Performance
- d. Government-Furnished Resources
- e. Procedures for Administering and Modifying the SA
- f. Methods for Coordination and Communication
- g. Such other particulars as are necessary to describe clearly the obligations of the parties with respect to the requested goods and services
- h. Funding (if applicable)
- i. Points of Contact

1. Higher Support Levels – Requests for ACE-IT Service that Exceed the Existing LOO SLAs. Support agreements stipulating service levels in excess of the standard LOO SLAs will specify any variance with the Roles and Responsibilities given in Appendix B. This is essentially OSBL support, and may involve funding a dedicated, on-site ACE-IT geospatial specialist

2. Alternate Support Levels – Requests by the Geospatial Community to Self-Perform Some Geospatial Functions that Require Privilege Elevation on Geospatial Server Systems and Databases. Support agreements stipulating that the Geospatial Community self-perform some geospatial functions that require privilege elevation on geospatial server systems or databases will specify any variance with Roles and Responsibilities given in Appendix B. Support Agreements may also be needed where tickets are routinely routed to non-ACE-IT personnel (e.g., to a site Geospatial Coordinator) for resolution, impacting ACE-IT standard SLA metrics. General differences are given below, unless otherwise stipulated in specific Support Agreements.

The types of privileges on geospatial servers and databases that may be approved in Support Agreements for authorized Geospatial Community representatives include but are not limited to privileges enabling the user to:

- a. Install / Upgrade / Remove Approved Software, including Database Management System Software
- b. Create and Manage Local Service Accounts for approved geospatial application and database software, that have privileges to login locally, login as a service, and login as a batch job
- c. Create, Start, and Stop Local Services for geospatial applications
- d. Modify system configuration files
- e. Modify application and database configuration files
- f. Login to the System Remotely
- g. Restart and shut down the system from the console and remotely
- h. Establish and manage directory shares and share permissions
- i. Connect remotely to system file shares
- j. Restore files and directories

- k. Examine system log files, including security logs
- l. Establish local print queues
- m. Load and unload device drivers
- n. Leave remove jobs running after remote disconnection
- o. Manage publication of approved geospatial datasets and tools
- p. Perform Database schema creation and management
- q. Perform Database table space creation and management
- r. Perform Database performance tuning
- s. Perform Database specialized patching not due to IAVAs
- t. Perform Database application loading / development / programming
- u. Perform Automated real-time data download / loading / ingestion
- v. Provide Emergency response / off-hours access to local systems

3. Roles and Responsibilities of the Geospatial Community.

- a. Identify business requirements for access to CECI and ACE-IT and specify the nature, extent, and duration of needed access.
- b. Identify individuals needing privileged system access and provide information on the training and certification of such individuals.
- c. Maintain required CECI security, training and certification levels for individuals authorized by CECI for elevated privileged access. For approval of local district application server administrative access, this typically requires the individual to obtain and maintain an IT-II Security Clearance Level and IAT-I technical training and certification level, to sign a Privileged Use Agreement, and to have in place a signed Duty Appointment, and to maintain registration on the Army's Training and Certification Tracking System (ATCTS) site.
- d. Maintain the accreditability of the system.
- e. Maintain responsibility for identifying backup requirements
- f. Maintain responsibility for identifying and responding to server hardware and performance issues; however, ACE-IT will continue to identify the server on the list of district servers requiring hardware maintenance support agreements, and ACE-IT will continue to put into place hardware maintenance contracts and arrange with off-site technicians for execution of required hardware maintenance unless otherwise stipulated in SAs.
- g. Request and obtain a separate system account used for system administration.
- h. Request and obtain an administrative alternate smart card where available and where required.
- i. Fully coordinate proposed server and database changes with ACE-IT application and database administrators and with local ACE-IT SA leads in advance of their execution.
- j. Maintain full system access by ACE-IT system administrators, including ACE-IT application and database administrators.

4. Roles and Responsibilities of ACE-IT.

- a. Provide infrastructure support and services, including networking infrastructure and network configuration services.
- b. Provide enterprise Active Directory administration services, including joining and disconnecting geospatial servers from a USACE Active Directory domain.
- c. Retain an administrative account with full administrative rights to the server system, applications, and databases.

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- d. In conformance with DA regulations, maintain system monitoring for information assurance reporting.
- e. ACE-IT may install a backup agent and execute back-ups on the system; however, the Geospatial Community will maintain responsibility for identifying what needs to be backed-up.
- f. ACE-IT may install performance monitoring tools to automate discovery of potential hardware issues. If such tools are installed, the local ACE-IT system administrator will provide access to performance logs or notify the Geospatial Community of errors identified by these tools.
- g. Process requests for geospatial administrator system accounts in accordance with ACE-IT and CECI procedures.
- h. Coordinate proposed server and database activities with site geospatial managers in advance of system changes.
- i. Provide reach-back support to geospatial administrators for technical assistance in accordance with SAs. Reach-back support is defined as best-effort support by ACE-IT. The geospatial community would still be accountable and responsible for the security and configuration of the server and any applications/databases on it unless otherwise specified in an SA.
- j. Maintain responsibility for performing all required security patches for information assurance and coordinate timing for application of required security patches with the designated site geospatial coordinator.

Appendix C: Organizational Structure for Provision of USACE Geospatial Services.**1. Geospatial Background.**

d. The USACE Geospatial community is a diverse community working with all business lines to deliver geospatial technology that meets mission requirements. The Geospatial community is comprised of GIS, remote sensing, survey (hydrographic and topographic) mapping, CAD, BIM, and collaborative engineering professionals. The Geospatial community has been tasked to develop a unified and integrated geospatial program across the USACE EGIS program. Geospatial Coordinators at each District and Divisions are listed on the USACE CorpsMap web site at:

https://maps.crrel.usace.army.mil/apex/f?p=205:403:4380786419888199::pg_R_133833911326298502:NO&pg_min_row=1&pg_max_rows=30&pg_rows_fetched=2

a. Geospatial activities exist within the FOA and Laboratory system and they entail the spectrum from data acquisition, data management, data analyses, and implementation/use of all relevant technologies affiliated with GIS, remote sensing, and survey & mapping, CAD, BIM, and collaborative design.

b. The Geospatial community implements this broad EGIS initiative by developing geospatial standards, implementing standardized geospatial data across all business lines, creating and providing effective access to geospatial data sets and funding geospatial requirements within the USACE business processes.

c. The Geospatial community provides these geospatial products and services to USACE and the public via various mechanisms including in-house contractors, A-E contracts, cost share agreements, and inter-agency cooperation.

