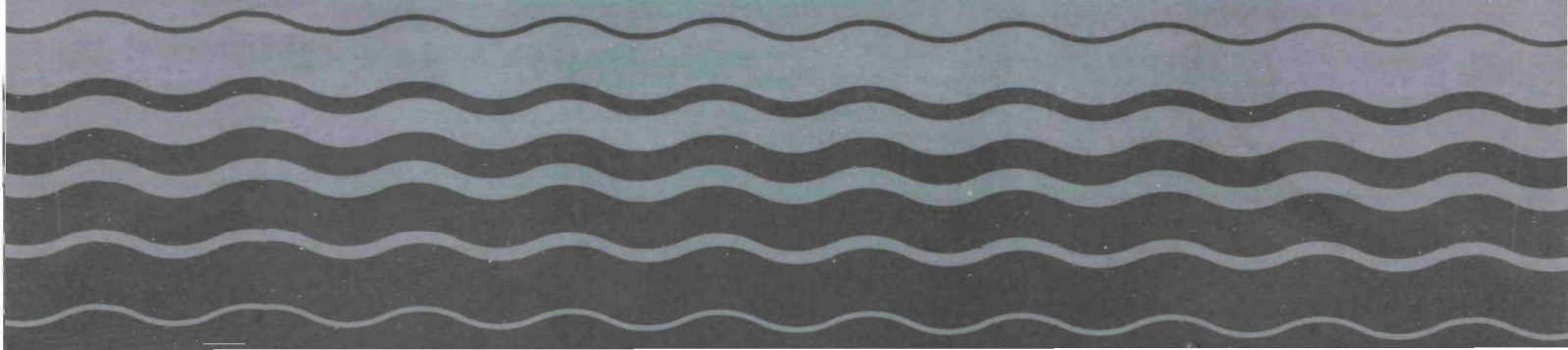


Water.



An Annotated Bibliography on Wellhead Protection Programs.



AN ANNOTATED BIBLIOGRAPHY ON
WELLHEAD PROTECTION PROGRAMS

Office of Ground-Water Protection
Office of Water
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

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OGWP extends its appreciation to the staff in the Regional Ground-Water Protection Offices and the Reference librarians at the EPA Headquarter's Library, who helped identify and collect references included in this document. OGWP would also like to extend its thanks to its consultant, Booz, Allen & Hamilton Inc., on this effort. Nina Bonnelycke served as the Booz, Allen & Hamilton Inc. staff person on the project.

Marian Mlay
Director
Office of Ground-Water Protection

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INTRODUCTION

This bibliography is part of a continuing effort by the U.S. EPA's Office of Ground-Water Protection (OGWP) to provide Technical Assistance Documents (TADs) for State and local officials developing Wellhead Protection (WHP) Programs under Section 1428 of the 1986 Safe Drinking Water Act Amendments. This bibliography references 142 documents that contain information on one or more of the six statutorily required WHP Program elements. The purpose of the document is to provide a mechanism by which State and local officials can use the experience of others as they begin to develop their WHP programs.

The document is divided into two sections. The first section contains a matrix of all 142 references and indicates which WHP Program elements are discussed in the individual references. The vertical axis of the matrix consists of an alphabetical listing, by author, of the 142 references. The page number which appears after each of these references identifies the location in this document of the complete citation and an abstract of the reference.

The horizontal portion of the matrix lists the six required WHP program elements:

- . Specify duties of State and local agencies and public water supply systems with respect to the development and implementation of programs required;
- . For each wellhead, determine the wellhead protection area as defined in subsection 1428(e) based on all reasonably available hydrogeologic information on ground-water flow, recharge and discharge and other information the State deems necessary to adequately determine the wellhead protection area;
- . Identify within each wellhead protection area all anthropogenic sources of contaminants which may have adverse effect on the health of persons;
- . Describe a program that contains, as appropriate, technical assistance, financial assistance, implementation of control measures, education, training and demonstration projects to protect the water supply within wellhead protection areas from such contaminants;
- . Include contingency plans for supplying water in case of contamination of wells or wellfields;

Include a provision for consideration of contamination within the expected wellhead area of new water wells serving public water supply systems.

The pertinent program elements are checked for each document cited in the matrix. Thus readers can scan the matrix to identify which program elements are discussed in each reference.

The second section of the document is an annotated bibliography of the 142 documents listed in the matrix. The documents have been grouped first by State and within each State section alphabetically by author. State groupings were used so that the reader could easily identify those documents that discuss programs in areas either hydrogeologically or institutionally similar to the one in which the reader is working. Additionally, an "other" section has been included which contains material written by the Federal government or other organizations not associated with a specific State. EPA requests that you contact your library or the organization for which a telephone number is listed should you wish to obtain a copy of any document listed in the bibliography.

The bibliography contains a selected group of documents that has been collected by EPA Headquarters and the Regional offices during the development of the Wellhead Protection Program. It was felt that these documents might be useful to States as they begin to develop WHP programs. It should be noted that the EPA library did a search of several data bases and that pertinent abstracts have been included.

As additional information on documents relevant to WHP becomes available, it will be provided to the States and others as either an update to this bibliography or as part of a topic-specific Technical Assistance Document. The States and others are encouraged to identify and/or submit documents that they feel would be useful to others as they develop WHP programs to:

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WELLHEAD PROTECTION PROGRAM MATRIX

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
American Water Works Association, 1984, <u>Emergency Planning for Water Utility Management</u> , Other, p. 69				X		
American Water Works Association, Committee on Material Spills Hazardous to a Water Supply, 1975, <u>Hazardous Materials Spills Emergency Handbook</u> , Other, p. 69				X		
Amsden, Timothy L., 1987, "Assembling Your State Groundwater Protection Strategy," <u>University of Kansas Law Review</u> , Other, p. 69				X		
Anderson-Nichols & Co., Inc., 1985, <u>Edgartown Water Resources Protection Program. Final Report: Phase 3</u> , MA, p. 37		X				
Association of Central Oklahoma Council of Governments, 1984, <u>Protocol for Establishment of a Ground Water Management and Protection Plan</u> , OK, p. 55	X			X		
Barnes, Robert P., and Mack G. Croft, 1986, <u>Ground Water Quality Protection Strategy for the State of Utah</u> , UT, p. 62	X					
Booth, Richard S., and Albert Bronson, 1983, <u>Major Institutional Arrangements Affecting Ground Water in New York State</u> , NY, p. 49	X					

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
Born, Stephen, et al., 1987, <u>A Guide to Groundwater Planning and Management for Local Governments</u> (Draft), WI, p. 67	X		X	X		
Bowes, Gerald W., et al., 1984, <u>Water Quality and Pesticides: A California Risk Assessment Program (Volume One)</u> , CA, p. 24			X	X		
Broward County Environmental Quality Control Board, 1984, <u>Regulation No. 84-3</u> , FL, p. 30				X		
Broward County Water Resources Planning and Programming Section, 1983, <u>The Potable Water Wellfield Protection Program for Broward County, Florida</u> , FL, p. 30	X			X		
Burchett, Charles R., et al., 1986, <u>The Edwards Aquifer. Extremely Productive. But...</u> , TX, p. 60				X		
Camp Dresser & McKee, Inc., 1982, <u>Wellfield Travel Time Model for Selected Dade, Broward, and Palm Beach Counties, Florida: Final Report</u> , 9243-110, FL, p. 30		X				
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WELLHEAD PROTECTION PROGRAM MATRIX (continued)

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Cape Cod Planning and Economic Development Commission, 1985, <u>Model Health Regulation to Prevent Leaking of Underground Fuel and Chemical Storage Systems</u> , MA, p. 37				X		
Central Connecticut Regional Planning Agency, 1981, <u>Guide to Groundwater and Aquifer Protection. Town of Burlington. Staff Paper 43</u> , CT, p. 26				X		
City of Austin, Texas, 1980-1982, <u>Watershed Ordinances</u> , TX, p. 60				X		
Clarke County Planning Commission, Water Study Committee, 1987, <u>Clarke County Ground Water Protection Plan</u> , VA, p. 65			X	X		
Connecticut Department of Environmental Protection, 1981, <u>A Handbook for Connecticut's Water Quality Standards and Criteria</u> , CT, p. 26				X		

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
<p>Connecticut Department of Environmental Protection, 1987, <u>Connecticut's Ground Water Protection Strategy</u>, CT, p. 26</p> <p>Connecticut Department of Environmental Protection, 1986, <u>Connecticut's Potable Water Law</u>, CT, p. 27</p> <p>Connecticut Department of Environmental Protection, 1987, <u>Protection of High and Moderate Yield Stratified Drift Aquifers</u>, CT, p. 27</p> <p>Connecticut Department of Health Services, 1986, <u>Summary of Recent Legislation Pertaining to Public Water Supplies</u>, CT, p. 27</p> <p>Connecticut Solid and Hazardous Waste Siting Committee, 1981, <u>Connecticut Solid and Hazardous Waste Land Disposal Siting Policy</u>, CT, p. 27</p> <p>Conservation Law Foundation of New England, Inc., 1984, <u>A Local Groundwater Protection Program. Primary Focus: Leaking Underground Storage Tanks</u>, Other, p. 70</p> <p>Cooperative Extensions of Suffolk County and Nassau County, 1985, <u>Land Use Management</u>, NY, p. 49</p>	X	X		<p align="center">X</p> <p align="center">X</p> <p align="center">X</p> <p align="center">X</p>	X	

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
Cornell University, Center for Environmental Research/Cooperative Extension, 1981, <u>Long Island's Groundwater and Your Lawn... How Are They Related?</u> , NY, p. 49				X		
Dade County, 1981, <u>Dade County Code, Section 24-12.1. Protection of potable water supply wells</u> , FL, p. 31				X		
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Dade County Water Resources Management Division, 1984, <u>Ordinance No. 84-60</u> (Potable Water Supply, Wellfield Protection Ordinance) and <u>Resolution 84-2025</u> (Regulations resulting from Ordinance 84-60), FL, p. 31				X		
Dade County Wellfield Policy Advisory Committee and Wellfield Technical Committee, 1985, <u>Northwest Wellfield Protection Plan</u> , FL, p. 31	X			X		
Dehan, Rodney S., 1984, <u>New Approach to Protection of Sensitive Aquifers in Florida</u> , FL, p. 32		X		X		
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DiNovo, Frank, and Martin Jaffe, 1984, <u>Local Groundwater Protection: Midwest Region</u> , Other, p. 70	X	X	X	X		
Dutram, Paul, 1986, <u>The Planning Process for Local Groundwater Protection</u> , ME, p. 36	X					
Edwards Underground Water District, 1987, <u>Suggested Design and Construction of Edwards Aquifer Wells</u> , TX, p. 60						X
Gallagher, Tara, and Susan Nickerson, 1986, <u>The Cape Cod Aquifer Management Project: A Multi-Agency Approach to Ground-Water Protection</u> , MA, p. 38	X			X		
Giese, R.G., 1982, "State Ground-Water Management Program," in <u>Ground Water Monitoring Review</u> , Other, p. 70				X		
Glatt, David L., 1985, <u>Ground-Water Investigation to Determine the Occurrence of Picloram in Selected Well Sites of Rolette County, North Dakota</u> , ND, p. 54			X			
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Heath, Douglas L., 1985, <u>Hydrogeologic Considerations of Zone of Contribution Methods Used by Cape Cod Planning and Economic Development Commission and SEA Consultants, Inc., for Public Supply Wells in Barnstable, Massachusetts</u> (Draft), MA, p. 38		X				
Hodges, Jr., Arthur L., 1967, <u>Ground-Water Favorability Map of the Otter Creek Basin, Vermont</u> , VT, p. 63		X				
Holman, David, 1986, <u>Groundwater (Drinking Water) Protection Alternatives for Pesticides and Fertilizers Based on Local Information and Comparable Potential Risk Index for Rock County, Wisconsin</u> , WI, p. 67			X			
Holman, David, 1986, <u>Groundwater Pollution Potential Risk Index System</u> , WI, p. 67			X			
Horsley, S.W., 1983, "Delineating Zones of Contribution for Public Supply Wells to Protect Groundwater," <u>Proceedings from the National Water Well Association Eastern Regional Conference on Ground Water Management</u> , MA, p. 38		X				

