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Title: DOE GIS CORE TEAM—A BEST PRACTICE

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DOE GIS CORE TEAM—A BEST PRACTICE

Abstract

Large government organizations such as the Department of Energy (DOE) are challenged with identifying and implementing best geospatial information management practices to ensure that operational needs are met and government objectives are achieved. Geographic Information System (GIS) professionals, complex wide within the Department, conduct spatial information management practices on a daily basis to complete a wide variety of science and engineering tasks. The DOE Office of the CIO recognized the wealth of geospatial information management knowledge within the DOE complex and formed the DOE GIS Core Team in 2001 as a result. The team is comprised of GIS experts—representing all major DOE labs, site facilities, and programs—who volunteer their time to address issues impacting the entire complex. These include the President's management agenda (with emphasis on the Geospatial One-Stop), homeland security, emergency response, site management, software and geospatial data licensing, and federal, national, and international standards governing the creation and dissemination of geospatial data. The strength of the DOE GIS Core Team is the wide diversity of GIS and scientific expertise represented on the team, which allows it to provide the DOE CIO's office with sound guidance on complex wide issues from a GIS practitioner's perspective.

The Core Team's mission is “to foster technical excellence and communication, to identify and advocate best business practices, and to provide sound recommendations on policy and standards.” As a first step toward identifying best practices the team conducted a survey of all known GIS assets across the DOE complex. The survey identified each site's GIS expertise, operating systems architecture and software applications, major project areas supported, and a number of other metrics important to the operation of a GIS organization. Results of the survey will be discussed, along with the mission of the Core Team. A broad overview of best practices utilized by many of the leading GIS organizations across the complex will also be provided.



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The DOE GIS Core Team



Annual Information Management Conference
Columbus, OH



DOE GIS Core Team

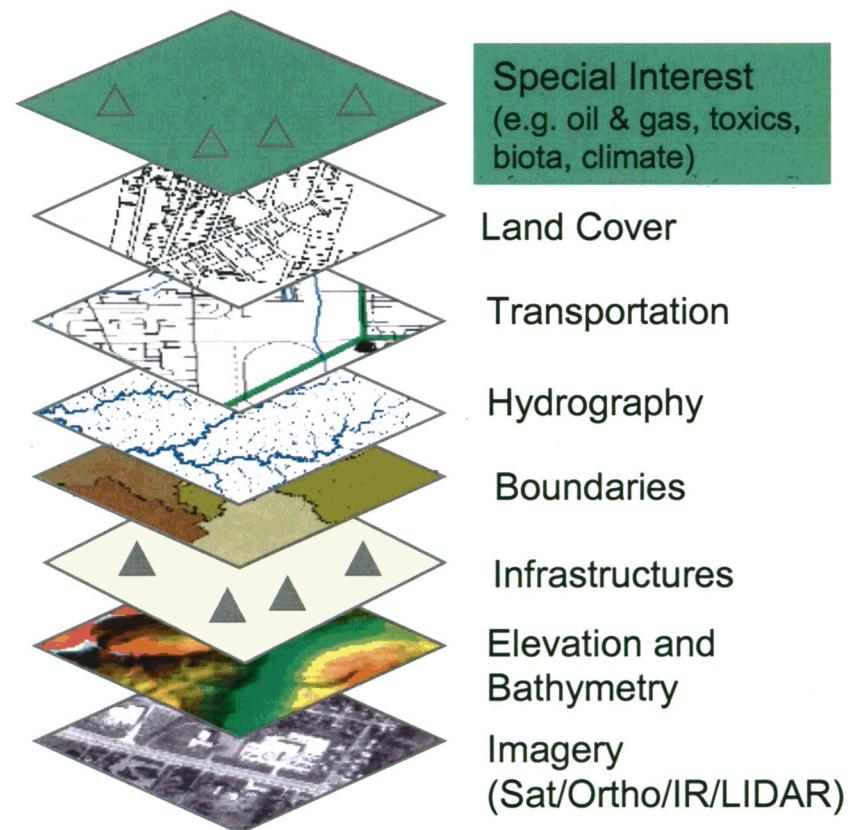
- Budhendra Bhaduri (Oak Ridge National Laboratory)
- Denise Bleakly (Sandia National Laboratory)
- Jim Bollinger (Savannah River National Laboratory)
- Liz Brady-Sabeff (National Renewable Energy Laboratory)
- Al Guber (Remote Sensing Laboratory)
- Karen Guziel (Argonne National Laboratory)
- Susan Hargrove (DOE-HQ Office of the CIO)
- John Lee (DOE - Oakland Operations Office)
- Randy Lee (Idaho National Engineering and Environmental Laboratory)
- Kurt Mickus (DOE-HQ Emergency Communications Network)
- David Morehouse (DOE-HQ EIA)
- Kevin Moore (DOE-HQ Emergency Communications Network)
- Amy Ramsdell (Brookhaven National Laboratory)
- Paul Rich (Los Alamos National Laboratory)
- Steve Rush (Hanford)
- John Stewart (DOE-HQ Office of Environmental Management)
- Hoyt Walker (Lawrence Livermore National Laboratory)

