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**Geospatial Standard Operating Guidance for Multi-Agency Coordination Centers**

***SUPPLEMENT FOR WILDFIRES***

****

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# CREDITS

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Foremost, the National Alliance for Public Safety GIS Foundation and its partners in the project are grateful for the time and expertise that so many practitioners contributed in developing this. Below is a list of individuals who participated in the development of this Wildfire version:

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# DOCUMENT BACKGROUND

This Standard Operating Guidance (SOG) document was developed by a team of Geospatial Information Systems (GIS) specialists and professionals, leaders in public safety operations & management, and incident support subject matter experts. This document strives to serve as a template to support national GIS standards for wildfire emergency response in a Multi-Agency Coordination Center (MACC). The National Wildfire Coordinating Group GIS Standard Operating Procedures (GSTOP, June 2006)[[1]](#endnote-1) served as the primary reference and guide to developing SOPs for Incident Command Systems. Examples are provided from the County of San Diego’s Standard Operating Procedures (SOP) and are for reference purposes only; they are not intended to set a standard.

This document proposes a set of guidelines for coordinating geospatial emergency response efforts. These guidelines are intended to serve as a shared foundation, encouraging improved communication and collaboration amongst GIS and other emergency response staff. This is a living document that provides a starting point to produce guidelines for the organization and management of geospatial data, map creation and output within MACCs. It is anticipated that this document will be updated as more and more local agencies adopt GIS operating procedures for emergency management and provide best practices back to the NAPSG Foundation.

Intended as a template, agencies are encouraged to modify document content to accommodate local and regional specific details. Modifications may range from referencing local datasets and file locations to adjusting standard map products to better account for local hazards or values at risk. It is recommended that you work with your local emergency service coordinators to create an SOP or SOG that meets the unique needs of your agency and/or jurisdiction.

The Department of Homeland Security’s (DHS) Federal Interagency Geospatial Concept of Operations (GeoCONOPS) provides additional information on federal geospatial activities undertaken in support of emergency management. The DHS GeoCONOPS is intended to be a blueprint for coordinating geospatial activities in support of the Stafford Act and the National Response Framework. The DHS GeoCONOPS is structured to address key mission areas of life and property saving, damage assessment, recovery, and Federal Operation Centers. To learn obtain a copy of GeoCONOPS visit, <http://www.napsgfoundation.org/blog/napsg-blog/119-napsg-sog-v-2>

## Tips on How to Use this Guidance Document

Within this document, *background information* on each section is offered in blue text boxes at the beginning of each chapter*.* The background information is intended to guide the user on how to utilize the associated guidance. Text which is bold, italicized, and in carrots delineates where **<<*local jurisdictional input is needed>>***. Examples are given in motion quotes and are intended to provide the reader with tips on how to use and interpret the examples provided. Diagrams are also marked as examples to indicate where local inputs are required. These examples and diagrams are offered up only for reference purposes and are not intended to set a standard.

It is recommended that once your agency has created a GIS operations document for your agency it is exercised when emergency management agencies or first responders conduct exercises. This is a good opportunity to see if the document actual works and provides useful information. If possible GIS staff should provide injects to exercises that specifically test different elements within the document. Exercise after action reports should identify areas of the document and GIS response that worked and did not work. The document should be updated after each exercise to improve its effectiveness.

For more information on how to integrate geospatial technologies within your public safety organization, please visit <http://carat.napsgfoundation.org/> for example best practices and a prototype version of the interactive Capability and Readiness Assessment Tool (CARAT). The CARAT is intended for public safety practitioners interested in learning about and/or building a GIS to support their agencies' work. It is designed to serve as an assessment tools to develop a roadmap for anyone interested in learning about, doing, or directing a GIS in support of public safety.

# LIST OF ACRONYMS

CAP - Common Alert Protocol (v1.1)

COI - Community of Interest

DE - Distribution Element

DHS - Department of Homeland Security

DOC - Department Operation Center

EDLX - Emergency Data Exchange Language

EEI - Essential Elements of Information

EMS MOC - Emergency Medical Services Medical Operations Center

EOC - Emergency Operation Center

FGDC - Federal Geographic Data Committee

GeoCONOPS - Department of Homeland Security’s Federal Interagency Geospatial Concept of Operations

GII - Geospatial Information Infrastructure

GIS - Geographic Information System

GSTOP - National Wildfire Coordinating Group GIS Standard Operating Procedures

HAVE - Hospital Availability Exchange

HIFLD - Homeland Infrastructure Foundation-Level Data

HSIN - Homeland Security Information Network

ICP - Incident Command Post

ICS – Incident Command System

IMT - Incident Management Team

JIC - Joint Information Center

MACC – Multi-Agency Coordination Center

MOUs - Memorandums of Understanding

NIEM - National Information Exchange Model

NIMS - National Incident Management Structure

NSGIC - National States Geographic Information Council

NWCG - National Wildfire Coordinating Group

OGC - Open Geospatial Consortium

SEMS - Standardized Emergency Management System

SOG - Standard Operating Guidance

SOP - Standard Operating Procedure

USNG - US National Grid

# INTRODUCTION

***Purpose*:** This Standard Operating Guidance document was prepared to provide guidance and key components of a template SOP or SOG that will help to facilitate local agencies and jurisdiction with the creation, preparation, coordination, and dissemination of GIS services and products during wildland fire emergency events. This is a living document that provides a starting point to produce guidelines for the organization and management of GIS data, map creation and output within Multi-Agency Coordination Centers (MACCs) specifically. Additionally, proper internal and external communication channels for sharing these products are addressed.

***Audience:*** The intended audience for this document includes all local and state staff assigned GIS positions supporting a wildland fire emergency event in a coordination center, including Emergency Operation Center (EOC), Department Operation Center (DOC) and Emergency Medical Services Medical Operations Center (EMS MOC) support responsibilities. This document is meant for use within Operations Centers and the Multi-Agency Coordination System, and, therefore, follows the National Incident Management Structure (NIMS). NIMS states that EOCs do not have to be organized around the Incident Command System (ICS). This document is not intended for use by the Incident Command, and, therefore, does not follow direct guidance procedures mandated in ICS. For more information about GIS use within ICS please see the [National Wildfire Coordinating Group GIS Standard Operating Procedures (GSTOP, June 2006)](http://www.nwcg.gov/pms/pubs/GSTOP7.pdf). However, components of this guidance document can be adopted and applied to the development of SOPs or SOGs for ICS specifically. For additional information on federal geospatial activities in support of emergency management, please see the Federal Interagency Geospatial Concept of Operations (GeoCONOPS) coordinated by the Department of Homeland Security.

***Objectives:***

Four objectives were set to adequately address GIS needs and practices in an emergency event:

1. Determine key GIS supplies and tools for MACCs (EOCs, DOCs, or MOCs)
2. Determine data and mapping protocols
3. Determine and document protocols for data/map dissemination/sharing via web applications
4. Determine data and map sharing practices with external contacts

In order to meet these four objectives, this document is broken down into the following nine chapters:

How GIS Can Assist Emergency Managers and First Responders? - Aids emergency responders who may be unfamiliar with the usefulness of GIS. This section aims to provide an overview of the capabilities for GIS within wildland fire response.

What Do GIS Professionals Need to Know About Emergency Management? - Outlines the various emergency management organizational structures and physical layout of the MACCs to aid GIS Staff when responding to an Emergency Operations Center (EOC), Department Operations Center (DOC), or Medical Operations Center (MOC).

GIS Staffing and Resource Requirements – Outlines the hardware, software, data, map and general resources necessary for GIS staff to perform their jobs as well as the GIS knowledge, skills and abilities that are required to adequately function in the many GIS emergency support roles that exist.

Staffing and Team Transition – Outlines the procedure for requesting additional GIS support, tracking GIS requests and handling shift changes.

File Naming and Directory Structure – Provides standardized naming conventions for GIS files and directory structure to support data management and facilitate identification of GIS data during shift changes.

Mapping Protocols – Details required map elements, data content and format conventions, distribution regulations, symbology guidelines and QA/QC procedures. This section also outlines agency specific cartographic standards for map products.

Data Protocols – Details data format conventions, backup policy, data sharing and the use of web applications to support GIS staff as well as data/map end users.

Data Acquisition and Dissemination – Provides information for briefing cycles and when incident data become available and accessible to GIS staff.

Documentation and Metadata – Outlines the documentation/metadata expectations and procedures.

# How GIS Can Assist Emergency Managers and First Responders?

All phases of emergency management involve the collection, analysis, and dissemination of geographically referenced data in a logical manner. GIS can provide a mechanism to centralize and visually display all of this data. It can allow hazards such as fire perimeters to be overlaid and viewed with base map data such as census information, streets, critical facilities, and power grids, so that emergency managers can begin to see the inherent risk and formulate a response, or even foresee recovery needs. This information can then be displayed in maps to effectively disseminate data.

## What is GIS?

A GIS is an information system that understands location. Much more than a map, a true GIS is intelligent and interactive.

Map projects are built with layers of data. Each of these layers can be stored in an individual file and displayed with each other to give a sense of relational location. For example data can include:

* Fire Perimeter
* Roads/Infrastructure
* Land use/Land cover
* Population Data (Census)
* Weather information
* First Responder Vehicle locations

This data can be “layered” with each other on a map to show which roads and populations are being affected by the fire perimeter. It can also depict the land use/cover surrounding the area along with the current weather over the fire to assist in such missions as first responder fire fighting planning as well as the location of those first responder vehicles.

This is what gives GIS its distinctive analytic ability. Because information can be organized by a specific place on the earth, you can see relationships between otherwise disparate datasets. GIS provides you with the type of situational awareness that enhances incident-level decision making and helps save lives.

## What Types of Questions GIS Can Answer?

GIS can answer many questions. Of particular interest when responding in an EOC to a wildfire event, one may be interested in the following:

* Where is the fire?
	+ GIS can utilize many resources to plot the fire perimeter and display this information on a map to show the relative location.
* What populations are being affected?
	+ GIS can visually display the fire perimeter over census information to visualize the population numbers and types being affected, or analysis can be conducted to numerically depict the population affected.
* Which roads need to be closed?
	+ With the fire perimeter layer in hand, GIS can identify the nearest roads. This can allow emergency managers to determine the roads that need to be closed, and aid in the egress/ingress if first responder vehicles if needed.
* What assets are deployed where?
	+ With initial assets already in the field, GIS can assist in determining where additional assets should be deployed for maximum effectiveness.

## What Resources are Needed?/Where Can I Get Them?

In order to run a successful GIS response, certain resources are needed. The GIS Resources and Staffing section of this SOG aids in identifying the staffing and resources needed for a successful response. It is recommended that MACCs work with their local government agencies to identify these resources and develop relationships to have GIS responders report to the MACC if/when needed. It is also recommended that MACC officials and GIS responders work together prior incidents to better understand each other’s roles and the role they each play in a successful response.

## What are the Keys to Successful Use of GIS?

The keys to a successful GIS aided response are understanding, integration, and training.

* Understanding – Understanding how GIS can be best used to assist in planning and response efforts.
* Integration – Integrating the use of GIS into planning and response workflow.
* Training – Training GIS professionals in the timely delivery of GIS products. Training emergency managers and responders on how to make optimum use of GIS to assist them in their decision-making.

## NAPSG Quick Guide

For more information please reference the NAPSG publication: A Quick Guide to Building a GIS for Your Public Safety Agency at the NAPSG website:

<http://www.napsgfoundation.org/attachments/article/81/Quick-Guide-GIS-Public-Safety-May-2011-PDF.pdf>

## GLOSSARY OF TERM

Address geocoding - Process of assigning a street address to a location on a map based on the street network. This is an interpolation and is not always 100% accurate.

Aerial photograph - A photograph taken vertically downward from the air. Aerial photograph images may be in the form of paper prints, often 9" x 9", or transparent film.

Area- A calculation of the size of a two-dimensional feature, measured in square units

Attribute – Non-spatial information about a geographic feature in a GIS, usually stored in a table and linked to the feature by a unique identifier. For example, attributes of a street segment might include its name, length, and address range.

Base data - Basic level of map data (street network, jurisdictional boundaries, etc) on which other information is placed for purposes of comparison or geographical correlation.

