CHAPTER EIGHT PROGRAMS FOR WATER QUALITY ASSESSMENT

Water quality assessment is an integral part of water quality management in New Mexico. Information on water quality serves as a basis for various program decisions. Moreover, statewide assessments of surface and groundwater quality are an important component of this federally-required report. Monitoring activities and programs used by New Mexico to assess ground and surface water quality are described below.

Surface Water Quality Assessments

The State uses a wide variety of methods for assessment of its water quality. Second-party data including discharger's reports, published literature, data stored in the United States Environmental Protection Agency's (EPA's) database, as well as data generated by the United States Geological Survey (USGS) are routinely reviewed. The New Mexico Environment Department (NMED) generates large amounts of data through intensive surveys, assessment of citizen complaints, special studies aimed at areas of special concern (e.g., mercury concentration in water, sediments and fish), short- and long-term nonpoint source pollution monitoring, and effluent monitoring.

Surface Water Quality Monitoring

Water quality monitoring and other surveillance activities provide water quality data needed to (1) revise water quality standards, (2) establish waterbody monitoring/management priorities, (3) develop water quality-based effluent limitations, (4) develop total maximum daily loads (TMDL), (5) assess the efficacy of point source water pollution controls through the National Pollutant Discharge Elimination System (NPDES), (6) identify new areas of concern such as the statewide fisheries mercury study, and (7) evaluate the efficacy of best management practices (BMPs) developed to mitigate the impact of nonpoint sources.

Water quality data are acquired by four basic forms of monitoring: (1) ambient, fixed station monitoring performed by the USGS; (2) special water quality surveys of priority waterbodies by NMED; (3) effluent monitoring; and (4) NMED special studies.

Stream Monitoring

Ambient Monitoring

In addition to intensive and special water quality surveys, the Surface Water Quality Bureau has for many years relied on water quality data collected by the United States Geological Survey from a series of long-term fixed stations. Through 1995 the USGS maintained a network of 49 long-term fixed stations, located in almost every watershed in the State. The primary objective of this fixed station network has been to provide long-term measurements of water quality variables at representative points on the State's major streams to determine spatial and temporal water quality trends. These data are also used for determining TMDLs for these watersheds as required. Prior to 1996 the funding for this sampling effort was provided by an appropriation from the Legislature to the State Engineer Office, along with an equal match from USGS. In June 1996 the State Engineer Office withdrew all future funding for water quality data collection and concentrated on funding the stream flow studies. The Surface Water Quality Bureau reviewed the fixed-station network of stations compared to the upcoming TMDL commitments and recommended a slightly modified work plan involving 41 stations. Funding for part of this surveillance network is being provided by NMED through an EPA grant and by the USGS from matching funds. This funding arrangement will cease during 1998 and the future of fixed-station monitoring in New Mexico is in doubt.

In addition to the 41 fixed-station water quality stations maintained by USGS there are two additional stations yielding valuable water quality data for the State. These stations are part of the National Stream-Quality Accounting Network (NASQAN) and are located on the Rio Grande in Colorado and Texas just outside the New Mexico state boundaries. Locations of the fixed water quality network in the State, parameters sampled, frequency of sampling and other related information are presented in Figure 32 and Table 24 in Appendix D.

Special Stream Surveys

Special water quality surveys involve three or four seasonal sampling trips consisting of three to four sampling runs each. During each seasonal trip water quality samples are collected and measurements are made of physical parameters at representative points along a stream reach over a relatively short period of time (four to five days). The purpose of these investigations is to determine water quality characteristics under specific conditions, and to determine where possible, cause and effect relationships of water quality.

Special surveys are usually timed to coincide with annual periods of stress for the fish and macroinvertebrates of the waterbody, such as periods of annual low streamflow or highest ambient temperatures. Stream surveys conducted

during 1996 and 1997 are listed in Table 14. Benthic macroinvertebrate assessments to evaluate the integrity of aquatic communities were conducted in association with most of these stream surveys. Parameters sampled during special surveys are listed in Table 26 of Appendix D.

Special water quality surveys will be conducted on three watersheds during calendar year 1998. The watersheds under study, Jemez River, Rio Chama and Cimarron River, are all listed on the State's CWA § 303(d) list of waters requiring TMDL determinations. The Surface Water Quality Bureau is currently attempting to conduct water quality sampling efforts in each of the State's watersheds every five years.