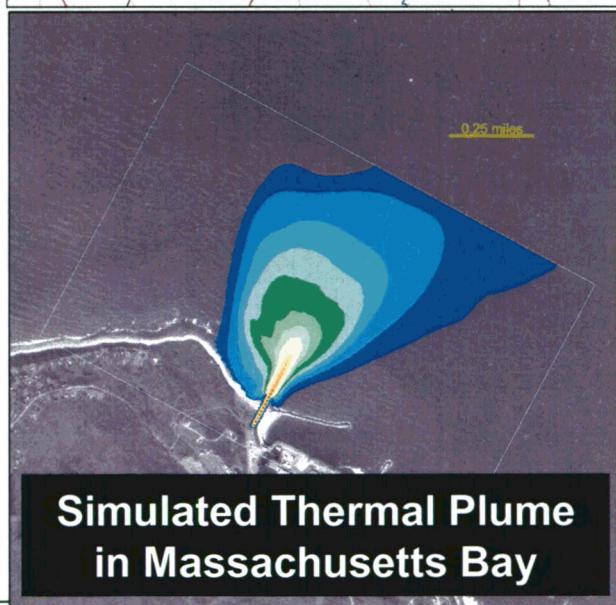
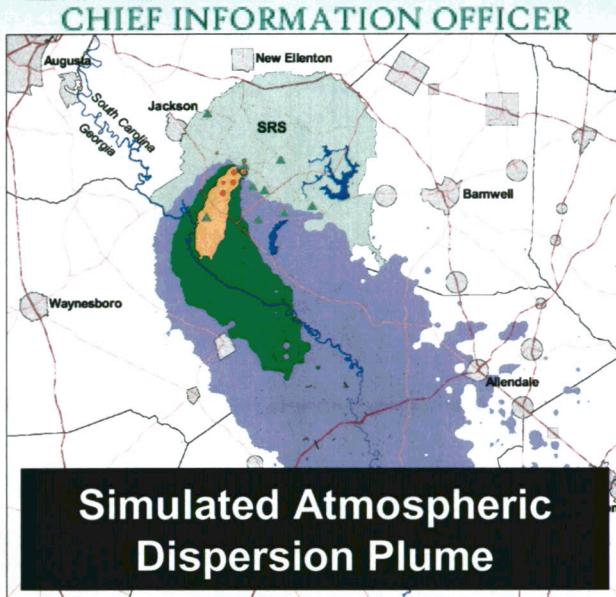


GIS = Geographic Information System

GIS key for decision support

- System for management, analysis, modeling, and visualization of **geospatial data**.
- Integrates science, information, and art through the combination of diverse data and models in a map-based context.
- More than 80 percent of all government information has a spatial component.





How DOE utilizes GIS

Infrastructure Protection/Emergency Response

- Modeling Infrastructure Vulnerabilities
- Emergency Operations Center Support
- Air Dispersion Modeling for Airborne Release of a Chemical, Biological, or Nuclear Agent
- Threat Assessment

Environmental Management

- Groundwater Contaminant Transport Modeling
- Spatial Analysis of Soils/Groundwater Contaminants
- Management of Waste Units/Cleanup Efforts
- Project Planning and Management to Reduce Costs

Other Uses

- Research and Development (many disciplines)
- Oil and Gas Resource Analysis at the Field/Reservoir Level
- International Nuclear Non-Proliferation
- Nuclear Materials Transportation and Accountability



GIS at DOE Headquarters

- Office of Emergency Operations
- Office of Energy Assurance
- Office of Energy Efficiency and Renewable Energy
- Energy Information Administration

- Office of Intelligence
- National Nuclear Safety Administration
- Office of Environmental Management
- Office of Legacy Management
- Office of Radioactive Waste