d. The EGIS program encompasses diverse roles that span data, software, and hardware realms. Many ERDC and FOA EGIS activities are tightly linked to workstation, middleware, server-side, and internet-based geospatial technology deployments.

e. There are several Centers of Expertise that serve the Geospatial community.

a. The Survey Engineering and Mapping Center at the Army Geospatial Center (AGC) maintains critical and current expertise in surveying, mapping, and geospatial database management for the benefit of all business practices in USACE. Center engineers and scientists are engaged in development, evaluation and application of new technology in geospatial data collection, processing, and exploitation; enabling higher accuracy, less time and cost, better consistency and compatibility of products, and increased applicability and benefit to products and processes using geospatial data. Center projects and activities include the following areas: GPS for surveying; Engineering surveys; large structure deformation monitoring; hydrographic surveying; LIDAR and IFQAR mapping; GIS data collection; electronic charting for navigation; National Inventory of Dams; terrain analysis; geodetic vertical and water level datums.

b. Remote Sensing/GIS Center. The Remote Sensing/GIS Center at ERDC CRREL is the U.S. Army Corps of Engineers Center of Expertise for Civil Works Remote Sensing and GIS. They provide assistance to Field Operating Agencies (FOAs) to maximize the benefits from new and emerging remote sensing and GIS technologies. These developing technologies are used

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to measure and monitor environmental conditions over land and water surfaces. In addition to Civil Works activities, the RS/GIS Center supports USACE military missions.

c. Photogrammetric Mapping Center. Since 1993 USACE-HQ has recognized and appointed CEMVS as a Center of Expertise (CX) for Photogrammetric Mapping in the USACE Directory of Expertise. The mission of the CX is to provide rapid response, full service photogrammetric mapping support, and maintain technical capability and proficiency in all aspects of photogrammetry including:

- Project Planning and Specification
- A-E Contracting (CONUS and OCONUS)
- Project cost estimating
- Image acquisition
- b) Photogrammetric map compilation
- c) LIDAR data collection and exploitation
- d) Photo Interpretation
- e) GIS development

(4) The Joint Airborne LIDAR Bathymetry Technical Center of Expertise (JALBTCX) mission is to perform operations, research, and development in airborne LIDAR bathymetry and complementary technologies to support the coastal mapping and charting requirements of the US Army Corps of Engineers (USACE), the US Naval Meteorology and Oceanography Command, and the National Oceanic and Atmospheric Administration (NOAA). JALBTCX staff includes engineers, scientists, hydrographers, and technicians from the USACE Mobile District, the Naval Oceanographic Office (NAVOCEANO), the USACE Engineer Research and Development Center (ERDC), and NOAA National Geodetic Survey.

(5) The Army Geospatial Center (AGC) mission continues ERDC TEC's legacy of providing geospatial support and products to warfighters, but has expanded its mission to support the Army's Battle Command Systems, facilitating dissemination of relevant geospatial information to every level across the dynamic battlefield environment. Additionally, the center will coordinate, integrate, and synchronize geospatial information requirements and standards across the Army, as well as develop and field geospatial enterprise-enabled systems and capabilities to the Army and Department of Defense. The AGC is designated as the Army Knowledge Center for Geospatial Expertise, and serves as a key enabler of the Army Geospatial Enterprise - an integrated system of technologies and processes that delivers a geospatial Common Operational Picture to the Warfighter.

(6) The CAD/BIM Technology Center for facilities, infrastructure and environment offers a full range of technical and professional services for geospatial technologies including computer-aided Design (CAD), building information modeling (BIM), geographic information systems (GIS), and computer-aided facility management (CAFM) systems. The Center also provides centralized procurement vehicles for products and services to agencies and users of these systems.

2. CECI and ACE-IT Background.

(a) CECI's vision statement states that "the vision for Corporate Information is to migrate from a highly decentralized Information Management / Information Technology (IM/IT) service model to a regional-enterprise model. Oversight and management of many "basic" IM/IT services will be at the Regional Business Center and enterprise level, providing services down to the District."

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(b) ACE-IT's mission statement notes that "ACE-IT is the provider of Information Management / Information Technology (IM/IT) support for USACE. The ACE-IT mission is to provide transformed enterprise-wide IM/IT services for all information management functional areas to include Automation, Communication, Information Assurance, Records Management, Printing & Publications and Visual Information. These services include local support activities, as well as enterprise services such as centralized AIS hosting, long-haul communications, e-mail support, service desk and information assurance services. ACE-IT will provide these IM/IT services to all USACE CONUS offices. Additionally, ACE-IT will provide IM/IT services such as centralized AIS hosting, long-haul communications, enterprise e-mail support, enterprise service desk and enterprise information assurance services to all USACE OCONUS offices."

(c) Per ACE-IT's technically accepted proposal, "Our Enterprise CADD, GIS, and Water Management (WM) User Support Team will maintain a close working relationship with engineers and water management throughout the Corps in order to fully understand their needs and challenges and to ensure that the infrastructure and support provided fully meets those needs in an efficient and effective manner. This dedicated team of functional experts will perform the following specific support functions: develop specific hardware configurations to optimize CADD, GIS, and WM systems and servers; coordinate enterprise-wide software acquisitions for all scientific and engineering software purchases, bundling previously separate purchases to obtain the most economical volume license terms. By serving as liaison between ACE-IT Systems Administration Team and the end users of CADD, GIS, and WM servers, we will ensure that required changes are made without interfering with critical ongoing operations. Coordination of software patching and version upgrades for CADD, GIS, and WM software will ensure interoperability Corps-wide. Finally, they will provide second-tier user support for all enterprise CADD, GIS, and WM applications and systems and provide the interface with hardware and software vendors providing third-tier support."

APPENDIX K

Metadata

K-1. Introduction. It is the intent of this document to describe a solution for meeting geospatial metadata requirements. This appendix will describe for USACE employees:

- a. The value of metadata.
- b. Metadata services and architecture.

K-2. The Value of Metadata.

a. Geospatial metadata are information about geospatial data (any data that have geographic coordinates). U.S. Federal Executive Order No. 12906 Sec. (b), dated April 11, 1994, requires all Federal agencies to document geospatial data using standard documentation and to make that documentation accessible to the National Geospatial Clearinghouse.

