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Innovative Use of Technology:
i-MapNJ New Jersey Environmental Management System (NJEMS)

Executive Summary

The New Jersey Department of Environmental Protection (NJDEP) Bureau of Geographic Information Systems has developed i-MapNJ NJEMS (www.nj.gov/dep/gis/imapnj/imapnj.htm), an interactive environmental mapping application. i-MapNJ NJEMS enables users to view and perform basic GIS analysis on regulated sites in New Jersey from data residing in NJDEP's New Jersey Environmental Management System (NJEMS). i-MapNJ NJEMS provides users the ability to perform both NJEMS and GIS data queries and display the spatial relationships of NJEMS sites with respect to each other, and in relation to other GIS mapped features, in nearly forty data layers.

Using i-MapNJ NJEMS, users can perform basic NJEMS site queries, view and analyze the results along with selected GIS mapped data layers on a map, and print the map. An NJEMS site is an entity that is regulated by, or of some interest to, one or more programs within NJDEP. The application can search for individual locations (NJEMS sites, address locations, NJ State Plane coordinates) or multiple NJEMS sites based on some user-entered selection criteria. The NJEMS sites selection criteria allow selections based on NJDEP agency activity, program interest, and discharged parameter. The NJEMS site selections are restricted to an area of interest designated by the user. The areas include sites within a radial range from a currently selected location, or sites within a municipality, county, or watershed management area.

The i-MapNJ NJEMS application uses ESRI's ArcIMS technology that enables agencies to provide spatial data and map services over the Internet. Since the application only requires the use of a Web browser running on the user's machine, citizens can access the application and begin exploring their neighborhood or any area of interest in the state. Several online tutorials are available, complete with many examples of how to use the data queries and map tools in the application. Several-use specific tutorials exist, including one for well drillers to help them avoid areas with known groundwater contamination. Another tutorial shows users how to identify habitats critical to New Jersey's endangered and threatened species. For certain submittal documents for NJDEP, citizens and the regulated community can easily obtain NJ State Plane coordinates for specific locations directly from the i-MapNJ NJEMS application. All GIS layers have FGDC-compliant metadata documents, accessible through the application, that allow users to understand the currency, completeness, accuracy limitations, and method of data collection. From this information, users can judge whether the data is suitable for their particular analysis.

Description of Project

Nine years ago when new management took the reins at the New Jersey Department of Environmental Protection (NJDEP), they asked a very basic question: "How can we determine what is going on at any one regulated facility in the state in terms of air, water, and land?" Like many state environmental agencies, the NJDEP has historically struggled with antiquated environmental databases that were unable to provide cross-media (water, air, land) answers to difficult environmental questions. New thinking concerning database normalization and integration had some states, such as New Jersey, reorganizing data and integrating powerful software to assist in the search for solutions from information. Having achieved this goal, the next logical step was to export that information in a user-friendly application to citizens through the Internet.

The New Jersey Environmental Management System (NJEMS) is the integrated transactional Oracle database that contains NJDEP's major program databases. Within NJEMS, all of the data are associated with sites that are regulated or are of some interest to a program in NJDEP. In order to assist managers and staff in their quest for solutions from the gigabytes of data residing in NJEMS, a new intranet application, i-MapNJ NJEMS, was developed in October of 2001 with assistance from American Management Systems (AMS) of Fairfax, Virginia. NJDEP and AMS chose ESRI's ArcIMS, supported by ArcSDE, to deliver interactive mapping across NJDEP's intranet. The i-MapNJ NJEMS application enabled NJDEP staff to view and perform basic GIS analyses using GIS data layers on permitting, agency activity, and enforcement data residing in NJEMS.

NJDEP wanted to provide the same application on the Internet, making it available to citizens and the regulated community. After testing the i-MapNJ NJEMS application on the intranet, the NJDEP ported the application to the Internet in September 2002. Now citizens and the regulated community could access information from the NJEMS database and integrate that information with GIS data in a state-of-the-art, easy-to-use ArcIMS application powered by Oracle and ArcSDE. This enables users to work with much of the same data that NJDEP decision-makers use for reviewing permit applications and determining potential contributors to environmental problems with local and/or regional impacts.

When launched, the application displays a map of the state of New Jersey. Users can then click on the *Find an individual location* button to search for an NJEMS site by ID, locate an address (NJEMS site or not), or locate an x,y coordinate (in the NJ State Plane Coordinate system). Alternatively, users may attempt a multi-site search by clicking the *Find sites by specified criteria* button. They may also turn on any of nearly forty GIS data layers available for display in the map view. Not all layers are initially available to the user at the full statewide map view. More layers become available as the user focuses in on a smaller area, and the

map scale becomes more appropriate for their display. Current digital orthophotography, land use/land cover, soils, hydrography, roads, watersheds, wellhead protection areas, areas of known groundwater contamination, and potential habitats for threatened and endangered species are included among the layers. Further analysis can be performed using GIS map tools in the toolbar including zoom, pan, measure, identify, select, buffer, print tools and more.