GIS at DOE Facilities

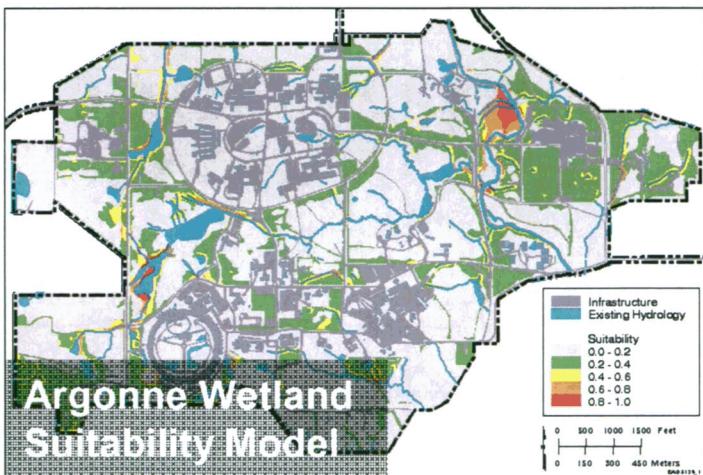
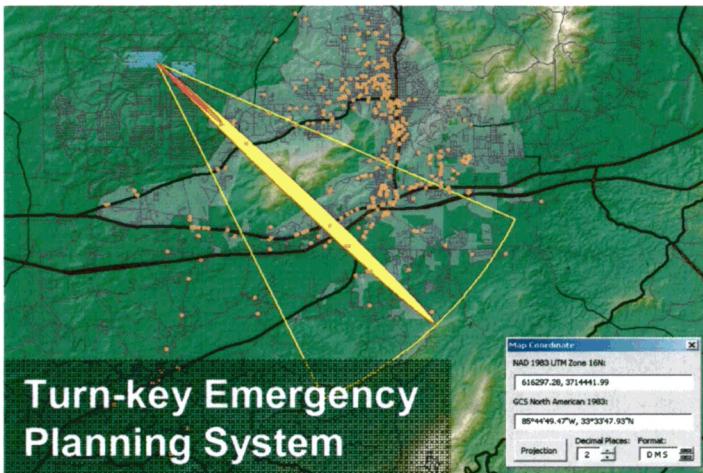
- Argonne
- Brookhaven
- Idaho Engineering and Environmental
- Lawrence Berkley
- Lawrence Livermore
- Los Alamos
- National Energy Technology
- National Petroleum Technology

- Oak Ridge
- Pacific Northwest
- Pantex
- RSL/NTS
- Rocky Flats
- Sandia
- Savannah River
- ...



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Argonne National Laboratory



System Architecture

- Unix/Windows based client-server
- Windows - User Interface

Key Programs

- Site operations support with ANL GIS
- Applied GIS modeling and analysis for diverse federal sponsors in Environmental Assessment Division
- Systems development and homeland security for diverse federal sponsors in Decision Information Sciences division

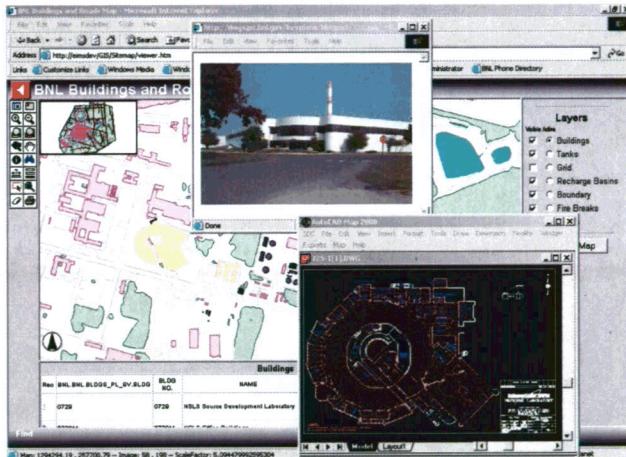
Best Practices

- Advanced GIS software development, analysis, modeling, visualization, web development, and mobile devices, remote sensing

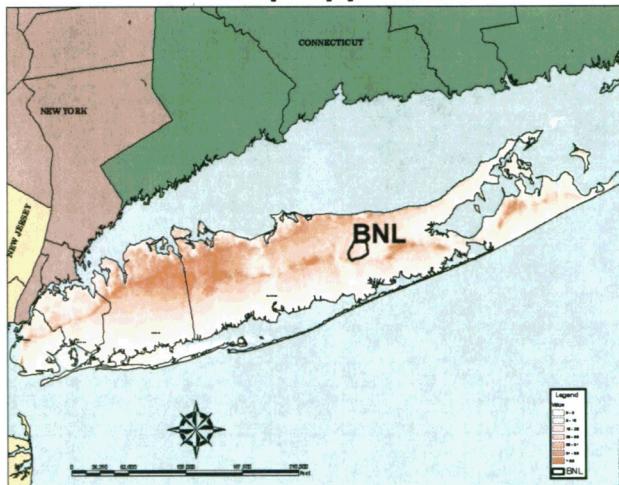


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Brookhaven National Laboratory



