GIS Solution for Environmental Impact Statements (EIS)

By Stephen Osiecki, GISP
VHB, Inc.
sosiecki@vhb.com

Introduction:

Environmental Impact Statements (EIS) require immense amounts of diverse data to be collected, analyzed and documented.   During the EIS process, data needs to be readily available for the project team. Often the project team consists of users in multiple disciplines and offices, sub-consultants, government agencies and the client who all need access to the data to help with their decision making. Coordinating, managing and sharing these resources between these groups can be a difficult problem. GIS is tailor made for EIS projects by performing complex resource analysis, disseminating data and producing the myriad of graphics and illustrations to communicate the findings. This paper explains how GIS is successfully integrated into EIS process and the benefit it plays.

Data Collection:

Typical EIS projects involve extensive data collection efforts, assembling publicly available and client-supplied material, supplemented with aerial photography and mapping as well as in-the-field observation of critical environmental and transportation resources. Various resources of data available over the internet often are already in GIS format. As data is brought together from different sources, GIS plays the role of integrating the data into a central repository system. The data is stored, documented and goes through a quality assurance and control regiment that follows the GIS and mapping industry standards.

If field work is necessary to collect resource data, custom ArcPAD applications are developed to be used in the field. ArcPAD software is loaded onto a mobile device (pocket, notebook or tablet PC) along with exsisting base data (aerial mapping or vector data) along with valuable resource data. Custom drop-down boxes that contain critical attributes of the resource are created. These drops-down boxes eliminate much of the writing and/or typing of the field technicians, thus eliminating the chance for typos and inconsistencies in data entry from one technician to the other. Field technicians use ArcPAD to collect the field data by using a GPS receiver to capture the spatial location or by digitizing the spatial location on the computer screen using a stylus. Since the field technician can see instantly on the screen if the spatial and attribute information is correct, ArcPAD allows the technician to provide quality assurance checks and control while in the field. ArcPAD applications have been created for several EIS resources (wetlands, streams, threatened and endangered species, etc.) and transportation related resources (roadway access locations, speed limits, horizontal and vertical deficiencies, etc.). Since the data is collected in a GIS format, it is easily imported back into the project GIS thus eliminating the tedious task of digitizing the data and doing manual data entry into a database/spreadsheet back in the office.

Data Assembly and Management:

EIS projects can be very large in actual size and data resources are so diverse and numerous, that often several gigs of data are needed for the project team to effectively do their work. Collecting, storing, sharing and managing data is an enormous effort and a data management plan needs to be developed for various disciplines to be able to leverage the data for their tasks and decision making.

ArcSDE is used as a database management system (DBMS). ArcSDE allows for the flexibility to manage and store gigs of data in a centrally located location while allowing multiple users to access the data. ArcSDE helps reduce the need of data duplication by managing data versioning, thus eliminating the need to keep previous copies of the data. Having all the data stored in a central location makes managing the data easier. Having a small number GeoDatabases is easier to backup, copy or access than having hundreds of datalayers all over the project folders and servers. GIS is the perfect solution for managing huge, diverse data sets across disciplines, by multiple users.

Data Distribution to Project Team:

ArcIMS websites are developed and used by the project team to analyze and visualize resource data to help with their decision making. All the various resource data is available to the project team through ArcIMS websites. Users are able to view recommended alternatives overlaid over existing resources and perform simple queries and identifies on data to help with their decision making. Many authors prefer to use ArcIMS websites instead of having maps printed. Since ArcIMS references the most current GIS datalayers being used on the project the author is confident that the data being viewed through ArcIMS is the most current data. Once a map has been printed, there is no way of knowing if it is showing the latest versions of the resource data or alternatives. ArcIMS is always referencing the latest versions of the resource and alternative data. Using ArcIMS as a alternative to draft maps has saved countless hours and project budget by not needing to print maps out every time a resource or alternative gets changed or updated. Also, the ArcIMS websites can be setup so that anyone with web access can view them or they can be restricted to users that only have login/password privileges to view them.

Analysis and Mitigation:

During the EIS process, there are numerous analysis and summary reports that are generated. Proposed improvements and alternatives need to be analyzed against various resource data to screen out and find the best viable alternatives. Resource data needs to be summarized and shared with the project team to help with decision making. With the introduction of the personal GeoDatabases in ArcGIS, summarizing, reporting and analyzing data has become more efficient and produces a better final product. Summary and analysis results stored in a GeoDatabase allow for Microsoft Access to be used to summarize and report the data. Reporting wizards are setup in Microsoft Access and allow the user to run reports at their leisure. Since all the reports are referencing GIS data from the GeoDatabases the user is assured that the report wizard is always using the latest version of the data. Reports are customized to meet the author's needs so that they can be formatted and dropped into the text version of the report. Microsoft Access is a wildly

used software package; creating and customizing the reports can be done by a wide variety of users.

Public Involvement/Presentation Material:
EIS require many cartographic and presentation material during the lifecycle of the project. Often maps and graphics need to be produced and shared with team members, reviewing agencies, the public and the client. One map series may contain hundreds of graphics showing the recommended concept overlaid over various resources. Storing all the base and resource data in a GIS allows for cartographers to pull the data from a central location, i.e. ArcSDE. With all the base, resource and preferred alternatives stored in ArcSDE, cartographers can pull the data from a central location, eliminating the chance of using old or incorrect versions of the data. ArcGIS has a suite of cartographic tools that allow the user to create analytical and illustrative maps easily. The DSMapbook extension allows the cartographer to automate, manage and print entire map series. Entire map series can be printed overnight without the need of a cartographer to "baby-sit" the process. Since the map layouts are referencing ArcSDE, whenever the resource data is updated in ArcSDE, the map layouts will automatically be updated. Generating presentation material and maps from GIS result in cost and time savings from eliminating the plot-markup-redraft-plot cycles previously required before GIS.

Conclusion:
When GIS is used throughout the EIS process on a project, cost and time savings become evident in the analysis and public outreach phases. By collecting and storing project data in a GIS, it allows the team to leverage GIS to analyze, summarize and make key decisions more efficiently. GIS provides a key role in data management which in return helps the entire project team by giving them analytical tools and protocols to use on their desktops at their leisure.

GIS Works with your NEPA Planning Process
Save time, money, and produce a professional product