

IMPLEMENTATION OF NEW YORK STATE'S SOURCE WATER ASSESSMENT PROGRAM IN NASSAU AND SUFFOLK COUNTIES

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The federal Safe Drinking Water Act (SDWA) Amendments of 1996 created a Source Water Assessment Program (SWAP) to evaluate existing and potential threats to the quality of public drinking water supplies. The New York State Department of Health (NYSDOH) Bureau of Water Supply Protection developed the New York State SWAP Plan, and directed the implementation of the Plan for the over 1,300 public supply wells that provide drinking water to nearly 3 million people in Nassau and Suffolk Counties.

Assessment of each well required:

- Delineation of its source water recharge area;
- Determination of the prevalence of various contaminants associated with land use and point sources within each well's source water area; and
- Evaluation of each well's susceptibility to potential contamination based on the prevalence of contaminants within the source water area, the model-estimated time of travel to each well, and the contaminant characteristics

Three existing tools were used creatively to evaluate the potential impact of man's activities and complete the Source Water Assessments. Successful implementation of this project required application of three-dimensional groundwater models, integration of the model output with GIS summaries of land use types and point source locations, and use of a carefully planned database to organize information relating land use types and point source data and relate it to the potential to cause groundwater contamination.

While groundwater models are routinely applied to assist in evaluating water quality impacts, the scale of application for SWAP is believed to be unique. Traditional source water area delineations have incorporated a number of simplifying assumptions that result in parabolic shaped source water areas located immediately upgradient of each well. Long Island's public supply well network consists of hundreds of wells, many of which are screened deep within the aquifers and that have contributing or source water areas located miles away from the well, as shown by figure 1. This is particularly true of public supply wells screened within the Lloyd aquifer along Long Island's north and south shores.

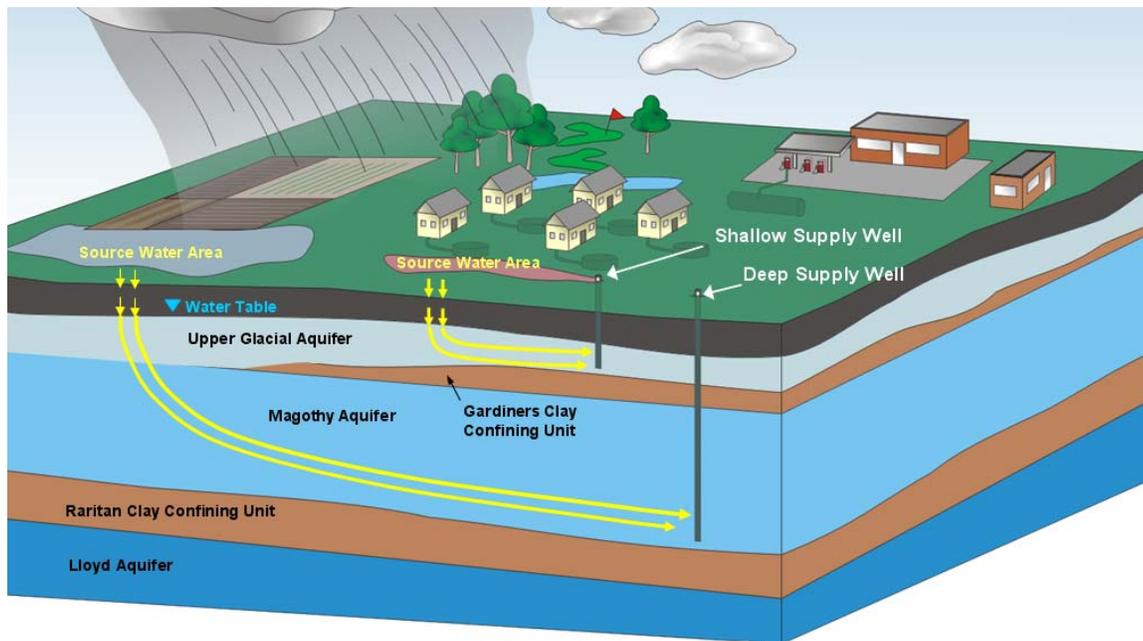


Figure 1 - Location and Size of Source Water Areas Depend upon Well Characteristics

Water supply pumping at all of these wells simultaneously also modifies the regional flow fields, such that the contributing areas are not regularly shaped zones, but complex shapes that fit together like “pieces in a puzzle”, as shown by figure 2. A complex three-dimensional modeling framework was required to consider the simultaneous water supply pumping of hundreds of wells.

The land uses and specific facilities (point sources) within each well’s model estimated source water area were inventoried and their potentials to contaminate ground water (contaminant prevalence) were assessed independently for each of four contaminant categories (microbials, nitrates, volatile organic chemicals (VOCS) and pesticides). The overall potential for these potential contamination sources to be present within a supply’s source water area was aggregated, to develop a “contaminant prevalence rating” for each contaminant category.

