Standard Guide for Locating Abandoned Wells[1]

This standard is issued under the fixed designation D 6285; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This guide for locating abandoned wells, provides general procedures and suggestions for identifying the locations of wells that are installed for the purposes of oil and gas exploration or production, or for ground water exploration, supply, monitoring, remediation, or injection, and subsequently have been abandoned. Not all states require documentation of such abandonment; thus, this guide has been prepared to provide direction for determining the locations of those abandoned wells.

1. Scope

1.1 This guide provides an approach to selecting and implementing a program to identify the locations of abandoned wells. This guide provides descriptions of methods to be used as starting points in the search for these locations. It is not intended to be a step-by-step procedure to conduct the search program. This guide also provides listings of government agencies that may have well location information. It is understood that addresses and phone numbers change and that the included information may not be accurate in the future.

1.2 The described methods are approaches that have been used at many sites across the United States. Other methods may be appropriate. Typically, several approaches are used to obtain acceptable confirmation of well locations. This guide is not limited to specific wells. The method chosen should be appropriate for the size of the area being searched and the type of well being located. Some well types and construction materials may preclude their detection by any of the methods described.

1.3 This guide offers an organized collection of information or series of options and does not recommend a specific course of action. This guide cannot replace education and experience and should be used in conjunction with professional judgement.

2. Referenced Documents

2.1 *ASTM Standards:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[2]

D 5092 Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers[3]

D 5299 Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities[3]

D 5518 Guide for Acquisition of File Aerial Photography and Imagery for Establishing Historic Site-Use and Surficial Conditions[3]

PS 78 Provisional Guide for Selecting Surface Geophysical Methods[3]

3. Significance and Use

3.1 Millions of oil and gas wells, water supply wells, and wells installed for environmental monitoring and remediation purposes, have been abandoned. The need to determine the locations of these abandoned wells is based on safety and threats to the environment. Improperly constructed or abandoned wells may pose a safety threat to humans and animals, may be sources of brines and other undesirable fluids coming to the surface, may be conduits for transport of contamination from the surface to the substrate, or may cross-contaminate water-bearing zones in the subsurface. All states do not require documentation of the abandonment of wells and may not have specific requirements for abandonment procedures.

4. Methods for Locating Abandoned Wells Whose Locations Have Been Recorded, Observed, or Marked at the Surface

4.1 *Records Search*—Information regarding the potential location, type, age, method of abandonment, and other pertinent information about wells often can be determined by a thorough review of local, state, or federal records. Many states and other governmental agencies have reporting requirements for both the installation and abandonment of all types of wells. Typically, oil and gas wells are controlled by separate agencies

[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

Current edition approved Nov. 10, 1999. Published January 2000. Originally published as D 6285 – 98. Last previous edition D 6285 – 98.

[2] *Annual Book of ASTM Standards*, Vol 04.08.

[3] *Annual Book of ASTM Standards*, Vol 04.09.

from water and environmental wells. With the recent proliferation of environmental studies, the number of agencies that may maintain these records has increased.

4.2 *Local Agencies*—Local (city and county) agencies typically retain records of oil and gas leasing agreements, tax records, plat maps, property ownership maps, and other related information. Information on municipal wells often is retained in local courthouses.

4.3 *State Agencies*—Most states have several agencies that maintain records of drilled wells. Some states maintain sophisticated computer databases, others maintain paper records. Location information also varies by state and can be by township, range and section, state plane coordinate system, UTM coordinates, or latitude and longitude. Drilling logs, installation diagrams, production records, mechanical integrity testing reports, and other information often are available. Injection wells information typically also is available.

4.3.1 A starting place for well record information is the State Geological Survey. If they do not maintain well records, they typically can provide direction to the proper agency. A list of state geological surveys is provided in Appendix X1.

4.3.2 Water well records are required in most states. The sophistication of record keeping and location detail is variable. State health agencies often maintain records for public water supply wells. A list of state agencies known to maintain records of abandoned water wells and resource protection wells, for example, monitoring wells, is provided in Appendix X2.

4.3.3 Within the states that produce oil and gas, a specific agency usually has been given the responsibility for maintaining well information. A list of state agencies that maintain oil and gas well records is provided in Appendix X3.

4.4 Environmental monitoring wells have become more prolific within the last decade. Both federal and state agencies typically require documentation of the installation of these wells. The administrative records for specific Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA) sites and Resource Conservation and Recovery Act (RCRA) sites are the best sources of monitoring well location information that may not be available at specific public agencies. Other federal agencies, for example, the Department of Defense (DoD), the Department of Energy (DoE), and the U.S. Geological Survey, may have records of wells that have been installed at specific government sites.

4.4.1 Refer to Practice D 5092 as it lists the minimum amount of information required for documentation of each installation. Guide D 5299 lists information required to document the abandonment of wells.

4.5 *Interviews*—Conversations or interviews with local property owners, longtime residents, and drilling contractors often provide information about the locations of abandoned wells. Property owners often can identify specific well locations. Drilling contractors often maintain internal records of well locations. A careful explanation of the need for locating certain wells is necessary sometimes to obtain access to these proprietary data. The initial purpose for conducting the interview should dictate the type and format of interview documentation.

4.6 *Reconnaissance*—Actual site visits may identify the locations of abandoned wells whose surface locations have been marked or whose installation or abandonment have left soil disturbances that are identifiable as well-related.

5. Airborne and Space-Based Photographic and Other Methods for Locating Abandoned Wells Whose Locations Are Unknown

5.1 *Aerial Photographs*—Aerial photographs may be used to detect the surface disturbance associated with well drilling activities or the actual surface equipment. Historical photographs may document the actual drilling of now-abandoned wells. Aerial photographs may be available at many different scales and from many different sources.