Base map – Basic map that seldom changes and is used repeatedly, often additional information such as a fire perimeter is placed on a base map to show relative location.

Boundary Line - A division between adjacent political entities or geographic zones. Boundary lines may be imaginary lines, physical features that follow those lines, or the graphical representation of those lines on a map.

Buffer – Spatial analysis that can be performed to create a zone around a map feature measured in units of distance or time. A buffer is useful for proximity analysis.

Census Data - Any one of various types of precisely defined geographic areas used by the U.S. Census Bureau to collect and aggregate data population data including population numbers, languages spoken, income, age, etc. The largest unit of area is the entire United States, while the smallest is a census block.

Centroid - The geometric center of a feature.

Clip - Analysis that extracts features from one polygon layer that reside entirely within a boundary of another polygon layer.

Contour Line - A line on a map that connects points of equal elevation.

Coordinate System - A set of references to indicate a point on the earth’s surface.

Decimal Degrees - Values of latitude and longitude expressed in decimal format rather than in degrees, minutes, and seconds.

Desktop GIS - Mapping software that is installed onto and runs on a personal computer and allows users to display, query, update, and analyze data about geographic locations and the information linked to those locations.

Feature - A representation of a real-world object on a map.

GPS - Acronym for *Global Positioning System*. A system of radio-emitting and -receiving satellites used for determining positions on the earth. The orbiting satellites transmit signals that allow a GPS receiver anywhere on earth to calculate its own location through trilateration.

Map Extent - The limit of the geographic area shown on a map, usually defined by a rectangle. In a dynamic map display, the map extent can be changed by zooming and panning.

Map Service – Maps generated and served up over the Internet.

MODIS Active Fire Mapping Program – Run by the USDA Forest Service, provides a near real-time geospatial overview of the current wildland fire situation at regional and national scales. Locations of current fires and the extent of previous fire activity are ascertained using satellite imagery acquired by the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor. The MODIS sensor can display hotspots thus showing current fire burn.

Query – The ability to select features or records from a database and visualize them in tabular format or geographical representation.

#

# What Do GIS Professionals Need to Know About Emergency Management?

In order to respond to an emergency incident as a GIS Responder, it is important to understand the various emergency management and incident command systems that are in place. In many cases, the GIS Responders to MACCs may be unfamiliar with the layout, hierarchy, and processes taking place. For example, GIS Responders may be asked to physically take a map or digital file, etc. to the Joint Information Center (JIC) or to various agencies sitting within the EOC, and it will be helpful to know where to find them and how the EOC is being run. It may also be helpful to know proper chain of command. Not all MACCs are alike. GIS responders may also want to refer to and become familiar with the DHS GeoCONOPS.

## TRAINING

The minimum training requirements for individuals responding in an EOC are offered by FEMA Independent Study.  Those courses are:

1. IS 100.b - Intro to the Incident Command System
2. IS 200.b - ICS for Single Resources and Initial Action Incidents
3. IS 700.a  National Incident Management System (NIMS) an Introduction.
4. IS-800.b - National Response Framework, an Introduction.

## NIMS

The **National Incident Management System (NIMS)** was released in March 2004 by the Department of Homeland Security (DHS). NIMS offers a standardized approach to incident management and response. It was developed to allow first responders from different jurisdictions and disciplines to better work together in an effort to respond to all hazards including natural disasters and emergencies. Benefits of NIMS include a unified approach to incident management, standard command and management structures, and emphasis on preparedness, mutual aid and resource management. NIMS lays out the standardized structure of an ICS and definitions of an EOC. For more information about NIMS see: <http://www.fema.gov/emergency/nims/>

## ICS

The **Incident Command System (ICS)** is a command structure set up in the field for first responders. Some of these command systems have GIS staff. ICS provides a flexible mechanism for coordinated and collaborative incident management for first responders in the field. The physical location where the ICS is set up is called the Incident Command Post (ICP). If you are requested to respond or drop off information to the ICP, the following organizational structure is helpful for finding the right people. For more information about ICS see: <http://training.fema.gov/EMIWeb/IS/ICSResource/index.htm>



Figure 1 – EXAMPLE ICS ORGANIZATIONAL STRUCTURE. Examples are for reference purposes only and are not intended to set a standard.

## FeFederal Interagency Geospatial Concept of Operations (GeoCONOPS)

The **DHS GeoCONOPS** serves as a blueprint for coordinating federal Departments and Agencies and their respective activities in support of incidents per the Stafford Act and National Response Framework. The DHS GeoCONOPS identifies federal geospatial activities based on key mission areas of life and property saving, damage assessment, recovery, and Federal Operation Centers.

## Multi-Agency Coordination System

According to FEMA, multiagency coordination is a process that allows all levels of government and all disciplines to work together more efficiently and effectively. Often, cooperating agencies develop a **Multiagency Coordination System (MACS)** to better define how they will work together and to work together more efficiently; however, multiagency coordination can take place without established protocols. MACS may be put in motion regardless of the location, personnel titles, or organizational structure. Multi-Agency Coordination Centers (MACCs) such as EOCs, and DOCs, etc are part of several system elements included within the MACS.  EOCs and DOCs are intended to facilitate MACS functions, and may provide support to Area Command, Incident Command, or Unified Command when resource needs exceed local capabilities.



Figure 2 – FEMA MULTI-AGENCY COORDINATION SYSTEM DIAGRAM, from NIMS. Examples are for reference purposes only and are not intended to set a standard.

## EOC

NIMS defines **Emergency Operations Centers (EOCs)** as a component of a Multiagency Coordination System. EOCs do not have to be organized around ICS. NIMS states that "EOCs may be organized by major discipline (e.g., fire, law enforcement, or emergency medical services); by emergency support function (e.g., transportation, communications, public works and engineering, or resource support); by jurisdiction (e.g., city, county, or region); or, more likely, by some combination thereof. Incident Command Posts need reliable communication links to EOCs to ensure effective and efficient incident management.” Personnel representing multiple jurisdictions and functional disciplines and a wide variety of resources may staff EOCs.

An EOC is activated to support the on-scene response during an escalating incident by relieving the burden of external coordination and securing additional resources.

An EOC is the physical location where organizations and agencies come together during an emergency to coordinate response and recovery actions and resources. It is also where management decisions are facilitated.

**GIS**

Fire Services Coordinator

EAS Room

Radio Room

**R.A.C.E.S.**

Audio/ Visual Hardware - Plotters

**Joint Information Center (JIC)**

**211 – Public Inquiry**

**Policy**

**Video Wall Display (3)**

**Law**

**Fire/Health**

**Const. & Engineer.**

**Care & Shelter**

**Ops Chief/ EOC Director/ Recovery**

**Logistics**

**Plans**

**Liaisons**

Operations

**Information and Intelligence**

See Figure 2 – Example of OAEOC Physical Layout

Figure 3 *–* EXAMLE EMERGENCY OPERATIONS CENTER PHYSICAL LAYOUT. Examples are for reference purposes only and are not intended to set a standard.

***<<State/Regional/Local System Name>>***

<<Include a description or reference to state, regional, or local systems or documents which impact emergency operations in the area. >>



Figure 4 – EXAMPLE OAEOC LEVEL III ORGANIZATION CHART. Examples are for reference purposes only and are not intended to set a standard.

## GLOSSARY OF TERMs

Action plans: Written or verbal plans that reflect the overall incident goal (control objectives) and incident strategy, objectives for the designated operational period, specific tactical actions and assignments, and supporting information for the designated operational period.

Activation: A notification category that provides urgent information about an unusual occurrence or threat of occurrence, and orders or recommends that the notified entity activate its emergency response (usually via its emergency operations plan). An activation may be partial or full.

Advisory: A notification category that provides urgent information about an unusual occurrence or threat of an occurrence, but no activation of the notified entity is ordered or expected at that time.

After Action Report (AAR): The document that describes the incident response and findings related to system response performance.

Alert: A notification category between “advisory” and “activation” that provides urgent information and indicates that system action may be necessary.

Chain of Command: A series of command, control, executive, or management positions in hierarchical order of authority. (NIMS)

Command Post (CP): An ad hoc location established at or as near as possible to a disaster site, from which the incident commander (IC) functions.

Common Operating Picture: A broad view of the overall situation as reflected by situation reports, aerial photography, and other information or intelligence (sometimes map based). (NIMS) This is to ensure all decision-makers have a common understanding of the incident and incident response situation.

Damage Assessment: An appraisal or determination of the effects of the disaster on human, physical, economic, and natural resources.

Emergency Management Team: The management unit that operates at the EOC, and is responsible for all Emergency Management Operations during an incident (this is different from an *incident management team* which operates at the incident command post). Responsibilities include:

1. Directly supporting the Incident Management Team (IMT)
2. Directly managing emergency issues (or delegating the management) related to the incident but outside the defined scope of the Incident Management Team.

Emergency Operations Center (EOC): The physical location at which the coordination of information and resources to support domestic incident management activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction. EOCs may be organized by major functional disciplines (e.g., fire, law enforcement, and medical services), by jurisdiction (e.g., Federal, State, regional, county, city, tribal), or some combination thereof. (NIMS)

Essential Functions: Functions required to be performed by statute, Executive Order, or otherwise deemed essential meet mission requirements.

Evacuation: Organized, phased, and supervised withdrawal, dispersal, or removal of civilians from dangerous or potentially dangerous areas, and their reception and care in safe areas. (NIMS)

Exercise: A scripted, scenario-based activity designed to evaluate an agency’s or multiple agencies’ emergency preparedness plans. Can take for as a *tabletop* (minimal or no physical activity), *functional* (outside agencies are simulated), or *full-scale* (includes all or most functions).

Hazardous Material (HAZMAT): Any material which is explosive, flammable, poisonous, corrosive, reactive, or radioactive (or any combination), and requires special care in handling because of the hazards posed to public health, safety, and/or the environment. (Firescope 1994)

Joint Information Center (JIC): A facility established to coordinate all incident-related public information activities. It is the central point of contact for all news media at the scene of the incident. Public information officials from all participating agencies should collocate at the JIC.

(NIMS)

Planning Section: Section of EOC responsible for the collection, evaluation, and dissemination of operational information related to the incident, and for the preparation and documentation of the IAP. This section also maintains information on the current and forecasted situation and on the status of resources assigned to the incident. In many cases GIS is placed in the planning section. (NIMS)

Public Information Officer: A member of the Command Staff responsible for interfacing with the public and media or with other agencies with incident-related information requirements. (NIMS)

Situation report (SITREP): A document that is developed and distributed during response as a means for disseminating a current situation assessment.

**Example Title Page for Your Agency’s SOG**

**Geospatial Standard Operating Guideline for the**<<Insert Jurisdiction/Agency>>
<<Insert Coordination Center>>

# GIS Resource & STAFFING Requirements

**Background:**  This chapter details the physical resources and personnel skill sets required for GIS responders to fulfill GIS needs & expectations in a wildland fire emergency event. Potential GIS responders should be identified prior to an incident.

Not all MACCs are alike. Please be sure to modify the sections and examples below to fit your MACC needs. For example if the local MACC does not have computers loaded with GIS software or data, the document will need to provide instructions on where the equipment is located. The GIS Staffing Requirements section is also solely provided as an example and should be modified based on your jurisdictional needs are scalable based on the size of the jurisdiction as well as the size of the incident.

Be sure to consider that the guidance on staffing is for MACC (where a “GIS Unit” or a “GIS Branch” is likely to exist) and may or may not be organized in the same fashion as the Incident ICS. EOCs do not have to be organized around ICS. NIMS states in the Command and Management chapter that "EOCs may be organized by major discipline (e.g., fire, law enforcement, or emergency medical services); by emergency support function (e.g., transportation, communications, public works and engineering, or resource support); by jurisdiction (e.g., city, county, or region); or, more likely, by some combination thereof. Specifically, one point of differentiation to note is that in ICS there is no ‘Unit’ for GIS. However, a Geospatial Task Group may be constructed to support the GIS needs for ICS.

Not all MACCs are alike. Please be sure to modify the sections and examples below to fit your MACC needs. For example some MACCs may have a GIS Unit within the Planning Section, while some may have a GIS Branch within the Intel/Info Section of the NIMS structure. When using this document as a template, be sure to modify it to meet the structure of your facility.

