Geographic Information System Data Conversion, Training and Layer Development

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Abstract

This paper explores and explains methods incorporated by McKim & Creed to convert CAD data and provide staff training and layer development. The objective of this project for Clearwater Gas System was to take existing CAD-based files and convert them into a GIS format. GIS standards and rules were developed and implemented, and a protocol was established to guide Clearwater Gas System staff in retrieval and data analysis. The protocol also applies to future updates that will enable the GIS to integrate with the utility's asset management system and increase map accuracy.

Service Area

Clearwater Gas System's service area covers portions of Pinellas and Pasco Counties, located on the Gulf Coast of central Florida.

The Client: Clearwater Gas System Overview

Clearwater Gas System is owned and operated as an enterprise utility by the City of Clearwater. The utility services both natural gas and propane gas users within a 298-square-mile, two-county area. Within these two counties, Clearwater Gas System serves 17 municipalities and maintains more than 690 miles of live main pipelines. The utility has more than 18,000 customers who are served by 90 employees. Clearwater Gas System has annual operating revenue of $30 million.

The Consultant: McKim & Creed, PA Overview

McKim & Creed offers a full range of engineering, surveying, landscape architectural, and planning services via offices from Virginia to Florida. Core competencies of the firm include water and wastewater planning and design, site / civil engineering, structural engineering, and surveying (geomatics). Since 1992, *Engineering News-Record* has ranked McKim & Creed among its top 500 design firms in the U.S.

The Project: An Overview

Clearwater Gas System's database contains information from the early 1920s, when propane and natural gas were not easily obtained by the general public, to the present day. Prior to this project, the data resided in ink and paper drawings and electronic CAD files. The CAD files, which were quickly becoming antiquated as new CAD versions were developed, consisted of multiple drawings in various formats. This made finding specific data very difficult.

In May 2003, the utility's management decided to bring the data into a GIS platform for better access and manageability. To implement the process, Clearwater Gas System

hired McKim & Creed to convert the existing data and create a protocol for inventorying that data.

Establishing Standards and Converting Data

The first steps of the project were to develop standards for attributing the data and to establish a naming convention, and McKim & Creed and Clearwater Gas System staff worked closely together to produce these criteria. The team set up a protocol that included viewing areas for updates, and enabled current service grids of data to be corrected individually and checked for errors.

After the standards and protocol were established, the team began editing, updating, and converting the data. To determine accuracy, the data was compared to existing as-builts, record drawings, and drawings from the City and consultants.

McKim & Creed then converted the data into shape files using ArcGIS 8.3. Other departments within the City of Clearwater utilize this same ESRI software and have developed a citywide GIS, so information can be easily exchanged between departments and the utility.

The CAD drawings were merged into a single file, which created an area-wide drawing of the Clearwater Gas System service area. The multiple-layered drawing was then checked for accuracy to ensure that the different layers followed the established standard.

Checking and Re-checking

Once the data was converted into shape files and a personal geodatabase created, the data was subjected to a rigorous quality assurance and control process. This ensured that the data not only met the established standards and protocol, but also contained accurate spatial location with proper standard attributes for each feature.

In conducting the quality control process, the team examined the service area grid by grid, beginning with areas that had been backlogged. Team members checked for duplications, overlapping of annotation, errors, and / or current updates, and applied the protocol standards to each grid.

After each grid was checked, McKim & Creed developed a standard cartographic layout—using ESRI templates—to be applied to the grids. The grid layouts were then converted into digital .pdf files, and hard copy maps were generated for use by both field staff and City department personnel.

Utility Staff Learns to Do it on Their Own

Another component of this project was training utility staff members to use the new GIS. McKim & Creed conducted an overall basic training course to introduce staff members to the usage of the software. Clearwater Gas System personnel worked with McKim & Creed in data conversion and quality control, which increased the utility staff's knowledge of and comfort level with the new system. As the utility staff's proficiency grew, McKim & Creed adopted an "over the shoulder" training approach, which gave the staff reassurance and confidence in their ability to create and update the data.

Project Provides Accurate, Accessible, Standardized Data and Trained Staff

The end products of the City's data conversion from CAD to GIS format were shape files and a personal geodatabase. Within the data there are now usable points, polygons, and annotation. Features now have intuitive and standard names and attributes associated with each structure.

Developing a cartographic layout that can be converted to a .pdf format resulted in a cost-effective solution to printing and reprinting large-scale maps for use in the field. These layouts are also available to the utility's customers, who can now obtain maps in a timelier manner, with more accurate information and results.

At the end of this project, Clearwater Gas System's personnel were trained to a level to completely function on the GIS format, thereby eliminating expensive and time consuming training requirements.

The data conversion and updating of the existing data has helped standardize the spatial data format for the entire service area of Clearwater Gas System. The utility can now utilize its full range of resources in a single integrated system, and is able to create tables and charts, conduct extensive analysis, and run queries requiring several overlays with multiple files with a usable end result. In the near future, the GIS data will be integrated into the Cities Asset Management System (Synergine Asset Management), which is currently being implemented throughout the City of Clearwater.

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