GIS for a Large Chemical Warfare Materiel Investigation/Remediation Project in Washington, DC

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Richmond, VA

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Presentation Overview

- Introduction

- What is GIS?

- GIS Applications to Spring Valley
  - Sampling Applications
  - Spatial Analysis
  - Stakeholder Involvement

- Lessons for Effective Management of Large GIS Databases
  - Standardization & Automation
  - Data Organization

- Conclusion

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Introduction

Introduction

- WWI: US gov't established the AUES in NW Washington, DC, to investigate testing, production, and effects of noxious gases, antidotes, and protective masks.

- Spring Valley currently comprises about 1200 homes, multiple residences of foreign ambassadors, a university, a seminary, and various commercial properties.
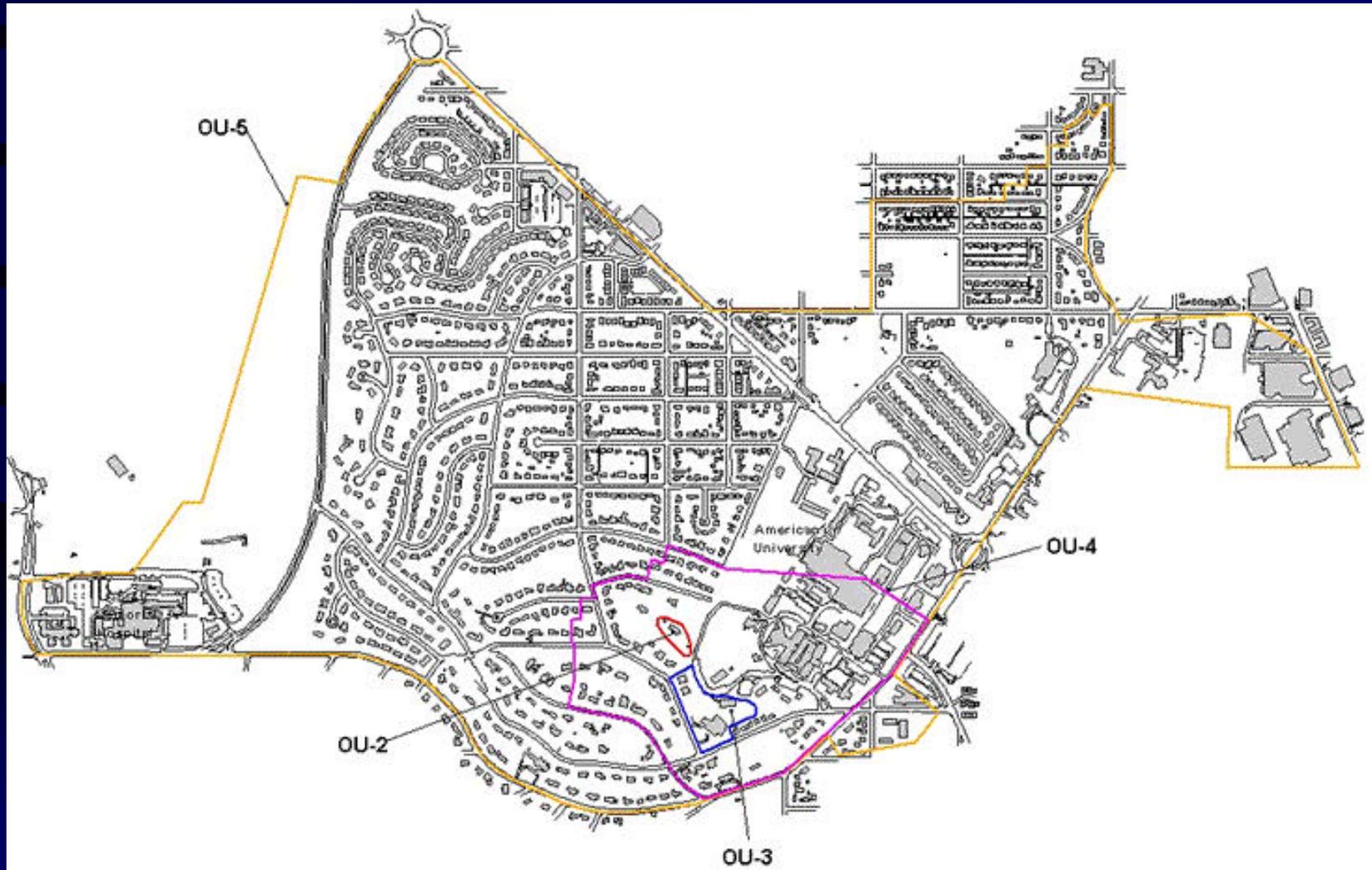
Introduction (cont'd)
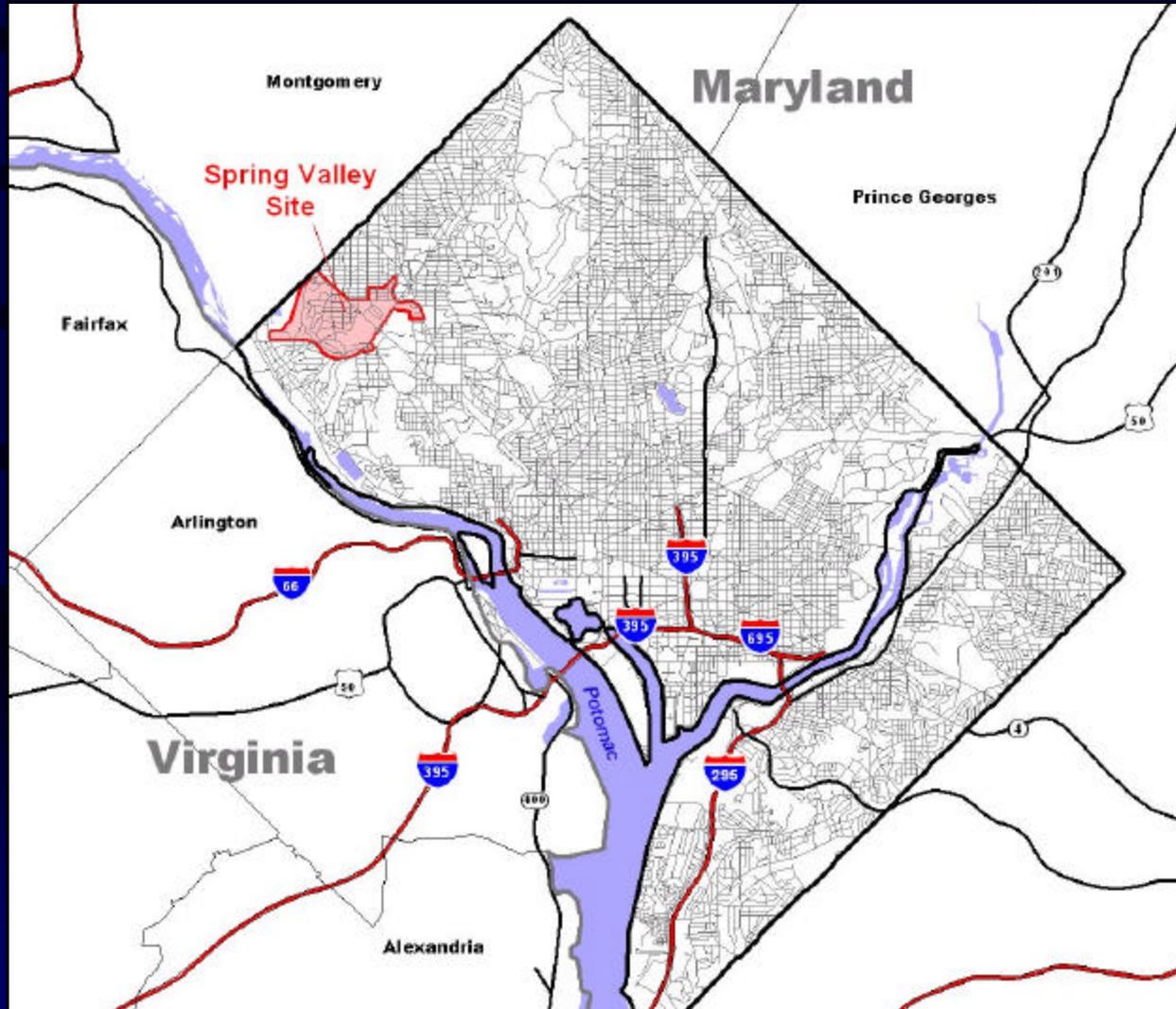
Introduction (cont'd)

- Buried military ordnance uncovered in 1993.