5.1.1 The larger the scale of the aerial photograph, the easier it is to identify features. Photographs usually are available at a low cost. Photographs, however, may not be available for a given area or may not be at an appropriate scale. Interpretation of the photographs should be performed by trained personnel.

5.1.2 *Sources of Aerial and Satellite Photographs*—Many local and state governmental agencies have archives of aerial photographs of their area of jurisdiction. In addition, a review of the local telephone directory listing of companies that provide aerial photographic services may provide sources of aerial and satellite photographs. See Appendix X4 for a list of agencies to contact.

5.2 *Other Remotely Sensed Data*—Surface disturbances, associated either with the original well installation or with leaking fluids from an improperly abandoned well, may be detectable using various remotely sensed data. These data include, but are not limited to spectral, radar, and color infrared data acquired by satellite or aircraft. Spectral imagery may be used to detect vegetative stress resulting from either drilling activities or from the presence of saline or contaminated water leaking from an abandoned well. Thermal infrared imagery may be used to detect temperature anomalies resulting from the presence of metal casing. Spectral, color infrared, and radar imagery also may be used in textural analysis to deduce surface disturbances that may have resulted from drilling and well installation activities.

5.2.1 Most of these data are available only in digital format. Appropriate computer hardware and software, as well as personnel trained in image processing, may be necessary to use these data. Relative costs per unit aerial coverage for data acquisition and processing may be high for small search areas but low for large search areas. Ground verification of wells is necessary.

5.2.2 *Sources of Imagery*—See Appendix X5 for a list of agencies to contact.

6. Geophysical Methods for Locating Abandoned Wells Whose Locations Are Unknown

6.1 In general, metal detectors and magnetometers can be used to detect metallic wells casing at various depths. Electromagnetic and resistivity methods can be used to detect both metallic well casings and fluids leaking from abandoned wells. Ground penetrating radar may be used to locate uncased wells or wells with nonmetallic casings.

6.2 *Metal Detectors*—Metallic well casings (ferrous or nonferrous) can be detected using portable metal detectors. The response of a metal detector us proportional to the area of a metal target. The larger of diameter of the buried casing, the easier it is to detect. Response also is inversely proportional to the depth of the target. The coil of the metal detector must pass directly over the buried casing in order for the casing to be detected, therefore, a closely spaced survey grid is necessary. Depth of detection for these metal detectors is usually 1 to 3 ft. Equipment usually is inexpensive and little training is required to operate it.

6.2.1 A special type of time domain electromagnetic sensor that uses relatively small loop transmitters functions as a metal detector with a greater depth of investigation and the ability to detect larger objects than convectional metal detectors.

6.3 *Magnetometers*—Ferrous metal well casings can be detected by a magnetometer survey. The response of a magnetometer is proportional to the mass of the target and is inversely proportional to the target's depth. A magnetometer may detect a buried casing that is off the side of a survey line and may detect a casing that has been cut off below the surface.

NOTE 1—The magnometer dose not have to pass directly over the target as in the case of a metal detector.

Depth of detection using a magnetometer is much greater than for any other method described. Large diameter deep well casings, such as those used in the oil and gas industry, commonly are detected by airborne magnetometer surveys. Equipment is easy to use.

6.3.1 Surface magnetometer surveys can be used to detect wells that contain ferrous metal casing at or near the surface.

6.3.2 A downhole (borehole) magnetometer may be used when the upper portion of the casing in an abandoned well is at a depth greater than the resolution of a surface survey, and there is an opening in which to lower the probe.

6.3.3 Airborne magnetometer surveys are used for general reconnaissance of an area. This method works best to locate large diameter wells, These surveys require ground verification of detected anomalies. They usually are more expensive than ground-based surveys.

6.3.4 *Sources of Airborne Magnetic Survey*—See Appendix X6 for recommended source.

6.4 *Electromagnetic Methods*—Magnetic anomalies caused by the presence of conductive materials at the surface and in the shallow subsurface may be detected at the surface, from boreholes in the subsurface, or sometimes from the air. These methods may be used to detect either metallic casing or saline water associated with a leaking abandoned well. Measured anomalies may be small, and there may be interference from cultural sources of electromagnetic energy. Also, surveys may require close line spacings. Electromagnetic methods include both frequency and time domain methods, which require interpretation by trained personnel.

6.4.1 Frequency domain electromagnetic methods (conductivity surveys), measure the connectivity of subsurface materials by using a transmitter coil to generate an electromagnetic field that induces an electrical current in the earth. The induced current generates a secondary electromagnetic field that can be detected by a receiver coil. The magnitude of the induced current is a function of the composition and porosity of the soil and the conductivity of pore fluids. Since metallic well casing usually is more conductive than the surrounding soil, its presence may be detected by this method. Saline fluids leaking from abandoned wells often are more conductive than surrounding materials and may be detectable. Direct contact with the soil is not required for this method, and as a result, survey times may be rapid. Conductivity surveys should be conducted and interpreted by trained personnel.

6.4.2 Time domain electromagnetic methods are based on the principle that currents induced in the ground decay rapidly, producing a secondary magnetic field proportional to the conductivity of the subsurface material. By measuring the time decay of the secondary magnetic field as the induced current diffuses downward, a vertical electrical profile of the subsurface can be obtained. Depth of measurement depends on the primary (induced) field strength and range from a few meters to more than a kilometer. This method is useful especially for detecting conductive fluids, such as saline fluids leaking from an abandoned wellbore. These surveys must be conducted and interpreted by trained personnel.

6.5 *DC Resistivity*—This method may be used to detect saline water associated with a leaking abandoned well. The resistivity method is used to measure the resistance of subsurface materials to the flow of electricity. Since saline fluids are less resistance to electrical current flow than the surrounding soil, their presence can be inferred by this method, which requires interpretation by trained personnel.

6.5.1 Resistivity surveys must be correlated with known subsurface information. The indirect detection of fluids coming from an abandoned wells may be easier than the detection of the actual well casing using this method.