Internet Map Applications



GIS Analysis and Mapping

Key Programs Supported

- Environmental restoration
- Environmental compliance
- Natural and cultural resources
- Communication of environmental stewardship requirements to internal and external stakeholders
- Laboratory-wide mapping and special projects

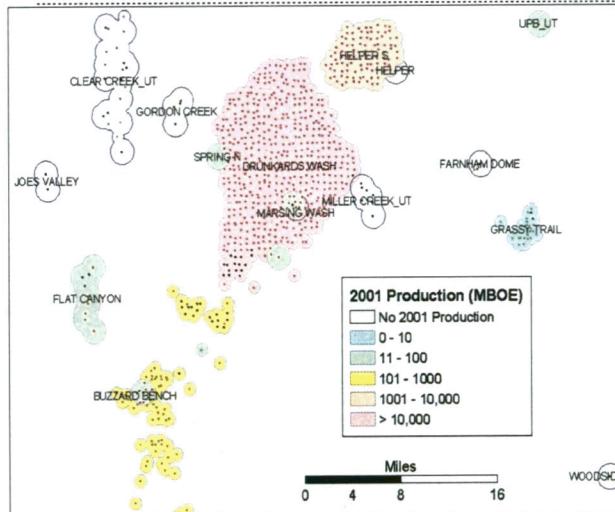
Key Capabilities

- Enterprise GIS architecture expertise
- Internet applications are proven framework models
- Advanced integration of GIS, Autocad, and environmental information database



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EIA Office of Oil and Gas



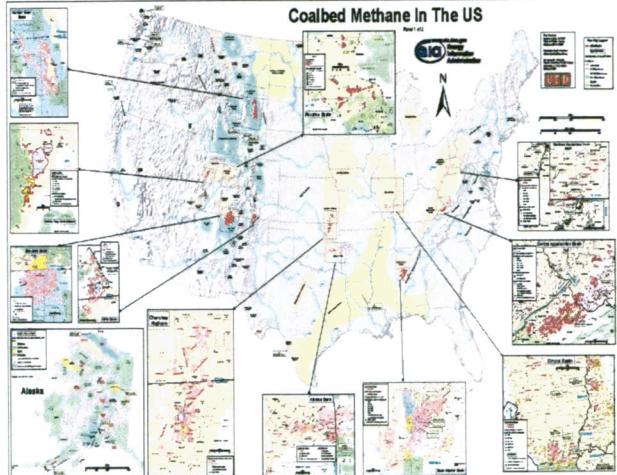
Analysis of Oil and Gas Fields and Reservoirs

- Automated imputation of field productive limits from well data via petroleum geology/engineering-guided statistical geometric analysis
- Automated spatial determination of what fields, and what portions of their proved reserves and projected growth, are associated with onshore Federal lands (EPCA Section 604)

Efficient, Effective Conveyance of Energy Information

- Example: 90+% of what's known about U.S. coal bed methane resources (location, proved reserves, production & developmental histories) in just two big pages, not a book

U.S. Natural Gas Transportation Grid from Wellhead to Industrial Burner Tip or LDC Service Area

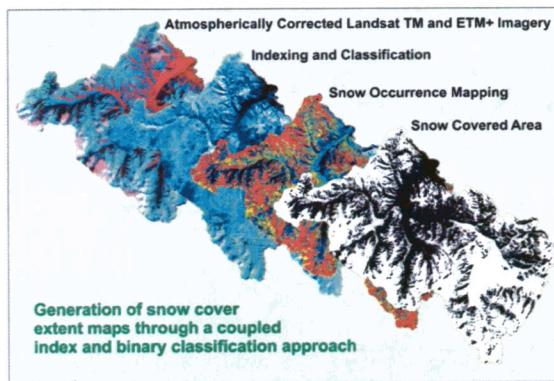


- Supports multiple technical/economic analyses and emergency response; has extensive menu-accessible engineering detail and flow history (OUO application, not shown)