- Over 700 pieces of ordnance collected in the neighborhood, and extensive testing conducted to determine CWM-contaminated locations.

- Since 1993, 5 phases of sampling expanded to over 1000 properties from only a few.
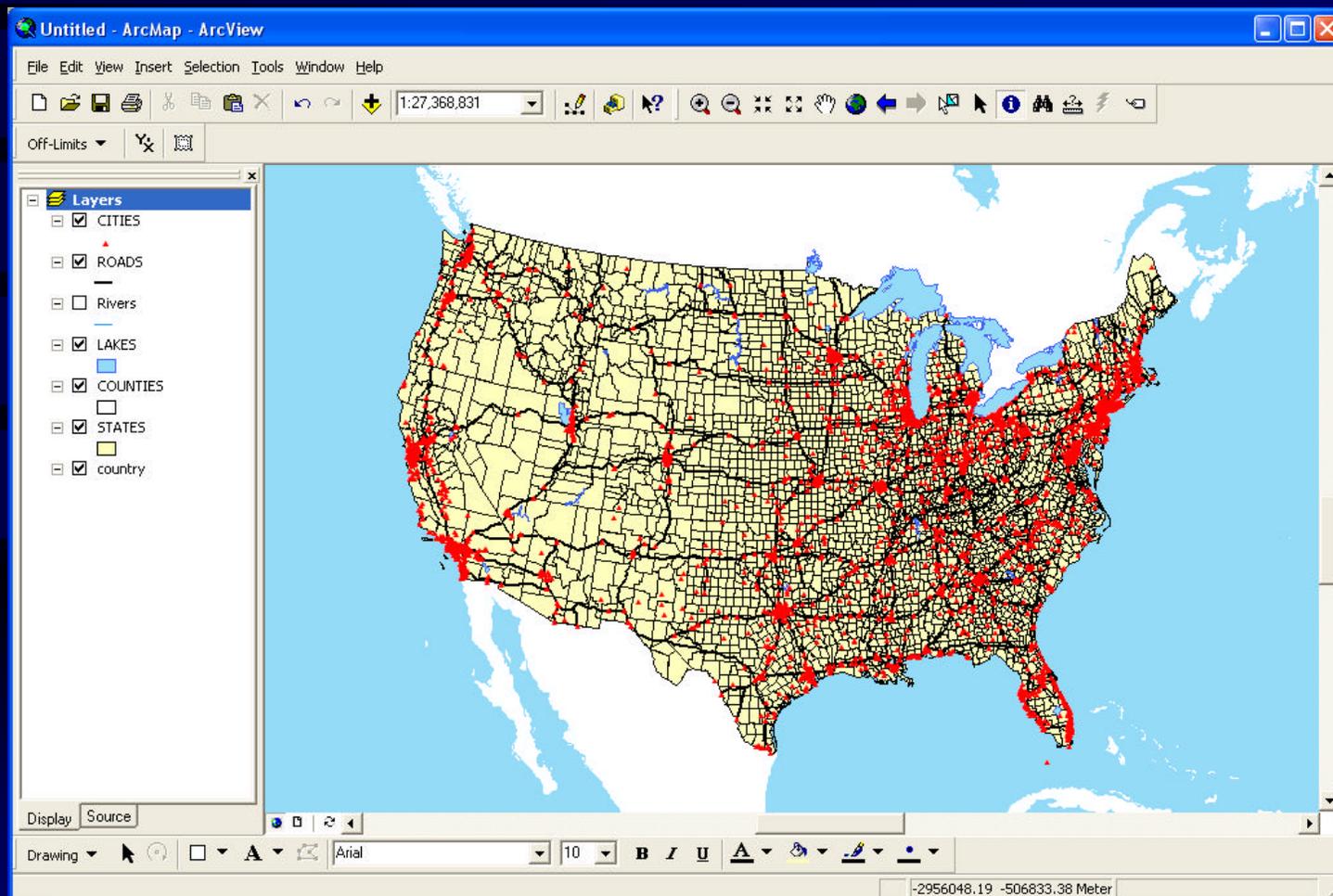
Introduction (cont'd)

What is GIS?

- GIS Stands for Geographic Information Systems.

- It allows users to store geographic information electronically, and then display, query, and analyze that information.