*Examples are for reference purposes only and are not intended to set a standard.*

* ***Purpose:*** This chapter details the resources and skill sets required for GIS Responders to fulfill GIS needs & expectations in an emergency event.

## RESOURCE REQUIREMENTS

**Example GIS Supply List**

The table below (next page) serves as an example for the “GIS Supply List”. The needs and availability of resources for each agency or jurisdiction will vary. Use this list as a guiding example and not as a fixed set of requirements.

|  | **REQUIRED** | **Location** |
| --- | --- | --- |
| **Office** | **Field** | **Primary** | **Secondary** | **Tertiary** |
| HARDWARE (Where possible, field hardware should be ruggedized) |
| Laptop and/or Desktop  | √ | √ | [ ]  | [ ]  | [ ]  |
| License keys, dongles and codes written down | √ | √ | [ ]  | [ ]  | [ ]  |
| Plotter &/or printer | √ |  | [ ]  | [ ]  | [ ]  |
| Projector | √ |  | [ ]  | [ ]  | [ ]  |
| GPS Hardware |  | √ | [ ]  | [ ]  | [ ]  |
| Projection Screen |  |  | [ ]  | [ ]  | [ ]  |
| Multi-Gb Flash Drive (32 Gb or more) | √ | √ | [ ]  | [ ]  | [ ]  |
| Portable, External Hard Drive (1 Terabyte or more) | √ | √ | [ ]  | [ ]  | [ ]  |
| Backup Laptop Battery |  | √ | [ ]  | [ ]  | [ ]  |
| 3G Broadband Access Card Activated | √ | √ | [ ]  | [ ]  | [ ]  |
| Cell phone with published number and TXT or SMS activated | √ | √ | [ ]  | [ ]  | [ ]  |
| SOFTWARE |
| GIS Software license to machine | √ | √ | [ ]  | [ ]  | [ ]  |
| MS Office | √ | √ | [ ]  | [ ]  | [ ]  |
| Adobe Reader | √ | √ | [ ]  | [ ]  | [ ]  |
| Adobe Acrobat Full Version |  |  | [ ]  | [ ]  | [ ]  |
| GPS device and GIS software support GPS analyst (e.g. ArcGIS GPS Analyst extension) |  | √ | [ ]  | [ ]  | [ ]  |
| Coordinate Converter |  |  |  |  |  |
| Metric Converter | √ |  | [ ]  | [ ]  | [ ]  |
| DATA RESOURCES |
| Commercially Available Imagery | √ |  | [ ]  | [ ]  | [ ]  |
| Locally Available Downloaded Data | √ |  | [ ]  | [ ]  | [ ]  |
| Spare Copies of the above | √ |  | [ ]  | [ ]  | [ ]  |
| MAP RESOURCES |
| Department Specific Maps |  |  | [ ]  | [ ]  | [ ]  |
| Wall Maps |  |  | [ ]  | [ ]  | [ ]  |
| Locally Used Road Maps | √ |  | [ ]  | [ ]  | [ ]  |
| Campus Maps |  |  | [ ]  | [ ]  | [ ]  |
| Transit Maps |  |  | [ ]  | [ ]  | [ ]  |
| Tourist (POI) Maps |  |  | [ ]  | [ ]  | [ ]  |
| GENERAL RESOURCES |
| GIS Desk Book\* | √ |  | [ ]  | [ ]  | [ ]  |
| Markers (Dry Erase)/Pens/Pencils | √ |  | [ ]  | [ ]  | [ ]  |
| Compass (Magnetic not scribing type) |  |  | [ ]  | [ ]  | [ ]  |
| Ruler or map scale | √ | √ | [ ]  | [ ]  | [ ]  |
| CDs/DVDs - Writeable | √ |  | [ ]  | [ ]  | [ ]  |
| Post It Notes |  |  |  |  |  |
| Push Pins | √ |  | [ ]  | [ ]  | [ ]  |
| Plotter Ink Cartridges | √ |  | [ ]  | [ ]  | [ ]  |
| Plotter Paper (to include Mylar) | √ |  | [ ]  | [ ]  | [ ]  |
| Phone Books |  |  | [ ]  | [ ]  | [ ]  |
| SAFETY |
| Personal Phone with Texting ability or SMS (to communicate with relatives) | √ | √ |  |  |  |
| Personal hot drink cup and/or water bottle | √ | √ |  |  |  |
| A supply of your business cards (Current business cell phone on card) | √ | √ |  |  |  |
| Snack Food, e.g., energy bar | √ | √ |  |  |  |
| Your emergency contact list printed up and current – The emergency GIS group members, your family personal contacts. | √ | √ |  |  |  |

Figure 5 Example GIS SUPPLY LIST, this example is provided for reference purposes only and is not intended to set a standard.

\*GIS Desk book to include – SOP, Contact List, Data/Map Matrix, Symbology Quick Guide, GIS EOC Staff Checklist, Map/Schematic of the Room (where are resources located), Set of appropriate symbol sets, GIS Software Tips/Tricks, How to Access/Use your EOC Software.

## STAFFING REQUIREMENTS

To ensure access to critical geospatial information and products, personnel must be readily available to support the many entities engaged in incident operations. This level of specific operational support provides situational awareness and geospatial tools to the managers of MACCs and field facilities.

The skills required for GIS support staff are varied by the event, duration of the event, and phase of disaster, i.e. response, damage assessment, recovery. The <<EOC/DOC/MOC Unit/Branch/ etc>> is responsible for collecting, analyzing, and disseminating information across all Emergency Support Functions. The focus of the team will be to develop an integrated common operational picture of an emergency event. It will review information coming from the field, DOCs and EOC personnel to quality control the data, identify gaps, and develop intelligence products for staff. Most of the <<branch/unit/etc>> products will be built around geospatial information. The structure is modular. In a small incident, one person could fill more than one role and in a large-scale incident several people could staff the same role.

**Example Geospatial Roles and Responsibilities:**

Provided below, in Figure 6, is an example list of key geospatial position titles and associated responsibilities per the DHS GeoConops, Section 2.1, Table 2-1. This list provides a good example of the types of roles you may want to have identified for your facility; however the roles and position titles will need to be modified to fit your facility. These roles are scalable, and one person may fill multiple roles during smaller incidents, while multiple people may need to fill one role during larger scale disasters. The GIS role tables in the appendix contain position titles more relevant to an EOC.

| **Position Title**  | **Roles &/or Responsibilities**  |
| --- | --- |
| Team Leader  | * Responsible for the coordination of geospatial information system (GIS) production, remote sensing, and geospatial database efforts.
* Conducts briefings, attends meetings, and directs overall geospatial support operations.
* Interfaces with federal, state, and local authorities establishing Memorandums of Understanding (MOUs), partnerships, and data sharing agreements.
* Proactively seeks opportunities to integrate geospatial products into executive decision-making.
 |
| Deputy Team Leader  | * Reports to the Geospatial Team Leader.
* Responsible for maintaining the coordinated efforts of the geospatial team.
* During times of absence of the Team Leader, becomes the representative of the Team.
 |
| Administrative Assistant  | * Reports to the Team Leader.
* Provides administrative support to the Team Leader and the Team in general.
* Manages reception area.
* Greets customers and assists them in filling out request forms.
 |
| Geospatial Production Manager  | * Reports to the Team Leader.
* Coordinates GIS requirements and supervises assigned Geospatial Analysts.
* Prioritizes GIS production and activities.
* Works with product requesters to properly define requirements and ensures the timely preparation and delivery of recurring and ad hoc GIS products.
 |
| Geospatial Analyst  | * Reports to the Geospatial Production Manager.
* Prepares recurring and ad hoc GIS products.
* Compiles various types of geospatial information into map and data products.
* Analyzes geospatial data from various sources to answer diverse questions and populate geospatial products.
 |
| Geospatial Imagery Manager  | * Reports to the Team Leader.
* Responsible for the coordination of RS requirements, resources, and requests for the team.
* Operates as task originator & collection manager for assets related to the operation.
* Works with Geospatial Production Manager to ensure imagery- derived products are delivered in a timely manner.
* Supervises Imagery Analysts.
 |
| Imagery Analyst  | * Reports to the Geospatial Imagery Manager.
* Processes and interprets acquired imagery.
* Processes imagery in native and/or other formats.
* Prepares image data files for use by the Geospatial Analyst Staff.
* Creates imagery-derived datasets and products.
 |
| Geospatial Database Manager  | * Reports to Team Leader.
* Responsible for creating and managing the file-based data storage system, updating and distributing associated documentation, answering all queries for use, and briefing teams on use of data.
* Initiates data sharing agreements or purchases for data as required and arranges for data updates as necessary.
 |
| Geospatial Database Administrator  | * Reports to the Geospatial Database Manager.
* Develops, maintains, and coordinates the geospatial data used.
* Sets database access rights and privileges.
* Responsible for data backups as required.
 |
| Geospatial Data Analyst  | * Reports to the Geospatial Database Manager.
* Designs and builds custom database queries as requested by task force members.
* Performs quality control and corrects anomalies in the data.
* Loads data sets under direction of Database Manager.
 |

Figure 6 – GEOSPATIAL ROLES AND RESPONSIBILITIES– per the DHS GeoConops, Section 2.1, Table 2-1. Examples are for reference purposes only and are not intended to set a standard.

### GIS Role Tables

In the GIS Role tables, each GIS Role is thoroughly defined as are the skills required in order for an individual to qualify to fill each GIS Role in the manner required to adequately support the <<State/Regional/Local System Name>> in an emergency event. An individual’s ability to assume each GIS role is determined by the frequency with which that individual conducts certain GIS or GIS-related activities within their daily work routine. These values are idealized and do not need to be exactly duplicated or represented in the person filling the role. Refer to Appendix 1 for an example of a full description of GIS emergency roles and responsibilities.

**Example GIS Role Chart:**

Provided below, in Figure 7, is an example of one GIS Role and its associated skill set requirements and responsibilities. Additional example GIS Role charts are provided in the appendix. The specific duties and tasks where specific GIS software is referenced should be updated to reflect the software used by your individual agency. The role charts provided here serve only as examples and do not set standards for the use of any particular software.

|  |
| --- |
| **ROLE: GEOSPATIAL ANALYST -** This position can perform research, database queries and statistical analysis for the GISspecialist. Frequently during emergencies, data come into the INCIDENT/EMERGENCY OPERATION CENTER in less than pristinecondition. The analyst will massage the data into a usable format. Having a GIS Analyst on site will free up the GIS specialist to concentrate on simple GIS analysis and map production. **Key Requirements Include:*** Prepares recurring and ad hoc GIS products.
* Compiles various types of geospatial information into map and data products.
* Analyzes geospatial data from various sources to answer diverse questions and populate geospatial products.
 |
|  | **DUTY/TASK** | **FREQUENCY** |
| Administering and Operating GIS Application | Use geospatial software (i.e. ArcINFO 10) to identify, evaluate, and input spatial data. | Often (weekly) |
| Use geospatial software to query data. | Often (weekly) |
| Convert or import digital data using digitizers, scanners or GPS. | Often (weekly) |
| Analyze raster data sets with Spatial Analyst/Grid or Imagine | Often (weekly) |
| Analyze vector data sets with Geoprocessing | Often (weekly) |
| Project spatial data | Often (weekly) |
| GIS Product Development | Create FDGC-compliant Metadata | Often (weekly) |
| Collect field location data via GPS | Often (weekly) |
| Edit GIS data | Often (weekly) |
| Convert data (i.e., geodatabase, shapefile, coverage, DWG, etc.) | Often (weekly) |
| Generate statistics | Often (weekly) |
| Geocode data | Often (weekly) |
| Perform image analysis | Often (weekly) |
| Map and Create new GIS data | Often (weekly) |
| Maintain existing GIS data (QA/QC) | Often (weekly) |
| GIS Services to End Users | Create maps | Often (weekly) |
| Create reports based upon GIS Analysis | Often (weekly) |
| Create charts | Often (weekly) |
| Create tables | Often (weekly) |
| Interpret analysis for client | Often (weekly) |
| Determining design format of GIS data layers or database used with GIS layers | Often (weekly) |
| Directly work with clients to meet their GIS need or further their understanding of GIS | Occasionally (every month) |

Figure 7- EXAMPLE GIS ROLE CHART – The role charts provided here serve only as examples and do not set standards for the use of any particular software.