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Horsley, Scott W., and Thomas C. Cambareri, 1986, "Delineating Zones of Contribution for Public Supply Wells to Protect Ground Water In New England," <u>Journal of the New England Water Works Association</u> , Other, p. 39		X				
Hrezo, Margaret, and Pat Nickinson, 1986, <u>Protecting Virginia's Groundwater: A Handbook for Local Government Officials</u> , VA, p. 65	X			X		
Hrezo, Margaret, and Mattie Quesenberry, 1985, <u>Options for Managing Underground Storage of Petroleum Products in Virginia</u> , <u>Bulletin 150</u> , VA, p. 65			X			
Illinois Environmental Protection Agency, 1986, <u>A Plan for Protecting Illinois Groundwater</u> , IL, p. 34		X				
Jaffe, Martin, and Frank DiNovo, 1987, <u>Local Groundwater Protection</u> , Other, p. 71	X	X	X	X		

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Koppelman, Lee E., et al., 1984, <u>Nonpoint Source Management Handbook</u> , NY, p. 49				X		
Long Island Regional Planning Board, 1986, <u>Special Ground Water Protection Project for the Oyster Bay and Brookhaven Pilot Areas</u> , NY, p. 50				X		
Maine Association of Conservation Commissions, 1986, <u>Ground-water Quality: A Handbook for Community Action</u> , ME, p. 36			X			
Maine Department of Environmental Protection, 1986, <u>Threats to Groundwater in Maine</u> , ME, p. 36			X			
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Massachusetts Audubon Society, Community Groundwater Protection Project, 1986, <u>Landfills and Groundwater Protection. Groundwater Information Flyer #8</u> , MA, p. 40			X	X		

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Massachusetts Audubon Society, Community Groundwater Protection Project, 1985, <u>Local Authority for Groundwater Protection. Groundwater Information Flyer #4</u> , MA, p. 40	X			X		
Massachusetts Audubon Society, Community Groundwater Protection Project, 1984, <u>Mapping Aquifers and Recharge Areas. Groundwater Information Flyer #3</u> , MA, p. 40		X				
Massachusetts Audubon Society, Community Groundwater Protection Project, 1985, <u>Pesticides and Groundwater Protection. Groundwater Information Flyer #7</u> , MA, p. 41	X		X	X		
Massachusetts Audubon Society, Community Groundwater Protection Project, 1984, <u>Underground Storage Tanks and Groundwater Protection. Groundwater Information Flyer #5</u> , MA, p. 41			X	X		
Massachusetts Department of Environmental Quality Engineering, 1987, <u>Recommendations of the Cape Cod Aquifer Management Project Concerning Enhanced Groundwater Protection in Landfill Programs</u> , MA, p. 41				X		

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Massachusetts Department of Environmental Quality Engineering, 1983, <u>Groundwater Quality and Protection... A Guide for Local Officials</u> , MA, p. 42	X		X	X		
Meyer, Michael, 1986, <u>A Summary of Ground-Water Pollution Problems in South Dakota</u> , SD, p. 57			X			
Meyer, Michael, 1986, <u>Assessment of the Feasibility of Establishing an Aquifer Classification System for South Dakota</u> , SD, p. 57	X					
Michigan Department of Natural Resources, 1983, <u>Site Assessment System (SAS) for the Michigan Priority Ranking System Under the Michigan Environmental Response Act</u> (Act 307, P.A. 1982) (Review Draft), MI, p. 44			X			
Michigan Department of Natural Resources, 1980, <u>Critical Materials Register</u> , MI, p. 44			X			
Miller, D.W., 1981, "Guidelines for Developing a State-Wide Ground-Water Program," <u>Ground-Water Monitoring Review</u> , Other, p. 71				X		

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Montana Department of Agriculture, 1985, <u>A Survey of Ground-Water Contamination by Pesticides in Montana</u> , MT, p. 46			X			
Moore, V. Suzanne, and Larry A. Pinkston, 1986, <u>Utilization of Aquifer Data Collection, Storage and Manipulation Techniques by a Nonregulatory Ground Water Management Agency</u> , OK, p. 55			X			
Morrissey, Daniel J., 1987, <u>Estimation of the Recharge Area Contributing to a Pumped Well in a Glacial-Drift, River Valley Aquifer</u> , Other, p. 71		X				
Mullikin, Elizabeth B., 1984, <u>An Ounce of Prevention. A Ground Water Protection Handbook for Local Officials</u> , VT, p. 63				X		
Murphy, Jim, 1986, <u>Protecting Our Groundwater. What Every Community Can Do</u> , CT, p. 28	X			X		
Nebraska Association of Resources Districts, 1984, <u>Handbook on the Preparation of Groundwater Management Plans</u> , NB, p. 47				X		

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New York Department of Environmental Conservation, 1986, <u>Long Island Ground Water Management Program</u> , NY, p. 50	X			X		
New York Department of Environmental Conservation, 1985, <u>Draft Upstate New York Groundwater Management Program</u> , NY, p. 50	X			X	X	
New York Department of Environmental Conservation, 1978, <u>Ground Water Classifications Quality Standards and Effluent Standards and/or Limitations</u> , NY, p. 50				X		
New York State Legislative Commission on Water Resource Needs of Long Island, 1985, <u>Progress Report</u> , NY, p. 51	X			X	X	
Newton, David F., 1984, <u>Groundwater Management in the Northeast</u> , Other, p. 72	X			X		
Nickerson, Susan, 1986, <u>Local Participation in Regional Groundwater Management: A Cape Cod Example</u> , MA, p. 42	X			X		

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
North Carolina Department of Natural Resources and Community Development, 1985, <u>North Carolina Administrative Code, Title 15, Subchapter 2L, Classifications and Water Quality Standards of North Carolina</u> , NC, p. 53				X		
Northwest Kansas Groundwater Management District No. 4, 1982, <u>Groundwater Management District Act</u> , KS, p. 35				X		
Northwest Michigan Regional Planning and Development Commission, 1981, <u>Brine Contamination of Groundwater: An Investigation of Brine Mud-Pits and Road Brining</u> , MI, p. 44			X			
Pacenka, Steven, et al., 1984, <u>Protecting Ground-Water Supplies in River Valley Communities</u> , NY, p. 51				X		
Pinkston, L.A., and V.S. Moore, 1986, <u>Zone Specific Ground Water Sampling Prior to Well Completion</u> , OK, p. 55			X			
Raymond, Lyle, 1984, <u>Collecting Information</u> (Synopsis Series, File No. 85-1(c)), NY, p. 51		X	X			
Raymond, Lyle S., Jr. (ed.), 1981, <u>Groundwater Use Management in the Northeastern States: Legal and Institutional Issues</u> , Other, p. 72	X			X		

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
Reiter, Paul F., 1985, <u>Estimating Pumping Well Recharge Areas with Computer Models</u> , Other, p. 72		X				
Rodon, Rafael, 1980, <u>Dade County's Regulatory Approach to Wellfield Protection</u> , FL, p. 32		X				
Santa Clara County, California, 1983, Memorandum on adoption of the hazardous materials ordinance, CA, p. 24				X		
Schenectady County Planning Department, 1984, <u>Groundwater Supply Source Protection: A Guide for Localities in Upstate New York</u> , NY, p. 52	X			X		
Shade, Diane, 1986, <u>A Brief Assessment of Ground-Water Contaminants Associated with Health Effects in South Dakota</u> , SD, p. 57			X			
Shade, Diane, 1986, <u>Pesticides Used in South Dakota Ground-Water/Health Risks</u> , SD, p. 57			X			
Shade, Diane, 1985, <u>South Dakota Vulnerable Shallow Public Wells Study</u> , SD, p. 58		X				
Shade, Diane, 1986, <u>Summary of Ground-water Regulations for South Dakota: Federal, States and Local</u> , SD, p. 58	X					

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
Shifrin, Neil S., et al., 1981, <u>Ground Water Protection by Recharge Zone Management: Institutional Arrangements</u> , VA, p. 65	X			X		
Singh, Udai P., et al., 1985, <u>The Biscayne Aquifer Protection Plan</u> , FL, p. 32				X		
Skidmore, Owings and Merrill, 1979, <u>Community Planning for Water Resources Management: A Guide Book</u> , Other, p. 73				X		
South Dakota Department of Water and Natural Resources, 1985, <u>The Big Sioux Aquifer Water Quality Study</u> , SD, p. 58			X			
Southern Water Authority, 1985, <u>Aquifer Protection Policy</u> , 1985, Other, p. 73	X		X			
Spokane County Planning Commission, 1983, <u>Aquifer Sensitive Area Overlay Zone. Section 4.16A.000</u> , WA, p. 66				X		
Spokane County 208 Coordination Office, <u>Critical Materials Handbook</u> (Draft), WA, p. 66			X	X	X	
St. Ores, Jeffrey, et al., 1982, <u>Groundwater Prevention in Southeast Minnesota's Karst Region. Extension Bulletin 465-1982</u> , MN, p. 45				X		
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WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
State of California Water Resources Control Board, 1984, <u>Title 23. California Administrative Code. Rules and Regulations for Water</u> , CA, p. 24			X			
State of New Jersey, 1979, Articles 5 and 6 in the <u>Pinelands Protection Act</u> , NJ, p. 48				X		
Stroman, Michael J., 1986, <u>The Aquifer Land Acquisition Program: An Approach for Protecting Groundwater Resources in Massachusetts</u> , MA, p. 43				X		
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Texas Rural Water Quality Network Project, 1987, <u>Protecting Texas Groundwater: Opportunities for State and Local Action</u> , TX, p. 60	X		X	X		X

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
<p>Texas State Legislature, 1959, <u>Text of the Act Creating the Edwards Underground Water District</u>, TX, p. 61</p> <p>Texas Water Commission, 1985, <u>Chapter 313. Edwards Aquifer</u>, in the Commission regulations, TX, p. 61</p> <p>Tri-County Regional Planning Commission, 1979, <u>Tri-County Region 208 Water Quality Management Plan</u>, MI, p. 44</p> <p>Trippe, J.T.B., et al., 1979, "Preventing Groundwater Pollution: Towards a Coordinated Strategy to Protect Critical Recharge Zones," <u>Harvard Environmental Law Review</u>, Other, p. 73</p> <p>U.S. Water Resources Council, 1979, <u>Essentials of Ground-Water Hydrology Pertinent to Water Resources Planning</u>, Other, p. 73</p> <p>U.S. Water Resources Council, 1981, <u>State of the States: Water Resources Planning and Management. Groundwater Supplement</u>, Other, p. 74</p> <p>University of Wisconsin, Environmental Resources Center, 1984, <u>Groundwater Protection Through Local and Land Use Controls</u>, Other, p. 74</p>	<p align="center">X</p>	<p align="center">X</p> <p align="center">X</p>		<p align="center">X</p> <p align="center">X</p> <p align="center">X</p> <p align="center">X</p>		

WELLHEAD PROTECTION PROGRAM MATRIX (continued)

AUTHOR	Agency Duties	WHPA Determination	Source Identification	Management	Contingency Plans	New Wells
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Van Waegeningh, H.G., 1985, "Overview of the Protection of Groundwater Quality," <u>Theoretical Background. Hydrology and Practice of Groundwater Protection Zones.</u> Other, p. 74		X				
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Vermont Department of Water Resources and Environmental Engineering, 1985, <u>Vermont Ground Water Law, Chapter 48.</u> VT, p. 63				X		
Vermont Department of Water Resources, 1983, <u>Vermont Aquifer Protection Area Reference Document.</u> VT, p. 63		X				
Washington Department of Ecology, 1986, <u>Guidelines for Designating Groundwater Management Areas and Programs.</u> WA, p. 66	X					
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WELLHEAD PROTECTION PROGRAM MATRIX (continued)

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The report summarizes the major accomplishments over the past four years for the identification, control, and prevention of water contamination by agricultural chemicals. The primary focus of this report and nine companion volumes is on those pesticides with the greatest potential for adverse impacts on the quality of both surface and ground water. The in-depth pesticide risk assessment program, pesticide registration evaluations, and pesticide-related special studies are discussed. Cooperative efforts between the SWRCB and the California Department of Food and Agriculture are highlighted.

