Emergency Operation Center Application
Montgomery County, Maryland

Program Category #14: Information Technology

1.0 Abstract

The Montgomery County, Maryland Department of Technology Services - Geographic Information Systems (DTS-GIS) team, in cooperation with the Department of Fire & Rescue Service (DFRS), developed an ArcView GIS based Emergency Operations Center (EOC) application. The application provides the County Emergency Management (EM) team assembled at the EOC during emergencies with useful geographical and tabular data and improves EM staff efficiency for displaying and printing Montgomery County (MC) geographic and associated attribute data. The EOC application functionality includes geographical data display, and attribute data for over 40 MC databases, including Washington Gas lines, WSSC water lines and hydrants, MC road networks, and Maryland-National Capital Park and Planning Commission (M-NCPPC) property data listings. EM staff need only call up the application in the event of an EOC emergency activation or emergency exercise and access the information. The MC geographic data presented in the EOC application reflects information downloaded daily, weekly, or quarterly by DTS-GIS.

2.0 Need for the Program

The Montgomery County EOC application was developed to improve EM staff efficiency and to provide useful geographic information to the participants in the event of an EOC activation. This application extends the ability of EM staff to access quickly and efficiently the relevant MC geographic data features. Prior to the development of the application, there was no user friendly way to access and display geographic information for the location of an emergency incident within the staff's area of interest. Consequently, DFRS EM staff asked DTS-GIS to create the application to reduce the complexity of creating incident maps and to provide a sophisticated, yet simple application, to allow EM staff to quickly search and locate an emergency incident in Montgomery County. As a result, DTS-GIS developed the EOC application to enable EM staff to quickly locate a County emergency incident based on the input of an address by a staff member. The application was also created to provide additional information about the emergency incident location and to include a tool for calculating a radius, creating a (circular) buffer, and identifying premise addresses around the incident in case an evacuation was necessary.

3.0 Description of the Program

The EOC application was designed and tested on the Environmental Systems Research Institute (ESRI) GIS software ArcView, and the Microsoft Internet Explorer web browser. After a few tutorials and revisions, the EOC application was approved by EM staff and is installed on the EOC PC workstation. The following sub-section describes the process used to develop and maintain the EOC application.

<u>Step 1: Establish functional requirements</u>

Upon attending many EOC activations and exercises, DTS-GIS was provided with functional requirements for the EOC application in October of 2001. The application was to provide quick access to geographical and associated attribute data of the county for over 40 data layers selected from Montgomery County's GIS database server. These include Hazard Materials Facilities sites, flood prone areas and dams, gas lines, and water lines. In addition, EOC staff was to be able to query an emergency incident to obtain a variety of information on that location. GIS database attributes provided were, for example, Hazard Materials Facilities sites, the type of material at that site, the license number and the address of the facility. The map layers needed for the project are chosen from menus in the application and are then downloaded from the computers hard drives.

The application has been installed on two designated PC's--the Office of Planning and Research common area computer and the Emergency Operation Center GIS computer. These PC's are Local Area Network (LAN) connected so that they can access the GIS data live or have the most current data downloaded to the application on the hard drive for speed of use. The data provided by the EOC application is to be updated weekly by a DTS-GIS staff member. Microsoft Internet Explorer web browser technology was used to create and display HTML pages for the search result report.

Step 2: Collect data, documents, and information

DTS-GIS is the clearing house for all the needed geographic and attribute data to operate the EOC application. Geographic data is provided by DTS-GIS in ArcInfo coverages and (ArcView) shapefiles. The data layers include, but are not limited to, Hazard Materials Facilities sites, flood prone areas and dams, gas lines, and water lines. These data layers are updated quarterly and then go through quality control checks. The updated data are then imported to the EOC application. Other useful geographic references for the displaying and mapping of emergency incident locations include County Ride On Bus routes, Washington D.C. area Metro Bus routes and Metro stations (provided by the Montgomery County Department of Public Works & Transportation, DPWT), school locations (provided by Montgomery County Public Schools, MCPS) and the street centerlines (provided by DTS-GIS).