# STAFFING AND TEAM TRANSITION

**Background:** It is recommended that GIS staff expectations & team structures are identified prior to an incident. Potential GIS responders should be made aware of these expectations before agreeing to become a GIS Responder. The environment during an incident in MACC can be very frantic with request for information and maps coming from a variety of people and disciplines. Responders are also expected to work long hours while keeping a high performance level and intensity. Some GIS staff may not function well in this type of environment and may not be an ideal candidate as a GIS Responder.

It is also very important that public safety personnel are educated on the value and use of geospatial information and how it can & should be integrated into their workflows. Conducting exercises & cross-training for both public safety & GIS personnel is an important part of implementing your agency’s SOPs.

Not all MACCs are alike, please be sure to modify the examples below to fit your facility needs. Examples are for reference purposes only and are not intended to set a standard.

* **Purpose:** In order to facilitate a smooth transition between shifts, it is important that GIS staff accurately maintain a record of all requests and their priority level as well as what has been delivered and what is pending. It is also important that GIS staff are named, teams identified, and back-up staff arranged in the planning process. The purpose of this chapter is to identify GIS Staffing periods and team transition requirement.

## GIS RESPONDER EXPECTATIONS

**Example GIS Responder Expectations:**

GIS are considered an essential emergency function and GIS Staff are consequently considered essential personnel during an emergency event. Staff that is directly affected by the event is not expected to report to work. It is the responsibility of GIS staff to communicate their availability status to the GIS Team Leader. The GIS Team Leader will keep track of which staff is available to report and which staff has been affected by the event and unable to report.

## EOC/DOC/MOC GIS STAFFING

EOCs, DOCs and MOCs employ **<<enter shift length, ex: 12 hour>>** shifts. During most emergency events the EOC, DOCs and MOC are staffed 24 hrs/day.

<<Outline how EOC, DOC, and MOC are staffed. Detail the process for obtaining additional GIS support and identify reserve staff resources>>

## TEAM TRANSITION

**Example Beginning of Shift Tasks:**

* Sign in on your operations center’s Staffing Log.
* Communicate your role and availability via <<Identify appropriate communication systems and channels>>
* Assess GIS needs of Incident Command and your operations center and the needs of fellow GIS staff at other operations centers.
* As necessary or requested, provide data, map products and progress reports through relevant communication channels

### Start of Shift

At the beginning of a shift, GIS staff should complete the following tasks: **<<Enter local protocols.>>**

### End of Shift

At the end of a work shift, GIS staff will debrief their replacement with the following information: **<<Enter local protocols.>>**

FILE NAMING AND DIRECTORY STRUCTURE

**Example End of Shift Tasks:**

* Wrap up the project/map/data that you are working on to the best of your ability.
* Communicate the end of your shift via **<<Identify appropriate communication systems and channels>>**. Include the name of your replacement.
* Debrief your replacement in the following:
	+ What deliverables have been requested?
	+ What are the standardized products and what is their schedule?
	+ What has been created, what is left to be created?
	+ Where are the necessary scratch files?
	+ What base data have been modified?
	+ Where are your notes?
	+ Provide the last Media Report?
	+ What next steps have been identified?
	+ Provide your replacement with your contact information.
	+ Provide your replacement with contact information for other GIS Staff that are currently staffing the event or that are due to report.

**Background:** This chapter is intended to provide GIS staff with a common, standardized file naming convention and directory structure. The examples provided are for reference purposes only and are not intended to set a standard.

The example directory structure was borrowed from the National Wildfire Coordinating Group GIS Standard Operating Procedures (GSTOP) used by GIS Specialists to fulfill the GIS needs of the Planning Section of the Incident Management Teams. Standard naming conventions and directory structures foster easier collaboration between varying shifts of GIS Responders. The directory structure is set up with the date and time at the beginning of each folder and file to facilitate easy chronologic sorting ensuring that the most recent map information is at the top or bottom of a file list depending on sort order.

Per section 2.3, Information Sharing and Data Dissemination, of the GeoCONOPS, DHS recommends federal agencies share data in compliance with the National Information Exchange Model (NIEM). NIEM is a program supported by DHS and other Federal agencies to facilitate data sharing by providing a common vocabulary to ensure consistency and understanding amongst disparate agencies. NIEM utilizes Open Geospatial Consortium (OGC) standards for geospatial data. The emergency management domain data elements and attributes were derived from current standards set forth by the Emergency Data Exchange Language (EDLX). For more information on NIEM, please visit [https://www.niem.gov](https://www.niem.gov/).

Not all MACCs are alike. Please be sure to modify the sections and examples below to fit your facility needs. Examples are for reference purposes only and are not intended to set a standard.

* **Purpose:**  This chapter provides GIS staff with a common, standardized file naming convention and directory structure. The structure and naming conventions set herein are intended to support an efficient work flow process by providing self-evident naming protocols that are specific not only to each individual incident but also to each incident’s time(s) and date(s).

**Example Directory Structure:**

The example directory structure convention provided here was borrowed from the GSTOP. This structure will be accessible on the*<<Folder location>>* however; it is also suggested to maintain a copy on your desktop/laptop C:\ drive in the event that a network connection is not possible. The directory structure is set up with the data and time at the beginning of each folder and file to facilitate easy chronologic sorting.

## GIS File Directory Structure

During an emergency event, incident related data and maps are to be retrieved from: 1. <<Folder location>> and/or 2. <<Web application>> per the file structure outline and guidelines defined below.

**Example Directory Structure**

* <<Folder (for example, P:\EOCGIS)>>\BaseData - This folder contains base map data; data specific or derived from the event are NOT stored here.
	+ DEMs - Digital Elevation Models
	+ Logos – logos and data disclaimers
	+ Raster – Hillshade, Eagle Aerial Imagery, Air Photo Imagery
	+ Vector – Transportation, Admin Boundaries, Points of Interest, etc
* <<Folder>>\Tools This folder contains extensions, scripts, models, DMS-DD conversion macro/script, other software used during the incident
* <<Folder>>\Incidents\ - This is the top tier GIS Emergency Response directory:
	+ YYYY\_IncidentName – This is the top tier Folder for a unique event. 4-digit year and the name of the Unique Incident (e.g. 2003\_CedarFire)
		- Date (YYYYMMDD) date/time stamped incident spatial data layers; one folder for each day of the incident
			* Incident Data – All data stored in this folder are data that are specific to the incident and include a date/time stamp – DATA SHOULD NOT BE PUBLISHED TO THE WEB UNTIL THE PRODUCT IS READY FOR USE/DISSEMINATION AND APPROVED BY THE INCIDENT COMMANDER. Consideration should be given to breaking ‘incident data’ into sub-groups 1) DEM, 2) Raster, and 3) Vector – as incident data could be collected in these forms.
			* Products – GIS analysis and map products produced for the event on that day
			* Workspace – Workspace for that day
			* External Maps – Daily maps produced outside the organization



Figure 8- Example Directory Structure*.*

*NOTE*: In addition to incident related maps and data, resources such as basemap data, GIS Map templates, layer files, scripts and other tools will be accessible on <<Folder location>>.

GIS File Naming Convention

All data files (\*.shp, \*.xls, \*.dbf, \*.kml, etc.) must contain <<enter local regulations>>. Similarly, map document names (\*.pdf, \*.jpg, etc) must contain <<enter local regulations>>.

**Example GIS File Naming Convention:**

Provided below is a recommended GIS file naming convention that can be applied. Be sure to consider your local regulations when defining this component of your SOP or SOG.

**Example GIS File Naming Convention**

All data files (\*.shp, \*.xls, \*.dbf, etc.) must contain date/time, incident agency responsible for creating a map and subject matter qualifiers. Similarly, map document names (\*.pdf, \*.jpg, etc.) must contain date/time, incident name, subject matter information as well as size (e.g. 11X17, ANSI B, Custom32X66, etc.) and orientation (i.e. portrait vs. landscape) of the map.

* + Data file – yyyymmdd\_hhmm\_IncidentName\_Subjectmatter\_Agency.
	+ Map document - yyyymmdd\_hhmm\_IncidentName\_Subjectmatter\_Agency\_Size\_Orientation.\*\*\*

For field collected data, also include a Source Code tag when naming the data file:

* GPS\_Name = Global Positioning System\_Collector’s Name
* FOBS = Field Observer
* SITL = Situation Unit Leader

For data/maps that were provided by Local, State or Federal Agency tag with Agency’s Acronym:

* CalFire (or relevant state agency)
* CDC
* Etc

NOTE: When adding non-standard tags ALWAYS notify GIS staff of their presence and meaning.

NOTE: It is the responsibility of each GIS responder to ALWAYS communicate the file naming convention that they are using to those with whom they are sharing the data.

Figure 9- Example File Naming Conventions.

# MAPPING PROTOCOLS

**Background*:*** It is recommended that map templates populated with base data and symbolized similar to local map products be compiled prior to an incident. Templates speed up the process of getting the maps out to the Emergency Management Team especially during the first response period. You may find that map templates and elements need to be changed based on the type of incident or as the incident expands and contracts.

The use of the US National Grid (USNG) should also be incorporated into your agency’s SOGs and policies. Resources to support the implementation of USNG are available from the USNG Implementation Center (<http://mississippi.deltastate.edu/>) and from the Federal Geographic Data Committee (FGDC) (<http://www.fgdc.gov/usng>).

It is important to establish QA/QC procedures. Before a map is released from the GIS Unit/Branch all map elements must be updated including scale bar, file location information, title, legend, and symbology. Special attention should be paid to time and date information. This information is critical when asked to reproduce a map or for after action reporting or for litigation purposes.

There is not a nationally adopted incident-level symbology set. This is a gap that DHS, FEMA, and NAPSG are currently working to address. There are however, standard symbol sets put forth by the Homeland Security Working Group (<http://www.fgdc.gov/HSWG/index.html>), National Fire Protection Association ([http://www.nfpa.org](http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=170&cookie%5Ftest=1)), and the National Wildfire Coordinating Group (NWCG) (<http://www.nwcg.gov/>).

Agencies may want to establish standard and optional map products based on types of incidents that reoccur on a frequent basis in their region such as floods, hurricanes, or wildfires.

Not all MACCs are alike. Please be sure to modify the examples below to fit your facility needs. Examples are for reference purposes only and are not intended to set a standard.

* **Purpose:** In order to maintain a uniform look and feel, to facilitate interpretability and ease of use, all GIS Staff will follow the guidelines listed below when creating map products in support of an emergency event.

## MAP TEMPLATES

* + Map Templates are available at: <<Folder location or hyperlink>>
	+ Use the Templates available at this location to create all map products

***Note:*** *In a future version of this document, example map templates may be provided. Additional research is required to create the map templates for the most broadly relevant needs for MACCs. Additionally through the development of this guidance, NAPSG Foundation has identified a need for map templates for incident command, NIMS, and other key applications.*

## MAP ELEMENTS

**Example Required Map Elements:**

* Title – Includes Incident Name, Map theme, Geographic Extent, time/date stamp of data
* Legend
* Scale Bar
* Logos and Data Disclaimers
	+ Logo and data disclaimer to recognize data sources
	+ Logo and data disclaimer to recognize County Group/Dept/Division
* File Location– provide the full path name for the network location of the map document; ex: C:\GIS\Incidents\yyyy\_IncidentName\YYYYMMDD\Products\yyyymmdd\_hhmm\_IncidentName\_Subjectmatter\_Agency\_Size\_Orientation.mxd
* North Arrow
* Projection – Name of the projection, datum, and units
* Data Sources – who, what, where, when, why and how (source codes - refer to page 21 of <http://www.nwcg.gov/pms/pubs/GSTOP7.pdf> NWCG SOP)
* “Time Sensitive Data” Disclaimer Stamp – for all maps that are time sensitive
* “DRAFT” stamp – if map is a draft

## PRODUCT FORMAT CONVENTIONS

* + Share completed map products with **<<enter agency/section>>** in **<<enter format>>** format.
	+ Export maps with 100 dpi resolution to keep file size down, unless higher resolution is necessary to see detail (300 dpi is recommended for hard copy print maps). This eases data sharing and load on networks.