SANTA CLARA COUNTY, CALIFORNIA, 1983, Memorandum on adoption of the hazardous materials ordinance, San Jose, Calif., November 15, 1983, 5 pp. plus attachments. Tel.: (408) 299-2424.

The memorandum includes text of the Santa Clara Hazardous Materials ordinance, which California has used as a statewide model ordinance. It discusses a strategy for the implementation of the ordinance, including the creation of a hazardous materials unit and budget and staff requirements.

STATE OF CALIFORNIA LEGISLATURE, 1983, Assembly Bill No. 1803, Sacramento, Calif., 5 pp. Tel.: (916) 445-2323.

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STATE OF CALIFORNIA WATER RESOURCES CONTROL BOARD, 1984,
Title 23, California Administrative Code, Rules and
Regulations for Water, Subchapter 15, Discharges of Waste
to Land, Sacramento, Calif. Tel.: (916) 322-8353.

The regulations discuss the water quality impacts of waste discharge to land. They establish waste and site classifications and waste management requirements for waste treatment, storage or disposal in landfills, surface impoundments, waste piles, and land treatment facilities. Ground-water monitoring is discussed.

CONNECTICUT

CENTRAL CONNECTICUT REGIONAL PLANNING AGENCY, 1981, Guide to Groundwater and Aquifer Protection, Town of Burlington, Staff Paper 43, Burlington, Conn., 34 pp. Tel.: (203) 589-7820.

The guide was written as a general primer for local officials on how different sources can contaminate water supplies. It contains specific recommendations on how the town can protect its aquifer. Appendix B contains an Aquifer Protection Model Ordinance, and Appendix C contains model aquifer protection regulations on underground fuel storage.

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION, 1981, A Handbook for Connecticut's Water Quality Standards and Criteria, Water Compliance Unit, Connecticut DEP, Hartford, Conn. Tel.: (203) 566-2588.

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CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION, 1987, Connecticut's Ground Water Protection Strategy, Water Compliance Unit, Natural Resources Center, Connecticut DEP, Hartford, Conn., 14 pp. Tel.: (203) 566-2588.

The strategy discusses the roles of both State and local governments in the State's comprehensive ground-water quality management program. Statewide programs include drinking water standards, water quality standards and classifications, source controls, enforcement, statewide bans, best management practices, victim compensation, planning, water use and allocation, monitoring, research, data management, local assistance, and education. Regional and local programs include land use controls, aquifer identification, performance standards, well protection, household hazardous waste, and local monitoring, inspections, and enforcement.

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The Potable Water Law establishes a procedure by which a party responsible for contaminating a ground-water supply may have to provide potable drinking water to the affected population. If a responsible party cannot be located, the municipality in which the contamination occurs may have to supply the water. The law also includes a provision for the State to provide grants to municipalities not responsible for contamination, if the communities are ordered to provide potable drinking water. The document includes a flow chart of actions to be taken by the State staff when they find a contaminated well.

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Protection of High and Moderate Yield Stratified Drift Aquifers, Hartford, Conn., 29 pp. Tel.: (203) 566-2588.

This report identifies Connecticut's high and moderate yield aquifers and examines methods of increasing protection of these aquifers. Chapter III, "Implementing a Protection Strategy," describes various techniques for protecting critical aquifers. Techniques discussed include land acquisition, BMPs, and zoning.

CONNECTICUT DEPARTMENT OF HEALTH SERVICES, 1986, Summary of Recent Legislation Pertaining to Public Water Supplies, Hartford, Conn., 10 pp. Tel.: (203) 566-1253.

A collection of brief summaries of several important pieces of legislation pertaining to public water supplies passed in 1984, 1985, and 1986 by the Connecticut legislature. Several laws pertain to improved ground-water protection through planning as well as through emergency assistance.

CONNECTICUT SOLID AND HAZARDOUS WASTE SITING COMMITTEE, 1981, Connecticut Solid and Hazardous Waste Land Disposal Siting Policy, State of Connecticut, Hartford, Conn., 24 pp. Tel.: (203) 566-2588.

The policy builds on the "Connecticut Water Quality Standards and Criteria" (Classification) System, Federal and State solid and hazardous waste regulations and criteria, and Federal and State wetland and flood planning regulatory programs. Includes explanatory text.

HARRISON, ELLEN T., and MARY ANN DICKENSON, 1984, Protecting Connecticut's Groundwater: A Guide to Groundwater Protection for Local Officials, Connecticut Department of Environmental Protection, Hartford, Conn., 40 pp. plus appendices. Tel.: (203) 566-2588.

A planning document explaining ground water: what it is, how it becomes polluted, where it needs to be protected, and what is being done to protect it. The document concentrates on what local communities can do to identify and protect ground water.

Topics covered include Connecticut's inspection and enforcement programs, how to identify program inadequacies, how to choose a mix of protection mechanisms, technical assistance available in Connecticut, use of educational methods for alerting the public, and land use options.

MURPHY, JIM, 1986, Protecting Our Groundwater, What Every Community Can Do, a series of articles in a Connecticut Department of Environmental Protection publication, Citizens' Bulletin, Hartford, Conn. Tel.: (203) 566-2588.

A series of articles explaining local government roles and activities. The articles summarize the planning process suggested for local governments who are assessing ground-water protection needs.

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DELAWARE

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL, 1987, State of Delaware Regulations Governing the Construction of Water Wells, Division of Water Resources, Groundwater Management Section, Water Supply Branch, Delaware DNREC, Dover, Del., 27 pp. Tel.: (302) 736-4793.

The report contains the Delaware regulations on new wells. Topics covered include location, design, installation, use, disinfection, modification, repair, and abandonment of all wells and associated pumping equipment. Section 4.01 outlines the siting criteria for new wells and describes minimum horizontal separation distances from a variety of sources, including septic tanks and seepage pits.

WATER RESOURCES AGENCY FOR NEW CASTLE COUNTY, 1987, New Castle County Resource Protection Area Program Revision, Water Resources Agency for New Castle County, Newark, Del., 51 pp. Tel.: (302) 731-7670.

The report presents results of a detailed investigation into land management approaches to local water ground-water protection. It proposes improved land management measures to protect water resources through expanded use of New Castle's Resource Protection Area program; presents rationale and criteria used to define resource areas to be protected; and presents proposed land use restrictions for each area.

FLORIDA

BROWARD COUNTY ENVIRONMENTAL QUALITY CONTROL BOARD, 1984, Regulation No. 84-3, Ft. Lauderdale, Fla., 20 pp. Tel.: (305) 765-5881.

Adds a new section on above ground or underground storage tanks to the Broward County Environmental Quality Control Board's Code of Regulations. The regulation discusses licenses required, approvals to construct and operate tanks, required containment barriers, monitoring wells, leak detection fees, and exemptions.

BROWARD COUNTY WATER RESOURCES PLANNING AND PROGRAMMING SECTION, 1983, The Potable Water Wellfield Protection Program for Broward County, Florida, Broward County Public Works, Ft. Lauderdale, Fla., 135 pp. Tel.: (305) 357-6318.

A discussion of the development of Broward County's program to protect public drinking water supply wellfields. It explains the need to protect drinking water supplies and presents an implementation strategy to provide this protection. Topics covered in the report include identification of existing potential sources of ground-water contamination, gaps in the existing regulatory process, methodology used to determine wellfield protection areas, and computer simulation used to determine aquifer conditions and contamination.

The report summarizes three components that at a minimum should be in a program. These elements are: all existing regulations and regulatory functions with additional legislation to fill gaps, clear delineation of the responsibilities of the various agencies and any necessary coordinating mechanisms, and the recognition of all potential sources of contamination along with necessary control mechanisms. The report presents alternative wellfield protection programs based on the consideration of the above components.

CAMP DRESSER & MCKEE, INC., 1982, Wellfield Travel Time Model for Selected Dade, Broward, and Palm Beach Counties, Florida: Final Report, 9243-110, Ft. Lauderdale, Fla., 165 pp. Tel.: (305) 776-1731.

The report describes the methodology, assumptions, and procedures used to develop a numerical flow/transport model based on ground-water pollutant travel time. The computer program written to implement the model is described along with a listing of the computer input data.

DADE COUNTY, 1981, last amended in 1986, Dade County Code, Section 24-12.1, Protection of potable water supply wells, Miami, Fla. Tel.: (305) 375-5137.

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An in-depth discussion of land use planning and zoning techniques used in Dade County for aquifer protection. The report describes different instruments for land use planning and zoning and how they can be used together to accomplish aquifer protection goals.

DADE COUNTY WATER RESOURCES MANAGEMENT DIVISION, 1984, Ordinance No. 84-60 (Potable Water Supply, Wellfield Protection Ordinance) and Resolution 84-2025 (Regulations resulting from Ordinance 84-60), Dade County, Miami, Fla. (Amendment included). Tel.: (305) 375-5137.

Text of the Dade County Wellfield Protection Ordinance and Regulation Ordinance; includes sections on "Prohibitions, Restrictions and Permitting within Zones of Influence" and authority for issuing the Dade County list of hazardous and toxic substances.

DADE COUNTY WELLFIELD POLICY ADVISORY COMMITTEE and WELLFIELD TECHNICAL COMMITTEE, 1985, Northwest Wellfield Protection Plan, Dade County Planning Department and Dade County Department of Environmental Resources Management, Miami, Fla., 103 pp. Tel.: (305) 375-3376, 375-3318.

A descriptive report on land use policies and environmental regulations governing wellfield protection areas. Contains committee recommendations on land use policy and environmental regulation and enforcement.

Also contains the recommendations of the Wellfield Policy Advisory Committee on public awareness and involvement. Includes discussion of personnel commitment for developing public school curriculum and public presentation materials.

DEHAN, RODNEY, 1984, New Approach to Protection of Sensitive Aquifers in Florida, Florida Department of Environmental Regulation, Tallahassee, Fla. Tel.: (904) 488-3601.

The document describes Florida's system of aquifer classification. There are four classes, varying by such factors as confinement, population served, and quality. A description of the application of a calculated fixed radius method for delineating zones of protection is given.

DEHAN, RODNEY, 1984, Trends in Ground-Water Protection in Florida, Florida Department of Environmental Regulation, Tallahassee, Fla., 26 pp. Tel.: (904) 488-3601.

