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New York State's Automatic Water Quality Surveillance Program*

*By: Staff Report, Water Pollution Committee  
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New York State's Automatic Water Quality Surveillance Program

Staff Report by Water Pollution Committee

Summary

The N.Y.S. Department of Environmental Conservation recently installed two automatic water quality monitors on the Genesee River in the Rochester area. These monitors are part of a statewide system of automatic and manned water sampling stations. The automatic monitors continuously measure water characteristics and transmit data hourly to a central computer in Albany. Monthly reports are issued by the Department.

Background

The New York State Department of Environmental Conservation is authorized (under Article 12, Section 1210, of the Public Health Law, enacted during the 1962 session of the New York State Legislature) to "establish a water quality surveillance network with sufficient stations and sampling schedule to meet the needs of the state, including ground water and surface water, both fresh and salt, and publish the results of such water quality surveillance network periodically."

The state's water quality surveillance program is conducted through a network of approximately 200 sampling stations, 116 of which are operated by the Environmental Conservation Department; the remainder by other agencies, municipalities, and industries. Stations have been established in the 17 principal watersheds in the State. Thirteen stations are sampled by the Department's 12 automatic monitors; the remainder are sampled manually at regular intervals.

The manual sampling stations are located at sites representing the general quality of the state's waters in various drainage basins; the automatic monitors are situated where the quality changes rapidly.

In 1960, the State Health Department, which then had jurisdiction over the State's water pollution control programs, proposed replacing the existing manual surveillance network with an automatic monitoring system. The first automatic electro-chemical sensor for water monitoring was purchased in 1966. During that first year, the Health Department evaluated the feasibility of using both the electro-chemical type and the wet-chemistry type, and concluded that the former was both feasible and practical, while the state-of-the-art of the wet-chemistry type failed to meet the requirements of quick response, minimum maintenance, and economical operation.

The initial feasibility study and experience also showed that automatic monitors would not replace manual sampling, but would supplement it where water quality fluctuates rapidly, and that automatic monitoring had to be developed on a true real-time computer systems approach.

### Rochester Monitors:

In July 1970, two automatic major monitors became operational in the Rochester area. They are located on the Genesee River, one at Scottsville and the other at the Charlotte dock in Rochester. Others are located along the Hudson, Mohawk, Seneca and Niagara Rivers and on Canadarago Lake.

These monitors operate 24 hours a day, seven days a week, continuously sampling the following characteristics: dissolved oxygen, water temperature, pH, conductivity, turbidity, dissolved chlorides, dissolved fluorides, solar radiation intensity, air temperature, water level. Once each hour, a central computer in Albany interrogates each monitor (via telephone lines) for data and records the information. If any of the parameters exceeds desirable or legal limits, the computer prints out an "alert" message, and automatically sounds an alarm to call the situation to the attention of water quality surveillance personnel.

As a quality control measure, water samples are collected manually at each site twice a month and analyzed.

The Department issues monthly reports summarizing the data from the automatic monitors. This information is useful to engineers, industries, and government agencies engaged in water resources and water pollution control activities. The reports, titled "AQUA" (Water Quality Surveillance Automatically) are available by contacting the Rochester regional office of the Department (1100 Commerce Building, 119 Main Street East).

A related part of the water quality surveillance program is known as the "Water Watchers" program. In order to increase the scope of the surveillance network, the Department requests those involved in water supply and pollution control--as well as interested citizens--to take note of and report any unusual events occurring in the waters near them, particularly drastic variations in water quality such as high bacteriological concentrations, accidental chemical spills, oil slicks, fish kills, or any other potentially hazardous conditions.

To report such an event, call the Rochester regional office (546-6556) or Albany (collect: Area Code 518-457-7362); or write:

Water Watchers  
Water Quality Surveillance  
Pure Waters Division  
N.Y.S. Dept. of Environmental Conservation  
Albany, New York 12201

Reports will be published (and, if desired, the contributor's name included) in the next issue of "AQUA".