## MAP DISTRIBUTION REGULATIONS

Example map distribution guidelines:

* + GIS Staff is not at liberty to distribute maps or GIS incident data to media or public. This is the decision of incident command.
	+ Incident maps may be distributed to the Public if requested/instructed by **<<enter position>>.**

## MAP SYMBOLOGY GUIDELINES

**Background:**  This chapter details the physical resources and personnel skill sets required for GIS responders to fulfill GIS needs & expectations in an emergency event. Potential GIS responders should be identified prior to an incident.

Not all MACCs are alike. Please be sure to modify the sections and examples below to fit your MACC needs. For example if the local MACC does not have computers loaded with GIS software or data, the document will need to provide instructions on where the equipment is located. The GIS Staffing Requirements section is also solely provided as an example and should be modified based on your jurisdictional needs are scalable based on the size of the jurisdiction as well as the size of the incident.

Be sure to consider that the guidance on staffing is for MACC (where a “GIS Unit” or a “GIS Branch” is likely to exist) and may or may not be organized in the same fashion as the Incident ICS. EOCs do not have to be organized around ICS. NIMS states in the Command and Management chapter that "EOCs may be organized by major discipline (e.g., fire, law enforcement, or emergency medical services); by emergency support function (e.g., transportation, communications, public works and engineering, or resource support); by jurisdiction (e.g., city, county, or region); or, more likely, by some combination thereof. Specifically, one point of differentiation to note is that in ICS there is no ‘Unit’ for GIS. However, a Geospatial Task Group may be constructed to support the GIS needs for ICS.

Not all MACCs are alike. Please be sure to modify the sections and examples below to fit your MACC needs. For example some MACCs may have a GIS Unit within the Planning Section, while some may have a GIS Branch within the Intel/Info Section of the NIMS structure. When using this document as a template, be sure to modify it to meet the structure of your facility.

*Examples are for reference purposes only and are not intended to set a standard.*

* + Reference the most widely used symbol set by your jurisdiction.
	+ A symbol set specifically for MACCs has not yet been developed or socialized. NAPSG is currently working with DHS & FEMA to fill this gap
	+ The FGDC offers some suggested symbology that may or may not support the needs of your agency. For these resources visit - <http://www.fgdc.gov/HSWG/index.html>.
	+ If you are an ArcGIS user, additional resources on how to use the FGDC symbology are available at - <http://resources.arcgis.com/content/kbase?fa=articleShow&d=29213>

## QA/QC

* + Strive for excellence on the first go. If a bad map or bad data are discovered, update the <<enter GIS position>> immediately. The GIS group (and all individuals referring to map/data) will be notified via <<Identify channels for communicating QC related issues>>, identify what exactly the flaw is, work to correct the map and redistribute immediately.
	+ Remove incorrect data or maps from locations such as published web applications as soon as possible, but do not delete the bad information from the disk drive. Instead, add a tag to the file name indicating that it is bad data and should not be used. A record of any bad data that was released may need to be accessed at some point during or after the event.

## Standard Map Product Definitions

The standard map product definitions section outlines the product objectives, target audience, data content and cartographic requirements for those map products. These map products communicate incident specific details as well as general environment and infrastructure information to support emergency management operations.

<<Enter standard map product definitions.>>

## Optional Map Product Definitions

The optional map product definitions section outlines the product objectives, target audience, data content and cartographic requirements for those map products that are *optional* for all State or Regional Multi-Agency Incidents. These map products provide supplementary and specialized information for use during the response and recovery phases of the incident. Other ad-hoc map products may also be requested to meet incident specific needs.

<<Enter optional map product definitions.>>

Note: In a future version of this document, example map product definitions will be provided. Additional research is required to create a list of the most broadly relevant list of map product definitions. Additionally through the development of this guidance, NAPSG Foundation has identified a need for map product definitions for incident command, NIMS, and other key applications.**DATA PROTOCOLS**

**Background:** It is recommended that data formats, data and map transfer protocols, and back up policies be standardized prior to an incident. Things to consider are native data and file formats that emergency responders and other GIS responders will be accessing. For example, if a .dbf table is distributed out to emergency management officials and they use Microsoft Excel to open the file they will receive a warning message, most responders will not go beyond the warning message to access the file. Another example is, if a .pdf or .kml file is distributed to field personnel and they do not have Adobe Acrobat Reader or Google Earth on their mobile device, the field personnel will not be able to open the file.

It is recommended that the all data be stored locally in the MACC on a computer/hard drive designated for EOC use. This is to accommodate loss of network/Internet connectivity. Storing data on a back-up DVD or thumb-drive may also be beneficial.

The briefing cycles section is intended to give GIS responders direction for responsibilities and a timeframe for which products may need to be ready.

The damage assessment section is intended to give direction on how damage assessment data can be collected.

Not all MACCs are alike. Please be sure to modify the examples below to fit your facility needs. Examples are for reference purposes only and are not intended to set a standard.

**Example Data Format Conventions:**

GIS staff should adhere to the following Data Format Conventions. Examples provided here serve only as examples and do not set standards for the use of any particular software.

* ***Purpose*:**  This chapter discusses data format conventions, data backup and data sharing policies.

## DATA FORMAT CONVENTIONS

**

**Example Data Format Conventions**

* Acceptable Data Formats include - <<Example: .xls, .dbf, .shp, File Geodatabase, KML
* Post tables for GIS staff as .dbf for quick import into ArcGIS
* When working with Excel spreadsheets remember that cell values linked to calculations will not be translated between .xls and .dbf. If there are values of consequence that are linked to a calculation, create a new field for the data values and perform a paste special (Values only) before converting to .dbf. Make sure that there are no spaces in the header row and worksheet tabs.
	+ Also note Microsoft 2007 does not support saving as a .dbf; however, ArcMap now intakes .xls and has always accepted .CSV files.
* Tables posted for consumption of use outside of GIS should be in an MS Excel (.xls) or (.xlsx) format to avoid software compatibility warnings when opening the file.
* Acceptable Map [Output] Formats include - <<Example: .jpg, .pdf, .mxd
* When exporting to .jpg or .pdf use a resolution of 100 dpi (for printing hard copies 300 dpi is the recommended resolution) unless higher resolution is necessary to see detail. This reduces file sizes to accommodate file sharing amd network limitations.
	+ Use Relative Paths Option when sharing .mxds with others - Select the Document Properties option from the File Menu, followed by the Data Sources button in the “Map Title” Properties dialog. Then select “Store relative path names to data sources” and “Make relative paths the default for new map documents I create.”

NOTE: When posting zip files, use same naming convention as associated data file (refer to above naming conventions).

Figure 10 – EXAMPLE DATA FORMAT CONVENTIONS

## DATA BACKUP POLICY

******To avoid duplication of effort and loss of work products GIS staff are to adhere to the following practices <<Enter data backup policy>>

**Example Data Backup Policy:**

GIS staff should adhere to the following Data Format Conventions to avoid loss of data.

**Example Data Backup Policy**

* Perform and save all work in the Workspace directory under the incident (or on your C: Drive if the network is unavailable or sluggish)
* Create backup copies of the files you are working on, on a regular basis
	+ At a specific time interval, it is recommended this be done every 2-4 hours
* Save/Backup work to USB memory stick or to portable, external hard drive
	+ Tip: Purchase a portable, external hard drive with backup software.
	+ IMPORTANT – *Legal action* is often associated with post disaster mitigation, relief, and funding. Saving all your work and keeping a time log or journal of events, people, and requests made is highly suggested.

Figure 11-EXAMPLE DATA BACKUP POLICY

BRIEFING CYCLES

During an emergency event, the <<Emergency Operation Center (or DOC/MOC/etc)>> operates on a <<enter briefing cycle times, ex: 12 hour>> briefing cycle. Often <Enter briefing times>>, EOC Officials and/or Elected Officials and/or staff brief the media/public. These briefings provide information as to the extent of the area and population affected as well as actions enlisted by the <<jurisdiction or entity>> and other agencies to show the incident progression (if applicable) and reconcile the damage.

**Example - Direction for GIS Staff:**

Between scheduled briefings Incident Management Teams - IMT (and field responders only if an IMT is not set-up) send data, in various formats, to EOC staff. GIS staff is responsible for compiling these data, conducting analyses and providing maps to help staff make decisions regarding susceptible vulnerable populations, facility closures, potential environmental health hazards, etc. GIS staff is also responsible for providing maps for the briefings. Example briefings maps illustrate the extent of damage or the evacuation areas.

## US National GRID

The use of a standardized grid, such as the USNG should also be incorporated into your agency’s SOGs and policies. The USNG is a point reference system of grid references commonly used in United States. It provides a nationally consistent language of location in a user-friendly format. Utilization of the USNG will aid in interoperability between local, state, and federal agencies. Resources to support the implementation of USNG are available from the USNG Implementation Center (<http://mississippi.deltastate.edu/>) and from the FGDC (<http://www.fgdc.gov/usng>).

## Damage Assessment

As outlined in Section 3.1 of the DHS GeoCONOPS,

*Damage assessments are conducted by multiple entities in support of their mission specific information requirements. These efforts are time and labor intensive and often focus on long-term recovery missions as opposed to critical response operations. The immediate needs of the post-event response are assessed using reports from field observations, localized damage reports, imagery sources, models, and subject matter expertise.*

One helpful resource when conducting damage assessments is the use of a common grid to divide up responders. Utilization of a common grid reference system, such as the USNG is recommended for damage assessments and should be included in your agency’s SOP.

Below is a table of the FEMA damage classifications listed in the DHS GeoCONOPS. These classifications are recommended for use by all agencies. This will streamline the collection and consolidation of local damage assessment efforts. It will also streamline the transfer of data to state and federal agencies.

***FEMA Damage Classification***

|  |  |
| --- | --- |
| **Damage Level**  | **Observed Damages**  |
| **General Damage Classifications**  |
| LD  | Limited Damage  | Generally superficial damage to solid structures (e.g., loss of tiles or roof shingles); some mobile homes and light structures are damaged or displaced.  |
| MD  | Moderate Damage  | Solid structures sustain exterior damage (e.g., missing roofs or roof segments); some mobile homes and light structures are destroyed, many are damaged or displaced.  |
| ED  | Extensive Damage  | Some solid structures are destroyed; most sustain exterior and interior damage (roofs missing, interior walls exposed); most mobile homes and light structures are destroyed.  |
| CD  | Catastrophic Damage  | Most solid and all light or mobile home structures destroyed.  |
| **Wildfire Damage Classifications**  |
| B  | Burned  | Areas observed that have already burned.  |
| LD  | Limited Damage  | Few structures are burned/destroyed.  |
| ED  | Extensive Damage  | Some structures are completely burned/destroyed and sustained observable exterior damage.  |
| CD  | Catastrophic Damage  | Most structures are completely burned/destroyed.  |

Figure 12 – EXAMPLE FEMA DAMAGE CLASSIFICATION, per the DHS GeoCONOPS.DATA ACQUISITION AND DISSEMINATION

**Background:**  This section is intended to familiarize GIS Responders with the types of data that may be requested of them, data they may need to acquire, data they may need to create, and how that data is transferred. This section also provides GIS responders with federal geospatial products and programs available to them. GIS Responders may want to refer to and become familiar with the DHS GeoCONOPS. The DHS GeoCONOPS lists various datasets and essential elements of information required to support federal geospatial activities.

The Public Data Sharing/Exchange Policy section establishes the rules for the sharing of data and policy for release to the news media and for public release. It is important to note that GIS responders are not allowed to release incident information to anyone outside the incident without following the policies identified within the jurisdiction.

The Minimum Essential Datasets section provides an example of datasets that GIS responders may want to have at their disposal prior to an incident. GIS responders may also want to refer to and become familiar with the DHS GeoCONOPS and its Appendices. Section 2.2.2 of the DHS GeoCONOPS lists essential elements of information and relevant datasets used to support federal geospatial activities. It may not be necessary to include the list in the local document, but it is recommended that a list is available in case GIS assistance is provided by individuals or entities that are not familiar with the local data. It is also a good idea to have this data available on an Emergency DVD/CD or hard drive that can be shared with other responding agencies or to easily reload data in case of hardware failure.