6.6 *Ground Penetrating Radar (GPR)*—It may be possible to locate uncased wells or wells with nonmetallic casings using ground penetrating radar (GPR). The GPR method uses high frequency radio waves to measure the transmission of electromagnetic energy through the subsurface, and its reflection by interfaces in the subsurface at which electrical properties vary. Variations in electrical properties result from changes in moisture content, bulk density, grain size, and clay content.

6.6.1 GPR is suited to detecting the disruption of subsurface layering associated with well construction or for situations in which and uncased abandoned well contains void space or homogeneous fill. Well casing also may be detected as a point reflector in a GPR survey record if the radar antenna is pulled directly over the well. Radar surveys should be conducted and interpreted by trained personnel.

7. Report

7.1 When an abandoned well, which has not been previously located, has been identified, the location and other pertinent data should be forwarded to the local, state, or federal agency having jurisdictional control of the well location. Most of these agencies are identified in Appendix X1-Appendix X3.

8. Keywords

8.1 abandoned wells; aerial photography; decommissioned wells; geophysical methods; remote sensing; well location

APPENDIXES

(Nonmandatory Information)

X1. Geological Surveys in the United States and its territories and Canada

X1.1 *United States*:

ALABAMA
Geological Survey of Alabama
420 Hackberr Lane
P.O. Box O
Tuscaloosa, AL 35486-9780
(205) 349-2852
fax (205) 349-2861

ALASKA
Alaska Division of Geological and Geophysical Surveys
794 University Avenue, Suite 200
Fairbanks, AK 99709-3645
(907) 474-7147
fax (907) 479-4779

ARIZONA
Arizona Geological Survey
416 West Congress Street, Suite 100
Tucson, AZ 85701
(520) 770-3500
fax (520) 770-3505

ARKANSAS
Arkansas Geological Commission
3815 West Roosevelt Road
Little Rock, AR 72204
(501) 663-9714
fax (501) 663-7360

CALIFORNIA
California Division of Mines and Geology
Department of Conservation
801 ″K″ Street, MS 12-30
Sacramento, CA 95814-3531
(916) 445-1923
fax (916) 445-5718

COLORADO
Colorado Geological Survey
1313 Sherman Street, Room 715
Denver, CO 80203
(303) 866-2611
fax (303) 866-2461

CONNECTICUT
Connecticut Geological and Natural History Survey
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3540
fax (860) 566-7292

DELAWARE
Delaware Geological Survey
University of Delaware
DGS Building
Newark, DE 19716-7501
(302) 831-2833
fax (302) 831-3579

DISTRICT OF COLUMBIA
Geologist of Washington DC
Department of Biological and Environmental Science
University of the District of Columbia MB44-04
4200 Connecticut Avenue, NW
Washington, DC 20008-1154

FLORIDA
Florida Geological Survey
903 West Tennessee Street
Tallahassee, FL 32304-7700
(904) 488-4191
fax (904) 488-8086

GEORGIA
Georgia Department of Natural Resources
Geological Survey
19 Martin Luther King Drive, Room 400
Atlanta, GA 30334
(404) 656-3214
fax (404) 657-8379

HAWAII
Department of Land and Natural Resources
Division of Land and Water Development
P.O. Box 373
Honolulu, HI 96809
(808) 587-0230
fax (808) 587-0283

IDAHO
Idaho Geological Survey
Room 332 Morrill Hall
University of Idaho
Moscow, ID 83843
(208) 885-7991
fax (208) 885-5826

ILLINOIS
Illinois Geological Survey
Natural Resources Building
615 East Peabody Drive
Champaign, IL 61820-6964
(217) 333-4747
fax (217) 244-7004

INDIANA
Indiana Geological Survey
611 North Walnut Grove
Bloomington, IN 47405
(812) 855-9350
fax (812) 855-2862

IOWA
Iowa Geological Survey Bureau/DNR
123 North Capitol Street
109 Trowbridge Hall
Iowa City, IA 52242-1319
(319) 335-1575
fax (319) 335-2754

KANSAS
Kansas Geological Survey
1930 Constant Avenue, West Campus
University of Kansas
Lawrence, KS 66047
(913) 864-3965
fax (913) 864-5317

KENTUCKY
Kentucky Geological Survey
228 Mining and Mineral Resources Building
University of Kentucky
Lexington, KY 40506-0107
(606) 257-5500
fax (606) 257-1147

LOUISIANA
Louisiana Geological Survey
University Station, Box G
Baton Rouge, LA 70893-4107
(504) 388-5320
fax (504) 338-5328

MAINE
Maine Geological Survey
Department of Conservation
State House Station No. 22
Augusta, ME 04333-0022
(207) 287-2801
fax (207) 287-2353

MARYLAND
Maryland Geological Survey
2300 St. Paul Street
Baltimore, MD 21218-5210
(410) 554-5559
fax (410) 554-5502

MASSACHUSETTS
Massachusetts Office of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, MA 02202
(617) 727-9800
fax (617) 727-2754

MICHIGAN
Michigan Geological Survey
735 E. Hazel Street
Box 30028
Lansing, MI 48909-7756
(517) 334-6907
fax (517) 334-6038

MINNESOTA
Minnesota Geological Survey
University of Minnesota
2642 University Avenue
St. Paul, MN 55114-1057
(612) 627-4780
fax (612) 627-4778

MISSISSIPPI
Mississippi Office of Geology
Department of Environmental Quality
Southport Center
2380 Highway 80 West
P.O. Box 20307
Jackson, MS 39289-1307
(601) 961-5500
fax (601) 961-5521

MISSOURI
Missouri Department of Natural Resources
Geological Survey
111 Fairgrounds Road
P.O. Box 250
Rolla, MO 65402
(573) 368-2100
fax (573) 368-2111