A description of Florida Department of Environmental Regulation activities for assuring high quality ground water. Covers the Florida ground-water classification system, injection well controls, monitoring network set-up, goals for monitoring, and phases necessary to accomplish established objectives.

RODON, RAFAEL, 1980, Dade County's Regulatory Approach to Wellfield Protection, Dade County Department of Environmental Resources Management, Miami, Fla., 40 pp. Tel.: (305) 375-3307.

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The Biscayne Aquifer is the sole source of drinking water for about three million people in southeast Florida. Many municipal wellfields have been contaminated with priority pollutants. A preventive action plan for protecting the aquifer from hazardous waste contamination was developed and recommended for the tri-county Biscayne Aquifer area. The 20 elements of the plan fit into these four categories: regulation, waste management, construction/treatment, and information needs. The development of public awareness and education programs on hazardous waste issues is advocated, as is the determination of a maximum contamination level of pollutants in local soils.

YODER, DOUGLAS, 1986, Protection of Wellfields and Recharge Areas in Dade County, Florida, Dade County Department of Environmental Resources Management, Miami, Fla., 24 pp. Tel.: (305) 375-3318.

A description of two local efforts relating to recharge area and wellfield protection. Provides a history of the planning process involved in developing the East Everglades Management Plan and the Dade County Wellfield Protection Program. Discusses variability in political will, legal authorities, financial capacity, technical resources, and administrative resources. Presents conclusions about local well protection programs.

ILLINOIS

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, 1986, A Plan for Protecting Illinois Groundwater, Springfield, Ill., 65 pp. Tel.: (217) 782-2829.

A discussion of ground-water quality problems in Illinois and the existing laws, strategies, and ground-water programs for dealing with those problems. The establishment of well site protection areas includes the use of arbitrary and calculated fixed radius methods of delineation.

KANSAS

NORTHWEST KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 4,
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16 pp. Tel.: (913) 462-3915.

The Act establishes ground-water management districts. Topics discussed include procedure to set up districts, district powers, procedures for designating intensive ground-water use control areas, and financing mechanisms.

MAINE

DUTRAM, PAUL, 1986, The Planning Process for Local Groundwater Protection, Maine State Planning Office No. 38, Augusta, Maine, 32 pp. Tel.: (207) 289-3261.

A review of the planning steps necessary at the local level for ensuring high quality ground water. Steps discussed include "form a ground-water committee," "inform the public," "gather existing data," etc.

MAINE ASSOCIATION OF CONSERVATION COMMISSIONS, 1986, Ground Water Quality: A Handbook For Community Action, Maine Association of Conservation Commissions, Hallowell, Maine, 52 pp. Tel.: (207) 623-4850.

The handbook describes an inventory process to identify former activities and land uses within a community that may threaten the quality of water supplies. Topics covered include organizing and conducting the inventory, using survey results, and acquiring land use and title information that might be useful in the inventory process.

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, 1986, Threats to Groundwater in Maine, Augusta, Maine (poster matrix). Tel.: (800) 452-1942.

This wallchart identifies eleven threats to ground-water resources in Maine (e.g., sand/salt piles, septic systems, etc.). Thirteen categories of specific information such as health effects, on-going research is presented for each threat.

MAINE GROUNDWATER CLASSIFICATION SUBCOMMITTEE, 1986, Groundwater Classification System, Ground Water Standing Committee of the Maine Land and Water Resources Council, Augusta, Maine, 16 pp. Tel.: (207) 289-3261.

A description of the draft Maine ground-water classification system, which consists of one class, and the process used to develop it. Sets a nondegradation goal, and prohibits discharges of pollutants to ground water. The paper discusses numerous ground-water protection goals and policies of the State.

MASSACHUSETTS

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The report describes the water quality sampling and modeling of nitrate concentrations in the ground-water underlying the Katama Peninsula. Aquifer characteristics are discussed with regard to data input to the analytical flow model used in the analysis of ground-water flow patterns. This model is a possible method for determining wellhead protection areas.

CAPE COD AQUIFER MANAGEMENT PROJECT, 1987, Water Supply Planning Recommendations, Massachusetts Department of Environmental Quality Engineering, Boston, Mass., 6 pp. Tel.: (617) 292-5657.

The recommendations of the Cape Cod Aquifer Management Protection Project Institutions Committee for water supply planning on Cape Cod. The report comments on existing provisions for contingency planning and siting of new wells.

CAPE COD AQUIFER MANAGEMENT PROJECT, AQUIFER ASSESSMENT COMMITTEE, 1986, Evaluation of Approaches to Determine Recharge Areas for Public Supply Wells (Draft), Massachusetts Department of Environmental Quality Engineering, Boston, Mass., 4 pp. Tel.: (617) 292-5657.

An evaluation of the Cape Cod Aquifer Management Protection Project method of delineating zones of contribution around public supply wells. The report outlines considerations surrounding the methodology used and reviews alternative approaches for delineating zones of contribution.

CAPE COD PLANNING AND ECONOMIC DEVELOPMENT COMMISSION, 1985, Model Health Regulation to Prevent Leaking of Underground Fuel and Chemical Storage Systems, Barnstable, Mass., 4 pp. Tel.: (617) 362-2511.

A sample model ordinance for regulating underground storage tanks. Topics covered include tank registration, inventory control, reporting, tank selection and installation, and product storage.

GALLAGHER, TARA, and SUSAN NICKERSON, 1986, The Cape Cod Aquifer Management Project: A Multi-Agency Approach to Ground Water Protection, Paper presented at the National Water Well Association Third Annual Eastern Regional Ground Water Conference, Springfield, Mass.
Tel.: (617) 292-5657 (Mass. Department of Environmental Quality Engineering).

The paper summarizes the background leading to the development of the Cape Cod Aquifer Management Project (CCAMP), which is a Massachusetts ground-water protection demonstration project. Responsibilities of the different levels of government are discussed, and CCAMP's water management work groups are described.

HEATH, DOUGLAS L., 1985, Hydrogeologic Considerations of Zone of Contribution Methods Used By Cape Cod Planning and Economic Development Commission and SEA Consultants, Inc., for Public Supply Wells in Barnstable, Massachusetts (Draft), Massachusetts Department of Environmental Quality Engineering, Boston, Mass., 11 pp. Tel.: (617) 292-5657.

A description of factors necessary for determining zones of contribution (well discharge, recharge, hydraulic gradient, and other hydraulic properties), outlines sources of information on these factors, and recommends essential steps for defining the zone of contribution for public water supplies in Cape Cod.

HORSLEY, SCOTT W., 1983, "Delineating Zones of Contribution for Public Supply Wells to Protect Groundwater" in Proceedings from the National Water Well Association Eastern Regional Conference on Ground Water Management, October 30 - November 2, 1983. Tel.: (614) 761-1711.

A basic introduction to methods for delineating zones of contribution for wells drawing ground water from glacial deposit aquifers on Cape Cod. Discusses shape and size of zones of contribution, rate of pumping, and changes in ground-water flow due to pumping. Protection measures discussed include travel time boundaries, zoning modifications in the area of contribution, land use restrictions, and land acquisition.

HORSLEY, SCOTT W., and CAMBARERI, THOMAS C., 1986, "Delineating Zones of Contribution for Public Supply Wells to Protect Ground Water In New England," in the Journal of the New England Water Works Association, vol. 100, No. 1, 24 pp. Tel.: (617) 329-9650.

A description of the procedures used to delineate zones of contribution to public water supply wells in two major geologic settings in New England. Discusses an analytical flow model with regard to delineation.

HORSLEY, SCOTT W., and J.D. WITTEN, 1985, "The Town of Duxbury, Massachusetts, Aquifer Protection Plan: A Case Study in Innovative Water Quality Protection Strategies," in Proceedings from the National Water Well Association Third Annual Eastern Regional Ground Water Conference. Tel.: (614) 761-1711.

An overview of the Duxbury, Massachusetts, ground-water protection policy. The article outlines the steps that the town took to develop its ground-water protection policy. Topics covered include hydrologic and geologic mapping of the aquifer, ground-water flow modeling, the delineation of zones of contribution to municipal wells, and the development of rules and regulations to protect the town's aquifer from future pollution and degradation. The main thrust of the policy is the control of residential and industrial development through a variety of regulations overseen by the Board of Health, the Board of Planning, and the Water Advisory Board.

KILNER, S.M., W.J. RIZZO, and J.F. SHAWCROSS, 1984, "Aquifer Protection Planning: Groundwater Protection in Two Massachusetts Communities," in the Journal of the New England Water Works Association, vol. 98, No. 4, 21 pp. Tel.: (617) 329-9650.

A description of the Aquifer Protection Plans of two Massachusetts communities, Burlington and Littleton. Compares the reasons and approaches taken to develop each plan. The stimulus in Burlington was predominately remedial; and in Littleton it was primarily preventive. The paper discusses the planning process used in addressing aquifer protection problems, sampling programs to identify the contamination sources in Burlington, regulations, implementation and enforcement of new regulations, siting of new wells, and the protection plan. The authors conclude that traditional approaches to well siting and ground-water protection are inadequate and that regional treatment and protection of ground-water quality is necessary.

MASSACHUSETTS AUDUBON SOCIETY, Community Groundwater Protection Project, 1984, Groundwater and Contamination: From the Watershed into the Well, Groundwater Information Flyer #2, Lincoln, Mass., 10 pp. Tel.: (617) 259-9500.

A primer for local officials and citizens who might develop ground-water protection programs. Pamphlet discusses how ground water moves through a watershed, cones of depression, areas of influence, areas significant to ground-water supplies that must be identified and protected to prevent contamination, and common ground-water contaminants and their sources.

MASSACHUSETTS AUDUBON SOCIETY, Community Groundwater Protection Project, 1986, Landfills and Groundwater Protection, Groundwater Information Flyer #8, Lincoln, Mass., 19 pp. Tel.: (617) 259-9500.

A flyer which examines sources of contamination from landfills. Major sections address how leachate is produced, and how to evaluate potential leachate problems. Includes suggestions on the type of information to collect when assessing the potential for contamination from landfills.

MASSACHUSETTS AUDUBON SOCIETY, Community Groundwater Protection Project, 1985, Local Authority for Groundwater Protection, Groundwater Information Flyer #4, Lincoln, Mass., 18 pp. Tel.: (617) 259-9500.

A flyer to provide information to help citizens and local officials protect ground-water resources. It explains powers for land use regulation held by local governments in Massachusetts.

MASSACHUSETTS AUDUBON SOCIETY, Community Groundwater Protection Project, 1984, Mapping Aquifers and Recharge Areas, Groundwater Information Flyer #3, Lincoln, Mass., 12 pp. Tel.: (617) 259-9500.

A discussion of several elements involved in mapping aquifers and recharge areas. Several delineation methods are identified that correspond to arbitrary fixed radius, hydrogeologic mapping, and numerical flow/transport models.

MASSACHUSETTS AUDUBON SOCIETY, Community Groundwater Protection Project, 1985, Pesticides and Groundwater Protection, Groundwater Information Flyer #7, Lincoln, Mass., 21 pp. Tel.: (617) 259-9500.

A flyer which suggests action that local officials and citizens can take to prevent ground-water contamination from pesticides. Nonregulatory measures such as land acquisition and acquisition of development rights are reviewed.

Contains sections on (1) "Local Authority to Control Pesticide Use," which reviews major legal cases and Massachusetts statutes with an impact on ground-water protection; and (2) "Which Pesticides Will Leach Into Ground-Water?"

MASSACHUSETTS AUDUBON SOCIETY, Community Groundwater Protection Project, 1984, Underground Storage Tanks and Groundwater Protection, Groundwater Information Flyer #5, Lincoln, Mass., 15 pp. Tel.: (617) 259-9500.