Data connection information is important to include in case automatic data connections fail. Data connection protocols are not easily remembered when hurried or tired.

Not all MACCs alike. Please be sure to modify the examples below to fit your facility needs. Examples are for reference purposes only and are not intended to set a standard.

Not all Multi-Agency Coordination Centers are alike especially related to the release of damage assessment information. Please be sure to modify the sections and examples below to fit your Multi-Agency Coordination System (MACS) facility needs. Examples are for reference purposes only and are not intended to set a standard.

* **Purpose:** This chapter provides GIS staff with an understanding of the media briefing cycles, incident data, and damage assessment protocols.

## Essential Elements of Information

The recommended datasets list details GIS datasets that are optional in support of the mapping functions outlined in these standards. Section 2.2.2 of the DHS GeoCONOPS provides additional detail on Essential Elements of Information (EEI) supporting federal emergency management operations. The relevant datasets are listed in Appendix B of the DHS GeoCONOPS. These EEIs may vary by specific incident type, but generally include information such as disaster boundaries, socioeconomic impacts, critical infrastructure, etc.

There are many ways for local jurisdictions to obtain base and incident specific geospatial data. It is recommended that MACCs leverage existing local jurisdiction and state agencies GIS clearinghouses or data warehouses to locate needed data. Contact your states’ geographic information council to find out what is available or contact your State GIS Coordinator. For a listing of State GIS Coordinators visit, <http://gisinventory.net/summaries/state_reps/State-Reps-05.05.2011.pdf?PHPSESSID=dce35f9a7bc71ce1e890e6830548afd>.

**Example Minimum Essential Datasets:** The recommended datasets list details GIS datasets that are optional in support of the mapping functions outlined in these standards. The DHS GeoCONOPS provides additional detail on EEIs supporting federal emergency management operations. The relevant datasets are listed in Appendix B of the DHS GeoCONOPS.

**Example Minimum Essential Datasets**

**Transportation**

* Purpose: Identify access routes to the incident, evacuation routes, and other related transportation reference points. Support routing of public vehicles (evacuation/avoidance).
* Streets (name, hierarchy – primary vs. interstate)
* Private roads
* Traffic control points
* Access control points
* Road construction
* Transportation resources - buses, school buses (with wheelchair access), ambulances
* Navigable waterways
* Mass transit
* Railways
* Airports
* Helicopter landing zones

**Population**

* Purpose: Identify impacted and at-risk populations.
* Daytime population
* At need populations (schools, daycares, public meeting places, seniors homes, universities etc)

**Buildings**

* Purpose: Identify affected facilities or facilities in use for the incident.
* Potential shelter sites (large buildings – schools, convention centers etc)
* Primary and secondary mass care centers from existing EOC plan
* Critical Infrastructure
* Building footprints
* Ice arenas (temporary morgues)

##

**Example Datasets Continued:**

**Utilities**

* Purpose: Identify infrastructure that could be damaged. Identify infrastructure that could be hazardous. Provide guidance for access by first responders.
* Utility pipelines
* Power lines (underground and overhead)
* Propane farms
* Sanitary Sewers
* Water Treatment Plants
* Storm water facilities - catch basins, storm sewers, outfalls
* Wet Hydrants
* Dry/draft hydrants
* Potable water mains
* Extremely Hazardous Sites and Hazardous Sites (SARAH Title 3 sites)
* Public Service facilities (public works, water treatment, waste water treatment, electric plants

**Communications**

* Purpose: Identify potential communication outages due to the incident.
* Cell towers
* Radio communication
* Siren locations, sound buffers
* Main internet hubs/lines

**Land Ownership/Administrative**

* Purpose: Identify land ownership. This data may be managed by the tax assessors office.
* Address points
* Parcel boundaries with CAMA data
* Jurisdictions

**Environment**

* Purpose: Identify physical environment conditions that may influence hazard behavior or response.
* Topography
* Water courses
* Lakes
* Rivers
* DEM
* Fuel models
* Historical fire incidents
* FEMA flood zones

##

**Example datasets continued**

**Imagery**

* Aerial imagery with Date
* Oblique aerial imagery (i.e., Pictometry)

**Grid Reference System**

* United States National Grid (USNG)

**Dynamic Datasets**

* Purpose: Gain perspective on incident within context of current conditions
* Atmospheric conditions (wind direction, etc)
* Traffic counts/traffic flow
* Incident Datasets

**Incident Specific**

* Purpose: Visualize location and extent of incident
* Location and extent of tactical area or incident boundaries (point, line, or polygon)
* Plume (fire, chemical, etc)
* Shake Map (USGS)

**Incident Command**

* Purpose: Identify incident operations sites and zones
* Incident command post
* Staging areas
* Hot/warm/cold zones
* Shelter sites
* Decontamination site
* Evacuation zone
* Police/fire stations
* Hospitals/emergent care
* Heliports
* Airports
* Landmarks

Figure 13 – EXAMPLE MINIMUM ESSENTIAL DATASETS

### National & Federal Geospatial Products and Programs

There are many Federal geospatial data and tools resources available to local agencies. This list is not inclusive of all programs, but will provide a broad overview of products available to local agencies.

#### HIFLD

The Homeland Infrastructure Foundation-Level Data (HIFLD) working group was established to address desired improvements in collection, processing, sharing, and protection of homeland infrastructure geospatial information across multiple levels of government and to develop a common foundation of homeland infrastructure data to be used for visualization and analysis on all classification domains. For more information on federal geospatial products and programs please visit HIFLD Working Group website at <http://www.hifldwg.org/>.

#### HSIN

Public Safety Responders may also want to obtain a Homeland Security Information Network (HSIN) GIS Portal credential. HSIN is a national secure and trusted web-based portal for information sharing and collaboration between federal, states, local, tribal, territorial, private sector, and international partners engaged in the homeland security mission. More information on HSIN can be found on the DHS website, <http://www.dhs.gov/files/programs/gc_1156888108137.shtm>. HSIN credentials can be requested by emailing hsin.helpdesk@dhs.gov or calling (866) 430-0162.

The HSIN GIS portal is located at https://government.hsin.gov/sites/gis and also contains a link to download HSIP Freedom data. Your HSIN GIS credential can also be used to *view* HSIP Gold data in OneView and DHS Earth.

Within HSIN, the main Geospatial Information Infrastructure (GII) website is located at <https://gii.dhs.gov> where you can access GII web services, the OneView map, and download the DHS Earth kml file for use in Google Earth. More information on the DHS OneView can be found in Appendix E of the DHS GeoCONOPS.

According to the DHS GeoCONOPS, the formal location for federal posting and accessing geospatial data is through the HSIN and DHS GII tools such as OneView.

#### HSIP Freedom and Gold

HSIP Freedom data is a subset of the HSIP Gold datasets developed and compiled by NGA over the past few years. Approximately 190 datasets were identified from HSIP Gold as license free and distributable to state and local Homeland Security/Homeland Defense mission areas. HSIP Freedom can be shared and distributed among state and local government agencies and is being made available through the HSIN GIS Community of Interest (COI). HSIP Gold can be requested after a federal disaster declaration through HIFLD.

#### HSIP-NAVTEQ State Release

The commercial street & transportation data from HSIP Gold is also available separately upon special request by eligible state agencies. This data set is the only commercial dataset found in HSIP Gold that is available to States without a presidentially declared disaster. This data release includes street data, points of interest data, and route analysis information as generated by NAVTEQ. It includes the navigation features for routing and route analysis that are particularly valuable in public safety GIS. At this time this data product is only available on special request via HIFLD and only to eligible state agencies. For more information about the HSIP-NAVTEQ State Release visit HIFLD Working Group website at <http://www.hifldwg.org/>.

#### NSGIC GIS Inventory

The GIS Inventory is managed by the National States Geographic Information Council (NSGIC) as a tool for states and their partners. Its primary purpose is to track data availability and the status of GIS implementation in state and local governments to aid the planning and building of Spatial Data Infrastructures. It can used by public safety agencies, mutual aid groups, EOCs, and MACS FACILITYs as a “yellow pages” directory for GIS information and also as a tool to share links to data & web mapping services to support public safety at the local and state levels. More information can be found at <http://gisinventory.net/>.

#### US National Grid (USNG)

The USNG is a point reference system of grid references commonly used in United States. It provides a nationally consistent language of location in a user-friendly format. Utilization of the USNG will aid in interoperability between local, state, and federal agencies. Resources to support the implementation of USNG are available from the USNG Implementation Center (<http://mississippi.deltastate.edu/>) and from the FGDC (<http://www.fgdc.gov/usng>).

#### Geospatial Platform

The Geospatial Platform is envisioned as a managed portfolio of common geospatial data, services and applications contributed and administered by authoritative sources and hosted on a shared infrastructure. More information can be found at <http://www.geoplatform.gov>

#### Virtual USA

Virtual USA aims to connect various disparate state emergency management geospatial data into one common operational picture by utilizing current information-sharing platforms to permit new and existing technologies to seamlessly exchange information with one another.

## INCIDENT DATA

Typical types of incident data include: Road Closures, Detours, Shelters, Evacuation Areas, or Incident Perimeters. Incident data comes from a number of sources: GPS data, field ICP, remotely sensed imagery, emergency or mass notification system, word of mouth, scratch paper, etc. There is an element of latency inherent in the distribution of GIS data, for a number of reasons:

* + Data need to be transferred from the field.
	+ Data are often converted into or created from scratch in a GIS friendly format before validation.
	+ Data must be approved for release by the data owner and/or the Emergency Management Team.
	+ Ability to commission reconnaissance flights/aerial surveys.
	+ Data analysis and computation time.
	+ Quality control of the data inputs and outputs

All incident data should be quality controlled. If a MACC makes changes and updates to data that originated in the field, the field teams should be given the opportunity to quality control as well. One efficient way of doing this is through the use of visualization tools. Visualization tools can easily allow GIS Responders in one location to view the GIS products of other responders in a separate location, and quickly accept or reject any data changes.

## COMMUNICATION

Communication with other local MACCs, State Operations Centers, and Federal Operations Centers can also be an invaluable resource during emergency activations. These connections can lead to data being more easily transferred. It is recommended that MACCs identify contacts within their emergency management network. One example of where to look for these contacts is through state GIS User Groups or the HIFLD working group.

## Data Dissemination

According to the DHS GeoCONOPS, the formal location for federal posting and accessing geospatial data is through the Homeland Security Information Network (HSIN) and DHS Geospatial Information Infrastructure tools (GII) such as OneView. However each local agency will have different data dissemination protocols. Section 2.2.3 of the DHS GeoCONOPS gives an overview of recommended ways to share data:

*Vector data products are fairly compact in individual file size, facilitating data sharing through web services, e-mail, and web postings. With agile delivery options, emergency managers have access to these data products in a timely manner to assist in their decision-making. Larger data files such as imagery or national datasets are more difficult to manage. Frequently these data types are shared through the physical transfer of external hard drives and other portable media.*

For dynamic data exchanges, DHS supports NIEM and OGC standards to facilitate data dissemination and information exchange. NIEM represents a collaborative partnership of agencies and organizations across all levels of government (federal, state, tribal, and local) and with private industry. The purpose of NIEM is to effectively and efficiently share critical information at key decision points throughout the whole of the justice, public safety, emergency and disaster management, intelligence, and homeland security enterprise. NIEM is designed to develop, disseminate, and support enterprise-wide information exchange standards and processes that will enable jurisdictions to automate information sharing. NIEM includes twelve domains. NIEM emergency management domain data elements and attributes were derived from existing messaging standards promulgated by the EDXL initiative, including the Common Alert Protocol (CAP v1.1), Distribution Element (DE), and Hospital Availability Exchange (HAVE), EDXL functions as a stand-alone suite of messaging standards. NIEM leverages EDXL concepts and methods. OGC is an international industry consortium of government agencies and organizations, universities, and the private sector that develops publicly available interface standards that are geo-enabled and interoperable.