Federal Executive Order No. 12906 Sec. (b)

Standardized Documentation of Data. Beginning 9 months from the date of this order, each agency shall document all new geospatial data it collects or produces, either directly or indirectly, using the standard under development by the FGDC, and make that standardized documentation electronically accessible to the Clearinghouse network. Within 1 year of the date of this order, agencies shall adopt a schedule, developed in consultation with the FGDC, for documenting, to the extent practicable, geospatial data previously collected or produced, either directly or indirectly, and making that data documentation electronically accessible to the Clearinghouse network.

b. Documentation and publication of metadata using standards and services adds tremendous value to spatial data assets. Data collection and data creation activities are costly but necessary for thorough engineering and scientific investigation. However, without documentation of the who, what, when, where, why, and how of these activities, and the ability to discover these data based on these same attributes, these data not only lose their value but begin to add additional expense to current and future projects. When geospatial metadata are documented and published to a metadata service, these data are discoverable by any and all users, reducing or eliminating costs associated with data discovery, data duplication, data misuse, or undiscovered data.

K-3. Metadata Services and Architecture.

a. Data and services must be documented and discoverable at the desktop where data are created and used in spatial data applications to maximize the efficiency of the geospatial workforce. The capability to discover existing spatial data and/or services, review their usefulness, and easily add them directly to mapping applications is the desired goal of each

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USACE District. Further, it is the intent of USACE for these capabilities to exist throughout the organization, including field offices, Districts, labs, Divisions, and Headquarters as an enterprise-wide solution.

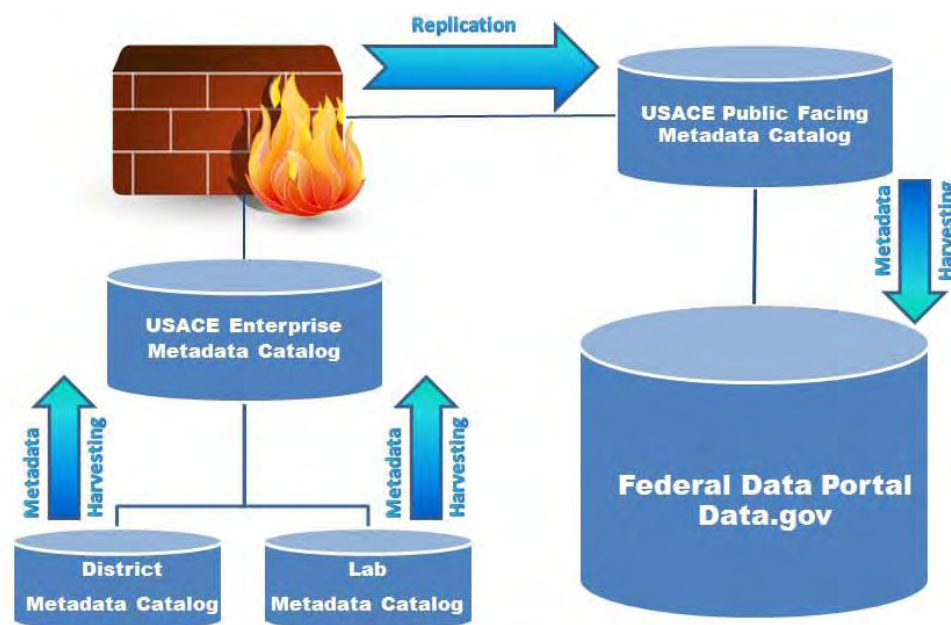


Figure K-1. The flow of metadata from the Districts and labs maintaining metadata locally to the USACE Enterprise Metadata Catalog and then outside the USACE firewall to the public and also discoverable at the Federal Data Portal, Data.gov.

b. To implement the model in Figure K-1, HQUSACE has established an enterprise-wide application that can harvest or consume metadata services and metadata files maintained by the Districts and labs. At the enterprise level, USACE is deploying a geospatial metadata service solution based on Geonetwork on the USACE Intranet. The USACE GeoNetwork can be configured to access metadata services maintained by the Districts and labs and then make them available through Data.gov.

c. At the local level, Districts and labs will establish a local solution for creating, validating, and publishing metadata, along with workflows to support those functions. Districts and labs can leverage Commercial Off-The-Shelf (COTS) software, ArcGIS Server Geoportal Extension through the existing ELA with ESRI, or other software such as the open source software GeoNetwork. If a District or lab does not have the ability to maintain a metadata portal, it may request access to the Enterprise GeoNetwork to publish its metadata files.

d. The local metadata management tool will need to be configured for metadata harvesting by the USACE Enterprise GeoNetwork. This configuration allows for local data and metadata management with an agency-wide capability with minimal impact to local workflow. The USACE GeoNetwork will be replicated outside the USACE firewall, creating a USACE node on the Internet where the metadata are accessible to the public. In addition to providing a metadata service to the public, the USACE GeoNetwork will be configured for metadata harvesting by

Data.gov, meeting the requirements of Executive Order 12906. If a District or lab does not have the capability to publish metadata to a web service where they will be consumable by the USACE Enterprise GeoNetwork, it can request access to GeoNetwork to upload its metadata files to its District or lab workspace.

e. The local metadata services will require administration by local GIS staff to ensure that appropriate content and data integrity are maintained. For Districts or labs that chose to use the the ArcGIS Server Geoportal, the required software and support for deployment are available through the existing USACE ESRI Enterprise License Agreement. If other metadata management software solutions are chosen, the local GIS staff will administer its web services through that tool. Metadata will be created and maintained locally where the related data are created and maintained. Each metadata record will be populated with appropriate content and a live link to the data or service utilizing Fully Qualifying Domain Names (FQDN). Including live links to data and services will allow ArcGIS users inside the USACE firewall to add data directly to their current map document. For security purposes, FQDN (rather than IP addresses) should be used in metadata. It is recognized that when metadata are shared outside of the USACE community, there is a definite possibility that the live link will be broken.

f. The USACE Enterprise GeoNetwork will be the central repository for all USACE metadata. The metadata holdings of this repository will primarily consist of metadata records harvested from the local metadata management instances at the Districts and labs or metadata records from Districts directly loaded into the USACE Enterprise GeoNetwork. The USACE Enterprise GeoNetwork Metadata Catalog will allow for search and discovery of geospatial data available throughout USACE.

APPENDIX L

Sample Memorandum of Agreement for Interagency Cooperation

and

Sample Disclaimer Statement / Digital Data Limitation of Use Statement

The following sample document provides a basis for a Memorandum of Agreement with external organizations for EGIS. Users are advised to revise this document to meet their needs and to coordinate any interagency agreements with their respective Offices of Counsel.