Lake and Reservoir Monitoring

Lake and reservoir monitoring in New Mexico is conducted to (1) collect information for standards development and to determine the trophic status for all publicly-owned or operated lakes where little or no physical, chemical, or biological information exits; and (2) update information with regard to trophic status of previously studied publicly-owned lakes. Lake water quality status, control measures, restoration efforts, and the status of mercury in lakes and reservoirs are discussed under Chapter Three, *Water Quality in Assessed Surface Waters*.

Forty publicly-owned playa lakes were studied from 1992 through 1995. These forty studies are listed in Table 15. Water quality samples and physical measurements were collected during one special survey conducted at each playa lake. Biological samplings for benthic macroinvertebrates, phytoplankton, and diatoms were included in most of the studies.

In 1996 and 1997 special lake water quality and biological assessment surveys were conducted on six New Mexico lakes in conjunction with stream sampling efforts. These special lake surveys consisted of threecseason sampling efforts from one station each at Bear Canyon Lake, Lake Roberts, Snow Lake and Wall Lake and two stations each at Sumner Reservoir and Brantley Reservoir. In 1997 summer surveys were conducted on three additional lakes - Grindstone Canyon Reservoir, Alto Reservoir and Bonito Lake. The surveys for these small lakes were conducted during the period of maximum stress to the aquatic ecosystem.

Special lake water quality and biological assessment surveys will be conducted on El Vado and Eagle Nest lakes during calendar year 1998. These surveys will consist of sampling efforts during spring, winter and fall. In addition, a single-season survey of Fenton Lake will be conducted during summer 1998 and a series of single-season surveys will be conducted on several bodies of water within Bottomless Lakes State Park near Roswell and on various playas.

Effluent Monitoring

Receiving streams are sampled in conjunction with effluent samples collected during Compliance Sampling Inspections at NPDES permitted discharge facilities. Inspectors collect samples from the discharge pipe as well as an upstream sample and a downstream sample. This group of samples provides information on the impact, if any, of the discharge on the chemical quality of the receiving stream. The information is stored in the EPA's STORET computer database and can be used to determine if water quality standards are being violated as the result of a point-source discharge. The data also provide information necessary for the preparation of NPDES water quality based permit effluent limitations.

NMED Special Studies

Nonpoint Source Monitoring

Under the Nonpoint Source Management Program, NMED conducts extensive water quality monitoring around the State to determine the effectiveness of BMPs used to control nonpoint source (NPS) pollution. Monitoring is also conducted in conjunction with targeted watershed demonstration projects. Intensive implementation of BMPs is ongoing in these watersheds to improve water quality. On a statewide basis, NMED monitors selected projects in priority waterbodies such as timber harvests, road construction and dredge-and-fill activities to determine the effectiveness of BMPs used to protect water quality in these projects.

NPS monitoring typically includes determinations of whether BMPs are being implemented as planned, and water quality sampling upstream and downstream of actual or potential NPS problem areas. In the case of short-term projects such as a utility line crossing of a river, monitoring may be done only once or twice during the project. In these projects, turbidity monitoring is often used as an indicator of erosion control effectiveness on the project. If turbidity standards are violated, additional water quality parameters may also be checked.

In the case of monitoring watershed improvement projects, samples are collected seasonally over a multi-year period. Water quality is monitored upstream and downstream of all major NPS problems and control BMPs implemented in the watershed. Sampling repeatedly over a multi-year period will allow the State to document the effectiveness and feasibility of watershed restoration projects in improving water quality. As discussed previously, other indicators of improvement are being developed and implemented.

Future Directions

Monitoring and Evaluation of Nonpoint Source Controls

Since 1988, New Mexico has been increasingly active in addressing nonpoint source pollution. Several agencies, such as the Soil & Water Conservation Districts (SWCD), State Land Office (SLO), State Parks Division (SPD), the State Highway & Transportation Department, the Natural Resources Conservation Service (NRCS), the United States Forest Service (USFS), and the Bureau of Land Management (BLM) are routinely including water quality BMPs to control nonpoint source pollution in their activities due to these efforts. The SWCD, NRCS, and USFS in conjuction with NMED have also initiated several major watershed restoration projects specifically aimed at NPS pollution abatement.