MONTANA
Montana Bureau of Mines and Geology
1300 West Park Street
Montana Tech of the University of Montana
Butte, MT 59701-8997
(406) 496-4167
fax (406) 496-4451

NEBRASKA
Nebraska Conservation and Survey Division
University of Nebraska
113 Nebraska Hall
901 North 17th Street
Lincoln, NE 68588-0517
(402) 472-3471
fax (402) 472-2410

NEVADA
Nevada Bureau of Mines and Geology

University of Nevada, Reno
Reno, NV 89557-0088
(702) 784-6691
fax (702) 784-1709

NEW HAMPSHIRE
New Hampshire Geological Survey
Department of Environmental Sciences
P.O. Box 2008
Concord, NH 03302-2008
(603) 271-3406
fax (603) 271-6588

NEW JERSEY
New Jersey Geological Survey
Department of Environmental Protection
P.O. Box CN-427
Trenton, NJ 08625-0427
(609) 292-1185
fax (609) 633-1004

NEW MEXICO
New Mexico Bureau of Mines and Mineral Resources
Campus Station
Socorro, NM 87801
(505) 835-5420
fax (505) 835-6333

NEW YORK
New York Geological Survey
NY State Museum
Empire State Plaza
3140 Cultural Education Center
Albany, NY 12230
(518) 474-5816
fax (518) 473-8496

NORTH CAROLINA
North Caroline Geological Survey
Department of Environment, Health, and Natural Resources
P.O. Box 27687
Raleigh, NC 27611-7687
(919) 733-3833
fax (919) 733-4407

NORTH DAKOTA
North Dakota Geological Survey
600 East Boulevard Avenue
Bismark, ND 58505-0840
(701) 328-9700
fax (701) 328-9898

OHIO
Ohio Department of Natural Resources
Ohio Geological Survey
4383 Fountain Square
Columbus, OH 43224-1362
(614) 265-6576
fax (614) 447-1918

OKLAHOMA
Oklahoma Geological Survey
100 East Boyd, Room N-131
Norman, OK 73019-0628
(405) 325-3031
fax (405) 325-7069

OREGON
Oregon Department of Geology and Mineral Industries
800 Northeast Oregon Street No. 28
Portland, OR 97232
(503) 731-4100
fax (503) 731-4066

PENNSYLVANIA
Pennsylvania Bureau of Topographic and Geologic Survey
Department of Environmental Resources
P.O. Box 8453
Harrisburg, PA 17105-8453
(717) 787-2169
fax (717) 783-7267

RHODE ISLAND
Office of the Rhode Island State Geologist
Department of Geology
University of Rhode Island
Kingston, RI 02881
(410) 792-2265
fax (401) 792-2190

SOUTH CAROLINA
South Carolina Geological Survey
5 Geology Road
Columbia, SC 29210-4089
(803) 896-7708
fax (803) 896-7695

SOUTH DAKOTA
South Dakota Geological Survey
University of South Dakota Science Center
414 Clark Street
Vermillion, SD 57069-2390
(605) 677-5227
fax (605) 677-5898

TENNESSEE
Tennessee Division of Geology
401 Church Street
Life and Casualty Tower, 13th Floor
Nashville, TN 37243-0445
(615) 532-1500
fax (615) 532-0231

TEXAS
Texas Bureau of Economic Geology
The University of Texas at Austin
Box X, University Station
Austin, TX 78713-7508
(512) 471-1534
fax (512) 471-0140

UTAH
Utah Geological Survey
2363 South Foothill Drive
Salt Lake City, UT 84109-1492
(801) 467-7979
fax (801) 467-4070

VERMONT
Vermont Geological Survey
Agency of Natural Resources
103 South Main Street
Center Building
Waterbury, VT 05671-03001
(802) 241-3496
fax (802) 244-1102

VIRGINIA
Virginia Division of Mineral Resources
P.O. Box 3667
Charlottesville, VA 22903
(804) 293-5121
fax (804) 293-2239

WASHINGTON
Washington Department of Natural Resources
Division of Geology and Earth Resources
P.O. Box 47007
Olympia, WA 98504-7007
(360) 902-1000
fax (360) 902-1785

WEST VIRGINIA
West Virginia Geologic and Economic Survey
Mont Chateau Research Center
P.O. Box 879
Morgantown, WV 26507-0879
(304) 594-2331
fax (304) 594-2575

WISCONSIN
Wisconsin Geological and Natural History Survey
3817 Mineral Point Road
Madison, WI 53705-5100
(608) 262-1705
fax (608) 262-8086

WYOMING
Geological Survey of Wyoming
Box 3008
University Station
Laramie, WY 82071-3008
(307) 766-2286
fax (307) 766-2605

X1.2 *U.S. Territories*:

GUAM
Department of Agriculture
P.O. Box 2950
Agana GU 96910
(671) 734-3948

NORTHERN MARIANA ISLANDS
Natural Resources Department
Office of the Governor
Saipan MP 96950
(670) 322-9830

PUERTO RICO
Puerto Rico Department of Natural Resources
Division of Geology
Box 5887
Puerta de Tierra Station
San Juan PR 00906
(809) 722-2526
fax (809) 724-0365

U.S. VIRGIN ISLANDS
Department of Planning and Natural Resources
Nisky Center, Suite 231
St. Thomas, VI 00802
(809) 774-3320

X1.3 *Canada*:

ALBERTA
Alberta Department of Energy
Geological Survey
9945 10th Street
Edmonton, Alberta T5K 2G6 Canada
(403) 422-1984
fax (403) 422-1449

BRITISH COLUMBIA
Geological Survey Branch
1810 Blanshard Street, 5th Floor
Victoria British, Columbia V8V 1X4 Canada
(604) 952-0372
fax 952-0371