The search types, using the *Find an individual location* and the *Find sites by specified criteria* query buttons within the i-MapNJ NJEMS application, are designed to retrieve either a single site or multiple sites from NJEMS. Single site queries provide for locating an NJEMS site (or any location of interest) by entering an ID, locating a site by address, or locating a New Jersey State Plane coordinate. The multiple site queries enable the retrieval of sites having one or more NJDEP program interests (of interest to the air, water, site remediation, etc., programs), sites based on NJDEP agency activity criteria (often activities related to permits and inspections), or sites with discharge or emission parameter criteria. The multiple site queries also allow the user to limit the retrieved set of sites to a specific geographic area. The geographic area can be a radial range (circle) where the user specifies a radius distance from a designated NJEMS site (or any location of interest), or the area can be defined by a GIS polygon that represents a county, municipality, or watershed.

The application is available to the public from the NJDEP or NJDEP GIS Web sites and from the New Jersey Spatial Data Clearinghouse Web site as an interactive mapping application. In any of these instances, the user's default Web browser is opened and a splash page is displayed with the button to launch the application. In addition, the splash page offers links to explanation and background pages, links to tutorials, and feedback pages.

Significance to the improvement of the operation of government

For casual users, i-MapNJ NJEMS delivers the ”big picture” overview of features that are of environmental concern across the state. For environmental managers, i-MapNJ NJEMS provides the integrated environmental data in detail on the desktop.

The key to success was a vision born in the early 1990s to integrate program data by normalizing and geo-spatially enabling the data in a single transactional database. Later advances allowed GIS data to be stored in the same system using Spatial Database Engine to retrieve the data. Additional functionality, born in this century, allowed for the integration and serving of all this information across the Internet. Creating an easy-to-use template and serving the data in a browser has allowed the DEP to leverage information to citizens and the regulated community.

For the public, i-MapNJ NJEMS allows DEP data to be truly public and easily accessible. By definition it therefore allows citizens, non-governmental organizations, and the regulated community the ability to see and interpret NJDEP data in the same way the NJDEP uses the information to make environmental decisions. Although conclusions may differ, the starting point in the analysis has been leveled because the parties are now using at least some of the same data to evaluate their concerns. i-MapNJ NJEMS is proving to be extremely helpful in improving application response times. By using i-Map, the regulated community can improve permit applications and reduce editing, negotiation, and review periods. Citizens can search around their homes or neighborhoods for regulated entities and parameters and become more aware of environmental resources that may be of interest.

Benefits realized by service recipients, taxpayers, agency or state

One of the greatest benefits of i-MapNJ NJEMS is that it is a Web-based application, distributed via the Internet, requiring no software from the user other than a Web browser. i-MapNJ NJEMS serves a wide variety of tabular and spatial data that has been integrated into the easy to use application. Historically, accessing this class of information required users to know exactly what data they were looking for, identify the NJDEP program that maintained those records, initiate a request for the data, and provide their own analysis (GIS and otherwise) software to examine the data. i-MapNJ NJEMS allows seamless queries of many of these records free of charge, using an Internet browser-based application, and Internet map-serving technology. This defines a unique, cost effective system that serves everyone, as the data represented in this application is the same data resident in the NJDEP's production server environment.

Return on investment, short-term/long-term payback

The i-MapNJ NJEMS application provides return on investment in multiple ways. The application

- Integrates disparate environmental data sources of different format types
- Promotes cross media analysis
- Distributes data
- Defines preset queries with many permutations such that individuals may ask their own questions
- Allows for smarter permits to be submitted because the regulated community uses NJDEP data
- Counters stovepipe data mentality
- Provides a vehicle for the regulated community to find and submit NJ State Plane coordinates
- Runs in a browser (no desktop GIS software required)
- Uses thin client-server technology that enhances performance
- Is available at no cost
- Allows users to prescreen any “area of interest” in the state
- Promotes better environmental decision making
- Puts a form of GIS on everyone’s desktop

The completion of the i-MapNJ NJEMS application was a milestone for NJDEP. As programs throughout the department witnessed the power of linking NJEMS and GIS using ArcIMS and ArcSDE, many new ideas emerged. Many of these new ideas have been driven by the need to serve more GIS and environmental data, provide queries that ask new and different questions, and provide additional GIS-like tools functionality. Future development will incorporate additional sources of environmental data and integrate database report software and thematic user profiles within the application. Now, the public, regulated community, non-governmental organizations, and state government can explore New Jersey in ways never before possible through an environmental perspective using NJDEP’s i-MapNJ NJEMS.