The source water assessments also evaluated the well’s “sensitivity” to each of the four types of contamination, the likelihood that contamination would reach the well, considering the model-estimated time of travel to each well, and the fate and transport of those contaminants. Finally, each well’s “susceptibility” to each of the four categories of contamination was assessed, based upon the assigned ratings for contaminant prevalence and sensitivity.

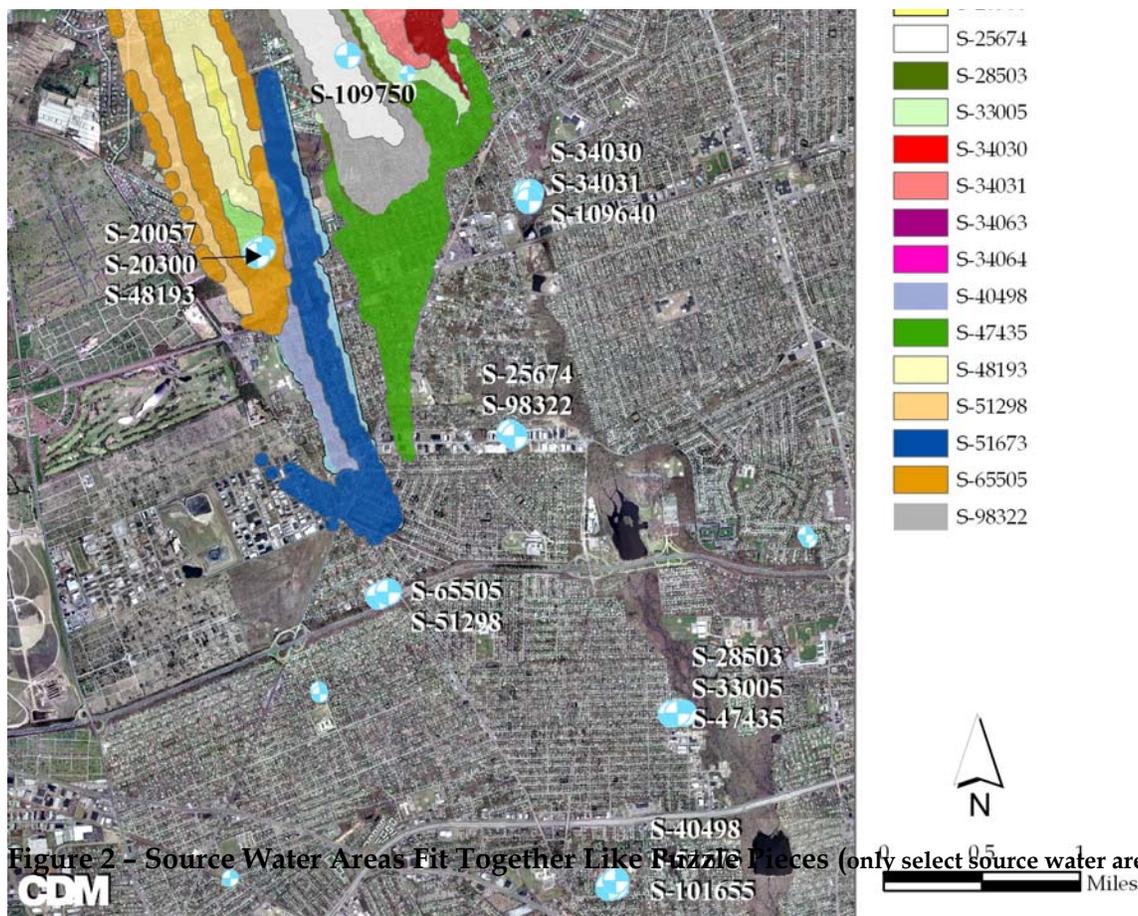


Figure 2 - Source Water Areas Fit Together Like Puzzle Pieces (only select source water areas shown).

The Long Island SWAP shows how complex regional problems can be resolved with carefully planned integration of existing technologies. A Microsoft Access® database was used to integrate well data, groundwater model results, and ArcInfo® compiled-land use and contaminant source summaries in each travel time of zone for each well. The criteria for assessing contaminant prevalence, sensitivity and susceptibility were also incorporated into the database. Using the data and criteria, database functions were developed to quickly generate the land use and point source contaminant prevalences, well sensitivities and susceptibilities, and to automatically compile the ratings into individual well assessment reports. Due to the sheer volume of data and the number of well reports required, manual compilation and report generation using other techniques would have been nearly impossible. Simultaneously simulating multiple wells with the groundwater models, processing the information using ArcInfo® and a carefully designed database proved to be crucial.

Well-specific reports, including a series of tables, figures and the characteristics of the source water area, along with a summary of the data characterizing each well, were prepared. These resources are now available to Long Island water managers for use in their continuing work to protect and preserve the Island's drinking water resources.

Acknowledgements

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