A flyer intended to help local officials and citizens understand the problems associated with underground storage tanks, and to provide information and suggestions for developing leak-prevention programs. Contains a section on "How to Detect Leaks," which discusses Massachusetts inventory requirements.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING, 1987, Recommendations of the Cape Cod Aquifer Management Project Concerning Enhanced Groundwater Protection in Landfill Programs, Boston, Mass., 8 pp. Tel.: (617) 292-5657.

A set of recommendations based on an assessment of ground-water protection from landfill contamination on Cape Cod. Current regulations and guidelines are reviewed. Suggests ways in which public water supplies could be protected through siting, construction, and monitoring procedures. The report makes 37 recommendations concerning topics such as site evaluation and assessment, expansion requests, monitoring, inspection and enforcement, leachate control, landfill capping, intra-agency coordination, and governmental roles.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY
ENGINEERING, 1983, Groundwater Protection Strategy,
Boston, Mass., 22 pp. Tel.: (617) 292-5657.

This strategy is the Massachusetts general plan for dealing with ground-water resources within the State. The information in the strategy is most appropriate for the hydrogeologic mapping method of wellhead delineation.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL QUALITY
ENGINEERING, 1983, Groundwater Quality and Protection...A Guide for Local Officials, Division of Water Supply, Massachusetts DEQE, Boston, Mass., 100 pp. Tel.: (617) 292-5527.*

The handbook discusses principles of ground-water hydrology, common contaminants and their sources, and local regulatory and management options. A discussion of ground-water law and a list of Federal and State agencies providing ground-water assistance is also included.

NICKERSON, SUSAN L., 1986, Local Participation in Regional Groundwater Management: A Cape Cod Example, Cape Cod Planning and Economic Development Commission, Barnstable, Mass., 21 pp. Tel.: (617) 362-2511.

A description of the Cape Cod Aquifer Management Program. Implementation of the program is described, and the strategy for achieving voluntary cooperation with the regional management program is outlined. The article describes the Cape Cod Planning and Economic Development Commission model ground-water protection ordinance for controlling toxic and hazardous materials, and the text of the model ordinance is included as an appendix.

* Citations marked with an asterisk are based on Susan Turnquist's bibliography, Community Guide to Groundwater Protection and Management: An Annotated Bibliography, Northeast Regional Center for Regional Development, State College, Penn., 1985.

STROMAN, MICHAEL J., 1986, The Aquifer Land Acquisition Program: An Approach for Protecting Groundwater Resources in Massachusetts, in Proceedings from the National Water Well Association Third Annual Eastern Regional Groundwater Conference, 9 pp. Tel.: (617) 292-5526 (Mass. Department of Environmental Quality Engineering).

A description of the Massachusetts program for reimbursing communities that acquire development rights to land above and around drinking water supplies. Applicants must supply information on the local aquifer/water supply, land use, resource protection and land acquisition. Applications are ranked according to two specific criteria: value and use of the resource and degree of resource protection.

MICHIGAN

MICHIGAN DEPARTMENT OF NATURAL RESOURCES, 1983 (updated annually), Site Assessment System (SAS) for the Michigan Priority Ranking System Under the Michigan Environmental Response Act (Act 307, P.A. 1982) (Review Draft), Lansing, Mich. Tel.: (517) 373-4800.

A presentation of Michigan's system for prioritizing actions at hazardous waste sites. Sites are ranked in terms of the relative risk a site poses to human and nonhuman populations, ecological systems, and important resources. Under this system, risk is a function of exposure and hazard.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES, 1980 (updated annually), Critical Materials Register, Environment Services Division, Michigan DNR, Lansing, Mich. Tel.: (517) 373-2190.

A register of critical materials that are or may be used or discharged in Michigan. The register is updated annually with the help of an advisory committee composed of government, special interest, and industry representatives. Chemicals reviewed for inclusion on the list include chemicals with well-recognized high toxicity (e.g., PCBs, mercury, cyanide, etc.), those from lists of priority chemicals developed by the National Institute of Occupational Safety and Health, EPA, etc., and chemicals of specific concern in Michigan. Document explains review methodology, hazard assessment process, and assessment criteria and rationale.

NORTHWEST MICHIGAN REGIONAL PLANNING AND DEVELOPMENT COMMISSION, 1981, Brine Contamination of Groundwater: An Investigation of Brine Mud-Pits and Road Brining, Traverse City, Mich., 40 pp. Tel.: (616) 946-5922.

A description of local agency use of the Electrical Earth Resistivity method to link chlorides in ground water to brine generated in oil drilling and production phases.

TRI-COUNTY REGIONAL PLANNING COMMISSION, 1979, Tri-County Region 208 Water Quality Management Plan, Lansing, Mich., 75 pp. Tel.: (517) 393-0342.

A summary of the region's ground-water quality problems. It reviews current management programs, and makes recommendations to improve these programs. Recharge area identification is discussed and hydrogeologic mapping is identified as a method to delineate these areas.

MINNESOTA

MINNESOTA WATER PLANNING BOARD, 1981, Toward Efficient Allocation and Management: Special Study on Local Water Management, St. Paul, Minn., 98 pp. Tel.: (612) 296-1424.

A study of local roles and authorities in water management; recommends a course of action for improving and clarifying relationships and authorities in local water management in Minnesota.

ST. ORES, JEFFREY, CALVIN E. ALEXANDER, JR., and CLIFTON F. HALSEY, 1982, Groundwater Prevention in Southeast Minnesota's Karst Region, Extension Bulletin 465-1982 (Ref. No. CDBU 0547), Agricultural Extension Service, University of Minnesota, St. Paul, Minn., 19 pp. Tel.: (612) 625-8173.

A discussion of the hydrogeology of Karst areas, sources which might cause contamination in Karst areas, and procedures which can reduce ground-water pollution potentials.

MONTANA

GOVERNOR'S GROUND-WATER ADVISORY COUNCIL, 1985, Issues In Ground-Water Management - An Evaluation of Montana's Ground-Water Policies and Programs, Montana Department of Natural Resources and Conservation, Helena, Montana.
Tel.: (406) 444-3742.

A review of Montana's ground-water management framework, including a description of the agencies responsible for ground-water management and recommendations that promote the wise development and protection of the State's ground-water resources.

MONTANA DEPARTMENT OF AGRICULTURE, 1985, A Survey of Ground-Water Contamination by Pesticides in Montana, Environmental Management Division, Montana DoA, Helena, Montana, 7 pp. Tel.: (406) 444-2944.

Study objectives were to (1) characterize three distinct agricultural production areas in Montana where pesticides might be found in the ground water, and (2) to sample wells in these areas to learn what, if any, pesticides had contaminated the ground water. Field investigators selected sampling sites with permeable soils, high water tables, irrigation, and a history of pesticide use. Sampling results are provided as well as an analysis and interpretation of the data collected.

NEBRASKA

NEBRASKA ASSOCIATION OF RESOURCES DISTRICTS, 1984, Handbook on the Preparation of Ground Water Management Plans, prepared by the Institute of Agriculture and Natural Resources for the Nebraska Association of Resources Districts, Lincoln, Neb., 45+ pp. Tel.: (402) 474-3383.

A reference manual for Nebraska's natural resources districts on preparation of ground-water management plans. Items discussed include technical requirements, policy requirements (including objectives), and preparation and review requirements.

NEBRASKA DEPARTMENT OF ENVIRONMENTAL CONTROL and NEBRASKA ENVIRONMENTAL CONTROL COUNCIL, 1987, Alternative Funding Mechanisms for the Nebraska Department of Environmental Control's Water Quality Related Programs and Activities, Nebraska State Legislature, Lincoln, Neb., 49 pp. Tel.: (402) 471-4700.

A study of funding mechanisms for ground-water quality protection programs; presents alternatives for funding Nebraska's ground-water programs.

NEW JERSEY

STATE OF NEW JERSEY, 1979, Articles 5 and 6 in the Pinelands Protection Act, Trenton, New Jersey, 14 pp. and 30 pp. Tel.: (609) 894-9342.

Article 5 contains the minimum standards for the development and use of land that the Pinelands Commission has deemed necessary to maintain the essential character of the Pinelands environment. Article 6 establishes management programs and minimum standards governing development and land use in the Pinelands. It is intended that the programs will be implemented through the administration of municipal and county master plans and land use ordinances.

NEW YORK

BOOTH, RICHARD S., and ALBERT BRONSON, 1983, Major Institutional Arrangements Affecting Ground Water in New York State, Center for Environmental Research, Cornell University, Ithaca, New York, 200 pp. Tel.: (703) 487-4650, (National Technical Information Service, Springfield, Va.).*

A description and assessment the State, county, and local government powers and activities whose exercise affects ground-water use and/or quality, and the overlaps, gaps, and conflicts in those powers.

COOPERATIVE EXTENSIONS OF SUFFOLK COUNTY AND NASSAU COUNTY, 1985, Land Use Management, part of the series entitled, Understanding Our Groundwater, Riverhead, New York. Tel.: (516) 727-7850.

A series of bulletins on land use management. Topics covered include land control techniques, zoning and zoning boards, planning boards, hydrogeologic zones, and the counties' special management area, "Pine Barrens."

CORNELL UNIVERSITY, CENTER FOR ENVIRONMENTAL RESEARCH/COOPERATIVE EXTENSION, 1981, Long Island's Groundwater and Your Lawn...How Are They Related?, Aquaterra, Water Resources Public Service Program, Center for Environmental Research/Cooperative Extension, Cornell University, Ithaca, New York, 2 pp. Tel.: (607) 255-7535.*

An example of a public information/education pamphlet. Discusses the contamination of ground water on Long Island by nitrates, particularly as a result of turfgrass fertilization.

KOPPELMAN, LEE E., EDITH TANENBAUM, and CAROLE SWICK, 1984, Nonpoint Source Management Handbook, Long Island Regional Planning Board, Hauppauge, New York, 437+ pp. Tel.: (516) 360-5189.

The handbook discusses the cumulative impacts of nonpoint source pollutants; recommends various nonpoint source controls for each pollutant source; offers guidelines for siting layout and density of development for single properties and subdivisions; shows how plan implementation strategies can be developed; facilitates preparation of Environmental Assessments and Impact Statements; furnishes technical justification for the adoption of needed nonpoint source controls; and provides model ordinances.

LONG ISLAND REGIONAL PLANNING BOARD, 1986, Special Ground Water Protection Project for the Oyster Bay and Brookhaven Pilot Areas, Hauppauge, New York, 140 pp. Tel.: (516) 360-5189.

The document presents specific ground-water management programs for two pilot areas in Long Island. It discusses the use of local land use controls, including site plan review, the transfer of development rights, and other measures directed primarily at the reduction or exclusion of point and nonpoint sources of contamination.

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION, 1986, Long Island Ground Water Management Program, Division of Water, New York DEC, Albany, New York, 239+ pp. (Executive Summary available.) Tel.: (518) 473-4641.

An assessment of management needs and identifies the full range of governmental activities available for managing ground-water resources. Ground-water problems on Long Island are described, and geographic targeting of protection efforts is discussed.

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION, 1985, Draft Upstate New York Groundwater Management Program, Division of Water, New York DEC, Albany, New York, 200+ pp. (Summary Document also available, 37 pp.) Tel.: (518) 473-4641.

A review of facts about ground water, problems with upstate New York ground waters, and government programs which affect ground water. The report recommends a program of management actions that Federal, State, regional, and local governments should take.