The DTS-GIS team approached the utility company Washington Gas (WG) for gas line data. Recognizing the need by EM staff for such data, WG readily agreed to the request. A memorandum of understanding (MOU) was established to specify the update frequency and limit the access of such data to EM personnel only.

Detailed EOC application instructions and sample output graphics were provided in hard copy format for easy reference. Tutorial classes will also be provided to EM staff by DTS-GIS.

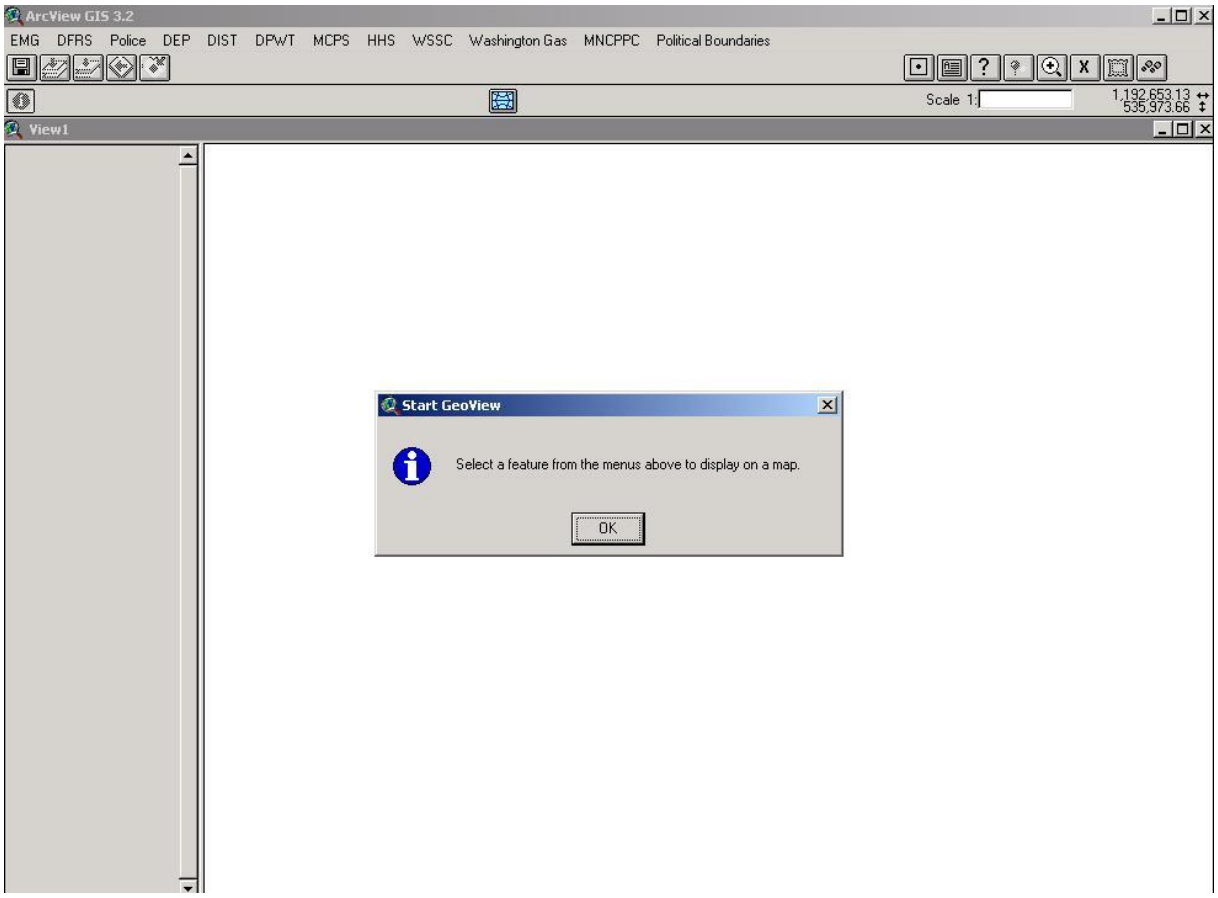
Step 3: Programming and Creating the Emergency Operation Center Application

The application was programmed with Avenue scripting using ESRI's ArcView software development environment. The geocoding (i.e., assigning coordinates to street addresses or intersections) capability was also provided by the ArcView software. Finally, ArcView

software was used to display the final map and query result to be printed. The application was initially tested on a Dell Optiplex GX300, Pentium 3 with Microsoft Windows NT 4.0.

