Technical Support Working Group

Technical Brief

PipelineNet Infrastructure Protection and Consequence Management Tool

Background: In cooperation with the Federal Emergency Management Agency and the Environmental Protection Agency, the Technical Support Working Group (TSWG) sponsored a project to develop software programs that would estimate the consequences of a terrorist attack on a city's drinking water infrastructure. The system, PipelineNet is now operational for in a number of locations in the United States.

Technical Description:

PipelineNet is a Geographic Information System (GIS)-based software tool with integrated database capability that can be used to model the flow and concentration of contaminants in a city's drinking water pipeline infrastructure. It contains a pipe network hydraulic model (EPANET), maps, and a US Census Population database. The PipelineNet model estimates the population at risk due to the introduction of contaminants in the public water supply and graphically maps this population.

The PipelineNet model permits the user to model the flow and concentration of a biological or chemical agent within a city or municipal water system. This model assesses the effects of water treatment on the agent, models the flow and concentration of an agent through the water distribution system within a city or municipality, and calculates the population at risk. PipelineNet performs the following functions:

- Simulates the flow and concentration of biological or chemical contaminants in a city or municipality's water distribution system
- Assesses the effects of water treatment on the contaminant
- Helps planners with present and future demand predictions
- Helps city managers with fire flow requirements
- Facilitates planning and design of distribution systems
- Aids in complying with drinking water regulations
- Assesses risks to population

The system is designed for:

- Planning for and conducting Emergency response to naturally, accidentally released, or terrorist introduced contaminants to water supplies.
- Modeling of Prediction of Water Demand based on population
- Regulatory Compliance Modeling
- Firefighting Water Flow Modeling

The EPANET component of PipelineNet was developed by the Water Supply and Water Resources Division (formerly the Drinking Water Research Division) of the U.S. Environmental Protection Agency's National Risk Management Research Laboratory. EPANET performs extended period simulation of hydraulic and water quality behavior within pressurized pipe networks. A network can consist of pipes, nodes (pipe junctions), pumps, valves and storage tanks or reservoirs. EPANET tracks the flow of water in each pipe, the pressure at each node, the height of water in each tank, and the concentration of a chemical species throughout the network during a simulation period comprised of multiple time steps. In addition to chemical species, water age and source tracing can also be simulated. EPANET can perform complex hydraulic modeling based on numerous variables and water system components. The system also features a full featured and accurate hydraulic modeling capability, and water quality modeling capability. EPANET can also be used to study such water quality phenomena as the blending of water from different sources, age of water throughout a system, loss of chlorine residuals, growth of disinfections by-products, and contaminant propagation events

Operating System: The PipelineNet system is operational in the Windows XP environment on either laptop or desktop computers. The minimum requirements are 64Mb Ram, 500 Mb of free disk space. A CD-ROM drive is also required. The PipelineNet system also requires ArcGIS. PipelineNet is an ArcGIS 9.2 based system, which integrates hydraulic and water quality models with existing databases. Using the ArcGIS platform, PipelineNet models characteristics of a water distribution system, such as flow, pressure, age, and chemical concentrations. By combining GIS with hydraulic and chemical concentration computations, users can effectively manage consequence assessment

PipelineNet has the capability to be connected to the Internet via a modem or Cellular accessible network to enable multiple inputs and assessments from various locations in a large-scale disaster situation. The system uses Arc View GIS, which is integrated into the system. The user must have an Arcview license to run PipelineNet.

Municipal water utilities, city and county public works departments, and Federal, State, and local emergency response and regulatory agencies can use PipelineNet. In view of the recognized increasing terrorist chemical and biological agent threat, PipelineNet will be an important addition to the nation's

counterterrorism responses. The developer, SAIC, will negotiate contracts directly with municipalities to integrate the necessary data into the PipelineNet model and deliver an immediately usable software. Subsequent to this delivery, SAIC will provide training and technical support to the user to ensure that the software is functioning correctly.

For additional information, go to
http://eh2o.saic.com/SectionProjects/Transport/DistributeSys/PipelineNet9X/PipelineNet9X.aspx