- GIS has intuitive visual impact: reveals new patterns, allows uninitiated to analyze and draw conclusions.
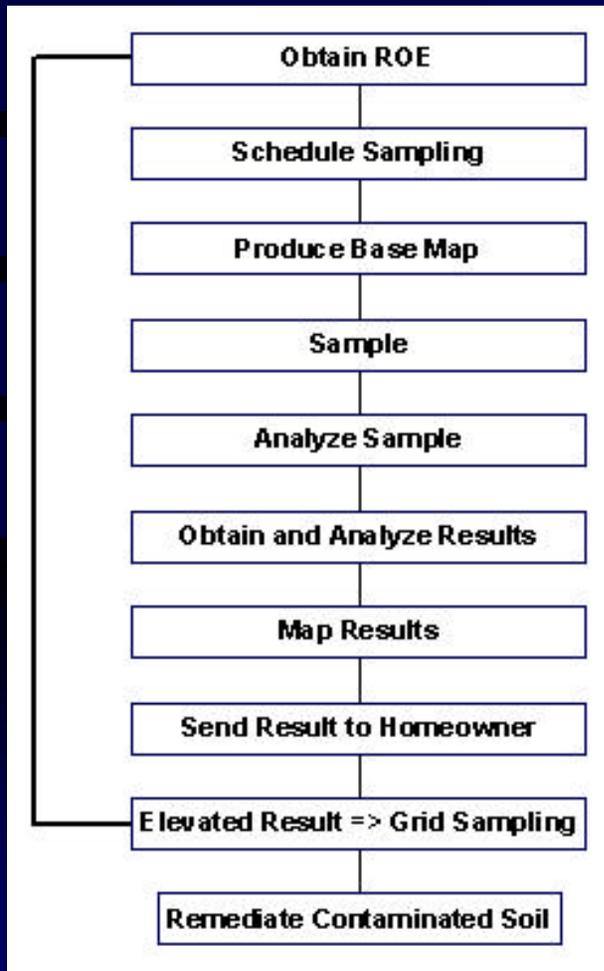
What is GIS? (Cont'd)

GIS Applications to Spring Valley

GIS Applications

- Sampling Applications
  - Rights of Entry and Sampling Data Tracking
  - Ensuring Randomness of Sampling Locations
  - 3D Visualization
- Spatial Analysis
  - Creating a Cut & Fill Layer
  - Classification Scheme
- Stakeholder Involvement

Rights of Entry (ROE) and Sampling Data Tracking

| Obtain ROE |
| --- |
| Schedule Sampling |
| Produce Base Map |
| Sample |
| Analyze Sample |
| Obtain and Analyze Results |
| Map Results |
| Send Result to Homeowner |
| Elevated Result => Grid Sampling |
| Remediate Contaminated Soil |

- Extensive sampling effort requiring coordination between different parties.

- GIS played a large role, from obtaining rights of entry (ROE) to displaying sampling results.

# Ensuring Randomness of Sample Locations

- Sampling process in accordance with EPA Soil Screening Guidance.

- Properties divided in either halves or quadrants.

- Half: 8 randomly located subsamples per half.

- Quadrant: 6 randomly located subsamples per quadrant.