MANITOBA
Geological Survey Branch
535-330 Graham Avenue
Winnipeg, Manitoba R3C 4E3 Canada
(204) 945-6559
fax (204) 945-1406

NEW BRUNSWICK
Geological Surveys Branch
Box 6000
Fredericton, New Brunswick E3B 5H1 Canada
(506) 453-2206
fax (506) 453-3671

NEWFOUNDLAND AND LABRADOR
Geological Survey
Box 8700
St. John's Newfoundland A1B 4J6 Canada
(709) 729-2763
fax (709) 729-3493

NORTHWEST TERRITORIES
Geology Division
Box 1500
Yellowknife, Northwest Territories X1A 2R3 Canada
(403) 920-8210
fax (403) 873-5763

NOVA SCOTIA
Department of Natural Resources
Box 698
Halifax, Nova Scotia B3J 2T9 Canada
(902) 424-5618
fax (902) 424-7735

ONTARIO
Geological Survey
933 Ramsey Lake Road
Sudbury, Ontario P3E 6B5 Canada
(705) 670-5758
fax (705) 670-5759

QUEBEC
Ministere des Ressources Naturelles du Quebec
5700 4e Avenue Quest Local A-214
Charlesbourg, Quebec G1H 6RI Canada
(418) 643-5159
fax (418) 643-2816

SASKATCHEWAN
Geology and Mines Division
1914 Hamilton Street
Regina, Saskatchewan S4P 4V4 Canada
(306) 787-2568
fax (306) 787-7338

YUKON TERRITORY
Exploration and Geological Services Division
345-300 Main Street
Whitehorse, Yukon Territory Y1A 2B5 Canada
(403) 667-3201
fax (403) 668-3198

X2. State sources of information about abandoned water wells

ALABAMA
Dept. of Environmental Management
Well Standards Program
P.O. Box 301463-1463
Montgomery, AL 36130
(205) 271-7790

ALASKA
Dept. of Natural Resources
Division of Water
P.O. Box 77211
Eagle River, AK 99577-2116
(907) 696-0070

ARIZONA
Dept. of Water Resources
500 North Third Street
Phoenix, AZ 85004-3903
(602) 417-2470

ARKANSAS
Soil and Conservation Commission
101 E. Capitol, Suite 350
Little Rock, AR 72201
(501) 682-1611

CALIFORNIA
Dept. of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001
(916) 327-8861

COLORADO
State Engineer's Office
Division of Water Resources
1313 Sherman Street, Room 818
Denver, CO 80203
(303) 866-3581

or

Division of Water Resources
Records Department
1313 Sherman Street
Denver, CO 80203
(303) 866-3447

CONNECTICUT
Dept. of Consumer Protection
Division of Occupational and Professional Licensing
Capitol Avenue 180
Hartford, CT 06106

(203) 566-3290

DELAWARE
Dept. of Natural Resources
Division of Environmental Control
89 Kings Highway
Dover, DE 19901
(302) 739-3665

DISTRICT OF COLUMBIA
Dept. of Consumer and Regulatory Affairs
Environmental Regulations Administration
2100 Martin Luther King Jr. Avenue, Suite 2
Washington, DC 20020
(202) 645-6601

FLORIDA
Dept. of Environmental Protection
2600 Blairstone Road
Tallahassee, FL 32399-2400
(904) 488-3601

GEORGIA
Water Well Standards Advisory Council
19 Martin Luther King Jr. Drive, SW
Room 400
Atlanta, GA 30334
(404) 656-3214

HAWAII
Dept. of Natural Resources
Commission and Water Resource Management
P.O. Box 621
Honolulu, HI 96809
(808) 587-0215

IDAHO
Dept. of Water Resources
1301 N. Orchard
Boise, ID 83726
(208) 327-7900

ILLINOIS
Division of Environmental Health
Dept. of Public Health
525 W. Jefferson Street
Springfield, IL 62761
(217) 782-5830

or

Illinois State Water Survey
(217) 333-2210

INDIANA
Dept. of Natural Resources
402. W. Washington Street
Indianapolis, IN 46204
(317) 232-1118

IOWA
Dept. of Natural Resources
Wallace State Office Bldg.
Des Moines, IA 50319-0034
(515) 281-8998

KANSAS
Dept. of Health and Environment
Forbes Field, Building 283
Topeka, KS 66620
(913) 296-5522

KENTUCKY
Division of Water
Ground Water Branch
14 Reilly Road
Frankfort, KY 40601
(502) 564-3410

LOUISIANA
Dept. of Transportation and Development
P.O. Box 94245
Baton Rouge, LA 70804
(504) 379-1434
MAINE
Dept. of Human Services
Division of Health Services
Station No. 10, Statehouse
Augusta, ME 04333
(207) 287-5680

or

Maine Geological Survey
Department of Conservation
Station No. 22 Statehouse
Augusta, ME 04333-0022
(207) 289-2801 (or 287-2801)
fax (207) 289-2353

MARYLAND
Dept. of Environment
2500 Broening Highway
Baltimore, MD 21224
(410) 631-3168

MASSACHUSETTS
Division of Water Resources
100 Cambridge Street
Boston, MA 02202
(617) 727-3267

MICHIGAN
Well Construction Unit
Dept. of Environmental Quality
3423 N. Martin Luther King Jr. Boulevard
P.O. Box 30195
Lansing, MI 48909
(517) 335-9183
fax (517) 335-9434

MINNESOTA
Dept. of Health
Metro Square Building, Ste. 220
P.O. Box 64975
St. Paul, MN 55164-0975
(612) 215-0810

MISSISSIPPI
Dept. of Environmental Quality
Office of Land and Water Resources
P.O. Box 10631
Jackson, MS 39289-0631
(601) 961-5332