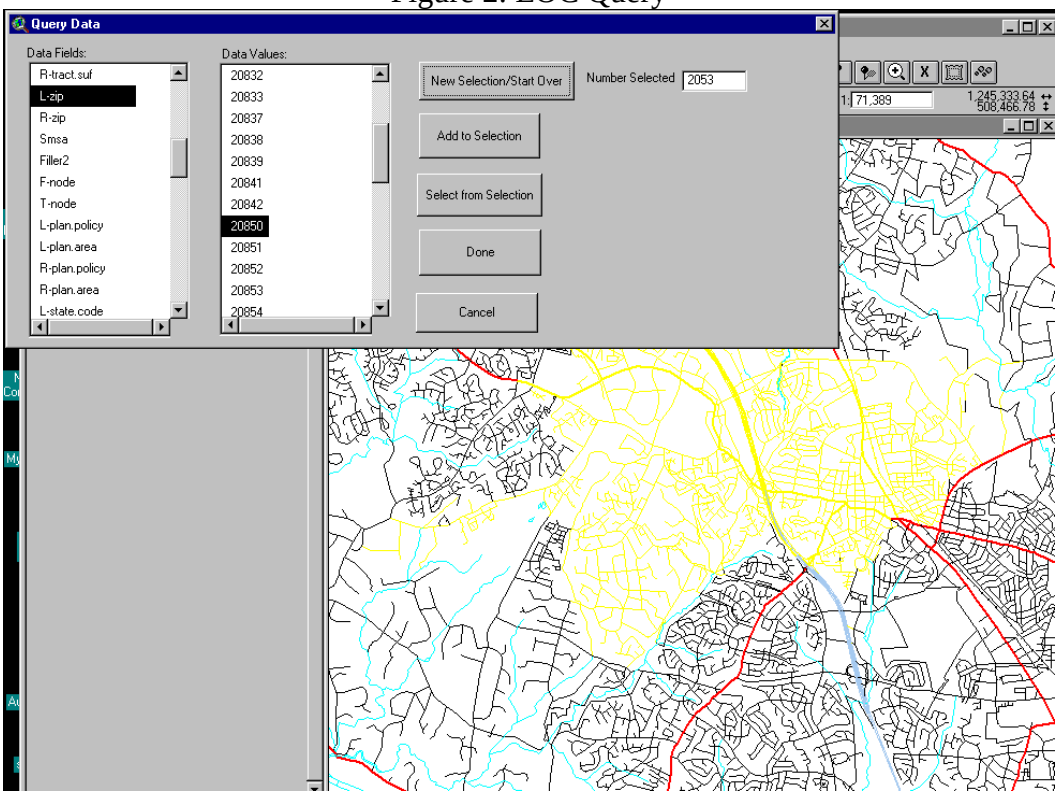
Unlike the 'busy' standard ArcView interface, the much simplified application interface is generated by functional dialog boxes and simple input boxes to enable EM staff to quickly and easily review the results of their query (Figure 1).