Ensuring Randomness of Sample Locations (cont'd)
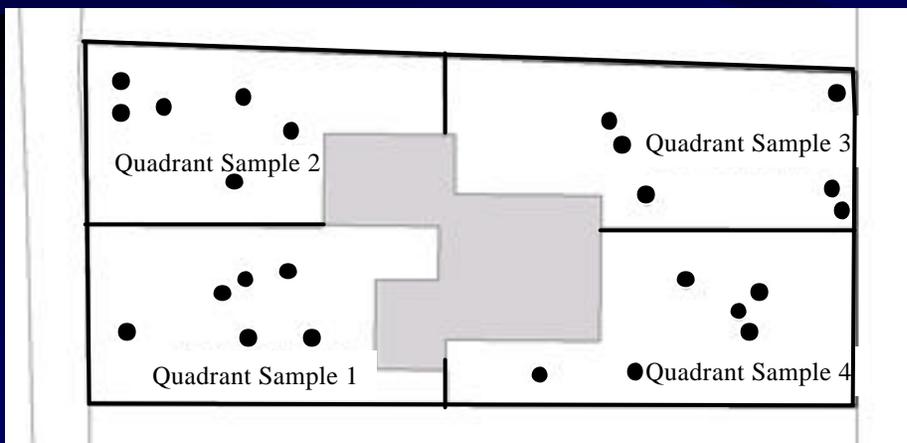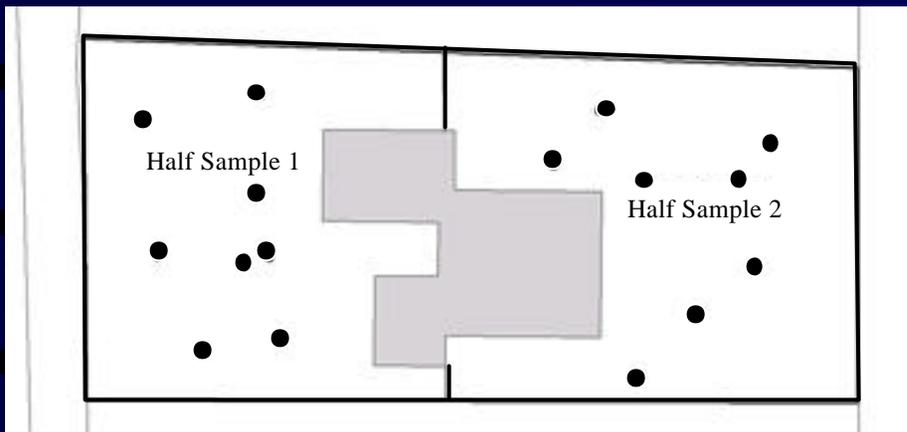
- Used GIS software to place random sample locations for over 1000 properties.
- Process took only about half a day.

Ensuring Randomness of Sample Locations (cont'd)
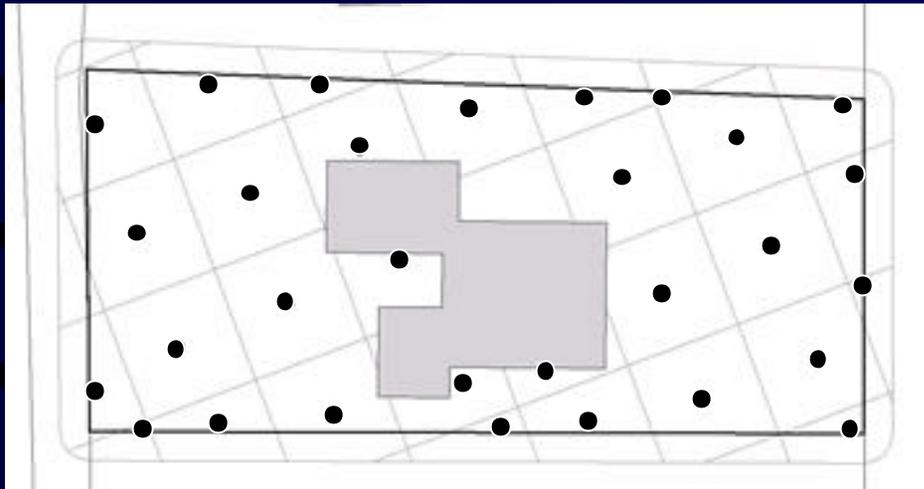
- If quad/half sampling results elevated, grid sampling is required.

- Grid samples taken every 20 feet. Sample locations determined using GIS software and data sent to surveyor.

3D Visualization

- GIS allows viewing sampling results in 3D.

- Easily allows determination of locations with extremely high results, since color scale for 2D maps did not differentiate between arsenic results such as 50 mg/kg and 1,000 mg/kg.

Creating a Cut & Fill Layer

- Cut & Fill layer one of the most used layers.
- Created to show difference in elevation between 1918 and today.
- Layer created from 1917 USGS topo map and 2000 elevation contours (from aerial survey).
- Information used extensively to determine depth of borings, and eliminating areas unlikely to contain buried ordnance.