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MEMORANDUM OF AGREEMENT
BETWEEN THE
<<PARTNER>>
AND THE
U.S. ARMY CORPS OF ENGINEERS, <<DISTRICT>>

PURPOSE AND AUTHORITY

This Memorandum of Agreement (MOA) is entered into by and between the <<PARTNER>> and the U.S. Army Corps of Engineers, <<DISTRICT>> (<CExxx>>) for the purpose of establishing respective responsibilities of the parties for delivering and/or sharing Geographic Information System (GIS) data, services and other such related work as may be agreed upon in the future. Implementation of requested services will be accomplished through the <<DISTRICT>> GIS Coordinator. This MOA is entered into pursuant to the Economy in Government Act, 31 U.S.C. 1535; 10 U.S.C. 3036(d) and the Intergovernmental Cooperation Act (31 U.S.C. 6505)

INTERAGENCY COMMUNICATIONS

To provide for consistent and effective communication, the <<PARTNER>> and <<DISTRICT>> shall each appoint field representatives to discuss and consider activities that may be pursued under this MOA.

The <<PARTNER>> and <<DISTRICT>> field representatives shall coordinate all requests for assistance under this MOA and shall serve as points of contact between the <<PARTNER>> and the <<DISTRICT>> on matters relating to this MOA.

The <<PARTNER>> and <<DISTRICT>> field representatives shall prepare agreed upon individual support agreements (ISAs) pertaining to data and application development and/or data management. The ISAs shall describe in detail the scope of the services to be provided, schedules, necessary funding arrangements, individual project managers, and such other particulars as are necessary to describe clearly the obligations of the parties with respect to the requested services. The authorized representative of each party shall agree to the ISA prior to the initiation of services by the <<DISTRICT>>. The <<DISTRICT>> will have exclusive direct communication authority with its contractors.

The GIS data sharing requests shall be communicated directly between the GIS coordinators of the respective organizations. The GIS coordinators will then be responsible for monitoring work accomplishment through normal workflow channels.

PROVISION OF ASSISTANCE

Nothing in this MOA can be or should be construed to require the <<PARTNER>> to use the services of <<DISTRICT>>, or require the <<DISTRICT>> to accept assignments from the <<PARTNER>>.

FUNDING

The <<PARTNER>> will provide funding resources for all costs associated with <<DISTRICT>>'s provision of assistance excluding data sharing. Major funding transfers, of \$250,000 or more, will be accomplished by using SF 1151, Nonexpenditure Transfer Authorization. The SF 1151 will be prepared and forwarded to CDR HQUSACE (CERM-FC) Washington, D.C. 20314-1000 for allotment. For individual taskings less than \$250,000 in total or less than \$50,000 in contracts, funding will be provided by reimbursable order with monthly billings to be made by SF 1080, Voucher for Transfer Between Appropriations. The reimbursable order (ISA) will specify the funding limitations and the applicable appropriation.

Direct costs are the costs that can be directly identified with and charged to the work under the ISA. Examples of such costs are salaries, wages, technical services, materials, travel and transportation (including permanent change of station costs), communications, and any facilities and equipment expressly approved for purchase under the ISA. In addition, any extraordinary costs such as hiring of outside experts and consultants (including legal support) to analyze claims and/or to testify before a board or court and costs directly identified for termination of the agreement are considered direct costs under this agreement.

Indirect costs are the overhead (including general and administrative and departmental) costs that cannot be directly identified to the work under the provision of assistance and are distributed/charged based on a predetermined rate against direct labor. Examples of such costs are salaries, equipment, materials, etc., of administrative support offices.

Expenditure limits established in the ISA will not be exceeded without prior approval from the <<PARTNER>>. If the actual cost to the <<DISTRICT>> is forecast to exceed the amount of funds available, the <<DISTRICT>> shall promptly notify the <<PARTNER>> of the amount of additional funding necessary to pay for the assistance. The <<PARTNER>> shall either provide the additional funds to the <<DISTRICT>>, or require that the scope of the assistance be limited to that which can be financed by the available funds, or direct termination of the project. Upon furnishing the assistance contemplated by the ISA, the <<DISTRICT>> shall conduct a final accounting within 100 days of project completion to determine the actual costs of the assistance provided.

APPLICABLE LAWS

The <<DISTRICT>> shall furnish all assistance under this MOA in accordance with applicable U.S. laws and regulations, and any applicable U.S. executive agreements. Unless otherwise required by law, all contract work undertaken by the <<DISTRICT>> shall be performed in accordance with the <<DISTRICT>> procurement and claims policies and procedures.

RECORDS AND REPORTS

The <<DISTRICT>> shall utilize established accounting systems to establish and maintain records and receipts of the expenditure of all funds provided by the <<PARTNER>>. Records shall be maintained in sufficient detail to permit identification of the nature of expenditures made by the <<DISTRICT>> and shall be made available for inspection by the <<PARTNER>> upon request.

The <<DISTRICT>> shall provide the <<PARTNER>> with project progress, financial, and related status reports on tasks agreed upon in the ISAs, including providing financial reports on all funds received, obligated, and expended. Frequency of reports will be agreed upon in subsequent ISAs.

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CLAIMS AND DISPUTES

All claims submitted by contractors arising under or relating to contracts awarded by the <<DISTRICT>> shall be resolved in accordance with United States law and the terms of the individual contract. The <<DISTRICT>> has dispute resolution authority for these claims. Any Contracting Officer's final decision pursuant to such a claim may be appealed by the contractor pursuant to the Contract Disputes Act of 1978 (41 U.S.C. 601-613). The Corps of Engineers Board of Contract Appeals (ENG BCA) is designated as the appropriate board of contract appeals. In lieu of appealing to the ENG BCA, the contractor may bring an action directly to the United States Claims Court. The <<DISTRICT>> shall be responsible for litigating all such appeals. The <<DISTRICT>> shall consult with the <<PARTNER>> regarding any settlement negotiations.

The <<DISTRICT>> shall notify the <<PARTNER>> of meritorious claims or appeals and shall submit requests to the <<PARTNER>> for funds to cover such claims or appeals. The <<PARTNER>> shall promptly provide such funds as are necessary to pay the costs of meritorious claims or appeals.

PUBLIC INFORMATION

Justification and explanation of the <<PARTNER>> programs shall be the responsibility of the <<PARTNER>>. The <<DISTRICT>> will make public announcements and respond to all inquiries relating to the ordinary procurement and contract award and administration process.

EFFECTIVE DATE AMENDMENT AND TERMINATION

The MOA is effective upon the date of the last signature by the parties. This MOA may be modified or amended only by written agreement.