Figure 1: EOC custom ArcView environment screen



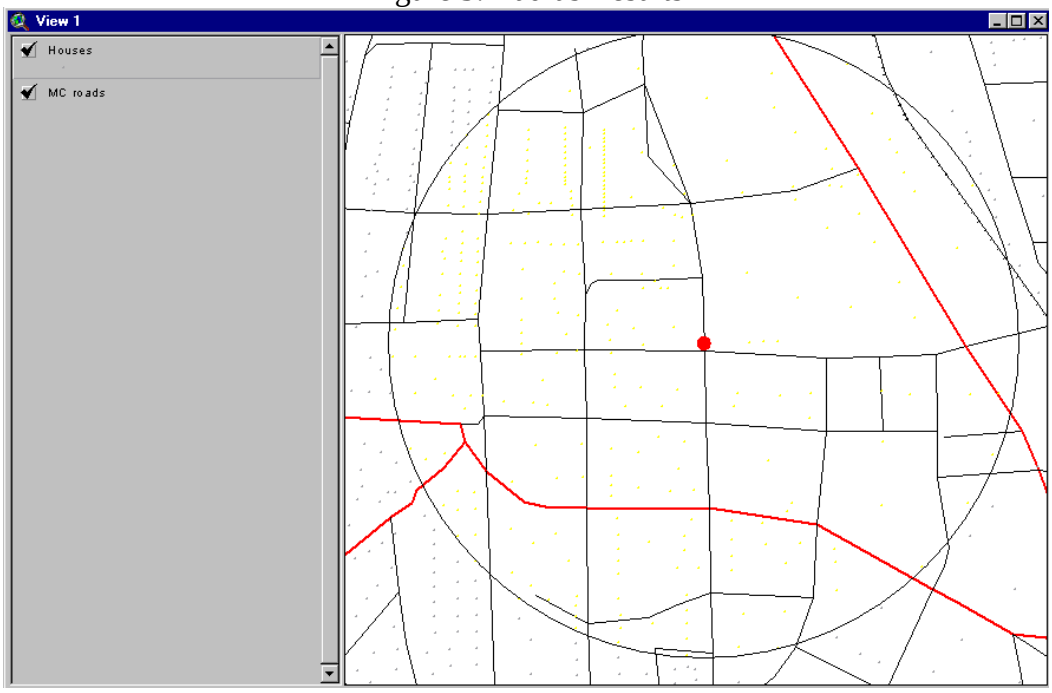
The EOC application was designed to enable users to quickly make a map and display all the relevant database information associated with a particular emergency incident. The application includes search options to find any specific geographic features within a user specified radius of an address. In addition, EM staff also has the option to conduct a more comprehensive search based on the query functionality dialog box that will allow the user to query one or more geographic databases. (Figure 2).

Figure 2: EOC Query



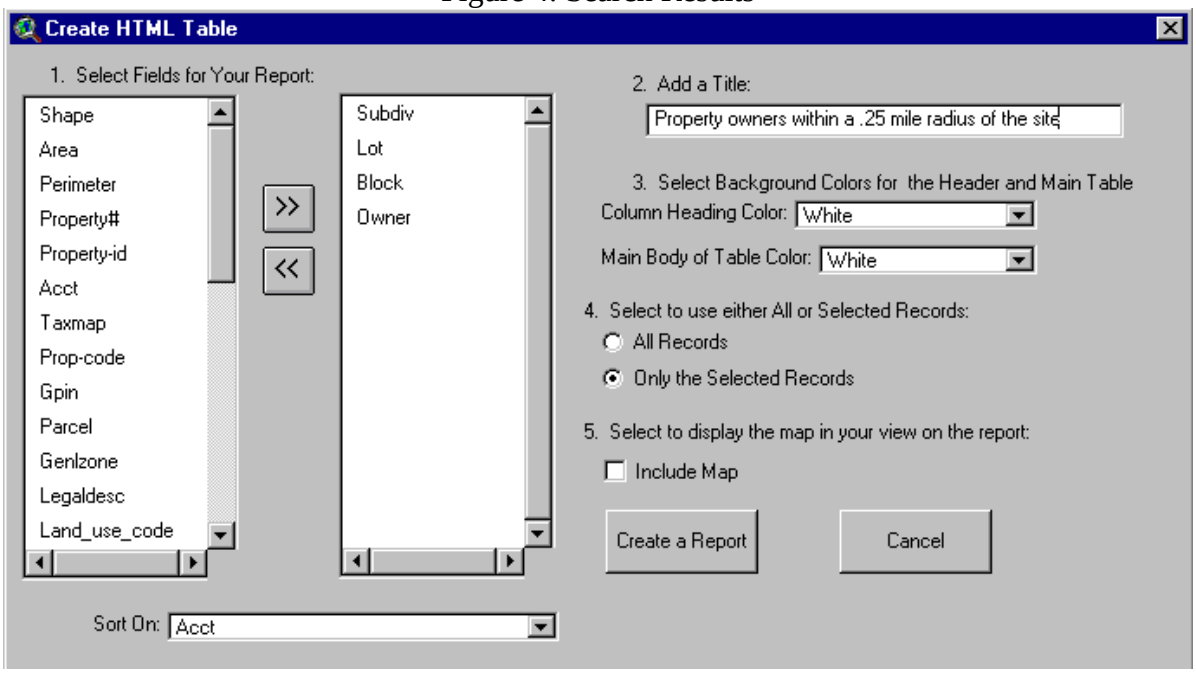
Another tool is the buffer tool, which is used to define a radius in miles around a specific address and select all user defined geographic features within that buffer, for example households to be evacuated in an emergency. (Figure 3)