Additional programs initiated by the SLO include a riparian improvement program (RIP) whose purpose is to identify, prioritize, and implement restoration projects in riparian areas and associated watersheds located on state trust lands in cooperation with lessees, adjoining land owners, and land management agencies. The SLO has also initiated a program to identify and control noxious weeds found on state trust lands. The program relies on cooperative efforts with land management agencies, county governments, and other interests to prevent to the extent possible the spread of noxious weeds and the consequent loss of productive agricultural lands.

The USFS has also initiated several major watershed restoration projects specifically aimed at NPS pollution. Since NPS pollution often occurs in discrete episodes related to precipitation events, it is difficult to assess the effectiveness of these controls using only traditional chemical water quality parameters. Simply stated, it is rare that staff would be in the right place at the right time to be able to sample the runoff from these precipitation events. Therefore, NMED is developing physical and biological indicators of water quality in order to monitor and evaluate nonpoint source control activities. Ultimately, the State will have measurable physical and biological water quality standards.

Implementation of Regulations Including Response to Spills and Complaints

Discharge Permit Implementation

Implementation of the ground water discharge permit program involves the compliance inspection of permitted facilities, as well as the review and evaluation of self-monitoring reports and enforcement. Compliance inspections generally are scheduled annually, and include split-sampling of monitor wells with the permittee. Most facilities are required to sample monitor wells on a quarterly basis, and the once a year split-sample is considered adequate to assure the accuracy of the self-monitoring data. For NMED's regulated facilities, basic information including date of receipt, whether the data was complete and whether there was an exceedance of the ground water standards, is entered into a computerized database. All NMED programs have direct access to this database.

Hazardous Waste Regulations

Under the State's Hazardous Waste Program, ground water data is being collected at fourteen individual sites as follows: two United States Department of Energy sites, six United States Department of Defense sites, one United States National Aeronautics and Space Administration site, and seven sites at private facilities. Monitoring parameters at all sites are hazardous constituents regulated under the federal Resource Conservation and Recovery Act.

Water Supply Regulations

NMED currently regulates 1,223 public water systems in New Mexico. Nearly all of these water supplies are derived from ground water sources. Four hundred ninety-five are '*non-community water systems*' which are sampled for nitrates once every 4 years. There are 596 '*community systems*' which are sampled for nitrates, fluoride and trace elements (i.e., arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) once every 3 years; for radiological parameters (gross *a* (alpha), radium^{226} and radium^{228}) every 4 years; and 8 regulated organic chemicals and 51 other contaminants once every 3 to 5 years depending on the vulnerability of the water supply sources.

Monitoring for trihalomethanes is required annually for systems serving populations greater than 10,000. A new class of public water supply has been defined: '*non-transient non-community*' water systems. New Mexico has 159 such systems serving schools, factories, etc. These systems will be required to monitor the same parameters and on the same schedule that '*community systems*' do now. All public water supply systems are required to conduct periodic microbiologic analyses. Analyses consist of total coliform counts and are done on a frequency determined by the population served.

Monitoring required by the State and federal regulations governing water supplies is usually performed by the water supply operators. In addition, NMED periodically collects samples for all parameters.

Oil Conservation Division Regulations

OCD performs ground water monitoring both to carry out responsibilities delegated to it by the Water Quality Control Commission and to ensure reasonable protection of fresh water as required by the Oil and Gas Act. OCD performs necessary monitoring as part of discharge plan review and at approved discharge plan sites. These discharge plans include the regulation of natural gas plants, natural gas

Table 14. Special Stream Surveys, 1996-1997.

Gila Watershed

Black Canyon Creek
Diamond Creek
East Fork Gila River
Gilita Creek
Iron Creek
Middle Fork Gila River
Sapillo Creek
Snow Canyon Creek
Taylor Creek

Pecos Watershed

Rio Bonito/Rio Hondo
Pecos River (Sumner to Brainard Lake)

Special three-season intensive water quality surveys were conducted on the following six lakes:

Gila Watershed

Bear Canyon Lake
Lake Roberts
Snow Lake
Wall Lake

Pecos Watershed

Sumner Reservoir
Brantley Reservoir

Single-season intensive water quality surveys were conducted on the following three lakes:

Pecos Watershed

Alto Reservoir
Bonito Lake
Grindstone Canyon Reservoir

Table 15. Playa Lake Surveys, 1996-1998.