Either the <<PARTNER>> or the <<DISTRICT>> may terminate this MOA by providing sixty calendar days written notice. In the event of termination, the <<PARTNER>> and the <<DISTRICT>> shall consult with each other concerning all claims for termination costs; however, the <<PARTNER>> shall continue to be responsible for all costs incurred by the United States under this MOA, or under the ISAs, and for the costs of closing out or transferring any ongoing contracts.

U.S. Army Corps of Engineers <<DISTRICT>> <<PARTNER>>

By: _____

By: _____

Name (PRINT): _____

Name (PRINT): _____

Title: _____

Title: _____

Date: _____

Date: _____

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The GIS Coordinators as of June 16, 1998 are:

<<NAME>>

<<TITLE>>

U.S. Army Corps of Engineers <<DISTRICT>> <<ORG>>

<<ADDRESS>> <<CITY>>, <<STATE>> <<ZIP>>

Phone: xxx.xxx.xxxx

Fax: xxx.xxx.xxxx

Email: xxxxx.xxxx@usace.army.mil

<http://xxx.xxx.usace.army.mil>

<<NAME>>

<<PARTNER ORGANIZATION>>

<<AGENCY>>

<<ADDRESS>> <<CITY>>, <<STATE>> <<ZIP>>

Phone: xxx.xxx.xxxx

Fax: xxx.xxx.xxxx

Email: xxx.xxxxx@domain.name

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**Jackson County
North Carolina**



Disclaimer Statement / Digital Data Limitation of Use Statement

Disclaimer

This digital data is produced and prepared for Jackson County, North Carolina. The data is compiled from recorded documents such as; deeds, plats, surveys, and other public documentation. This data is produced for inventory of real property and other administrative functions within the County. Users of this data should consult all before mentioned source documents for content verification. Jackson County or any County representative assumes no legal responsibility for the contents of this data.

Disclaimer of Damages:

In no event will Jackson County be liable for any special, consequential, indirect, or similar damages including any lost profits or lost data arising out of the use of data supplied by The County.

Data Limitations

Under no circumstance is this data to be offered for resale. The data distributed is intended for private and personal use only.

Company or Corporation Name: _____

Representative's Name: _____

Representative's Title: _____

Mailing Address: _____

Phone Number: _____

Email Address: _____

I have read and fully understand the information contained within this statement. I agree to fully comply with the terms and agreements listed herein.

Signature

Date

APPENDIX M

Sample Scope of Work for Cultural Resources GIS

**Scope of Work
For
Cultural Resources GIS
John H. Kerr Reservoir
23 June 2010**

1. General. The work shall consist of creating two feature classes, cultural_survey_area and terrest_archeological_site, from existing cultural resource data within the managed lands of John H. Kerr Reservoir. The managed lands for John H. Kerr Reservoir extend into multiple counties of both North Carolina and Virginia. The required feature classes shall be delivered in a Spatial Data Standards for Facilities Infrastructure and Environment (SDSFIE) compliant File Geodatabase.
2. File Geodatabase. A sample SDSFIE Compliant File Geodatabase (FGDB) will be provided by the Government. The sample FGDB will contain the required feature classes, tables, coordinate system, and geographic extents.
 - 2.1. Feature Classes. The Contractor shall populate the required feature classes with the appropriate geometry and attributes. Detailed definitions of the required feature classes and required attributes can be found at www.sdsfie.org.
 - 2.1.1. cultural_survey_area. The Contractor shall compile existing polygon feature class of surveyed areas with a newly created polygon feature class of additional surveyed areas not previously captured geographically. The existing polygon feature class of surveyed areas shall be provided by the Government. The Contractor shall create new polygons of additional surveyed areas from existing cultural resource survey reports provided by the Government. The Contractor shall scan each cultural resource survey report into individual Portable Document Files (PDFs) with filenames that match the report title. The Contractor shall populate the following required attributes with the appropriate data.

Attribute Name	Data Type	Constraint
Investgtor	Text (30)	<i>none</i>
Name of the investigator for this survey area.		
area_size	Double	<i>none</i>
The size of the area, zone, or polygon in square units.		
area_u_d	Text (16)	List: <u>d uomare</u>
The unit of measure for area.		
Perim	Double	<i>none</i>
The distance around the boundary of the area, zone, or subject item in linear units.		

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perim_u_d	Text (16)	List: <u>d_uomdis</u>
The unit of measure for length		
rep_date	Long	<i>none</i>
Date of final report. Format for date is YYYYMMDD (i.e., September 15, 1994 = 19940915).		
rep_name	Text (240)	<i>none</i>
Report name (truncate, do not abbreviate).		

2.1.2. terrest_archeological_site. The Contractor shall create a new point feature class from existing archeological site data from both the State of North Carolina and the State of Virginia.

2.1.2.1. North Carolina. The North Carolina State Historic Preservation Office (NCSHPO), located in Raleigh, NC, maintains analog records of all state registered cultural resource sites. Each site is plotted on USGS Quad Sheets with site specific data recorded on State Site Forms. The State Site Forms contain the information required to populate the required attributes below as well as the UTM Coordinates of the site point. The Contractor shall identify all sites that fall within the managed lands of John H. Kerr Reservoir, scan each corresponding State Site Form, create the required point geometry, and populate the required attributes below. The scanned State Site Forms shall be saved as individual Portable Document Files (PDFs) with filenames that match the State Site Identification Number located on the form.

2.1.2.2. Virginia. The Virginia State Historic Preservation Office (VASHPO), located in Richmond, VA, maintains Geographic Information System (GIS) records of all state registered cultural resource sites. It is important to note that the Virginia State schema may not match the required SDSFIE schema for this feature class. The Contractor shall identify all sites that fall within the managed lands of John H. Kerr Reservoir and translate the Virginia data into the required SDSFIE schema.

Attribute Name	Data Type	Constraint
----------------	-----------	------------

[PK] site_id	Text (20)	<i>none</i>
Primary Key. A unique, user defined identifier for each record or instance of an entity. (State ID)		
date_estab	Long	<i>none</i>
The date the site was recorded. Format for date is YYYYMMDD (i.e., September 15, 1994 = 19940915).		
affil_d	Text (16)	List: <u>d_dculpd</u>
Discriminator. The cultural prehistoric or historic period with which the artifact is affiliated.		

disturb_d	Text (16)	List: <u>d_culdis</u>
The level of disturbance of the site.		
Elevation	Double	<i>none</i>
The elevation above mean sea level at the cultural resource site.		
elev_u_d	Text (16)	List: <u>d_uomdis</u>
nreg_stt_d	Text (16)	List: <u>d_regstt</u>
Status of placement of site on the National Register of Historic Places.		
function_d	Text (16)	List: <u>d_arcfun</u>
The determined function of the site.		
area_size	Double	<i>none</i>
The size of the area, zone, or polygon in square units.		
area_u_d	Text (16)	List: <u>d_uomare</u>
The unit of measure for area.		