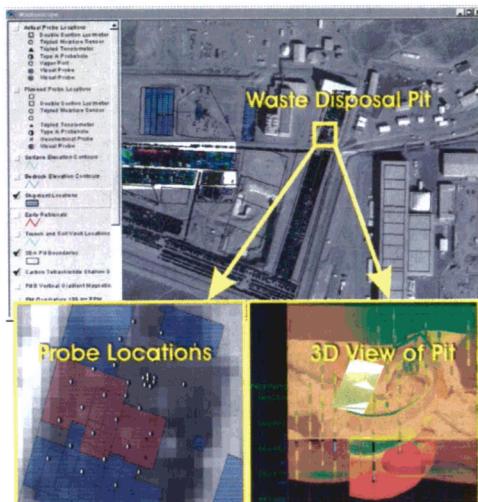


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Stream Flow Forecasting in Snow-Dominated Basins



Waste-O-Scope



Idaho National Engineering and Environmental Laboratory

Current Key Projects

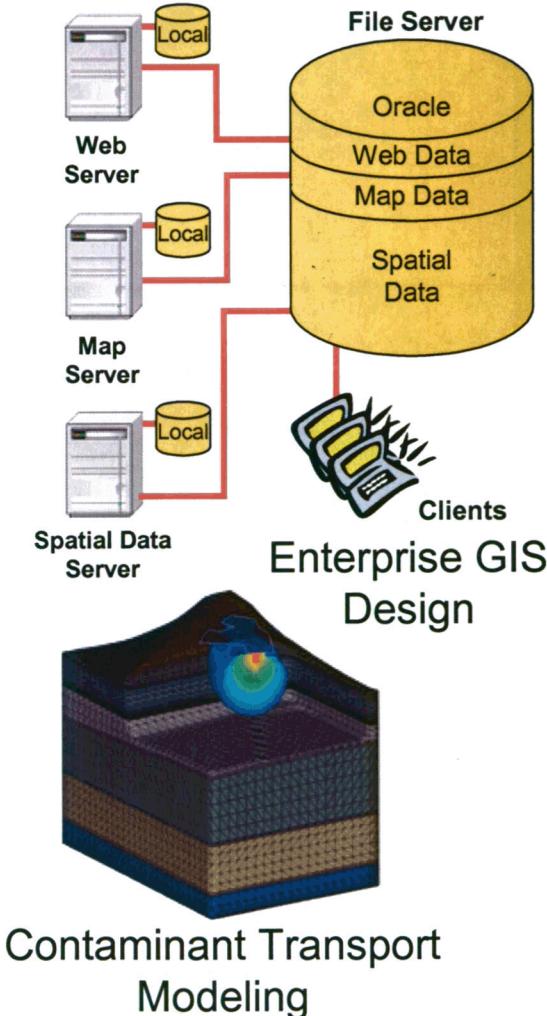
- Water Energy Resources of the United States
- Idaho Completion Project
- Pacific Northwest Regional Collaboratory
- Selenium Information System
- Vulnerability Reduction and Risk Assessment
- Carbon Sequestration Regional Partnerships

Key Capabilities

- Advanced Geospatial Modeling and Analysis
- Custom Geospatial Tool Development
- Advanced GIS and Remote Sensing Research
- Data Integration and Management
- Professional Cartographic Design and Production



Los Alamos National Laboratory



Some Key Projects

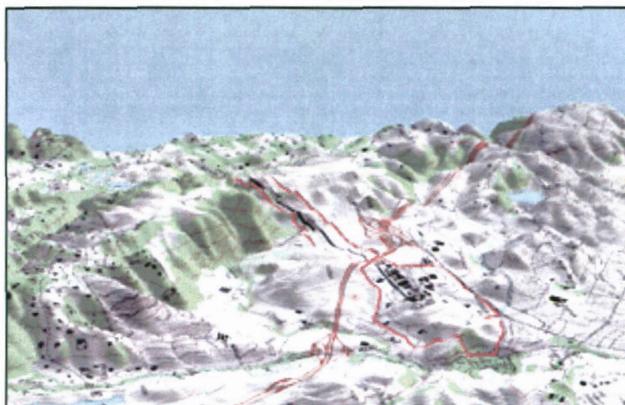
- Critical Infrastructure Protection
- Environmental Restoration Project
- Carbon Sequestration Regional Partnerships
- ZeroNet Water for Energy Initiative
- Advanced Chemical Identification Technology
- Yucca Mountain Project

Some Key Capabilities

- Enterprise GIS design
- Advanced GIS visualization and analysis
- 3D GIS
- Data and model integration
- Spatial decision support systems



Oakland Environmental Programs LandTrek



System Architecture

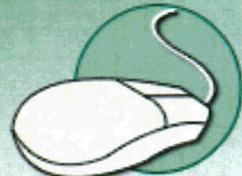
- Mapping with ArcIMS (Windows/Unix)
- Web browser interface