Bentley Lake, San Miguel County
Berry Williams Playa, Curry County
Browns Pond, San Miguel
Chicosa Lake, Harding County
Crater Lake, Catron County
Davies Tank, Doña Ana County
Dennis Chavez Lake, Curry County
El Caso Lake (Big), Catron County
Gabaldon Lake, Catron County
Green Acres Lake, Curry County
Ingram Playa, Curry County
Laguna Americana, Cibola County
Launa Del Perro, Torrance County
Laguna Gatuna, Lea County
Laguna Quatro, Eddy County
"Laguna Seco", Cibola County
Laguna Tres, Eddy County
Laguna Uno, Eddy County
Laguna Walden, Eddy County
Lake Stinky, Otero County
Lane Salt Lake, Lea County
"Leyba" Lake, Catron County
"Little El Caso Lake", Catron County
Little Tule Lake, Curry County
Malpais Springs, Otero County
Middle Lake (Four Lakes area), Lea County
"Mike's" Playa, Torrance County
Mound Springs, Lincoln County
North Lake Lucero, Doña Ana County
North Lordsburg Playa Lake, Hidalgo County
Pine Lake, Catron County
"Sacaton" Playa, Hidalgo County
Salt Lake (Wagon Mound Lake), Mora County
South Lake Lucero, Doña Ana County
South Lordsburg Playa Lake, Hidalgo County
Stinking Lake, Rio Arriba Count
T6NR13WS19 playa, Cibola County
Tule Lake, Curry County
Williams Sink, Lea County
Wallace Lake, San Miguel County

compression facilities, oil refineries, geothermal installations, brine production wells and oil field service companies. At a minimum, inspections and sampling of effluents and ground water are conducted before plan approval and again prior to plan renewal.

In addition to monitoring carried out by OCD personnel, self-monitoring is also required of dischargers under conditions specified in individual discharge plans. Finally, monitoring at selected locations is conducted in response to citizen complaints in areas of oil and gas production activity. OCD is currently developing a computerized database management system for discharge plan and water quality monitoring.

Superfund Program

Between January 1996 and December 1998, NMED's federally-funded Superfund Program completed 34 site investigations requiring varying degrees of effort. Preliminary Assessments, during which field screening instruments may be used but no samplings are made, were conducted at 12 sites. Site Inspections, involving field samplings, were performed at 10 sites which had previously received a Preliminary Assessment. Four Integrated Assessments were performed at sites where conditions warranted sample collection although a Preliminary Assessment had not been completed. Expanded Site Inspections, during which additional samplings are made, were conducted at 4 sites. Other sites have received initial investigative effort but have yet to be completed. Two draft Hazard Ranking System packages, a final phase of site evaluation prior to nominating a site to the National Priority List, were submitted.

The sites investigated can be categorized as follows: 17 solvent sites; 8 mining sites, 2 landfills, and 7 other sites. Several sites have received more than one level of investigation.

Environmental sampling at the 20 sites which required sampling was distributed as follows: ground water sampling at 17 sites; surface water sampling at 9 sites; and soil sampling at 19 sites. Most sites required sampling of more than a single medium. Samples were analyzed for a variety of organic and inorganic chemical parameters specifically related to site activities.

The Superfund Program has also provided Management Assistance to EPA on 12 sites which have required varying degrees of effort from reviewing and supplying comments to creating reports such as *Remedial Investigation /Feasibility Studies* and negotiating Administrative Order of Consents. Additionally, the Superfund Program is in the process of developing a Voluntary Remediation program to address cleanup of Brownfields sites.

NMED Ground Water Studies and Projects

NMED has undertaken numerous ground water quality studies addressing specific questions or problems, and special projects authorized by the State Legislature, or funded with federal Clean Water Act monies. During the past two years, an agricultural chemicals project has been underway in southern New Mexico. Twenty-seven wells have been sampled by that program.

Statewide Contamination Incident Inventory

In 1980, the Environmental Improvement Division, the predecessor to NMED, completed the New Mexico Surface Impoundment Assessment. This effort has evolved into an inventory of all known instances of ground water contamination in New Mexico. Update, expansion, and computerization of this inventory of contamination incidents from 1927 to the present are currently under way. By February 1996, 1,066 instances of anthropogenic ground water contamination had been identified, affecting 194 public water supply wells, most of which have been taken out of use. A total of 1,647 private wells have been affected. Some degree of remediation has occurred or is scheduled in 159 of the 875 cases (Figures 13 - 16).

