

## Abstract

The City of Calgary's ROADS business unit is responsible for managing the operation and maintenance of the entire transportation network infrastructure. As part of business processes ROADS collect, maintain and manage a great deal of information. The information covers many areas such as data on various infrastructure facilities and location of different maintenance work performed

With the ever-growing use of GIS technology, The City of Calgary has taken advantage of GIS as a more effective means for making better-informed planning and decision.

This paper will discuss high level requirement of implementing ArcGIS technology to enhance existed spatial and attribute data maintenance, query and display processes.

## ***Project Background***

The City of Calgary's Roads Business Unit mission is to provide the highest level of mobility and safety to those using the City's transportation infrastructure network. Roads Maintenance, a division of Roads, plays a fundamental role in the successful execution of the Business Unit's mission. The Roads Maintenance division is responsible for:

- Providing repairs to roads, concrete and asphalt sidewalks, curbs and gutters, right-of-way and median fences, guard rails, sound attenuation and concrete barriers and other infrastructure assets.
- Providing snow and ice control for the roadway network along developed rights-of-way by sanding and salting, snow plowing, and snow removal in accordance with the Council approved Snow and Ice Control Policy.
- Providing for removal of sanding materials and accumulation of dirt, litter, and debris from the total network of paved thoroughfares in accordance with the Council approved Street Sweeping Policy.
- Providing emergency response for debris control along arterial and other rights-of-way on a 24-hour, seven-day-per-week basis.

To provide acceptable level of service and maximize limited budget, the division implemented the first street management system in early 1980's. The system considerably improved the decision-making process involved in managing the transportation infrastructure network.

The system is a crucial part of Roads Maintenance business processes and is a source of information to make informed decision. This information covers many areas such as data on various infrastructure facilities, locations of different maintenance work performed, locations of various events and places where services are provided, and many others.

Even if most of the data is spatial in nature, the pavement management system was solely textual. With the ever-growing use of GIS technology, Engineers and Technicians realized the benefit of using GIS to manage information resources. Some of the benefits include increased access to many different data sets and types of information, powerful analysis tools, and quickly displaying the results of complex analyses in a graphical format.

The division wanted to take advantage of spatial data management tools as a more effective means for decision making and relaying information to staff. However, the process of linking pre-existing asset related information to map features has always been a challenge. Difficulties have traditionally be due to major process change requirements and technical incompatibilities, causing drastic and costly changes in the way existing data collection and maintenance is performed.

Roads Maintenance has initiated a GIS project in September of 1999 (RoadGIS: GIS for street maintenance management). The objective of this project was to implement a spatial and attribute data maintenance and analysis application. This allows GIS data maintainers, Technicians and Engineers to create, update and query street related features and associated attribute information directly in the GIS environment or in a Database Management System.

For various reasons the project was not completed. However, as a result of the initiative, the division was able to gain the following:

- Data sources were identified.
- Roads Maintenance Base Maps were created and loaded onto the corporate GIS database.
- Engineers and technicians were trained and GIS awareness was raised within the division.

In September of 2002 the division revisited the Roads Maintenance GIS project. The objective was to institute a solution that would integrate existing tabular asset management applications with spatial data. This presentation will discuss the requirements, challenges and solutions of the project.

# Roads Maintenance GIS Project

## *Objectives*

Business Objective:

- Improve the effectiveness of infrastructure asset management and the efficiency of staff through improved workflow processes.

Project Objective:

- Establish a spatial data maintenance application allowing Road Maintenance technicians and GIS data maintainers/cartographers to create, edit or delete "Street Segments" and relate line features and associated attribute information directly and dynamically within the GIS environment.

## *Scope*

This project will:

- Establish business stakeholders' responsibilities
- Review the business workflow processes
- Selection and implementation of a technical solution that meets Roads Maintenance business data management requirements.

## *Critical Success Factors*

- Establishment of a well-defined and solid workflow process that will remove previous system and workflow barriers.
- Implementation of the necessary tools that will ensure the roads segment inventory is complete and maintain on a consistent basis.
- Implementation of easy to use GIS tools that support the road maintenance activities, such as snow and ice removal planning.
- Establish a GIS strategy that complies with the corporate standards.

## ***Constraints***

- User skills ranged from absolute beginner to power user so the project system deliverables must be reasonable in terms of business functionality, and is not overly complex or sophisticated for the beginner, but also does not limit the power user.
- Internal security policy prevented native use of out of the box SDE versioning tools.
- Limited experience and resources necessary for developing in ArcGIS and the Geodatabase.
- Data steward and data maintainers were spread across many departments.
- The project system deliverables must integrate with an existing legacy system and the City's technical environment.
- Data in need of consolidation and validation.

## ***Key deliverables***

- A formalized workflow management program including steward and user responsibilities, tasks and lines of communication.
- A technical document outlining in detail the steps and rules required in assigning new RIS.
- Deliver a complete base map and data module that meets Roads Maintenance business requirements.
- Create new and enhance existing applications to support road maintenance businesses.
- User Documentation.

## ***Solution Proposal***

The primary focus was to implement a solution that meets Roads Maintenance business spatial data needs through establishment of data maintenance workflow process and technical environment that fits the divisions budget and timeline.

To accomplish the key deliverables, the project was broken into the following phases.

## Workflow Process improvement

- We reviewed the current environment at the time to identify strengths and weaknesses and provide a solution.

## Improved Process implementation

- Based on the output from the previous phase we identified deliverables and methods to achieve them.

## Functional and Technical requirement Analyses

- We examined technical opportunities and resources within our environment to determine which would best facilitate the functional requirements of the business.

## Technical solution development

- ArcGIS provided the greatest fit, so the solution design, development and data modeling were done using the ESRI application and data environment platform.

## Data Migration

- Possible sources of data were identified and migrated to the geodatabase data model.

## Final Solution Implementation

- During the final phase the system was rolled out, training was provided, documentation was completed and the support structure was put into place.

## Conclusion

Through out this project Roads Maintenance staff realized that well-planned spatial data management system is crucial for successful management of the Transportation Infrastructure Assets. Currently the business unit relies heavily on the spatial data to plan and manage assets. Now we have the foundation in place the management is committed to continue increasing the effectiveness of asset management practices through the use of GIS technology.

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