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Creating a Cut & Fill Layer (cont'd)
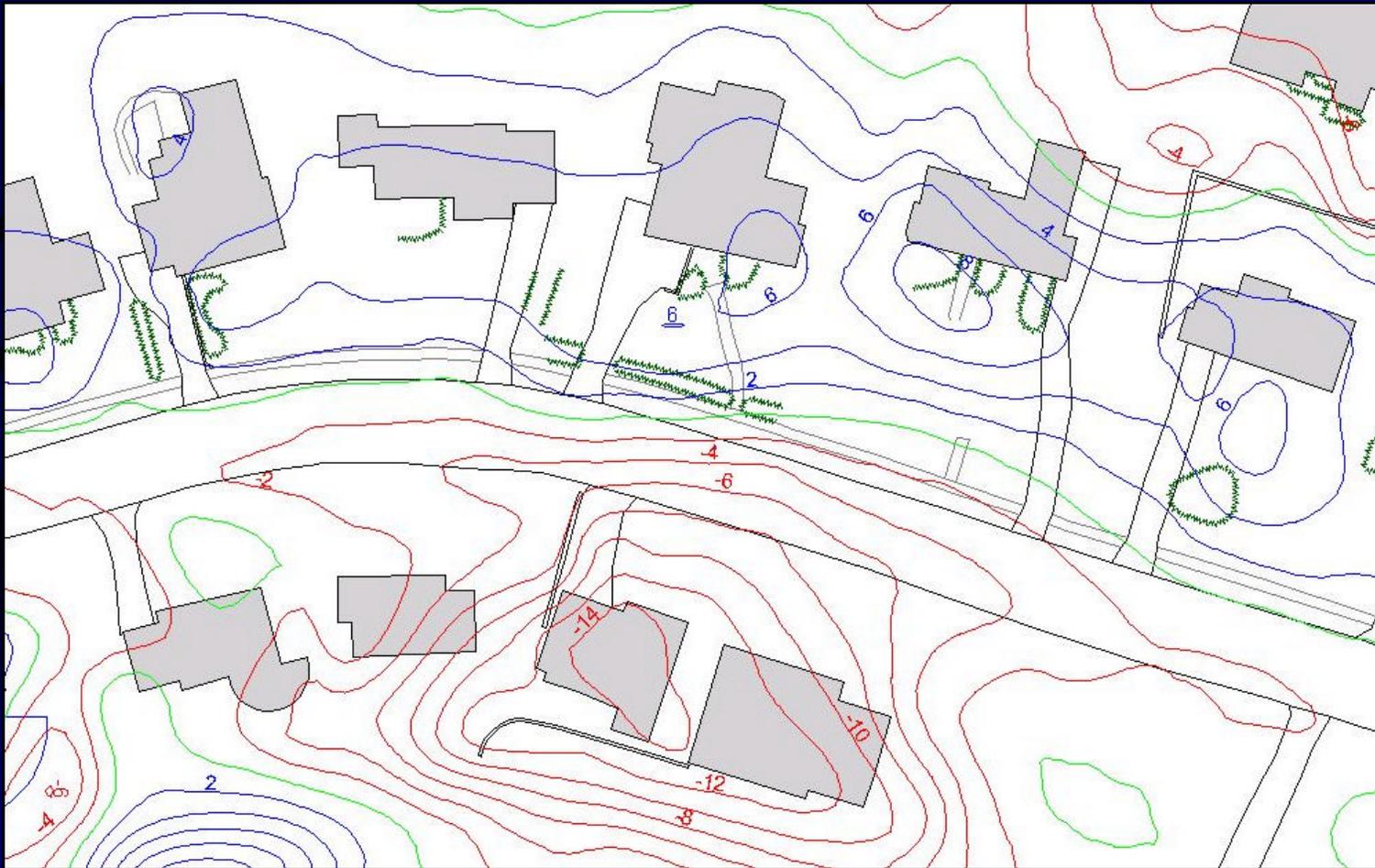
Classification Scheme

- Classification system developed to determine most likely locations to contain unexploded ordnance.

- System based on historical photograph analysis from four different years (1918, 1922, 1927, 1928), elevation difference (using Cut & Fill layer), and arsenic sampling results (over 10,000).

- System coded using GIS software customization language. Allows to rerun the script whenever new data is received.

Stakeholder Involvement

- Web site created to keep residents informed.
- Sampling results made available online to USACE employees.
- ArcIMS mapping service created to allow residents and Corps employees to view geographic data.