### Data Dissemination Protocols

Data dissemination is a vital part of incident response. A detailed work plan of designated paths by which data can be transferred from ICP in the field to MACCs to State Operations Centers to Federal Operations Centers should be outlined if possible.

Note: Additional research is required to outline data dissemination protocols. Through the development of this guidance, NAPSG Foundation has identified a need for geospatial data dissemination protocols for incident command, NIMS, and other key applications – which still need to be researched & developed.

### Information Dissemination Protocols

**Example Enterprise Database**

<<Provide process and connection properties for SDE databases.>>

Open GIS File Management Program

* Double Click Database Connections
* Select Add Spatial Database Connection
* Enter connection information:
	+ Server: <server>
	+ Service: <service>
	+ Database: <database>
	+ Username: <username>

Password: <password>

Local agencies should research visualization platforms as well as data transfer protocols as a way of sharing information. Location information can be easily shared via visualization tools and provide decision makers with needed information to effectively manage disasters.

## DATA CONNECTIONS

**Example Data Connections**

Example: <<Server name>>

Personal/File GDB, Shapefiles, Coverages: <<Folder location>>

CD/DVD: <<CD/DVD name>>

##

## GIS EMERGENCY DVD

<<If applicable, describe the datasets and other content provided on CD/DVD. Include information on how the CD/DVD is produced and distributed and identify any usage restrictions. Identify the physical location of the media>>

## Public DATA SHARING/EXCHANGE POLICY

### Web Applications

<<Describe web applications and systems. Provide guidance and outline the processes for sharing data and map products. Attachments may be included to provide step by step instructions for working with these systems.>>

### GIS Press Package (optional)

<<If data will also be shared with the public outline policies and procedures for data release or reference existing policies. >>

**Example GIS Press Package Policy:**

GIS Staff is not at liberty to distribute maps or GIS incident data to media or public. This is the decision of **<<insert title>>.** Data must be vetted by **<<insert title>>**. If there is any concern over the release of the data, **<<insert title>>** will contact the Data Owner to ensure the release is appropriate. Final sign-off then comes from **<<insert title>>**, bringing the info first to the Info/Intel Section Chief (See Figure 3 – OES/NIMS Org chart) for sign-off and then finally the EOC director. No release may be made before this final sign-off is made. GIS staff should adhere to the following GIS Press Package Policy when sharing data with the media.

**ExampleGIS Press Package Policy**

To further ensure the security and/or confidentiality of all incident related data:

* Do not share files through web applications unless the data are complete, ready-for-use, and where applicable you have been given the proper authority.
* When sharing GIS files, ALWAYS attach a projection file. Projection files are REQUIRED to be posted with all GIS data file formats. Projection to be used should be determined before emergency situation.
* When using web applications to share files, use the meta\_tag to alert GIS users as to status of the data/map/etc (i.e. FACT, DRAFT, etc.)
* Clear data and map transfer with your Operation Center Manager or Director, as needed, when sharing data and map products between EOC, DOC and/or MOC GIS Staff and/or through web applications.
* The Public Information Officer is responsible for sharing ALL data and/or maps with the media.
* Public Access to <<jurisdiction>> GIS Data During a Disaster
* When the need to distribute certain types of GIS information is first apparent, certain assurances must be made. In order for a data layer to be made available publicly in a GIS press package, it must meet the following eight criteria. The questions must be applied individually to each data set that is to be included in the GIS press package. A “No” answer on any of the following questions should prohibit the release of the specific data layer in the press package.
1. Is the Incident the source of the information (the data is not base data)?
2. Data is essential in the press package; otherwise the press package will not make sense?
3. Has the data has been cleared to be in the press package by its authors?
4. Has the data been cleared to be released by the incident PIO in this briefing cycle (if any doubt see question 3)?
5. Has the data been checked for quality and consistency?
6. Is the data or subject matter releasable and not described on the Release Constrained Data layer list?
7. Is the data still current with recent events?
8. Does the data have metadata (see standard in definition)?

Additionally, if the data passes the above questions with a “Yes” answer to all of them, the data must be summarily vetted.

Figure – EXAMPLE GIS PRESS PACKAGEDOCUMENTATION AND METADATA

**Background:** It is recommended that metadata be provided on all GIS data leaving the Multi-Agency Coordination Center, especially any data to be released to the public. Due to the proliferation of geospatial data during an incident from other agencies, news organizations, and social network crowd sourced information it is very important to attach a minimum set of metadata on data released to the public to distinguish the data as authoritative. Due to the time needed to complete FGDC (Federal Geographic Data Committee) compliant metadata, the file naming convention may serve as a good fit for data maintaining residency in the Multi-Agency Coordination System (MACS) facility during extremely busy periods of time.

Not all MACCs are alike. Please be sure to modify the examples below to fit facility needs. Examples are for reference purposes only and are not intended to set a standard.

* ***Purpose*:** This chapter provides guidance for the creation of metadata for all incident data and modified base data.

## DISSEMINATION OF METADATA

Metadata should be created/updated in GIS File Management System in compliance with the FGDC (Federal Geographic Data Committee). <<Reference any materials/policies that outline metadata guidelines>>.

The metadata file can be exported in HTML, SGML or .txt format and should be named in the same convention as the data to which it refers (date/time stamp, incident name, etc

# APPENDIX 1: EXAMPLE GIS ROLES AND RESPONSIBILITIES

The example roles for standard operation are based upon a white paper written by a Seattle Emergency Management Unit describing how to “Get the Most Out of GIS in an Emergency Operations Center”[[2]](#endnote-2) and the DHS GeoCONOPS. There are 8 roles and they are designed to work in conjunction with or in direct support of the EOC or Operation center. The role titles have been merged with the roles laid out in the DHS GeoCONOPS. Please update the role titles and number of roles to match what fits best in your jurisdiction. Provided in parenthesis are the titles from the DHS GeoCONOPS.

The Unit/Branch is responsible for collecting, analyzing, and disseminating information across all Emergency Support Functions. The focus of the team will be to develop an integrated common operational picture of an emergency event. It will review information coming from the field, departmental control centers and EOC personnel to quality control the data, identify gaps, and develop intelligence products for staff.

The structure is modular. In a small event, one person could fill more than one role and in a big event several people could staff the same role. Staffing is accomplished by tapping staff who are not currently assigned emergency roles under current response plans.

Most of the branch/unit’s products will be built around geospatial information. These include situation maps, an incident action plan, and briefing maps. However, being a team approach, the GIS Specialist will be called upon to support other team members as needed.

#### These roles are:

1. **GIS Branch Coordinator (Team Leader)**
2. **GIS Unit Leader (Deputy Team Leader)**
3. **GIS Specialist**
4. **Field Analyst/Observer**
5. **Communications Specialist**
6. **Geospatial Analyst (GIS Analyst)**
7. **Policy Analyst**
8. **Technical Liaisons**

## GIS Role Tables

In the GIS Role tables to follow, each GIS Role is thoroughly defined as are the skills required in order for an individual to qualify to fill each GIS Role in the manner required to adequately support the county in an emergency event. An individual’s ability to assume each GIS role is determined by the frequency with which that individual conducts certain GIS or GIS-related activities within their daily work routine. These values are idealized and do not need to be exactly duplicated or represented in the person filling the role. The specific duties and tasks where specific GIS software is referenced should be updated to reflect the software used by your individual agency. The role charts provided here serve only as examples and do not set standards for the use of any particular software.

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| ROLE: GIS BRANCH COORDINATOR (Team Leader) Because an incident will often involve multiple jurisdictions, agencies, and departments that require communication of GIS coordination activities and staff levels and resources, a Team Leader will be require as an umbrella communicator/coordinator. This role is designed to insure that the required GIS staff are available and informed of their duties to the Operation Centers. This role is often a member of the jurisdictions upper management with direct contact with the jurisdictions leadership. The role may serve as a liaison to other jurisdictions and can coordinate the GIS assistance of staff and GIS resources to other jurisdictions if requested by the respective emergency management or emergency services department. The defining characteristic of this role is providing the staff, training, resources, GIS logistical support (software, servers, field equipment, etc.) to the other roles.One of the most important duties performed by this position is preparing the jurisdiction for emergency response by developing staffing, ensuring personnel are adequately trained and equipped and by developing standard operational plans in coordination with the Operation Center GIS Coordinators. This role may also work in conjunction with the surrounding jurisdictions GIS emergency response units. Main responsibilities include:* Responsible for the coordination of geospatial information system (GIS) production, RS, and geospatial database efforts.
* Conducts briefings, attends meetings, and directs overall geospatial support operations.
* Interfaces with federal, state, and local authorities establishing MOUs, partnerships, and data sharing agreements.
* Proactively seeks opportunities to integrate geospatial products into executive decision making.
 |
| SKILL | DUTY/TASK | FREQUENCY |
| Administering and Operating GIS Applications | Use geospatial software (i.e. ArcINFO 10 or other) to identify, evaluate, and input spatial data | Rarely (every 6 mos.) |
| Use geospatial software to query data | Rarely (every 6 mos.) |
| Convert or import digital data using digitizers, scanners or GPS. | Rarely (every 6 mos.) |
| Analyze vector data sets with Geoprocessing | Rarely (every 6 mos.) |
| Project spatial data | Rarely (every 6 mos.) |
| GIS Product Development | Create FDGC Metadata | Rarely (every 6 mos.) |
| Collect field location data via GPS | Rarely (every 6 mos.) |
| Edit GIS data | Rarely (every 6 mos.) |
| Convert data (i.e., geodatabase, shapefiles, coverage, DWG,…etc) | Rarely (every 6 mos.) |
| Generate statistics | Rarely (every 6 mos.) |
| Geocode data | Rarely (every 6 mos.) |
| Perform image analysis | Rarely (every 6 mos.) |
| Map and Create new GIS data | Rarely (every 6 mos.) |
| Maintain existing GIS data (QA/QC) | Rarely (every 6 mos.) |
| GIS Services to End Users | Creating maps | Occasionally (every month) |
| Create reports based upon GIS Analysis | Often (weekly) |
| Create charts | Rarely (every 6 mos.) |
| Create tables | Rarely (every 6 mos.) |
| Interpret analysis for client | Often (weekly) |
| Determining design format of GIS data layers or database used with GIS layers | Often (weekly) |
| Directly working with clients to meet their GIS need or further their understanding of GIS | Often (weekly) |

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| ROLE: GIS UNIT LEADER (Deputy Team Leader)This role is designed to manage and maintain the GIS operations during the incident. This role assigns GIS work at the Operation Center and receives the requests for their Operation Center. Additionally, they perform QA/QC on the products that are produced in their Operation Center and ensure the work is finished by given deadlines. This role is required to post their information/data findings to web applications and to coordinate and communicate with the Incident GIS Coordination/Logistics Support Role.Main responsibilities include:* Reports to the Geospatial Team Leader.
* Responsible for maintaining the coordinated efforts of the geospatial team.
* During times of absence of the Team Leader, becomes the representative of the Team.
 |
| SKILL | DUTY/TASK | FREQUENCY |
| Administering and Operating GIS Applications | Use geospatial software (i.e. ArcINFO 10 or other) to identify, evaluate, and input spatial data | Occasionally (every month) |
| Use of geospatial software to query data | Occasionally (every month) |
| Convert or import digital data using digitizers, scanners or GPS. | Rarely (every 6 mos.) |
| Analyze raster data sets with Spatial Analyst/Grid or Imagine | Occasionally (every month) |
| Analyze vector data sets with Geoprocessing | Occasionally (every month) |
| Project spatial data | Occasionally (every month) |
| GIS Product Development | Create FDGC Metadata | Occasionally (every month) |
| Collect field location data via GPS | Rarely (every 6 mos.) |
| Edit GIS data | Occasionally (every month) |
| Convert data (i.e., geodatabase, shapefiles, coverage, DWG,…etc) | Rarely (every 6 mos.) |
| Generate statistics | Occasionally (every month) |
| Geocode data | Rarely (every 6 mos.) |
| Perform image analysis | Rarely (every 6 mos.) |
| Map and Create new GIS data | Occasionally (every month) |
| Maintain existing GIS data (QA/QC) | Occasionally (every month) |
| GIS Services to End Users | Creating maps | Often (weekly) |
| Create reports based upon GIS Analysis | Often (weekly) |
| Create charts | Often (weekly) |
| Create tables | Often (weekly) |
| Interpret analysis for client | Often (weekly) |
| Determining design format of GIS data layers or database used with GIS layers | Often (weekly) |
| Directly working with clients to meet their GIS need or further their understanding of GIS | Often (weekly) |