MISSOURI
Dept. of Natural Resources
Division of Geology and Land Survey
111 Fairgrounds Road
P.O. Box 250
Rolla, MO 65402
(573) 368-2100
MONTANA
Board of Waterwell Contractors
1520 E. Sixth Avenue
Helena, MT 59620
(406) 444-6643
NEBRASKA
Dept. of Health
Box 95007
Lincoln, NE 68509-5007
(402) 471-0598

NEVADA
State Engineer's Office
Division of Water Resources

123 W. Nye Lane
Carson City, NV 89710
(702) 687-3861

NEW HAMPSHIRE
Water Well Board
Water Management Bureau
P.O. Box 2008
Concord, NH 03302
(603) 271-3406

NEW JERSEY
Bureau of Water Allocation
Dept. of Environmental Protection
CN-426
Trenton, NJ 08625
(609) 984-6831

NEW MEXICO
Chief, Water Rights Division
State Engineers Office
P.O. Box 25102
Santa Fe, NM 87504-5102
(505) 827-6120

NEW YORK
Department of Health
Bureau of Community Sanitation and Food Protection
2 University Place, Room 404
Albany, NY 12203
(518) 458-6706

or

Department of Health
Bureau of Public Water Supply
2 University Place
Albany, NY 12203-3313

NORTH CAROLINA
Division of Water Quality
Ground Water Section
P.O. Box 29578
Raleigh, NC 27626-0578
(919) 715-6160
fax (919) 715-0588

NORTH DAKOTA
Division of Water Quality
1200 Missouri Avenue
Bismarck, ND 58504
(701) 328-5210

or

Board of Water Well Contractors
900 East Boulevard
Bismarck, ND 58505-0850
(701) 328-2757
fax (701) 328-3696

OHIO
Dept. of Health
Private Water Systems and Household Sewage Disposal
246 N. High Street
Columbus, OH 43266
(614) 466-1909

OKLAHOMA
Oklahoma Water Resources Board
3800 N. Classen
Oklahoma City, OK 73118
(405) 530-8900
fax (405) 530-8800

OREGON
Water Resources Department
290 North Central Street
Coquille, OR 97423
(503) 396-3121, ext. 254

PENNSYLVANIA
Dept. of Environmental Resources
Bureau of Topographic and Geologic Survey
P.O. Box 8453
Harrisburg, PA 17105-8453
(717) 787-5828

RHODE ISLAND
Dept. of Environmental Management
Division of Ground Water
291 Promenade Street
Providence, RI 02908
(401) 277-4700

SOUTH CAROLINA
Dept. of Health and Environmental Control
Ground Water Protection Division
2600 Bull Street
Columbia, SC 29201
(803) 734-5329

SOUTH DAKOTA
Dept. of Environmental and Natural Resources
Division of Water Rights
Joe Foss Building, 523 E. Capitol
Pierre, SD 57501-3181
(605) 773-3352

TENNESSEE
Division of Water Supply
401 Church Street, L and C Tower, 6th Floor
Nashville, TN 37243-1549
(615) 532-0176
fax (615) 532-0503

TEXAS
Texas Natural Resources Conservation Commission
P.O. Box 13087, MC 177
Austin, TX 78711-3087
(512) 239-0530

UTAH
Water Rights Division
1636 West North Temple, No. 220
Salt Lake City, UT 84116-3156
(801) 538-7382 or
(801) 538-7416

VERMONT
Dept. of Environmental Conservation
Water Supply Division
103 S. Main Street, 10N, The Old Pantry
Waterbury, VT 05671-0403
(802) 241-3400

VIRGINIA
Dept. of Health
Office of Environmental Health
P.O. Box 2448, Ste. 117

Richmond, VA 23218
(804) 786-1750

WASHINGTON
Dept. of Ecology
Mail Stop PV-11
Olympia, WA 98504-8711
(206) 459-6122

or

Washington State Department of Ecology
Water Resources Division
(Southwest Regional Office)
P.O. Box 47600
Olympia, WA 98504
(360) 407-6600

or

Washington State Department of Ecology
Water Resources Division
(Northwest Regional Office)
3190 160th Avenue SE
Bellevue, WA 98008-5452

or

Washington State Department of Ecology
Water Resources Division
(Central Regional Office)
15 W. Yakima Avenue
Yakima, WA 98902-3401
(509) 575-3800

or

Washington State Department of Ecology
Water Resources Division
(Eastern Regional Office)
N. 4601 Monroe, Suite 100
Spokane, WA 99205-1285
(509) 456-2926

WEST VIRGINIA
Dept. of Health
1800 Washington Street, East
Charleston, WV 25305
(304) 558-2981

WISCONSIN
Dept. of Natural Resources
Bureau of Water Supply
Private Water Supply Section
Box 7921
Madison, WI 53707
(608) 267-7649

WYOMING
State Engineer's Office
4E Herschler Building
Cheyenne, WY 82002
(307) 777-6160

X3. State Depositories for Oil and Gas Well Information

ALABAMA
State Oil and Gas Board of Alabama
P.O. Drawer O
420 Hackberry Lane
Tusccaloosa, AL 35486-9780
(205) 349-2852
fax (205) 349-2861

ALASKA
Alaska Oil and Gas Conservation Commission
3001 Porcupine Drive
Anchorage, AK 99501-3192
(907) 279-1433
fax (907) 276-7542

ARIZONA
Arizona Oil and Gas Conservation Commission
1645 West Jefferson, Suite 420
Phoenix, AZ 85007
(602) 255-5161
or
Arizona Geological Survey
416 W. Congress Street, Ste. 100
Tucson, AZ 85701-1315
(520) 770-3500
fax (520) 770-3505

ARKANSAS
Arkansas Oil and Gas Commission
P.O. Box 1472
2215 W. Hillsboro
El Dorado, AR 71731-1472
(501) 862-4965
fax (501) 862-8823