Chapter III describes existing program roles and responsibilities for Federal, State, and local agencies. Chapter IV, Section C is an extensive review of pollution source control programs in New York. Chapter IV, Section E, is a review of response and remediation programs in New York State. Chapter IV also reviews public participation and education.

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION, 1978, Ground Water Classifications Quality Standards and Effluent Standards and/or Limitations, Albany, New York, 16 pp. Tel.: (518) 473-4641.

A list of specific contaminant standards as set by the New York Department of Conservation.

NEW YORK STATE LEGISLATIVE COMMISSION ON WATER RESOURCE NEEDS OF LONG ISLAND, 1985, Progress Report, Albany, New York, 441 pp. Tel.: (516) 482-7722. (Document is produced annually.)

Chapter V discusses local ordinances for land use protection and control. Summaries of several model ordinances dealing with transfer of development rights, open space preservation, and minimum disturbance of natural vegetation are included. A proposed tenant registration program that describes a method by which illegal discharges of wastewater in unsewered areas can be identified and controlled is also discussed.

Chapter VI, "Water Supply," contains a section on alternatives for obtaining potable water supplies. Alternatives presented include deepening contaminated wells and increasing capacities of contaminant-free wells.

Chapter X presents legislation introduced by the Commission to require water supply systems to draft emergency water supply plans.

PACENKA, S.; M.J. HEATHER, K. PORTER, B. SILVERMAN, and L. MALLER, 1984, Protecting Ground-Water Supplies in River Valley Communities, Miscellaneous Bulletin 131, Cornell Cooperative Extension, Ithaca, New York.
Tel.: (607) 256-2080.*

The bulletin sets out basic principles and procedures for assessing and preventing threats to ground-water quality. A sample study area is described, information needs are outlined, and the methods for gathering data are defined. Hydrogeological theory is presented as background for the analysis of the data. The concluding section outlines the components of a ground-water protection program: adequate mapping, appropriate control over contaminating activities, monitoring, and community education.

RAYMOND, LYLE, 1984, Collecting Information (Synopsis Series, File No. 85-1(C)), Cooperative Extension, Cornell University, Water Resources Program, Ithaca, New York, 7 pp. plus abstract. Tel.: (607) 255-7535.*

One of a series to be included in a handbook for local officials and groups, the article is a digest of recommended steps by which a community may evaluate the area of their ground-water resource and sources of contamination.

SCHENECTADY COUNTY PLANNING DEPARTMENT, 1984, Groundwater Supply Source Protection: A Guide for Localities in Upstate New York, Schenectady, New York, 68 pp. Tel.: (518) 382-3286.

Chapter III, Section B describes various source categories and appropriate protective measures. Also has a section on local laws and ordinances and discusses the options for local control. Appendix C provides examples of special zoning districts.

Chapter V on implementation techniques contains a section on joint local/State regulations.

Chapter on "Financial Considerations" addresses potential revenue sources and related considerations dealing with property ownership, management, and use. Sources of assistance covered include issuance of municipal bonds, Federal assistance, and related issues.

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES, 1983-1986, Article 6 (Health Subdivisions, Developments, and Other Construction Projects) and Amendments; Article 7 Amendments (Water Pollution Control); Article 12 Amendments (Toxic and Hazardous Materials Storage and Handling Controls), with the article's "Standards for Administration," in the Code of Administrative Regulation, Suffolk County Sanitary Code, Suffolk County, Hauppauge, New York. Tel.: (516) 348-2755.

These articles in the Suffolk County Code of Regulations deal with regulatory controls on potential sources of ground-water contamination.

NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND
COMMUNITY DEVELOPMENT, 1985, North Carolina
Administrative Code, Title 15, Subchapter 2L,
Classifications and Water Quality Standards of North
Carolina, Environmental Management Division, North
Carolina DNR&CD, Raleigh, N.C., 18 pp. Tel.:
(919) 733-3221.

Contains the North Carolina code setting out the
State's ground-water classification system and quality
standards. Specific classes and standards for ground
water are described.

NORTH DAKOTA

GLATT, DAVID L., 1985, Ground-Water Investigation to Determine the Occurrence of Picloram in Selected Well Sites of Rolette County, North Dakota, Division of Water Supply and Pollution Control, North Dakota Department of Health, Bismarck, North Dakota, 35 pp. Tel.: (701) 224-2354.

This study was initiated to determine the presence of picloram in ground-water resources in Rolette County, North Dakota, due to leafy spurge eradication techniques. One hundred and twenty-six water samples were collected from existing private and public wells in areas considered sensitive to ground-water contamination during 1985. All water samples were analyzed for nitrate, secondary inorganics, and picloram concentration.

OKLAHOMA

ASSOCIATION OF CENTRAL OKLAHOMA COUNCIL OF GOVERNMENTS, 1984, Protocol for Establishment of a Ground Water Management and Protection Plan, U.S. EPA, Robert S. Kerr Environmental Research Laboratory, Ground Water Research Branch, Ada, Okla., 55 pp. Tel.: (405) 848-8961.

The report provides information on the development of a management plan for a specific aquifer in Oklahoma. It outlines major steps that were taken by local officials to accomplish this task. These steps are summarized in a "protocol flow chart."

MOORE, V. SUZANNE, and LARRY A. PINKSTON, 1986, Utilization of Aquifer Data Collection, Storage and Manipulation Techniques by a Nonregulatory Ground Water Management Agency, Association of Central Oklahoma Council of Governments, sponsored by U.S. EPA, Robert S. Kerr Environmental Research Laboratory, Ada, Okla., 80 pp. Tel.: (405) 848-8961.

The report describes the Association of Central Oklahoma/Garber-Wellington Association's aquifer information database, referred to as the Aquifer Data Management System (ADMS). ADMS houses information of water wells, oil and gas wells, and underground storage tanks. The system can be used by cities and communities to examine and complement State and Federal regulations, local land use regulations, and zoning ordinances.

PINKSTON, L.A., and V.S. MOORE, 1986, Zone Specific Ground Water Sampling Prior to Well Completion, Association of Central Oklahoma Council of Governments, sponsored by U.S. EPA, Robert S. Kerr Environmental Research Laboratory, Ada, Okla., 51 pp. Tel.: (405) 848-8961.

The study describes zone-specific ground-water sampling in uncased test holes. Two methods, the dual-wall reverse circulation drilling method and the open-hole inflatable packer method are discussed. In the study, three wells were sampled using these methods, and the sampling results were compared to expected water quality. The study describes the capabilities and uses of each testing method.

PENNSYLVANIA

WOODING, N. HENRY, JR., 1983, Make Your Water Supply Safe (Special Circular 45, revised), Cooperative Extension Service, Pennsylvania State University, University Park, Penn., 7 pp. Tel.: (814) 863-2713.*

A description of how water supplies become contaminated and how to locate and protect new wells as well as reconstruct old wells to protect water supplies. Discusses testing for bacteria, and ways (emergency and long-term) to treat contaminated water sources.

SOUTH DAKOTA

MEYER, MICHAEL, 1986, A Summary of Ground-Water Pollution Problems in South Dakota, Office of Water Quality, South Dakota Department of Natural Resources, Pierre, South Dakota, 17 pp. Tel.: (605) 773-3351.

The paper provides a brief summary of ground-water pollution problems within the State. Twelve sources of contamination are described, including information on cause and impacts on ground water and human health.

MEYER, MICHAEL, 1986, Assessment of the Feasibility of Establishing an Aquifer Classification System for South Dakota, Office of Water Quality, South Dakota Department of Water and Natural Resources, Pierre, South Dakota, 44 pp. Tel.: (605) 773-3351.

The paper assesses the feasibility of establishing an aquifer classification system for South Dakota and offers classification options for consideration. The investigation includes a vulnerability-based system for classification and the establishment of wellhead protection zones.

SHADE, DIANE, 1986, A Brief Assessment of Ground-Water Contaminants Associated with Health Effects in South Dakota, Office of Water Quality, South Dakota Department of Water and Natural Resources, Pierre, South Dakota, 7 pp. Tel.: (605) 773-3351.

The paper summarizes the health effects associated with ground-water pollution within the State. Contaminants reviewed include petroleum products, agricultural chemicals, and nitrates.

SHADE, DIANE, 1986, Pesticides Used in South Dakota Ground-Water/Health Risks, Office of Water Quality, South Dakota Department of Water and Natural Resources, Pierre, South Dakota, 22 pp. Tel.: (605) 773-3351.

A description of (1) pesticide use and characteristics in relation to ground-water investigations, and (2) the potential for ground-water contamination in South Dakota. The ten most commonly used pesticides in South Dakota are discussed. Pesticides that have been detected in or have a strong potential to enter ground water are reviewed. Discussions focus on the purpose or function of each pesticide, the potential for contamination, and health effects.

SHADE, DIANE, 1985, South Dakota Vulnerable Shallow Public Water Supplies Study, Office of Water Quality, South Dakota Department of Water and Natural Resources, Pierre, South Dakota. Tel.: (605) 773-3351.

The study identifies public ground-water supplies in South Dakota which are most vulnerable to contamination based on well depth and local geology. Using appropriate hydraulic parameters, the radius of influence or distance to zero drawdown was estimated for the wells included on the most vulnerable list.

SHADE, DIANE, 1986, Summary of Groundwater Regulations for South Dakota: Federal, State and Local, South Dakota Office of Water Quality, Pierre, South Dakota, 119 pp. Tel.: (605) 773-3351.

A summary of laws pertaining to ground water in South Dakota. Identifies agency roles and authorities, including institutional and legal barriers to ground-water protection. Appendix C contains the text of two local ordinances that regulate hazardous materials and require product registration.

SOUTH DAKOTA DEPARTMENT OF WATER AND NATURAL RESOURCES, 1985, The Big Sioux Aquifer Water Quality Study, Pierre, South Dakota, 338 pp. Tel.: (605) 773-3351.

In 1978, available water quality data indicated that the Big Sioux Aquifer contained elevated nitrate levels. In response to this finding, the Department of Water and Natural Resources completed this study of the aquifer. The study includes baseline data, an assessment of the overall quality of water in the aquifers, describes potential contamination problems, and describes a method for protecting the aquifer for future use.

TENNESSEE

TENNESSEE VALLEY AUTHORITY, 1985, Conceptual Onsite Wastewater Management Plan For Residential Developments Along Cedar Creek Reservoir, Division of Air and Water Resources, Office of Natural Resources and Economic Development, TVA, Chattanooga, Tenn., 19+ pp. Tel.: (615) 751-7338.

The report describes the TVA wastewater management plan to guide the siting of onsite sewage disposal systems for residential developments along the reservoir. Although the report focuses on averting surface water contamination, Appendix B contains a description of alternative onsite sewage disposal systems that may be applicable to ground-water protection efforts.

TEXAS

BURCHETT, CHARLES R., PAUL L. RETTMAN, and CHARLES W. BONING, 1986, The Edwards Aquifer, Extremely Productive, But...., U.S. Geological Survey in cooperation with the Edwards Underground Water District, San Antonio, Texas, 38 pp. Tel.: (512) 222-2204.

This document is an example of a public education publication. It summarizes investigations and research concerning the Edwards Aquifer and presents information in a manner intended to be useful to individuals who make decisions relating to ground-water protection. The document focuses on aquifer hydrogeology and factors affecting quantity and quality of ground water in the area.

CITY OF AUSTIN, TEXAS, 1980-1982, Watershed Ordinances. Tel.: (512) 499-2296.

Text of development ordinances relating to use and development in Austin aquifer-related watersheds. Discusses special controls required for all development of land within these aquifers.