Oil Conservation Division Ground Water Quality Studies

The Cedar Hill/Animas Valley Gas Study is attempting to determine the source of natural gas in ground water and domestic water wells in the area along the Animas River north of Aztec in San Juan County, and extending to Bondad, Colorado. The study is continuing and has identified some oil and gas production wells as conduits for migration of natural gas. Wells found to be acting as conduits are required to have remedial cementing or to be plugged. In addition, OCD has instituted new cementing requirements for oil and gas wells in the San Juan Basin.

Other Ground Water Quality Monitoring

U. S. Geological Survey

USGS, through its Water Resources Division's District Office in Albuquerque, often obtains information on the quality of ground water as part of limited duration studies conducted in New Mexico. These studies are conducted for specific ground water systems in cooperation with State, local or other federal agencies. Information about these and other activities are

available through bibliographies and catalogs of information. USGS also publishes "Water Resources Data New Mexico," an annual report which includes ground water levels and water quality data. The report explains how to obtain access to WATSTORE, the national water data storage and retrieval system established for handling water data collected through the activities of USGS, and for providing an effective and efficient means of releasing the data to the public.

Office of the State Engineer

The Office of the State Engineer along with the SWCD, the SPD and the USGS cooperate in ground water quality monitoring in conjunction with the State Engineer's primary mission of administering use of the State's water resources. Areas from which extensive salinity data are available include the Roswell and San Juan Basins, the Bolson-Mesilla Valley, and Curry and Roosevelt Counties.

Other Sources

Other organizations who collect, record, or make use of other sources of ground water data to create useful reports include the New Mexico Water Resources Research Institute, the New Mexico Agricultural Extension Service, the Mining and Minerals Division of the Energy, Minerals, and Natural Resources Department and New Mexico Bureau of Mines and Mineral Resources. Monitoring activities are also undertaken by the United States Bureau of Land Management under their statutory authority.

Ground Water Quality Monitoring and Data Management

During the past several decades, numerous federal, State and other government agencies have generated a large body of ground water quality and related data in New Mexico. Also, large amounts of data concerning known and potential contamination sources are kept by various entities. There is, however, no comprehensive bibliographic or data retrieval system for all ground water quality resources in New Mexico.

The plethora of ground water-related databases creates two major problems. First, it is difficult for water quality investigators to acquire comprehensive information needed, for example, to establish background water quality conditions. Secondly, information pertaining to historic water quality problems has often been filed away, forgotten or otherwise effectively lost. This situation creates unnecessary hardships for those who must deal with new developments in such cases. Poorly accessible information may cause investigators to arrive at erroneous conclusions, repeat past investigations or spend excessive amounts of staff time obtaining data.

Substantial progress has been made during the past few years to rectify some of the above problems. A major effort to computerize data management systems within NMED has been undertaken. Also efforts to integrate State and federal data systems have been started.

There is a widespread need to share ground water data between programs within NMED. In part because of this need, a Data General minicomputer system was installed in early 1990. One purpose of this system was to make data sharing among NMED programs easier by having programs transform their databases currently stored on multiple personal computer systems to a single database on the minicomputer. This solves the problem of having data on stand-alone independent computer systems using incompatible hardware and software and widely varying data formats. Finally, the minicomputer has a dedicated hookup to the EPA computer network. The result of this new computer system has been to facilitate data exchange within NMED, as well as enhance electronic communication with EPA.

Other ground water quality data management activities in New Mexico are noteworthy and are summarized in the rest of this section. NMED has developed substantial capability to model hydraulic head, mass transport and geochemical conditions in ground water. As more data management applications are transferred to NMED's minicomputer system, it is expected that some of these models will become available on the minicomputer.

Also of note is the growing use of geographic information systems (GIS) in the State for the management of ground water and other related environmental data. ARC/INFO software has become the *de facto* standard for GIS development in New Mexico. The Water Resources Division of USGS in Albuquerque has developed extensive GIS map data-layers relating to ground water quality issues. The City of Albuquerque has also accumulated some information in their GIS that is useful for ground water quality analysis. The State Engineer Office has started to develop GIS capabilities that will be used for ground water administration and data analysis.

Currently, the SWQB uses GIS to document water quality impacts and to provide coverages for use by various bureaus within the department for public meetings, grant-related requirements and general information dissemination.