A short Technical Appendix, describing the equipment and its operation is available on request to the R.C.S.I.

The documentary source of this bulletin was: Maylath, R.E. (undated manuscript), Monitoring New York's Waters Automatically. Division of Pure Waters, New York State Health Department. (Now, Division of Environmental Quality, N.Y.S. Environmental Conservation Department). 29 pages, including tables and figures.

Essentially the same report may have been published or may be published in a technical journal or State report.

Technical Information:

Monitor System:

The automatic monitoring system includes the following components:

--Major Monitors, contained within their own shelters and capable of measuring eight or more environmental parameters and transmitting the data digitally to the Computer Center. The two monitors installed in Monroe County are Major Monitors.

--Minor Monitors which measure less than eight parameters and transmit the data to the computer.

--Satellite Monitors which measure a maximum of four parameters and transmit the data to a Major Monitor.

--Telecommunications System which transmits the data among the Monitors, the Computer Center, and the Remote Terminal.

--Computer Center which collects, stores, analyzes and disseminates data and commands.

--Remote Terminal which receives data and sends functional commands.

Major Monitors:

The major monitors are designed to be essentially self-sufficient. They are made up of these modules:

--Environmental Parameter Sensors which presently measure these water and air parameters: hydrogen ion concentration (pH), dissolved chloride concentration, dissolved oxygen concentration, conductivity, water temperature, turbidity, water stage height, solar radiation intensity, and air temperature. Each parametric system has its own signal conditioner which amplifies, linearizes, and controls the 0.00 to 5.00 volt d-c positive output signal. Certain systems have automatic temperature compensation and some have automatic multi-range change capabilities.

--Equipment Status Sensors, including Environmental Alarm Sensors and Monitor Health Sensors. The Environmental Alarm Equipment provides adjustable high and/or low limits for certain environmental parameters. When a limit is exceeded, two simultaneous signals are produced, one to the automatic sampler and the other to the automatic telephone dialer. The automatic sampler, upon receiving a signal command from either the alarm equipment or the functional alarm equipment (see below) collects water samples for subsequent analysis. The Monitor Health Equipment maintains a check on how well the monitor is functioning. In the case of a malfunction, a binary signal is sent to the automatic telephone dialer; some equipment status sensors also send a signal to the functional command equipment.

--Functional Command Equipment allows the computer and/or personnel to control remotely up to 15 components (pumps, lights, automatic sampler, etc.) in the monitor shelter.

--Shelter for the major monitors is a house trailer, 10 feet by 20 feet, from which the automotive equipment has been removed.

#### Minor Monitors:

The Minor Monitors are essentially the same as the major monitors, except that they lack some of the equipment status sensors and functional command equipment and do not have their own shelters. They are designed to be installed in an existing facility, such as a water treatment plant or industry.

#### Satellite Monitors:

Satellite Monitors are designed to be small, compact, and weather tight with in-situ type sensors. Data collected is transmitted via radio to a major monitor located within five miles. Satellite monitors are used to measure a small number of parameters at sites where it is impractical to install a major monitor, or in cases where certain parameters cannot be measured at the major monitor site.

For example, a major monitor is located on the Mohawk River approximately three miles upstream from the confluence with the Hudson River. It is impossible to measure stream flow at this location, but half a mile downstream the United States Geological Survey maintains a stream gauging station. Because of terrain, it is uneconomical to locate the major monitor at the gauging station site, so a satellite monitor was installed at the U.S.G.S. station to measure stream flow.

#### Telecommunications System:

Two-way communications equipment receives and conditions signals from the sensors for transmission over telephone lines. Various signals represent the water quality values, status of the equipment, functional commands received from the computer, and alarms activated by either the water quality sensors or the equipment status sensors.

#### Computer Center:

A Burroughs B-3500 computer controls the surveillance system with the use of two software packages, the real-time module and the update-and-report module.

#### Remote Information Center:

A teletypewriter receives alarm information from the computer. It can also call the computer or the monitors directly for additional information and can transmit functional commands directly to the monitors.