3. Required Deliverables. The Contractor is required to deliver a SDSFIE 2.6 compliant FGDB, Scanned State Site Forms, Metadata Records, Bi-Weekly Status Reports, and a Final Written Project Report. All data shall be delivered on a new non-returnable Western Digital 1-TB Passport USB 2.0 Hard Drive.
 - 3.1. SDSFIE 2.6 Compliant FGDB. The Contractor shall deliver the required File Geodatabase with required feature classes, geometry, and populated attributes as described in 2.0 thru 2.1.2.2.
 - 3.2. Scanned Cultural Resource Survey Reports. The Contractor shall deliver all State Site Forms described in 2.1.1 as individual PDFs with filenames matching the report title.
 - 3.3. Scanned State Site Forms. The Contractor shall deliver all State Site Forms described in 2.1.2.1 as individual PDFs with filenames matching the State Site Identification Number located on the State Site Form.
 - 3.4. Scanned Site Evaluation Reports. The Contractor shall deliver all Site Evaluation/Investigation Reports as individual PDFs with filenames matching the corresponding State Site Identification Number included in the report.
 - 3.5. Metadata Record. An FGDC compliant metadata record is required for each feature class and shall be created using ESRI ArcGIS ArcCatalog and compatible with version 9.3 Service Pack 1. Appropriate information shall be entered in all required fields.

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- 3.6. Bi-Weekly Status Report. **The Contractor is required to submit a Bi-Weekly Status Report beginning on the Task Order Award Date, until all deliverables are received and accepted by the Government.** The Bi-Weekly Status Report shall be delivered via e-mail no later than 8:00 AM every other Monday and shall document the Contractor's progress from the previous Monday through the previous Sunday. The status report shall itemize each scope item with percent of work complete and an estimated date of completion. The report shall also include the number and type of employees working, a description of any problems and/or delays encountered, and/or any pertinent data observations made during data compilation activities.
- 3.7. Final Written Survey Report. A written report summarizing all data compilation activities shall be submitted as a Portable Document File (PDF) and in a bound hardcopy. The following items shall be included in the survey report:
- Written description of workflow to complete task order (start to finish) including flowchart diagram and detailed description of QA/QC process
 - Dates and times of each data compilation activity
 - Metadata Records as described in 3.5 above
 - Description of any significant features or data compilation techniques used
4. Quality Control. Data for each profile line shall be quality-control checked for the following concerns:
- No duplicate records
 - Required Feature Classes
 - Required Coordinate System
 - Required Geographic Extent
 - Population of all required attributes
 - Proper point/site location
 - Proper filenames for all scanned documents
5. Technical POC. All technical questions concerning GIS work under this task order shall be directed to Jim Jacaruso at (910) 251-4064. All technical questions concerning Archeological work under this task order shall be directed to John Mayer at (910) 251-4696.
6. Schedule of Work. All deliverables shall be complete and delivered not later than 31 January 2011.
7. Deliver To. All work shall be delivered to:

U. S. Army Corps of Engineers
Wilmington District
Attn: Jim Jacaruso, TS-EE
69 Darlington Avenue
PO Box 1890
Wilmington, NC 28402-1890

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IGE Summary Sheet

Apply AE rates as
negotiated in the contractHours as calculated
from IGE WorksheetMultiply AE hours by rates
to determine Cost per item

John H. Kerr Cultural Resources GIS
 IGE: <<preparer>>, <<DD-MMM-YYYY>>
 Using AE's 1st Year Rates

Item No.	Description	Unit	1st year	Hours	Cost
1	Project Manager	Hr.		40	\$0.00
2	Supervisory PLS (Office)	Hr.			\$0.00
3	Professional Engineer	Hr.			\$0.00
4	Engineering Technician	Hr.			\$0.00
5	Surveying Technician	Hr.			\$0.00
6	CADD Technician	Hr.			\$0.00
7	GIS Specialist Senior	Hr.		461.5	\$0.00
8	GIS Specialist	Hr.		413.5	\$0.00
9	GIS Technician	Hr.			\$0.00
10	Word Processor	Hr.			\$0.00
11	Supervisory Survey Tech (Party Chief)	Hr.			\$0.00
12	Survey Tech (Instrument Person)	Hr.			\$0.00
13	Survey Aid (Rod Person)	Hr.			\$0.00
14	Survey Party, Class II (Items 11 & 12)	Hr.			\$0.00
15	Survey Party, Class III (Items 11, 12, & 13)	Hr.			\$0.00
16	Survey Party, Class IV (Items 11, 12, 13, 13)	Hr.			\$0.00
17	GPS Survey Party, Class I	Hr.			\$0.00
18	GPS Survey Party, Class II	Hr.			\$0.00
19	GPS Survey Party, Class III	Hr.			\$0.00
20	ATV, 1-Person Crew, RTK GPS	Hr.			\$0.00
21	ATV, 2-Person Crew, RTK GPS Profiles	Hr.			\$0.00
22	Certified Hydrographic Surveyor	Hr.			\$0.00
23	Hydrographic Survey Technician	Hr.			\$0.00
24	Boat, 16 to 19 feet	Day			\$0.00
	Hydro Crew/Vessel 18'-20' Includes Vessel, 2-Person Crew, RTK GPS Capability and all Hydro equipment necessary software and hardware to meet USACE Hydrographic Survey Specifications	Hr.			\$0.00
25					
	Hydro Crew/Vessel 20-23' Includes Vessel, 2-Person Crew, RTK GPS Capability and all Hydro equipment necessary (software and hardware) to meet USACE Hydrographic Survey Specifications	Hr.			\$0.00
26					
	Hydro Crew/Vessel 24' and Greater Includes Vessel, 2-Person Crew, RTK GPS Capability and all Hydro equipment necessary (software and hardware) to meet USACE Hydrographic Survey Specifications	Hr.			\$0.00
27					
	Hydro Crew/Vessel - Small Beach/Surf Includes Vessel, 2-Person Crew, RTK GPS Capability and all Hydro equipment necessary (software and hardware) to meet USACE Hydrographic Survey Specifications	Hr.			\$0.00
28					
29	Multi-beam Sounding System	Hr.			\$0.00
30	Sidescan Sonar System	Hr.			\$0.00
31	Marker, Concrete Type 1a	Each			\$0.00
32	Marker, Concrete Type 1b	Each			\$0.00
33	Marker, Type 2	Each			\$0.00
34	Marker, Type 3	Each			\$0.00
35	Aluminum Monument Magnetic/Standard Size 30"	Each			\$0.00
36	Mileage (Sedan)	Mile		300	\$0.00
37	Mileage (Truck)	Mile			\$0.00
38	Mileage (Truck towing boat)	Mile			\$0.00
39	Travel IAW JTR (per person per day)	Day		8	\$0.00
	Profit on Labor and Equipment Rental Only 10%				\$0.00
	Total				\$0.00

