Lucky Discovery: GIS Project Reveals Unseen Threat from West Nile Virus

By Paul Beach
Sault Ste. Marie
Innovation Centre

Strange and wonderful things can happen when geospatial information is shared among organizations. In Sault Ste. Marie, a search for potential hazards in the electricity infrastructure led to the discovery of the most dangerous mosquito breeding ground for West Nile Virus ever found in the city.

Sharing of GIS data, tools and resources among organizations enabled a quick and coordinated response to this threat, and might inspire similar solutions in other communities.

Background

GIS services for the City and Public Utilities Commission of Sault Ste. Marie are managed by a not-for-profit community organization called the Sault Ste. Marie Innovation Centre.

In 2000, the centre formed the Community Geomatics Centre (CGC) to develop an information management tool to assist in efficient retrieval, reproduction and analysis of spatially related municipal and utilities infrastructure.

This map shows the locations of PUC submersible transformer vaults in Sault Ste. Marie.

The CGC developed an Integrated Geomatics Model, which in 2006 won both the Best Municipal GIS award and the Leadership in GIS award from URISA-Ontario Chapter (see the Fall 2006 issue of this newsletter). The CGC has expanded to serve a wide range of health-care, government and community organizations in the Sault Ste. Marie area.

The CGC is unique in Canada. It helps to establish and promote the partnerships and technological means to efficiently share geospatial data, tools and knowledge among community organizations.

Tripping Hazards

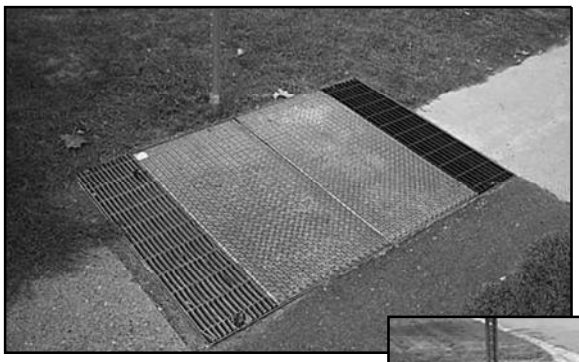
In 2005, the CGC assisted the Public Utilities Commission (PUC) to create a GIS-based tool to catalogue all possible tripping hazards that might exist in the water and electric infrastructure. These included such things as water curb box valves, electric anchor guys and transformer pads and vaults.

All potential tripping hazards were queried out and highlighted in the GIS. Approximately 300 maps were generated in a series through a batch plotting process.

Using these maps and a computerized form, PUC administrators compiled an inventory and analyzed the status of potential tripping hazards. The hazards were flagged for follow-up to mitigate further risks.

CGC staff, meanwhile, in carrying out the preliminary work to create their maps and database forms, performed field investigations of PUC assets that were potential tripping hazards. On one visit they detected an alarming number of mosquitoes in and around the PUC submersible transformer vaults.

At this time, the CGC was



Submersible transformer vaults, such as the one shown here, covered by a grate, have been phased out by Sault Ste. Marie's PUC in recent years in favour of transformers mounted on telephone poles or on concrete pads, like the one below.

working with the Algoma Health Unit (AHU) to map West Nile Virus test results for mosquitoes and birds. Staff notified AHU of what they had seen around the submersible transformer vaults.

The health unit completed larval dipping tests of several vaults in the early summer of 2006. The tests identified the vaults as mosquito larvae risks in residential areas across Sault Ste. Marie.

A research project was developed and conducted to determine the significance of the buried vaults to the risk of West Nile Virus.

West Nile Infections

West Nile Virus originated in birds in Africa but spread to North America in the late 1990s. It was first identified in New York State in 1999 and has since been found in almost all U.S. states and Canadian provinces.

Mosquitoes can transmit the virus to humans after biting infected birds. In 2006, there were 127 human cases of West Nile Virus in Canada. In the United States, 3,887 cases were reported in 2006 with 120 deaths.

Submersible Vaults

Sault Ste. Marie has more than 500 submersible transformer vaults. They were installed during the 1960s through the 1980s in many communities in North America.

The trend at that time was to bury all utility installations to create aesthetically pleasing residential subdivisions, free of poles, overhead wires and pole-mounted transformers.

Some communities still use submersible transformer installations today, but in most cases new transformers are either pad-mounted or pole-mounted.

Installation of new submersible transformers has essentially been eliminated due to increasing costs of maintenance and difficulty of troubleshooting an underground system during power outages. The submersible vaults also created tripping hazards and winter buildup of ice in driveways, and often conflicted with property owners when attempts were made to maintain or construct new driveways.

Of most concern to the AHU, buried vaults have no drains and can fill with water from rain or runoff.

Findings and Response

The 2006 larval dipping study found that the vaults were increasingly and quickly being infested with mosquito larvae. There was a 94-per-cent increase in the number of larvae within a month.

The AHU approached the city's Public Works and Transportation division and had the vaults treated to kill the larvae. The problem was solved in short order, as can be seen from this timeline:

- On August 18, 21 and 22, 2006, all buried vaults in the City of Sault Ste. Marie were treated with the larvicide

Bti (Bacillus thuringiensis israelensis) by Public Works and Transportation. The effects of Bti last several weeks.

- Larval dipping a week after the treatment indicated that the number of vaults with larvae had decreased by 35 per cent and the vaults that still had indications of larvae had significantly lower numbers.
- A month after treatment, larvae were not detected in 94 per cent of vaults and the remaining vaults with larvae had very few.
- The AHU recommended that the vaults be treated twice seasonally each year.

Benefits of Sharing

The discovery of West Nile Virus in submersible transformer vaults and the rapid response displays the benefits and effectiveness of a multi-enterprise GIS solution.

Sharing data, tools and resources between organizations, combined with the power of GIS, enabled a quick and efficiently coordinated response by AHU, PUC, CGC and Public Works to address a serious issue affecting the health of the community.

Paul Beach, manager of the Community Geomatics Centre, can be reached at pbeach@ssmic.com.