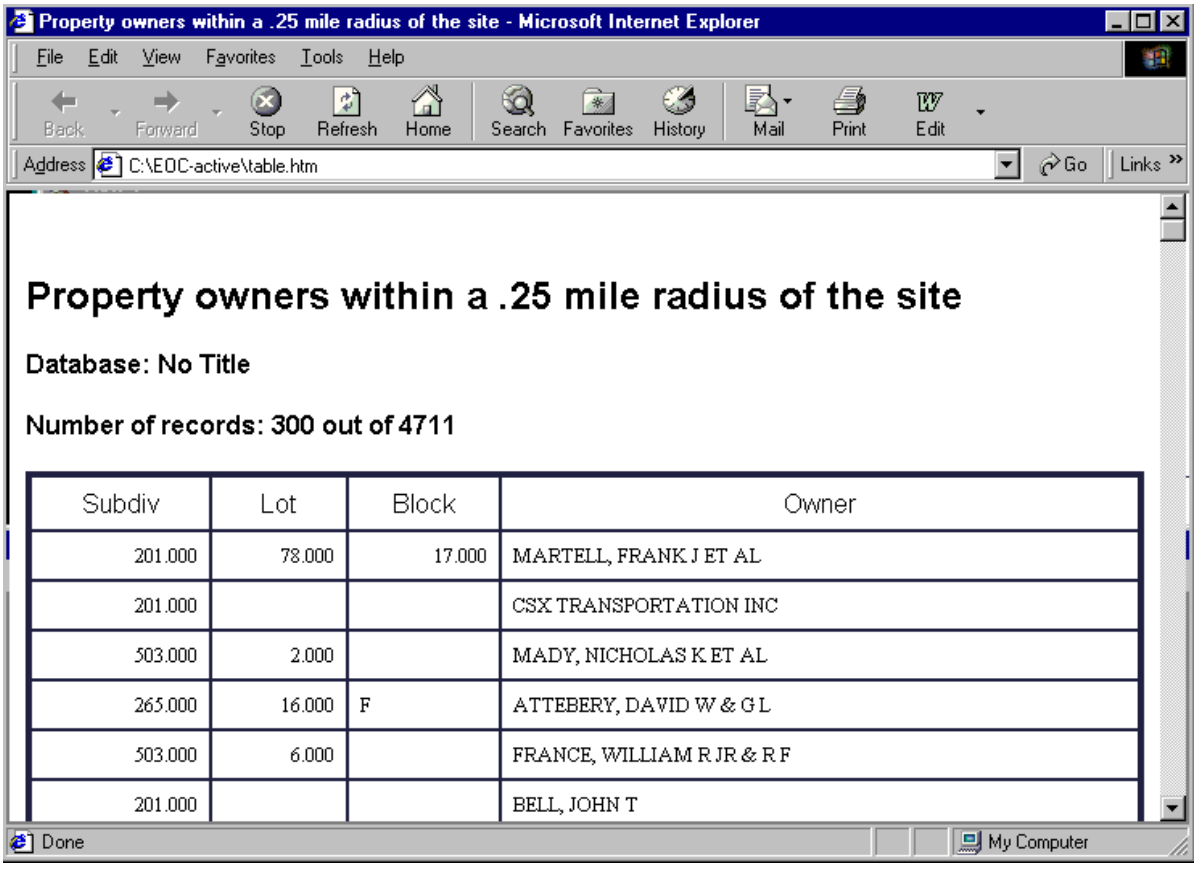
Figure 3: Radius Results



The search results, depicting geographic data within a user specified radius, are then formatted into an HTML page. (Figure 4).

