Managing Facilities Deactivation and Decommissioning with Geographic Information Systems (GIS)

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ABSTRACT

From the mid-1950's through the 1980's, the U.S. Department of Energy's Savannah River Site produced nuclear materials for the weapons stockpile, for medical and industrial applications, and for space exploration. Although SRS has a continuing defense-related mission, the overall site mission is now oriented toward environmental restoration and management of legacy chemical and nuclear waste. With the change in mission, SRS no longer has a need for much of the infrastructure developed to support the weapons program. This excess infrastructure, which includes over 1000 facilities, will be decommissioned and demolished over the forthcoming years. Dispositioning facilities for decommissioning and deactivation requires significant resources to determine hazards, structure type, and a rough-order-of-magnitude estimate for the decommissioning and demolition cost. Geographic information systems (GIS) technology was used to help manage the process of dispositioning infrastructure and for reporting the future status of impacted facilities.

DESCRIPTION

Several thousand facilities of various ages and conditions are present at SRS. Many of these facilities—built to support previous defense-related missions—now represent a potential hazard and cost for maintenance and surveillance. To reduce costs and the hazards associated with this excess infrastructure, SRS has developed an ambitious plan to decommission and demolish unneeded facilities in a systematic fashion. GIS technology was used to assist development of this plan by: providing locational information for remote facilities, identifying the location of known waste units adjacent to buildings slated for demolition, and for providing a powerful visual representation of the impact of the overall plan.

Several steps were required for the development of the infrastructure GIS model. The first step involved creating an accurate and current GIS representation of the infrastructure data. This data is maintained in a Computer Aided Design (CAD) system and had to be imported into a GIS framework. Since the data is maintained in a different format in CAD, import into GIS involved several spatial processing steps to convert various geometric shapes present in the CAD data to self-closing polygons. The polygons represent facility footprints in plan or map view. Once these were successfully imported and converted, building identifier attributes from the CAD had to be associated with the appropriate polygons in GIS. Attributes are stored as graphical information in a CAD system and are not "attached" to a building in a relational sense. In GIS, attributes such as building names, building area, hazards, or other descriptive information, must be associated or related to the spatial polygon representing a particular building. This spatial relationship between building polygons and the descriptive attribute information is very similar to relating tables of information in a relational database in which each table record has a unique identifier that can be used to join or relate that table to other tables of information present in the database. The CAD building identifiers were imported into the GIS and several spatial processing steps were used to associate building polygons with the correct identifiers. These spatial steps involved determining the intersection of and nearest identifiers with each building polygon in the GIS. Automating this process in GIS saved a significant amount of time.

Once a current and geographically correct representation of the infrastructure data had been created in GIS, field-engineering teams collected information for each facility. This information included the building area, radiological hazards and the associated area, industrial hazards such as asbestos or mercury, structure type (e.g. hardened, industrial, nuclear), annual surveillance and monitoring cost, and other engineering data. The facility engineering data was used in a simple model to determine the rough-order-of-magnitude cost for decontaminating and demolishing each facility. Finally, the engineering and cost data was linked to the GIS model so that this data could be rapidly displayed and analyzed in its geographic context.

RESULTS

Once the GIS representing SRS infrastructure and associated descriptive attribute information was developed, detailed maps depicting the future status of all site facilities were created. These maps display the relationship between known waste units and buildings that will be decommissioned and demolished. Cost and hazard information was also depicted illustrating areas and facilities that could present a particular demolition challenge. Although the GIS was quite helpful as an engineering and planning tool, its real power was evident in communicating the impact of the facilities disposition plan to senior management and other stakeholders.