Prepared By: _____
 Printed Name/Title

Approved By: _____
 Printed Name/Title

Date Prepared: _____

Date Approved: _____

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IGE Worksheet

Identify disciplines and staff requirements

Estimate hours for each discipline

John Kerr Cultural Resource GIS
Independent Government Estimate

	Hrs	No. People	GIS Senior	GIS Special	PM
Compile Existing Site Data from NC State Office					
Determine Data Extents	8	2	8	8	
Travel To/From Raleigh	6	2	6	6	
Examine Quads and Identify Site Numbers	8	2	8	8	
Scan Site Forms of all Identified Sites	16	2	16	16	
Create SDSFIE Point FC from Site Form Location Info	125	1	62.5	62.5	
Populate FC with Site Form Attributes	250	1	125	125	
Compile Existing Site Data from VGIN					
Request Data from VGIN	24	1	24	0	
Transform Data to SDSFIE Feature Class	24	1	24	0	
Compile Existing Surveyed Areas Data NC/VA					
Compile Existing Shapefiles from USACE into SDSFIE FC	24	1	24	0	
Create New Polygons from Reports provided by USACE	80	2	80	80	
Verify Existing/New/Quad Markings	40	2	40	40	
Deliverables					
Site FC with Metadata	16	1	4	12	
Surveyed Area FC with Metadata	16	1	4	12	
Scanned Site Forms NC	16	1	4	12	
Project Report	24	1	0	0	24
Coordination					
Review Reports with SAW	16	2	16	16	
Review Deliverables with SAW	16	2	16	16	16
	709		461.5	413.5	40

Determine these tasks from the Statement of Work

Summation of hours will populate the Hours column in the IGE Summary Sheet

APPENDIX N

Army Geospatial Imagery Office

N-1. Introduction.

a. The Army Geospatial Center (AGC) is the U.S. Army's Geospatial Information and Services focal point. AGC operates the Army Geospatial Imagery Office (AIO), which is responsible for Army-wide monitoring of commercial satellite imagery acquisition. The AIO conducts the research, acquisition, archiving, and dissemination of current and historical imagery, Advanced Geospatial Intelligence (AGI) data (for example, IFSAR or LiDAR), and related products for the Army warfighter and Corps of Engineers Districts and Divisions engaged in both military and civil works projects.

b. Responsibilities include researching available archives [both government and commercial data providers (CDPs)], placing orders for archived and/or new collections, tracking acquisitions, and distributing data to the customer. AIO also ensures that data acquired from government repositories and CDPs are stored in the AGC Imagery Library accessible on-line for Army customers. All high-resolution imagery acquired from the National Geospatial-Intelligence Agency (NGA) or the CDPs will be licensed "NextView" or "DoD/Title 50" to ensure that the data can be shared widely among all U.S. Federal government agencies.

c. The Title 50 Intelligence Community is listed below:

- (1) Office of the Director of Central Intelligence.
- (2) Central Intelligence Agency.
- (3) National Security Agency.
- (4) Defense Intelligence Agency.
- (5) National Geospatial-Intelligence Agency.
- (6) National Reconnaissance Office.
- (7) Other offices within the DoD responsible for the collection of specialized national intelligence through reconnaissance programs.
- (8) Intelligence elements of the U.S. Armed Services.
- (9) Federal Bureau of Investigation.
- (10) Department of Treasury.

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(11) Department of Energy.

(12) Bureau of Intelligence and Research of the Department of State.

(13) Such elements of any other department or agency as may be designated by the President, or designated jointly by the Director of Central Intelligence and the head of the department or agency concerned, as an element of the intelligence community.

N-2. Development of AGC's Imagery Office (AIO).

a. To help Army agencies and organizations avoid duplicating commercial imagery purchases or duplicating commercial imagery new collection taskings submitted to the NGA, the Office of the Assistant Chief of Engineers designated AGC (then TEC) in 1990 to act as the U.S. Army Commercial Imagery Acquisition Program Manager. To accomplish this task, the AIO was initiated with the added focus on educating the soldier on the uses, types, and availability of commercial satellite imagery. As Army use of this imagery increased and as the number of satellites increased, the AIO has grown to keep up with the demand. Currently, AIO provides thousands of dollars of imagery support to its customers and is an unofficial partner, with regard to commercial imagery requirements, with the NGA and the Army Imagery Requirements Office (AIRO).

b. AIO is the designated repository of selected commercial satellite imagery data pertaining to terrain analysis and water resources operations worldwide. These data support worldwide military applications and operations. AIO executes the Commercial Imagery Program for the AGC and the Army. The current revision of Army Regulation 115-11, *Geospatial Information and Services*, strengthens the role of AIO as the point of contact for acquisition of commercial satellite imagery in the Army.

N-3. How to Order Commercial Satellite Imagery.

a. USACE Commands are required to first coordinate with AIO before purchasing satellite imagery from a commercial vendor. USACE organizations with requirements for commercial satellite imagery must forward requests to AIO for research, acquisition, and dissemination of the data. The requests can be submitted as follows:

dll-agc-aio@usace.army.mil

Telephone: 703-428-6909

Fax: 703-428-7493

Online Request Form: <https://cac.agc.army.mil/Products/AGCImagery/inforequest.cfm>

b. Each request should include the following information:

(1) A shape file depicting the geographic area of interest. An Upper Left and Lower Right in coordinates (e.g., 27 00 00N 087 00 00W), degrees/minutes/seconds, decimal degrees, or MGRS is acceptable.