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| ROLE: GIS SPECIALISTThe most important function of the Geospatial Production Manager will be integrating the vast amount of data that a large event will generate. While most of the roles here do not directly address GIS coordination with agencies outside the Operation Centers (with the exception of the EOC GIS Coordinator and Incident GIS Coordinator), they are organized to facilitate the integration of data into an operation center in the context that it will be disseminated to others (one of the primary purposes of an EOC). The Geospatial Production Manager role will supervise the creation of map products that neatly summarizes the most important points of an emergency response on a small sheet of paper. The position will also perform ad hoc analysis at the request of the Team Leader. Part of the analytical function will be to perform analysis that verifies data. This specialist will also assist Emergency Public Information Officers produce spatial information for public consumption. The defining characteristic of this role is the ability to *quickly make maps and perform simple analyses* for the operation center coordinator. Main responsibilities include:* Reports to the Team Leader.
* Coordinates GIS requirements and supervises assigned Geospatial Analysts.
* Prioritizes GIS production and activities.
* Works with product requesters to properly define requirements and ensures the timely preparation and delivery of recurring and ad hoc GIS products.
 |
| SKILL | DUTY/TASK | FREQUENCY |
| Administering and Operating GIS Applications | Use geospatial software (i.e. ArcINFO 10 or other) to identify, evaluate, and input spatial data | Often (weekly) |
| Use of geospatial software to query data | Occasionally (every month) |
| Convert or import digital data using digitizers, scanners or GPS. | Occasionally (every month) |
| Analyze raster data sets with Spatial Analyst/Grid or Imagine | Occasionally (every month) |
| Analyze vector data sets with Geoprocessing | Occasionally (every month) |
| Project spatial data | Occasionally (every month) |
| GIS Product Development | Create FDGC Metadata | Occasionally (every month) |
| Collect field location data via GPS | Occasionally (every month) |
| Edit GIS data | Occasionally (every month) |
| Convert data (i.e., geodatabase, shapefiles, coverage, DWG,…etc) | Often (weekly) |
| Generate statistics | Often (weekly) |
| Geocode data | Rarely (every 6 mos.) |
| Perform image analysis | Rarely (every 6 mos.) |
| Map and Create new GIS data | Often (weekly) |
| Maintain existing GIS data (QA/QC) | Often (weekly) |
| GIS Services to End Users | Creating maps | Often (weekly) |
| Create reports based upon GIS Analysis | Occasionally (every month) |
| Create charts | Often (weekly) |
| Create tables | Often (weekly) |
| Interpret analysis for client | Often (weekly) |
| Determining design format of GIS data layers or database used with GIS layers | Rarely (every 6 mos.) |
| Directly working with clients to meet their GIS need or further their understanding of GIS | Rarely (every 6 mos.) |

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| **ROLE: FIELD ANALYST / OBSERVER**This role acts as the eyes of the operation centers and GIS specialist in the field. It provides a way for operation centers to directly access an incident site. One of its most important duties is collecting GPS data and relay it back to the GIS specialist. This position verifies information for the GIS specialist. Specifically, this individual is required to collected and report spatial information from the field in the forms of maps, data, or positions relay via phone or radio. Their primary task or job often is not related to emergency response, but they are required to perform this task during a disaster. They are skilled in GPS collection and are familiar with the difficulties of working in remote locations in rapidly changing environment. This role must be able to be able to be detached to a state or federal agency if called to this duty. This role is the primary forward observer for spatial information for command centers.  |
| **SKILL** | **DUTY/TASK** | **FREQUENCY** |
| Administering and Operating GIS Applications | Use geospatial software (i.e. ArcINFO 10 or other) to identify, evaluate, and input spatial data | Occasionally (every month) |
| Use geospatial software to query data | Occasionally (every month) |
| Convert or import digital data using digitizers, scanners or GPS. | Often (weekly) |
| Analyze raster data sets with Spatial Analyst/Grid or Imagine | Rarely (every 6 mos.) |
| Analyze vector data sets with Geoprocessing | Occasionally (every month) |
| Project spatial data | Rarely (every 6 mos.) |
| GIS Product Development | Create FDGC Metadata | Rarely (every 6 mos.) |
| Collect field location data via GPS | Often (weekly) |
| Edit GIS data | Often (weekly) |
| Convert data (i.e., geodatabase, shapefiles, coverage, DWG,…etc) | Often (weekly) |
| Generate statistics | Rarely (every 6 mos.) |
| Geocode data | Often (weekly) |
| Perform image analysis | Never (never) |
| Map and Create new GIS data | Often (weekly) |
| Maintain existing GIS data (QA/QC) | Rarely (every 6 mos.) |
| GIS Services to End Users | Creating maps | Often (weekly) |
| Create reports based upon GIS Analysis | Occasionally (every month) |
| Create charts | Occasionally (every month) |
| Create tables | Occasionally (every month) |
| Interpret analysis for client | Occasionally (every month) |
| Determining design format of GIS data layers or database used with GIS layers | Never (never) |
| Directly working with clients to meet their GIS need or further their understanding of GIS | Never (never) |

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| **ROLE: COMMUNICATIONS SPECIALIST** This role acts as the ears of the Unit by monitoring radio and TV communications. For the GIS analyst, it is an information source. It will often be the first to pick up new, raw information. The person filling this role will be able to provide frequent updates to the Geospatial Production Manager and assist with vetting information. This role will also be cross-trained to perform the simple tasks outlined in the GIS Specialist role. In a fast moving event, the Communications Specialist would directly update a map document set up by the Geospatial Production Manager.  |
| **SKILL** | **DUTY/TASK** | **FREQUENCY** |
| Administering and Operating GIS Applications | Use geospatial software (i.e. ArcINFO 10 or other) to identify, evaluate, and input spatial data | Occasionally (every month) |
| Use geospatial software to query data | Occasionally (every month) |
| Convert or import digital data using digitizers, scanners or GPS. | Rarely (every 6 mos.) |
| Analyze raster data sets with Spatial Analyst/Grid or Imagine | Never (never) |
| Analyze vector data sets with Geoprocessing | Rarely (every 6 mos.) |
| Project spatial data | Occasionally (every month) |
| GIS Product Development | Create FDGC Metadata | Rarely (every 6 mos.) |
| Collect field location data via GPS | Rarely (every 6 mos.) |
| Edit GIS data | Rarely (every 6 mos.) |
| Convert data (i.e., geodatabase, shapefiles, coverage, DWG,…etc) | Rarely (every 6 mos.) |
| Generate statistics | Rarely (every 6 mos.) |
| Geocode data | Rarely (every 6 mos.) |
| Perform image analysis | Never (never) |
| Map and Create new GIS data | Occasionally (every month) |
| Maintain existing GIS data (QA/QC) | Rarely (every 6 mos.) |
| GIS Services to End Users | Creating maps | Occasionally (every month) |
| Create reports based upon GIS Analysis | Rarely (every 6 mos.) |
| Create charts | Occasionally (every month) |
| Create tables | Occasionally (every month) |
| Interpret analysis for client | Rarely (every 6 mos.) |
| Determining design format of GIS data layers or database used with GIS layers | Never (never) |
| Directly working with clients to meet their GIS need or further their understanding of GIS | Rarely (every 6 mos.) |

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| ROLE: GEOSPATIAL ANALYSTThis position can perform research, database queries and statistical analysis for the Geospatial Production Manager. Frequently during emergencies, data comes into the EOC in less than pristinecondition. The analyst will massage the data into a usable format. Having a database expert on site will free up the GIS specialist to concentrate on simple GIS analysis and map production.Main responsibilities include:* Reports to the Geospatial Production Manager.
* Prepares recurring and ad hoc GIS products.
* Compiles various types of geospatial information into map and data products.
* Analyzes geospatial data from various sources to answer diverse questions and
* populate geospatial products.
 |
| **SKILL** | **DUTY/TASK** | **FREQUENCY** |
| Administering and Operating GIS Application | Use geospatial software (i.e. ArcINFO 10 or other) to identify, evaluate, and input spatial data. | Often (weekly) |
| Use geospatial software to query data. | Often (weekly) |
| Convert or import digital data using digitizers, scanners or GPS. | Often (weekly) |
| Analyze raster data sets with Spatial Analyst/Grid or Imagine | Often (weekly) |
| Analyze vector data sets with Geoprocessing | Often (weekly) |
| Project spatial data | Often (weekly) |
| GIS Product Development | Create FDGC Metadata | Often (weekly) |
| Collect field location data via GPS | Often (weekly) |
| Edit GIS data | Often (weekly) |
| Convert data (i.e., geodatabase, shapefiles, coverage, DWG,…etc) | Often (weekly) |
| Generate statistics | Often (weekly) |
| Geocode data | Often (weekly) |
| Perform image analysis | Often (weekly) |
| Map and Create new GIS data | Often (weekly) |
| Maintain existing GIS data (QA/QC) | Often (weekly) |
| GIS Services to End Users | Creating maps | Often (weekly) |
| Create reports based upon GIS Analysis | Often (weekly) |
| Create charts | Often (weekly) |
| Create tables | Often (weekly) |
| Interpret analysis for client | Often (weekly) |
| Determining design format of GIS data layers or database used with GIS layers | Often (weekly) |
| Directly working with clients to meet their GIS need or further their understanding of GIS | Occasionally (every month) |

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| **ROLE: POLICY ANALYST**This position provides administrative support to the team and produces the text that accompanies maps and other analysis if they require special explanation or detail. They help ensure that GIS maps communicate with a lay audience and integrate with non-geographic material. Although they are not technically part of the unit’s GIS structure they play an important role of minimizing miscommunication to the public and other non-technical agency representatives.Main responsibilities include:* Reports to the Team Leader.
* Provides administrative support to the Team Leader and the Team in general.
* Manages reception area.
* Greets customers and assists them in filling out request forms.
 |
| **SKILL** | **DUTY/TASK** | **FREQUENCY** |
| This role requires no specialized GIS skills, only a general understanding of what the technology is and what it does, and how has conducted the work or sources of information. This role is very important in that it should act as a reality check QA/QC in asking about the quality or source of information or claims made in the GIS products. This role is required to respond to the operation center or duty station. |
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| **ROLE: TECHNICAL LIAISONS** While not officially, members of the Unit, as needed, the operation center Unit will be augmented with scientific liaisons to better inform GIS analysis. Often, decision makers look to GIS analysts to provide detailed technical analysis outside their areas of expertise. The operation center plan provides a mechanism to request scientific support when needed. From areas multi-disciplinary areas of expertise, a pool will be formed of individuals to fill this role. |
| **SKILL** | **DUTY/TASK** | **FREQUENCY** |
| This role requires no specialized GIS Skills, only a general understanding of what the technology is and what it does. This role is very important role in that it should augment the expertise of GIS Analyst and GIS specialist so that they can make informed decision when working with spatial data that has a specific technical aspect, e.g., HAZMAT, sensitive biology, engineering, etc. This role does not require a response to the EOC or physical presence (unless requested), but should be available via phone and email when needed. |
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# Appendix 2: List of Referenced Links

1. National Wildlife Coordinating Group. GIS Standard Operating Procedures (June 2006) <<http://www.nwcg.gov/pms/pubs/GSTOP7.pdf>>

Federal Interagency Geospatial Concept of Operations (GeoCONOPS), Department of Homeland Security, Geospatial Management Office. For a digital copy visit, <http://www.napsgfoundation.org/attachments/article/113/DHS_Geospatial_CONOPS_v3.0_8.5x11.pdf> [↑](#endnote-ref-1)
2. Arnone, Harvey and T.J. McDonald, “Getting the Most Out of GIS in an Emergency Operations Center: Support for GIS operations using a Situation Status Unit” (ESRI International User Conference Proceedings and Seattle Emergency Management Agency) <<http://proceedings.esri.com/library/userconf/proc05/papers/pap1422.pdf>> [↑](#endnote-ref-2)