EDWARDS UNDERGROUND WATER DISTRICT, 1987, Suggested Design and Construction of Edwards Aquifer Wells, San Antonio, Texas, 16 pp. Tel.: (512) 222-2204.

This publication contains the minimum well construction standards recommended by the District. The manual addresses primarily the construction of domestic wells. It is directed towards area residents unfamiliar with drilling procedures, practices, and construction specifications for wells drawing ground water from the Aquifer.

TEXAS RURAL WATER QUALITY NETWORK PROJECT, 1987, Protecting Texas Groundwater: Opportunities for State and Local Action, Texas Department of Agriculture, Austin, Texas, and National Demonstration Water Project, Inc., Arlington, Va. Tel.: (512) 463-7504.

This report contains recommendations on how to improve ground-water protection in Texas. Topics examined include ground-water districts, source controls, and water well construction regulations. For each topic, the report describes the current Texas program and recommends program improvements.

TEXAS STATE LEGISLATURE, 1959, Text of the Act Creating the Edwards Underground Water District (Article 8280-219), as amended in 1979 and 1983, Austin, Texas, 11 pp. Tel.: (512) 222-2204 (Edwards Underground Water District).

This document contains the text of the act establishing the Edwards Underground Water District. The act delineates the District's geographic boundaries, powers of the District, election of the governing board, and bond issuance.

TEXAS WATER COMMISSION, 1985, Chapter 313, Edwards Aquifer, in the Commission regulations, Austin, Texas, 17 pp. Tel.: (512) 222-2204 (Edwards Underground Water District).

Portions of the Texas Water Code allow the Texas Water Commission to regulate and promulgate rules related to water quality. This publication contains the text of the Commission's regulations for controlling activities with the potential to contaminate the Edwards Aquifer. Topics covered include establishing a water pollution abatement plan, design of sewage collection systems, and permitting materials storage facilities.

UTAH

BARNES, ROBERT P., and MACK G. CROFT, 1986, Ground Water Quality Protection Strategy for the State of Utah, Utah Department of Health, Salt Lake City, Utah, 115 pp.
Tel.: (801) 538-6146.

The strategy reviews facts about ground water, describes government programs that affect ground water, and discusses potential sources of ground-water pollution. Provides management proposals for public consideration and comment.

VERMONT

HODGES, JR., ARTHUR L., 1967, Ground-Water Favorability Map of the Otter Creek Basin, Vermont, Vermont Department of Water Resources and Environmental Engineering, Montpelier, Vt. Tel.: (802) 244-5638.

The map illustrates the relative favorability for developing ground-water supplies in areas drained by Otter Creek. Four geologic types are mapped based on their potential for yielding ground water. Hydrogeologic mapping was the delineation method used.

MULLIKIN, ELIZABETH B., 1984, An Ounce of Prevention, A Ground Water Protection Handbook for Local Officials, Vermont Ground Water Coordinating Committee, Montpelier, Vt., 48 pp. Tel.: (802) 828-2761.

This booklet contains a chapter on choosing ground-water protection techniques. The chapter describes public education, observation techniques, long-term protection, regulatory schemes, and interim techniques. The next chapter, entitled "A Guide to Implementing Your Ground Water Protection Program," suggests a procedure for deciding which combination of techniques is appropriate for any one community.

VERMONT DEPARTMENT OF WATER RESOURCES AND ENVIRONMENTAL ENGINEERING, 1985, Vermont Ground Water Law, Chapter 48, Montpelier, Vt., 8 pp. Tel.: (802) 244-5638.

This document lays out the provisions of the ground-water protection laws in Vermont. The chapter covers the Vermont ground-water classification system and licensing of water well drillers.

VERMONT DEPARTMENT OF WATER RESOURCES AND ENVIRONMENTAL ENGINEERING, 1983, Vermont Aquifer Protection Area Reference Document, Montpelier, Vt., 47 pp. Tel.: (802) 244-5638.

A summary of summarizes Vermont's ground-water protection policy. The document discusses the types of aquifers present in Vermont, location of aquifer protection areas, and ways to delineate aquifer protection areas for each type of aquifer. Results of the land use survey to determine types of ground-water uses and potential sources of pollution in each aquifer region are discussed.

WILLEY, RICHARD E., and DAVID BUTTERFIELD, 1983,
Ground-Water Resources of the Rutland Area, Vermont,
Water-Resources Investigation 82-4057, U.S. Geological
Survey, 38 pp. Tel.: (802) 244-5638.

A description of the ground-water resources in the vicinity of Rutland, Vermont. The report indicates the location and potential yield of unconsolidated water-bearing deposits, evaluates the yield of the bedrock aquifers, and characterizes ground-water quality. It also provides an example of hydrogeologic mapping delineation methods.

VIRGINIA

CLARKE COUNTY PLANNING COMMISSION, WATER STUDY COMMITTEE, 1987, Clark County Ground Water Protection Plan, Lord Fairfax Planning District Commission, Front Royal, Va., 12 pp. Tel.: (703) 635-4146.

This study attempts to answer a variety of issues pertaining to local ground-water protection, including determination of areas of risk, probable sources of contamination, and additional activities needed to protect local ground water.

HREZO, MARGARET, and PAT NICKINSON, 1986, Protecting Virginia's Groundwater: A Handbook for Local Government Officials, Virginia Polytechnic Institute and State University, Blacksburg, Va., 44 pp. Tel.: (703) 961-5624.

This text includes a section on regulatory and nonregulatory tools available to local officials for ground-water planning. It lays out a step-by-step approach to ground-water protection planning. Regulatory tools covered include zoning and mandatory BMPs. Nonregulatory tools covered include purchase of development rights and voluntary BMPs. Also addressed in the appendices are zoning and site plan ordinances in Virginia and model ordinances for overlay zoning.

HREZO, MARGARET, and MATTIE QUESENBERRY, 1985, Options for Managing Underground Storage of Petroleum Products in Virginia, Bulletin 150, Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, Blacksburg, Va., 99 pp. Tel.: (703) 961-5624.

The bulletin includes discussion on the use of risk assessment in policy making. It reviews briefly current uses and criticisms of risk assessment for analysis of contamination threats.

SHIFRIN, NEIL S., and MICHAEL NOLAN, 1981, Ground Water Protection by Recharge Zone Management: Institutional Arrangements, JBF Scientific Corp., Mass. Tel.: (703) 487-4650 (National Technical Information Service, Springfield, Va.).

The report explores protection of ground-water quality by proper management of recharge zones. State, regional, and local agencies are analyzed for their possible roles in ground-water quality control, both nationally and in the three case study areas in Virginia. A State-oriented approach with active municipal participation is found to be the best alternative.

WASHINGTON

SPOKANE COUNTY PLANNING COMMISSION, 1983, Aquifer Sensitive Area Overlay Zone, Section 4.16A.000, Spokane, Wash., 10 pp. Tel.: (509) 456-2205.

This zoning ordinance fulfills the Spokane Section 208 programs specifications for development of land use regulations for aquifer protection.

SPOKANE COUNTY 208 COORDINATION OFFICE, 1984, Critical Materials Handbook (Draft), Spokane, Wash. Tel.: (509) 456-6024.

The handbook contains the Spokane Critical Materials Activity List and the Critical Materials List. The Activity List identifies sources of aquifer contamination in the Spokane area, and the Materials List is a list of 650 chemicals regulated both by State and Federal laws. Also contains some suggested BMPs intended to help users of potentially contaminating materials comply with the requirements of the County Aquifer Overlay Zone. Presents the Spokane model spill prevention, control, and clean-up plan.

WASHINGTON DEPARTMENT OF ECOLOGY, 1986, Guidelines for Designating Groundwater Management Areas and Programs, Water Resources Planning and Management Section, Washington DEC, Olympia, Wash., 16 pp. (Includes the Washington Administrative Code sections that address establishment of Ground Water Management Areas.) Tel.: (206) 459-6120.

The booklet is intended to help local governments and water user groups understand the Washington law that establishes ground-water management areas (Chapter 173-100 of the Washington Administrative Code). It serves as a guide for setting up local ground-water management plans and attempts to answer questions about the new process.

WASHINGTON DEPARTMENT OF ECOLOGY, 1986, Probable Ground Water Management Area Evaluation Procedure, Water Resources Planning and Management Section, Washington DEC, Olympia, Wash., 11 pp. Tel.: (206) 459-6000.

This report presents the procedures used by the Washington Department of Ecology to evaluate applications for designations of Ground Water Management Areas. Evaluation criteria and calculation of scores are described.

WISCONSIN

BORN, STEPHEN, DOUGLAS A. YANGGEN, and ALEXANDER ZAPOREZEC, 1987, A Guide to Groundwater Planning and Management for Local Governments (Draft), Wisconsin Geological and National History Survey, Madison, Wisc., 159 pp. Tel.: (608) 263-2627.

A planning guide or manual for local ground-water quality management. The guide provides information on a range of techniques for ground-water protection, and is designed to offer insight on how these techniques can be tailored to individual communities. Contains a section on "scope of local effort," which discusses establishing goals and objectives and identifying key participants.

The guide also includes sections on environmental assessment and management techniques and options for local controls on potential sources.

HOLMAN, DAVID, 1986, Groundwater (Drinking Water) Protection Alternatives for Pesticides and Fertilizers Based on Local Information and Comparable Potential Risk Index for Rock County, Wisconsin, Environmental Health Division, Rock County Health Department, Janesville, Wisc. Tel.: (608) 755-2641.

This report discusses Rock County's Risk Index System; it applies risk assessment techniques to rank contaminant sources, including pesticides and fertilizers. Risk assessment computations are laid out. Toxicology information is not used.

HOLMAN, DAVID, 1986, Groundwater Pollution Potential Risk Index System, Environmental Health Division, Rock County Health Department, Janesville, Wisc. Tel.: (608) 755-2641.

A more comprehensive discussion of the Rock County risk index than in the previous reference. Discusses the methodology used and how to interpret risk scores.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES, 1986, "NR 140 Becomes Administrative Rule," Groundwater Report, Madison, Wisc., 2 pp. Tel.: (608) 266-9276.

The article describes Wisconsin's new numerical standards for 46 substances of health or welfare concern. NR 140 establishes two sets of ground-water standards, the enforcement standard and the preventive action limit (PAL), which serves as a "trigger" for protective measures.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES, 1985, Chapter NR 140, "Groundwater Quality," in Wisconsin Register No. 358, Madison, Wisc. Tel.: (608) 266-9265.

This chapter of the Wisconsin Administrative Code establishes a two-tiered system of ground-water quality standards. Portions of the rule deal with where the standards apply (outside "design management zones" around regulated facilities/activities).

WISCONSIN LEGISLATIVE COUNCIL STAFF, 1984, New Law Relating to Groundwater Management, Information Memorandum 84-11, Madison, Wisc., 45 pp. Tel.: (608) 266-1304.

The memorandum describes 1983 Wisconsin Act 410, which was the basis for NR 410, the rule setting out Wisconsin's new ground-water quality standards.

OTHER

AMERICAN WATER WORKS ASSOCIATION, 1984 (reprint), Emergency Planning for Water Utility Management, Denver, Colo., 69 pp. Tel.: (303) 794-7711.

Chapter 5 contains a section listing key elements of an emergency plan. The paper is oriented primarily toward responding to water supply contamination.

AMERICAN WATER WORKS ASSOCIATION, Committee on Material Spills Hazardous to a Water Supply, 1975, Hazardous Materials Spills Emergency Handbook, Denver, Colo., 47 pp. Tel.: (303) 794-7711.

A handbook on how to set up plans for responding to hazardous materials spills, with sections on drafting spill plans and ordinances. There is little discussion of how to promote alternate water supplies.