CALIFORNIA
California Department of Conservation
Division of Oil, Gas, and Geothermal Resources
801 "K" Street, 20th Floor
Sacramento, CA 95814-3530
(916) 445-9686
fax (916) 323-0424

COLORADO
Colorado Oil and Gas Commission
1120 Lincoln Street, Suite 801
Denver, CO 80203
(303) 894-2100
fax (303) 894-2109

FLORIDA
Florida Department of Natural Resources
Geological Survey
Dept. of Environmental Protection
Gunter Building
903 West Tennessee Street
Tallahassee, FL 32304-7700
(904) 488-4191
fax (904) 488-8086

GEORGIA
Georgia Department of Natural Resources
Geological Survey
19 Martin Luther King Drive, SW, Room 400
Atlanta, GA 30334
(404) 656-3214
fax (404) 657-8379

IDAHO
Idaho Oil and Gas Conservation Commission
Department of Lands
P.O. Box 83720
Boise, ID 83720-0050
(208) 334-0200
fax (208) 334-2339

ILLINOIS
Department of Natural Resources

Office of Mines and Minerals
Division of Oil and Gas
524 South Second Street
Springfield, IL 62701–1787
(217) 782-7756
fax (217) 524-4819

INDIANA
Indiana Department of Natural Resources
Division of Oil and Gas
402 W. Washington Street, Room W293
Indianapolis, IN 46204
(317) 232-4055
fax (317) 232-1550

IOWA
Iowa Department of Natural Resources
Geological Survey Bureau
109 Trowbridge Hall
Iowa City, IA 52242-1319
(319) 335-1575
fax (319) 335-2754
KANSAS
Kansas Corporation Commission
Oil and Gas Division
1500 SW Arrowhead Road
Topeka, KS 66604
(913) 271-3100
fax (913) 271-3354
or
Oil and Gas Conservation Division
130 S. Market, Room 2078
Finney State Office Building
Wichita, KS 67202
(316) 337-6200
fax (316) 337-6211

KENTUCKY
Kentucky Department of Mines and Minerals
Oil and Gas Division
P.O. Box 14090
3572 Iron Works Road
Lexington, KY 40512–4090
(606) 246-2026
fax (606)-246-2038

LOUISIANA
Louisiana Office of Conservation
P.O. Box 94275
625 N. 4th Street
Baton Rouge, LA 70804–9275
(504) 342-5540
fax (504) 342-3094

MARYLAND
Maryland Department of the Environment
Water Management Administration
Tawes State Office Building
580 Taylor Avenue
Annapolis, MD 21401
(410) 974-3846
fax (410) 974-5067
or
Maryland Geological Survey
2300 St. Paul Street
Baltimore, MD 21218–5210
(410) 554-5504
fax (410) 554-5502

MICHIGAN
Michigan Department of Natural Resources
Subsurface Geology Section
Box 30028
Lansing, MI 48909
(517) 373-2329
fax (517) 335-3264
or
Michigan Geological Survey
735 E. Hazel Street
Box 30256
Lansing, MI 48909–7756
(517) 334-6923
fax (517) 334-6038
or
Michigan Public Service Commission
Gas Division
P.O. Box 30221
Lansing, MI 48909
(517) 334-7178
fax (517) 882-5170

MISSISSIPPI
State Oil and Gas Board of Mississippi
500 Greymount Avenue, Ste. E
P.O. Box 1332
Jackson, MS 39205
(601) 354-7114
fax (601) 354-6873

MISSOURI
Missouri Department of Natural Resources
Division of Geology and Land Survey
111 Fairgrounds Road
P.O. Box 250
Rolla, MO 65401
(573) 368-2100
or
State Oil and Gas Council
Department of Natural Resources
Division of Geological and Land Survey
P.O. Box 250
Rolla, MO 65401
(573) 368-2100
fax (573) 368-2111

MONTANA
Montana Board of Oil and Gas Conservation
2535 St. John's Avenue
Billings, MT 59102
(406) 656-0040
fax (406) 657-1604
NEBRASKA
Nebraska Oil and Gas Commission
Box 399
922 Illinois
Sidney, NE 69162
(308) 254-6919
fax (308) 254-6922

NEVADA
Nevada Department of Business and Industry
Division of Minerals Resources
400 W. King Street, Ste. 106
Carson City, NV 89710
(702) 687-5050
fax (702) 687-3957
NEW MEXICO
New Mexico Energy, Minerals and Natural Resources Department
Oil Conservation Division
2040 S. Pacheco Street
Santa Fe, NM 87505
(505) 827-7132
fax (505) 827-8177

NEW YORK
New York Department of Environmental Conservation
Division of Mineral Resources
50 Wolfe Road, Room 202
Albany, NY 12233–6500
(518) 457-9337
fax (518) 457-9298

NORTH CAROLINA
North Carolina Department of Environment, Health and Natural Resources

Division of Land Resources
P.O. Box 27687
Raleigh, NC 27611
(919) 733-3833
fax (919) 733-4407

NORTH DAKOTA
North Dakota Industrial Commission
Oil and Gas Division
600 East Boulevard, State Office Building
Bismarck, ND 58505–0804
(701) 328-9900
fax (701) 328-9898

OHIO
Ohio Department of Natural Resources
Division of Oil and Gas
4383 Fountain Square Ct.
Building B, 3rd Floor
Columbus, OH 43224
(614) 265-6893
fax (614) 268-4316

OKLAHOMA
Oklahoma Corporation Commission
Jim Thorpe Building, Room 240
P.O. Box 52000–2000
Oklahoma City, OK 73152-2000
(405) 521-2211
fax (405) 521-6045
or
Oklahoma Oil and Gas Conservation Division
P.O. Box 52000
Oklahoma City, OK 73152
(405) 521-2302
fax (405) 521-3099