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Stakeholder Involvement (cont'd)

Stakeholder Involvement (cont'd)

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Lessons for Effective Management of Large GIS Databases
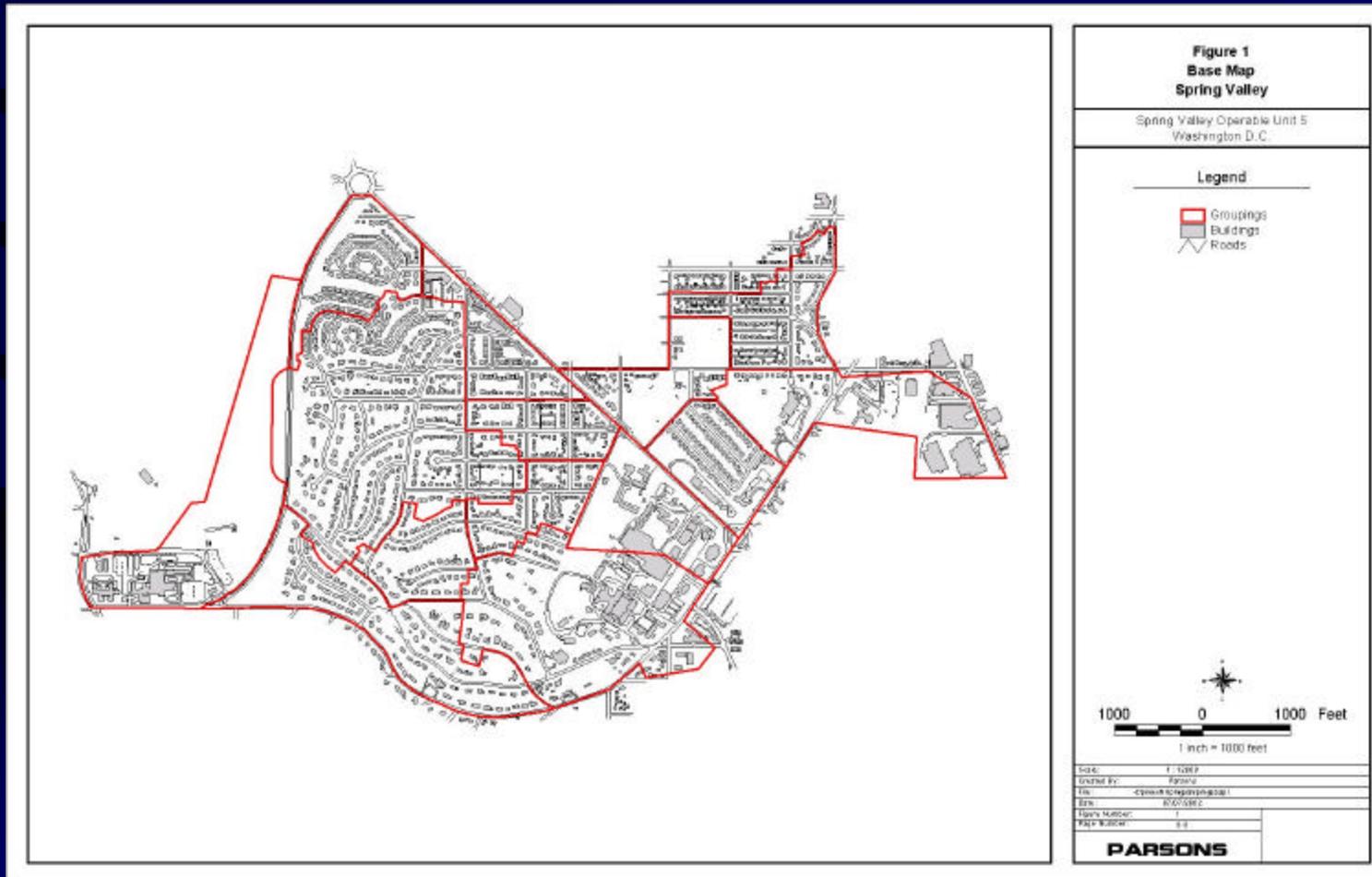
Standardization & Automation