AMSDEN, TIMOTHY L., 1987, "Assembling Your State Groundwater Protection Strategy", in the University of Kansas Law Review, vol. 35, No. 2 (Winter 1987), 10 pp. Tel.: (913) 864-4550.

An informal guide to developing a State ground-water protection strategy. The author describes the preparatory steps for developing a plan. These steps deal with issues such as uses of classification systems, understanding the relationship of ground water with other media, and use of education in managing ground water.

CANTER, LARRY, 1986, Functions and Activities of Groundwater Protection: Implications for Institutional Coordination, Environmental and Ground Water Institute, University of Oklahoma, Norman, Okla. Tel.: (405) 325-5202.

Action elements within ground-water programs may include the implementation of ground-water monitoring, assessment of ground-water usage, prioritization of pollution sources, usage of permits and inspections for source control, planning and completion/remedial actions, and usage of a pollution incident tracking system. Institutional coordination is needed since many elements are characterized by shared responsibilities, and possibly shared funding, among Federal, State, and local governmental levels. This paper explores these elements and their respective coordination needs and identifies several policy issues.

CONSERVATION LAW FOUNDATION OF NEW ENGLAND, INC., 1984, A Local Groundwater Protection Program, Primary Focus: Leaking Underground Storage Tanks, Boston, Mass. Tel.: (617) 742-2540.*

A sample ground-water protection program focusing on implementation on the local level.

DINOVO, FRANK, and MARTIN JAFFE, 1984, Local Groundwater Protection: Midwest Region, American Planning Association, Chicago, Ill., 327 pp. Tel.: (312) 955-9100.

The intent of this report is to help communities in the Midwest improve planning and land use control procedures for protecting ground-water resources. Chapter IV discusses 15 sources of point and nonpoint ground-water contamination, including agricultural irrigation and underground storage tanks. Chapter V presents Federal and State laws that have an impact on ground-water protection. Later chapters discuss how to develop a ground-water data base and identify recharge areas (Chapters VI and VII). The report also provides five examples of programs designed to protect areas sensitive to ground-water contamination.

GIESE, R.G., 1982, "State Ground-Water Management Program," in Ground Water Monitoring Review, vol. 2, No. 1, 4 pp. Author affiliation: U.S. EPA, Region V, Ground Water Protection Section. Tel.: (614) 761-1711.

This article presents a design for developing a comprehensive ground-water management program. The suggested design represents a compilation of ideas from States that are currently developing ground-water programs. The outline should provide advice to those States that have not yet begun to develop a program, but recognize the need to do so. Given the limited funds available to develop and implement a ground-water management program, the States should use the design as a guide, and devote their efforts to defining a State ground-water protection policy, identifying and evaluating existing and potential contamination sources, and to developing and implementing procedures to prevent or mitigate the contamination problems.

JAFFE, MARTIN, and FRANK DINOVO, 1987, Local Groundwater Protection, American Planning Association, Chicago, Ill., 262 pp. Tel.: (312) 955-9100.

A cross-section of existing and proposed ground-water protection programs that have been put into place by local government. The book examines ground-water threats, legislation, data needs, and policies and Evaluates local controls on ground-water contamination sources. The appendices present examples of local source control and sensitive area protection ordinances.

MILLER, D.W., 1981, "Guidelines for Developing a State-Wide Ground-Water Monitoring Program," in Ground-Water Monitoring Review, vol. 1, No. 1, 2 pp. Author affiliation: Geraghty & Miller, Annapolis, Md. Tel.: (614) 761-1711.

This article outlines the function of monitoring in a State regulatory context. The author draws on over two decades of experience in the field of ground-water protection, in both the government and private sectors, to provide information that will be useful to regulatory officials charged with the design, implementation, and enforcement of monitoring programs and useful to those subject to these regulations.

MORISSEY, DANIEL J., 1987, Estimation of the Recharge Area Contribution to a Pumped Well in a Glacial-Drift, River Valley Aquifer (Open-File Report 86-543), U.S. Geological Survey, Washington, D.C., 60 pp. Tel.: (303) 236-7476.

This report discusses wellhead delineation in glacial-fill river-valley aquifers, a common hydrogeological setting in New England. It compares the use of analytical, two-dimensional and three-dimensional numerical modeling techniques to delineate the zone of contribution to wells in this type of aquifer. The models' accuracy, their use in characterizing this type of aquifer, and the hydrogeologic information necessary to develop each model are discussed.

NEWTON, DAVID F., 1984, Groundwater Management in the Northeast (Publication No. 34), Northeast Center for Rural Development, Ithaca, New York (center located at State College, Penn., after October 1985), 175+ pp. Tel.: (814) 863-4656.*

A collection of nine bulletins from the Cooperative Extension on the following topics in ground-water management: overview, CES programming ideas, hydrology fundamentals, quality/treatment, summary of water laws in each northeastern State, institutional aspects, local planning for management, conservation as a management strategy, and sources of information and assistance.

RAYMOND, JR., LYLE S. (ed.), 1981, Groundwater Use Management in the Northeastern States: Legal and Institutional Issues, Center for Environmental Research, Cornell University, Ithaca, New York, 337 pp. Tel.: (703) 487-4650 (National Technical Information Service, Springfield, Va.).*

Topics addressed at the conference include ground-water hydrology, ground-water rights, integrated management, land use, permits with respect to public authority to act, the technical knowledge base, ground-water allocation, quantity and quality management, and local government responses to ground-water shortages.

REITER, PAUL F., 1985, Estimating Pumping Well Recharge Areas with Computer Models, in Proceedings from the National Water Well Association Conference on Ground-Water Models, August 19-20, 1985, Columbus, Ohio. Tel.: (614) 761-1711.

Ground-water modeling can provide an improved estimate of recharge areas that contribute water to supply wells. Case studies are outlined for two commonly encountered pumping well situations: wells receiving induced infiltration from nearby streams within a thin valley aquifer, and wells located in areas where surface water sources are negligible. In both situations, a mass balance technique was applied to steady state flow model results to determine recharge areas contributing water to the wells. Three-dimensional schemes were utilized in the second. For both, the computed recharge area deviated significantly from a circular area.

SKIDMORE, OWINGS AND MERRILL, 1979, Community Planning for Water Resources Management: A Guide Book, Boston, Mass., 24 pp. Tel.: (617) 247-1070.*

The guide presents six steps in the planning process: defining problems and goals, collecting and studying data, generating alternatives, evaluating effects, and participating in planning. For each step, the guide directs communities to consider a set of questions, lists types of information to be gathered, and suggests actions.

SOUTHERN WATER AUTHORITY, 1985, Aquifer Protection Policy, 1985, West Sussex, England, 47 pp. (The Southern Water Authority is located at Guildbourne House, Worthing, West Sussex, England, BN11 1LD.)

Focus is on the Southern Water Aquifer Authority's ground-water protection zones and the need to balance hydrogeological features, industrial concerns, and ground-water protection goals when developing a policy. The guide describes the various aquifer types within the authority, and the management controls used in each aquifer. Fifty-day inflow boundary zones around pumping stations are the basis for protection. Contains discussion on how changes in velocity, pumping rates, conductivity, etc., can affect the dimensions of a 50-day inflow boundary around wells.

TRIPPE, J.T.B., AND B. JAFFE, 1979, "Preventing Groundwater Pollution: Towards a Coordinated Strategy to Protect Critical Recharge Zones," Harvard Environmental Law Review, vol. 3, No. 3, Cambridge, Mass. Tel.: (617) 495-3110.*

The article expresses the authors' opinion on the creation of a coordinated strategy to protect critical recharge zones, with examples of what several States are doing to protect their drinking water sources.

U.S. WATER RESOURCES COUNCIL, 1979, Essentials of Ground-Water Hydrology Pertinent to Water Resources Planning, Washington, D.C., 38 pp. Tel.: (202) 254-6303.*

This bulletin is intended to bridge the communication gap between the ground-water hydrologist and the water resources planner, but is informative for any interested reader. It describes ground-water principles important to planning and management, discusses data requirements for ground-water resource evaluation, and outlines types of decision-making choices which will be encountered.

U.S. WATER RESOURCES COUNCIL, 1981, State of the States: Water Resources Planning and Management, Groundwater Supplement, State Programs Division, USWRC, Washington, D.C. Tel.: (202) 254-6303.*

This is the ground-water supplement to U.S. Water Resources Council's 1980 report, State of the States: Water Resources and Planning, and profiles ground-water management and protection programs in each State.

UNIVERSITY OF WISCONSIN, ENVIRONMENTAL RESOURCES CENTER, 1984, Groundwater Protection Through Local Land Use Controls, Madison, Wisc. Tel.: (608) 262-2000.*

A detailed discussion of how local zoning and subdivision ordinances can be used to protect ground water. Identifies specific actions local governments can take; explains relation of local programs to State ground-water authority and legal basis for local ground-water protection ordinances.

VAN DER HEIJDE, P.K.M. and M.S. BELIJN, 1987, Model Assessment for Delineating Wellhead Protection Areas, (Draft Report), International Groundwater Modeling Center, Butler University, Indianapolis, Ind. Tel.: (317) 283-9458.

This document contains a detailed explanation of the basics of ground-water modeling and a comparison of 64 ground-water models that can be used to delineate wellhead protection areas. Both ground-water flow models and contaminant transport and fate models are examined. The first two appendices include model descriptions and comparisons of user friendliness, usability, and reliability. The third appendix is a detailed annotation of the models.

VAN WAEGENINGH, H.G., 1985, "Overview of the Protection of Groundwater Quality," in Matthess, G., et al., Theoretical Background Hydrology and Practice of Groundwater Protection Zones, International Association of Hydrogeologists, vol. 6, 8 pp. Tel.: (614) 761-1711.

This article compares the ground-water protection policies of several European countries. It summarizes the criteria each country uses to delineate ground-water protection zones in tables.

VAN WAEGENINGH, H.G., 1985, "Protection of the Groundwater Quality in Porous Permeable Rocks," in Matthes, G., et al., Theoretical Background, Hydrology and Practice of Groundwater Protection Zones, International Association of Hydrogeologists, vol. 6, 10 pp. Tel.: (614) 761-1711.

A brief overview of ground-water quality protection in the low velocity unconsolidated aquifers of the Netherlands. Use of a 50-day delayed time method to delineate protection zones is highlighted. The article also discusses the limitations of this method in high velocity aquifers.

WERNER, JAMES D., 1983, Elements of a Groundwater Management Program, in Proceedings of the Virginia Groundwater Symposium, Blacksburg, Va., November 9-10, 1983, sponsored by the Environmental Defense Fund et al. Author affiliation: ICF, Inc., Washington, D.C. Tel.: (202) 387-3500.

Broad elements of a ground-water management program are outlined: goal selection (such as nondegradation, limited degradation, and differential protection); management strategy selection; aquifer classification; contaminant and source classification; uniform management; recharge area identification and classification; and program implementation (encompassing monitoring, enforcement, and organization).

ZUENA, A.J., 1985, "Hydrogeologic Aspects of Landfill Siting and Design," in the Journal of the New England Water Pollution Control Association, vol. 19, No. 2, 8 pp. Tel.: (617) 367-8554.

Individual sections of the report present an overview of a typical approach to conducting the tasks involved in siting sanitary landfills. These tasks may include research and evaluation of the current data base; the planning, design, and implementation of the hydrogeologic investigations program; the analysis of the resulting data to design the sanitary landfill (incorporating appropriate measures for ground-water protection and monitoring); and gas control systems affording maximum protection to both natural and man-made sensitive receptors in the potentially impacted area.