Figure 4: Search Results





EM staff can then print the query results and include a map of the area that displays the significant geographic data. Data can also be displayed thru the digital Ortho Photo Tool which can bring up an ortho-photo associated with a user defined location by clicking on the view with the mouse

Step 4: Review and revise EOC Application
EM staff reviewed and provided recommendations for the application during the period of January, 2001 through October, 2001. The recommendations were incorporated into the application by DTS-GIS and the application was approved to EM staff in October of 2001.

Step 5: Install EOC Application on the 2 EOC PC's
The EOC application has been installed on the two PC's. The appropriate disk drives of the database server have been connected to the PC's so that live updates and downloads may take place directly from the DTS-GIS databases.

Step 6: Maintain application content
The associated geographic data from MC and other sources, such as WSSC and Washington Gas, is downloaded by DTS-GIS on a quarterly basis. The data is then reviewed and prepared for input into the EOC application by DTS-GIS. The application content including GIS shape files, facility data and street centerlines will be updated annually by DTS-GIS. The system administration aspects of the application are also provided by DTS-GIS.

4.0 Use of Technology

The application was initially created and tested on a Montgomery County Government DTS-GIS Pentium 3 PC with Microsoft Windows NT 4.0, 1GB RAM, running ESRI's ArcView. ESRI's ArcView programming language, Avenue, was used as the application development environment to design, program, and test scripts used to create the EOC application. Microsoft Internet Explorer web browser technology was used to create and display HTML pages for the search result report.

Since this application is developed on top of the widely used ArcView GIS platform, it is relatively easy to plug in additional functionalities such as the plume modeling (after a chemical spill) capability of the ALOHA system.

5.0 The Cost of the Program

The total cost to develop the DFRS EOC application including staff time (programming and data maintenance) and software/hardware equipment was approximately $40,000. Approximately 80 hours of staff time was invested into the development of the application at a cost of $2,500. The GIS software cost approximately $15,000. Maintenance cost will vary according to staff salary.

In order for an EM staff member to effectively use the application, a Pentium 933 MHz or better Intel-based personal computer is recommended. The operating system can be Windows NT, 2000, or XP along with ESRI's ArcView GIS. A standard county T1 connection to the Internet through a Microsoft Internet Explorer web browser should satisfy the needs of staff.

6.0 The Results/Success of the Program

This application grew out of a need to expedite the map making and geographic data query processes in an emergency activation situation. Thus, the need for developing the application was evident. The performance of the DFRS EOC Application will be evaluated by using a Microsoft Access database spreadsheet to gauge the number of times the application is accessed and by interviewing County EM staff. Carol - Do we have any of this data yet?

The positive results of this application consist of a simple and uncomplicated way for EM staff to query, map and report the important geographic information surrounding an emergency. The application will also help reduce the demand on staff time in responding to the inquiries of the emergency planning staff in the EOC.

7.0 Worthiness of an Award

The DFRS EOC application provides EM staff with tools to search, display, map or report geographic emergency incident information in seconds rather than hours. Consequently, it is anticipated that the implementation of this application will replace the need to manually look up the location of an emergency incident, one by one, thereby resulting in a significant savings in staff time and retrieving a larger amount of geographic data within the area of interest. The delivery of geographic data surrounding an emergency incident empowers emergency management staff to find the pertinent geographic data that fits their needs. As a result, emergency management staff time, in this otherwise time consuming task, may be minimized.

Although there are other agencies that maintain this kind of geographic information database, Montgomery County is one of the first few local governments to develop this kind of service for its Emergency Operation Center. The DFRS EOC application serves as a model for other counties and municipalities who provide geographic data and information to their emergency management planners. Lastly, this application successfully enlisted utility company's participation by providing the County EOC with periodically updated gas line data.