Key Programs

- LandTrek – providing GIS expertise to EM sites, federal, state and local governments
- EPA Institutional Controls data sharing
- GIS support for Risk-Based End State at sites
- Applications for monitoring data
- Integrated Site Closure System for OAK sites

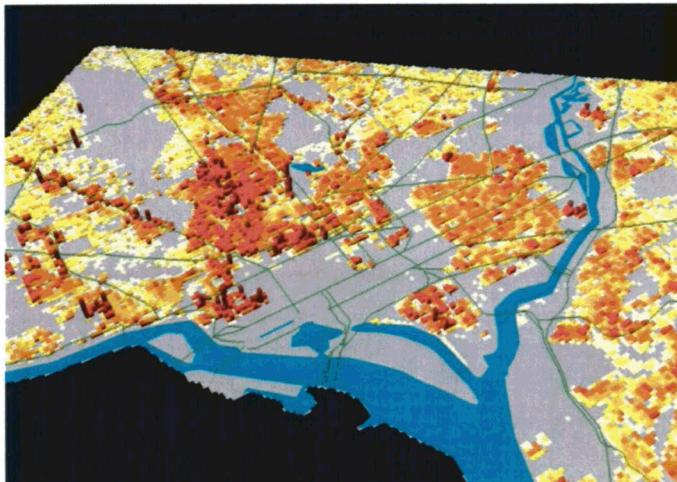
Best Practices

- Advanced Internet GIS application integration
- Making GIS data accessible, helping with closure and legacy management



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Oak Ridge National Laboratory



Key Programs

- Very High-resolution Global Population Distribution Modeling (day and night)
- USEPA National Pesticide Application Modeling
- DOE OEA Support for Emergency Operations
- Intelligent Consequence Management
- Agent-based Tera-scale Image Data Retrieval

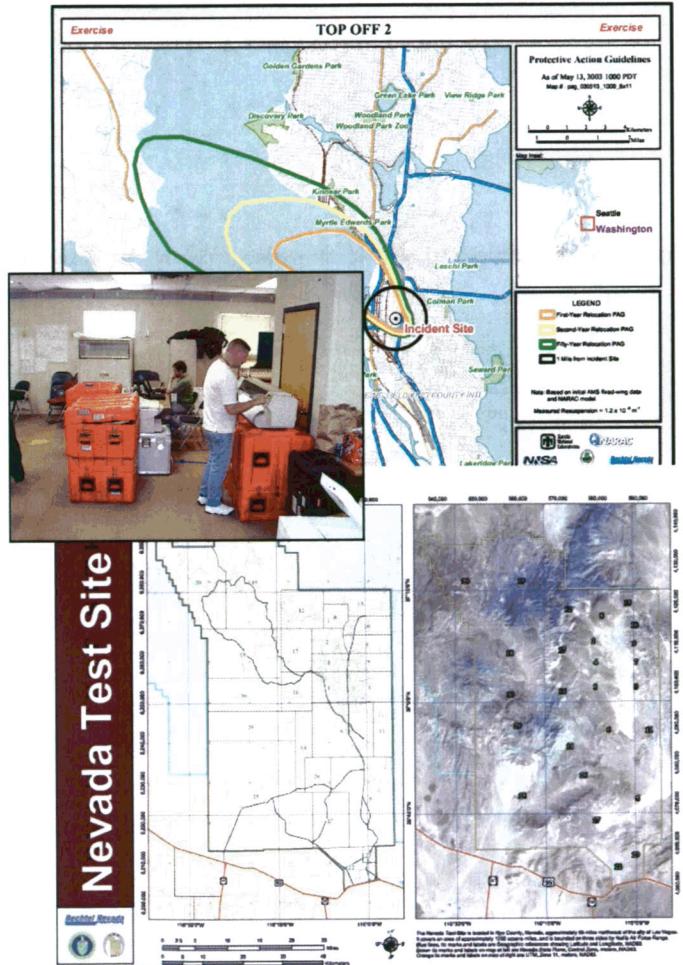
Capabilities

- Advanced Spatial Modeling and Simulations
- Innovative GIS software and data development
- Utilization of High Performance Computing in Data Integration & Visualization
- Decision Support Systems
- Tera-scale Spatial Data Management and Modeling



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Remote Sensing Laboratory Nevada Test Site



System Architecture

- Windows/LINUX based client-server
- Deployable and non-deployable configurations
- Windows GIS Application development

Key Programs

- Emergency Response for Nuclear Incidents
- Emergency Management for EOC operations
- Support for operations, environmental management, security, and business development at the NTS.
- Support for Intelligence related projects.