OREGON
Oregon Department of Geology and Mineral Industry

800 NE Oregon Street No. 28
Ste. 965
Portland, OR 97232
(503) 731-4100
fax (503) 731-4066

PENNSYLVANIA
Pennsylvania Division of Oil and Gas Regulation
1205 Kossman Building
Pittsburgh, PA 15222
(412) 565-5075
or
Department of Environmental Protection
Bureau of Oil and Gas Management
Rachel Carson State Office Building
400 Market Street, 5th Floor
Harrisburg, PA 17105–8765
(717) 772-2199
fax (717) 772-2291

SOUTH CAROLINA
Dept. of Health and Environmental Control
Bureau of Solid and Hazardous Waste Management
Division of Hydrogeology
2600 Bull Street
Columbus, SC 29201
(803) 896-4000
fax (803) 896-4002

SOUTH DAKOTA
South Dakota Dept. of Environment and Natural Resources
Western Field Office, Oil and Gas
2050 West Main, Ste. 1
Rapid City, SD 57702
(605) 394-2229
fax (605) 394-5317

TENNESSEE
Tennessee Oil and Gas Board
Dept. of Environment and Conservation
Division of Water Supply
401 Church Street, L and C Tower
Nashville, TN 37243–1549
(615) 532-0166
fax (615) 532-0503

TEXAS
Texas Railroad Commission
P.O. Drawer 12967
Austin, TX 78711–2967
(512) 463-7288
fax (512) 463-7161

UTAH
Utah State Division of Oil, Gas, and Mining
355 W. North Temple
3 Triad Center, Ste. 350
Salt Lake City, UT 84180–1203
(801) 538-5340
fax (801) 359-3940
or
Well Records Section
1594 West North Temple
Box 145801
Salt Lake City, UT 84114–5801
(801) 538-5340

VIRGINIA
Virginia Division of Mines and Quarries
219 Wood Avenue
Big Stone Gap, VA 22219
(703) 523-0335
or
Virginia Department of Mines, Minerals, and Energy
202 N. 9th Street, 8th Floor
Richmond, VA 23219
(804) 692-3200
fax (804) 692-3237
or
Virginia Division of Gas and Oil
P.O. Box 1416
Abingdon, VA 24212
(703) 676-5423
fax (703) 676-5459

WASHINGTON
Washington Department of Natural Resources
Oil and Gas Conservation Committee
PT 12
Olympia, WA 98504
(206) 459-6372
or
Dept. of Natural Resources
Division of Geology and Earth Resources
P.O. Box 47007
Olympia, WA 98504–7007
(360) 902-1450
fax (360) 902-1785

WEST VIRGINIA
West Virginia Department of Mines
1615 Washington Street, East
Charleston, WV 25311
(304) 348-2055
or
Oil and Gas Conservation Commission
No. 10 McJunkin Road
Nitro, WV 25143–2506
(304) 759-0516
fax (304) 759-0529
or
Division of Environmental Protection
Office of Oil and Gas
No. 10 McJunkin Road
Nitro, WV 25143–2506
(304) 759-0514

fax (304) 759-0529

WYOMING
Wyoming Oil and Gas Conservation Commission
123 South Durbin Street
P.O. Box 2640
777 W. 1st Street
Casper, WY 82602
(307) 234-7147
fax (307) 234-5306

X4. Sources of Aerial Photographs

National Space Science Data Center
NASA Goddard Space Flight Center
Greenbelt, MD 20771

EROS Data Center
U.S. Geological Survey
Mundt Federal Building
Sioux Falls, SD 57198

Media Services Branch
Still Photograph Library
NASA Johnson Space Center
P.O. Box 58425, Mail Code AP3
Houston, TX 77258–8425

Natural Resources and Conservation Service
(formerly Soil Conservation Service)
National Cartography and Spatial Center
Forth Worth Federal Center
Bldg. 23, Room 60
P.O. Box 6567
Forth Worth, TX 76115–0567
(800) 672-5567

Natural Resources and Conservation Service
State and County Field Offices

U.S. Geological Survey
National Cartographic Information Center
507 National Center
Reston, VA 22092

U.S. Geological Survey
Information Services
Box 25286, Federal Center
Denver, CO 80225

X5. Sources of Imagery

Canadian Centre for Remote Sensing
2464 Sheffield Road
Ottawa Ontario Canada K1A 0Y7

Earthnet User Services
ESA-ESRIN
Via Galileo Galilei
00044 Frascati Italy

EOSAT
4300 Forbes Boulevard
Lanham, MD 20706–9954

ISRO
Cauvery Bhavan
Kempegowda Road
Bangalore 560 009 India

Media Services
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91109

SPOT Image
18 Avenue Eduoard Belin
31055 Toulouse CEDEX France

X6. Source of Airborne Magnetic Surveys

National Geophysical Data Center
NOAA E/GC3
325 Broadway (Code 895)
Boulder, CO 80303–3328

REFERENCES

(**1**) Aller, L, "Methods for Determining the Locations of Abandoned Wells," *National Water Well Association*, EPA-600/2-83-123, 1984.

(**2**) Colwell, R.N., ed., "Manual of Remote Sensing," 2nd edition, *American Society of Photogrammetry*.

(**3**) Frischknecht, F.C., Muth, L., Grette, R., Buckley, T., and Kornegay, B, 1983, "Geophysical Methods for Locating Abandoned Wells," U.S. Geological Survey Open File Report 83-702, 1983.

(**4**) Frischnecht, F.C., Grette, R., Raab, P.V., and Meredith, J., "Location of Abandoned Wells by Magnetic Surveys: Acquisition and Interpretation of Aeromagnetic Data for Five Test Areas," U.S. Geological Survey Open File Report 85-614A, 1985.

(**5**) Johnson, D.H., Carrol, H.B., Heemstra, F.E., "How to Find Abandoned Oil and Gas Wells, *U.S. Bureau of Mines Information Circular 8578*, 1973.