- ArcView GIS extension written to automate and standardize map production.
- Approximately 3000 maps produced in the last 4 years.
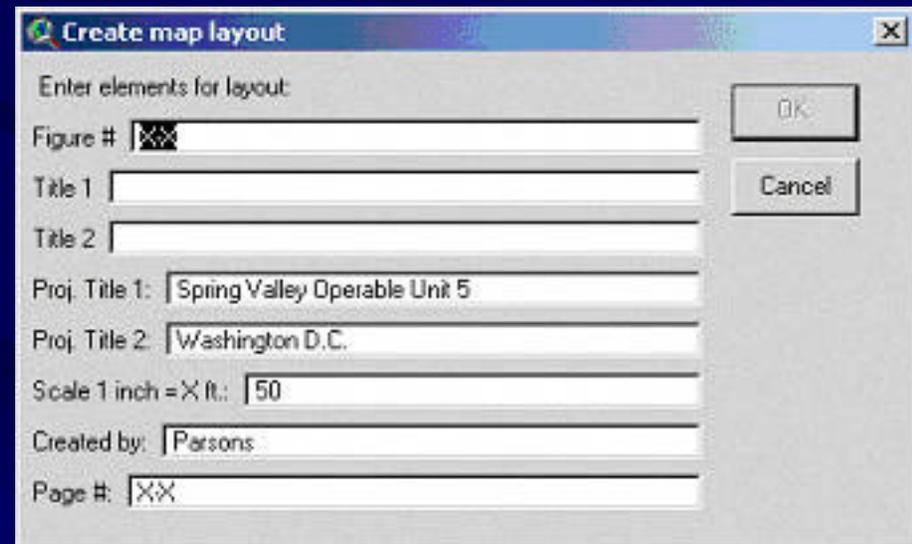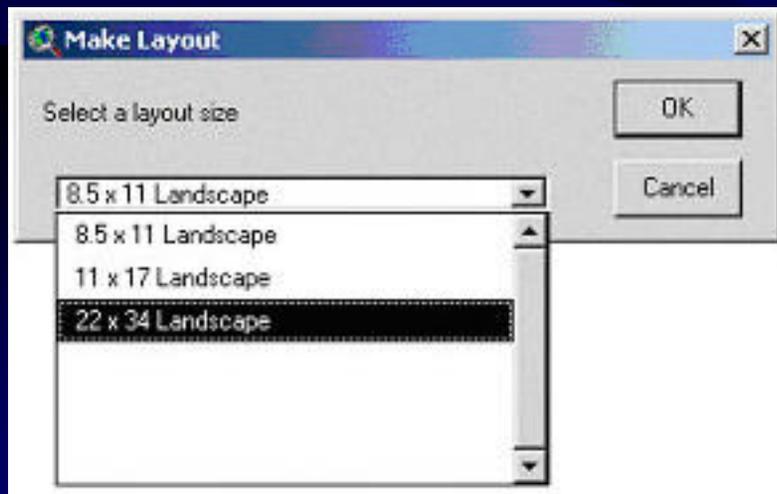
# Standardization & Automation (cont'd)

Data Organization

- Originally only 1 main GIS Analyst working on project at any one time, but 3 analysts over the length of the project.

- Project started small, grew to become full-time work.

- Data from many different sources.

  » Need for restructuring GIS database.

Data Organization (cont'd)

- Followed basic structure of SDSFIE.

- Currently converting all data to the USACE's new OE Life Cycle Data Management GIS Data Standard.
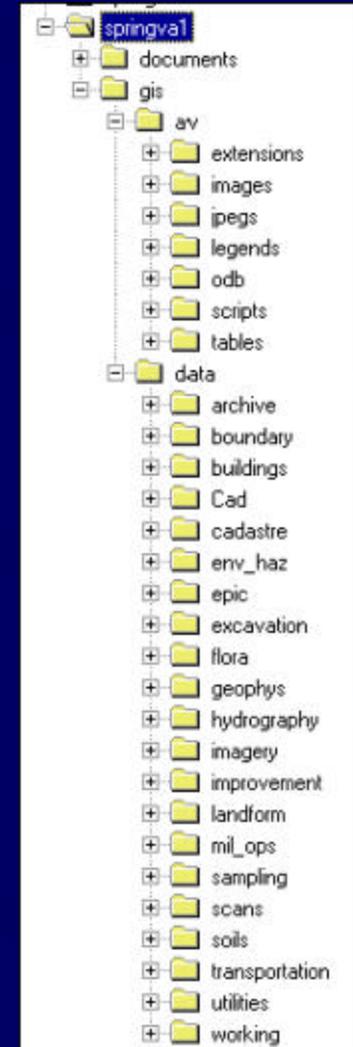
Conclusion

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- GIS extremely useful.
- Beneficial for GIS personnel to:
  - Understand larger picture.
  - Attend monthly partnering meetings.
- GIS expanded from cartographic output to programming and spatial analysis.

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