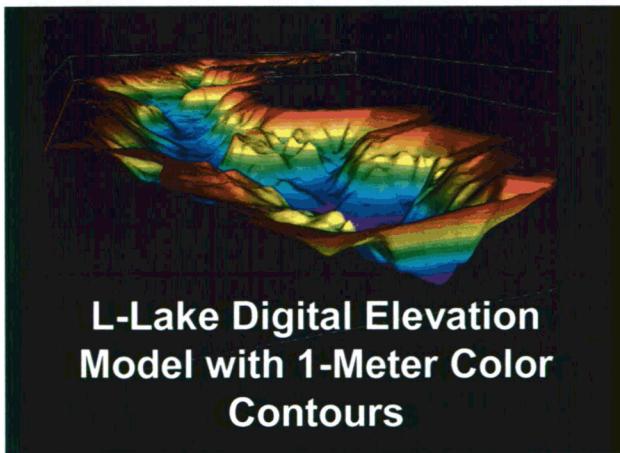
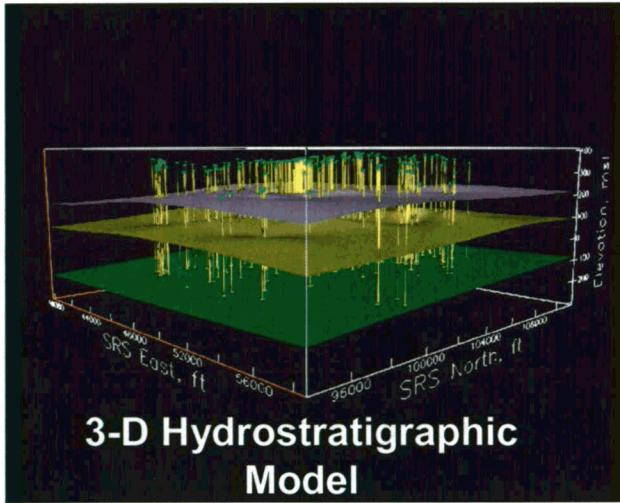
Best Practices

- Advanced GIS software development and technical integration. Worldwide database maintenance.
- Integration of GIS technologies for incident command and control and safety awareness.



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Savannah River National Laboratory

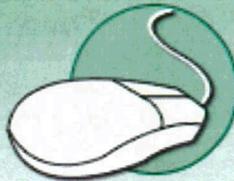


Key Programs

- Atmospheric dispersion modeling support
- US Department of Justice vulnerability analysis
- International nuclear non-proliferation modeling and support
- Groundwater advective transport modeling
- Subsurface geochemical anomaly detection

Capabilities

- Advanced GIS software development
- Nexus between GIS and advanced numerical/mathematical modeling



Core Team Mission and Objectives

Mission (August 2002)

Promote effective utilization of GIS science and technology:

- Foster technical excellence and communication
- Identify and **advocate best business practices**
- Provide sound recommendations on policy and standards

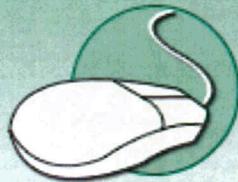
Objectives

- Encourage communication and broad technical exchange
- Implement **best business practices** regarding GIS and sharing data
- Implement **PRESIDENTS E-GOVERNMENT management agenda**; in particular **Geospatial One-Stop**
- Assist with implementation of OMB's geospatial policies and development of best geospatial data management practices (see <http://www.fgdc.gov/>)



DOE Enterprise GIS: Progress We Have Made

- User Group founded 1993
- Core Team established 2001 – voluntary, GIS experts from all major DOE labs and sites
- Survey of known DOE GIS assets - 2003:
 - 1,812 Geospatial Licenses
 - **Total annual expenditures measured in tens of millions**
- Core Team analysis of DOE GIS enterprise needs - 2003



DOE Enterprise GIS: Where We Stand

Consensus Opinion of GIS Experts from all Major DOE Labs and Sites:

- GIS is now managed by DOE as a tactical tool rather than a strategic resource
- “Near misses” due to lack of coordinated data sharing:
 - Hanford fire (June 2000)
 - Cerro Grande fire - Los Alamos (May 2000)
 - Northeastern U.S. blackout (August 2003)
- Voluntary efforts insufficient to address critical needs:
 - President’s management agenda (Geospatial One-Stop)
 - Compliance with OMB A-11 and A-16 and the Federal Geographic Data Committee’s standards
 - OMB expectation of agency management of GIS as a strategic corporate resource
 - Coordination to eliminate duplication, inefficiency, and waste
Corporate geospatial data and software licensing agreements. Examples of substantial savings (DoD, Interior, and Agriculture)