- (2) Acceptable date range for data coverage (e.g., 5 January 2010 to 3 March 2010).
- (3) Cloud cover and quality restrictions (e.g., less than 10 percent cloud cover, no haze, 10 degrees off nadir).
- (4) Satellite system/sensor or desired/required spatial resolution (e.g., 1 m or better). For basic satellite information, access http://www.agc.army.mil/tio/TIO_Resources.htm.
- (5) Desired media and delivery method (Fed Ex, Regular Mail, or FTP; DVD, external drive).
- (6) Point of contact, organization, mailing and electronic address, and telephone number.

N-4. Commercial Imagery Applications.

- a. Commercial imagery provides a backdrop for Geographic Information Systems vector data. It also provides a tool for facilities management, remediation, flood-plain management, and erosion and sedimentation studies.
- b. Commercial imagery can be useful to USACE in planning, managing, and inventorying natural resources.
- c. Flood-control efforts in USACE and the Army can utilize commercial satellite imagery for accurately capturing flood boundaries, tracking erosion and levee damage, documenting levee repairs, providing model validation, and providing a graphic context.
- d. Commercial satellite imagery can also be used as a tool to aid in the determination of severe, moderate, and light damage zones; impassable roads; damage model input; debris estimation; ice and water distribution; roofing; change detection; and damage to critical facilities and infrastructure, such as bridges, power plants, and power transmission towers.

APPENDIX O

Managing Historical Geospatial Data Records – A Guide for Federal Agencies

The Federal Geographic Data Committee

Managing Historical Geospatial Data Records – A Guide for Federal Agencies

The development of a National Spatial Data Infrastructure (NSDI) is an important step in ensuring the Nation's economic, environmental and scientific well being. The NSDI includes initiatives to establish an electronic clearinghouse to improve public access to and use of geospatial data and to implement content standards for metadata. The NSDI will play an important role in protecting and preserving geospatial data records through their life cycle from creation and use until they pass into the Nation's archives.

This fact sheet explains the responsibilities of Federal geospatial data producers for properly creating data, documenting data with appropriate metadata, making data available through the clearinghouse, and arranging for the appropriate disposition of the data. While the fact sheet is designed for Federal geospatial data producers, the guidelines and principles may be useful to anyone collecting or producing geospatial data.

What Is the Law?

The National Archives and Records Administration (NARA) is the Federal agency responsible for acquiring, preserving, and making available those records of enduring value created or received by various components of the Federal government. Federal agencies are required to manage records in accordance with the NARA regulations, as codified in 36 Code of Federal Regulations, chapter 12. They are required to seek the approval of the Archivist of the United States before any Federal Records are destroyed, stored in Federal Records Centers, or transferred to the National Archives for permanent preservation. State, local and regional governments and many corporations have similar regulations and guidance for their records.

Geospatial data producers and managers should be aware that this responsibility begins with the design and contracting for hardware and software systems used to create that data. Minimum system capabilities must ensure appropriate retention and disposition of the records required by law. When designing a new system, or considering the disposition of geospatial data in existing systems, geospatial data producers and managers should consult with the agency's departmental records officer or information resources manager to verify all legal requirements are met.

What Records Are Appropriate for Preservation?

Records in geospatial database systems that provide evidence of the organization, policies, programs, decisions, procedures, operations, or other activities of an agency of the Federal Government may be appropriate for preservation. A broader body of geospatial data may be preserved because of the value of the information it contains. Storage media for these data may include magnetic tape, floppy and hard disks, and optical cards and disks. The electronic records may include geospatial data files and databases with a national scope or those at the project or operations level.

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How Do Agencies Document Historical Information About Their Datasets?

The Federal Geographic Data Committee's (FGDC) Content Standards for Digital Geospatial Metadata specify required elements for capturing information about lineage, processing history, sources, intended use, status of the data, and other types of information available through the clearinghouse. This information establishes intellectual control over both the content of the data and the context within which the originating agency created and used the data. Additional historical information may be captured in records documenting the system design and use, and outputs from the data in the form of reports, maps, and other graphic materials.

Sources of Information

Information about retaining records (records scheduling and appraisal) is available from:

- Office of Records Administration, NARA
Telephone: (301) 713-7110

Information regarding electronic records is available from:

- [Center for Electronic Records](#), NARA
Telephone: (301) 713-6630
Fax: (301) 713-6911

Additional information can be accessed through NARA's homepage:

- URL: <http://www.nara.gov/>

Information about the FGDC is available from:

- FGDC Secretariat
Telephone: (703) 648-5514
Fax: (703) 648-5755
E-mail: fgdc@fgdc.er.usgs.gov
URL: <http://www.fgdc.gov/>

The FGDC maintains an anonymous FTP site at:

<ftp://fgdc.er.usgs.gov/gdc/>

Should the Geospatial Dataset be Saved?

Before you dispose of any geospatial data you should consider the following questions:

1. Do the data involve or reflect any legal rights of the Government or individuals?
2. Will the data be needed to defend the agency or the Government against charges of data fraud or misrepresentation?

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3. Could the data be useful to other Federal geospatial data users or the broader geospatial research community?
4. Will other users require access to the original “raw” (unedited, unprocessed) data?
5. Have the geospatial data been made available to other users through agency data sharing agreements, data user services, or the clearinghouse?
6. Can secondary users understand or interpret the data without technical expertise or assistance from the producer?
7. Are the data difficult or expensive to replicate?
8. Are there significant costs or consequences to the program or the Government if the data are lost?
9. Can the data be usefully integrated with newer data resulting from resurveying or improved methods of data collection and interpretation?
10. Does the estimated research value of the data exceed the costs to maintain them for secondary use by Government researchers or other?
11. Will the data be useful for analyzing geographic distributions over time?
12. Do the data support the study of geophysical changes over time?

If the answer to any of these questions is “yes,” the data may have long-term or permanent value. The agency’s records management or information resources management staff should be consulted for further guidance.

Geospatial Database System Considerations

Records Retention: Every dataset, record, or file in the system should have a designated retention period. Temporary records should be deleted or transferred to alternate storage media or facilities for temporary records only at specific times according to an approved records retention schedule.

Records Preservation: Geospatial data creators are required under 44 U.S.C., chapter 29, to preserve permanent records, both the data and appropriate documentation. When the designated permanent records are transferred to NARA at the predetermined date, the transfer will be in a format and on a media acceptable to NARA at the time of transfer.

Records Integrity: The hardware and software systems design must ensure data integrity. This can be accomplished by using passwords and audit trails, by restricting when records can be edited, and by maintaining a “history” file in a meaningful format of all changes, when appropriate.

Historical Data Working Group
 FGDC, 590 National Center, Reston, VA 22092
 URL: <http://www.fgdc.gov/nara/hdwgfsht.html>
 Last modified: 7-27-1998