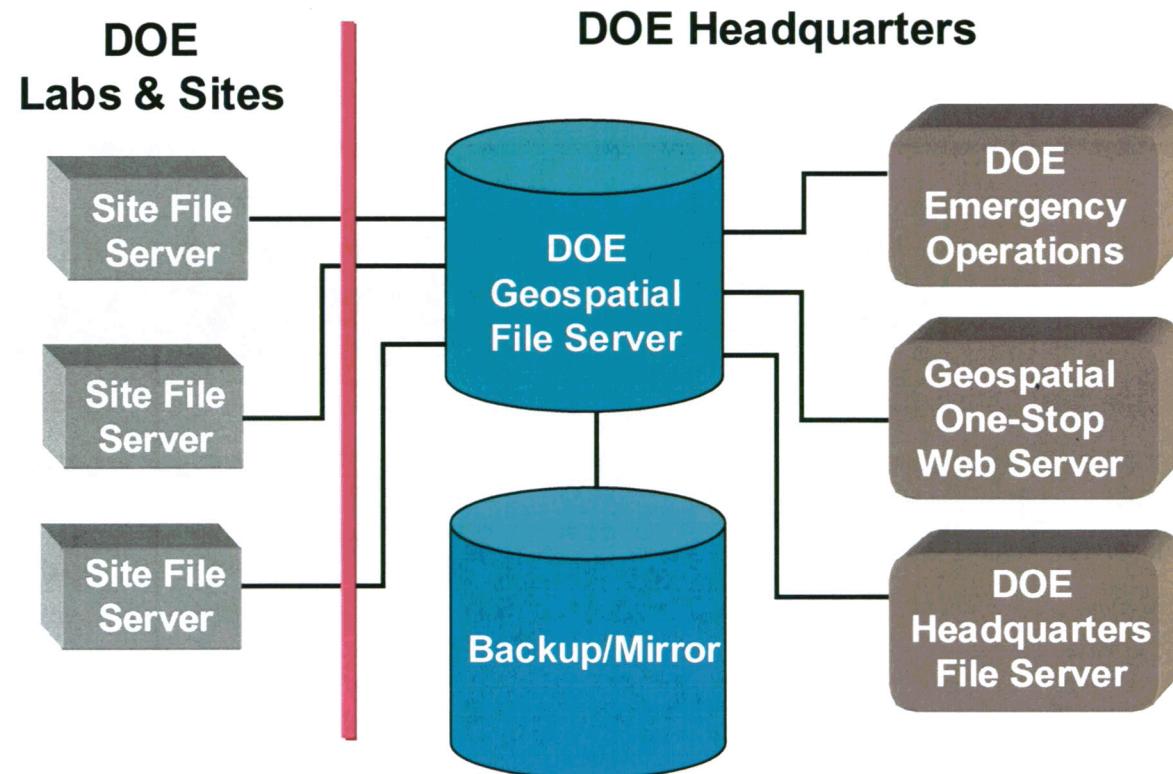
DOE Enterprise GIS: Where We Need to Go

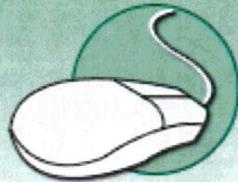
- The solution: complex-wide enterprise GIS
 - Provides data access, backup, and defense-in-depth for emergency response **so that the next near-miss does not become a major event**
 - Leverage economies of scale through central server & coordination
 - Participate in Geospatial One-Stop and comply with FGDC standards: **will reduce costs by eliminating duplication and rework**
 - Satisfies data sharing needs for the complex
 - Addresses OMB requirements: manages GIS as a strategic resource
- Genesis for enterprise system already exists within DOE
- DOE Emergency Communications Network (ECN) planning coordinated geospatial data sharing across the complex to support emergency management. **Why not leverage and broaden this effort?**



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Core Team Vision for DOE Enterprise GIS





Summary

- Active and supportive GIS user community
- Current GIS use: project support (tactical)
- Critical Need: DOE-HQ support for enterprise GIS (strategic)
- Genesis for enterprise solution already exists within DOE Core Team
- Recommend partnering between the Office of the CIO, EIA, and ECN as path forward

Support for enterprise GIS by DOE critical for best business practices and for emergency operations.