GROUND WATER RESOURCES

Davis County

Open File Report 80-26 WRD
Compiled by PATRICIA M. WITINOK
GROUND WATER RESOURCES OF DAVIS COUNTY

Introduction

Approximately 63% of the residents of Davis County rely on ground water as the source of their drinking water. It is estimated that the use of ground water in the county currently approaches .35 billion gallons per year. For comparison, this amount would provide each resident with 104 gallons of water a day during the year. Actually, few if any households use this much water, and the rather large annual per capita use reflects the greater water requirements of the county's industries, agribusinesses, and municipalities.

The users of ground water in the county draw their supplies from several different geologic sources. Several factors must be considered in determining the availability of ground water and the adequacy of a supply source:

- **distribution** - having water where it is needed,
- **accessibility** - affects the costs for drilling wells and pumping water,
- **yield** - relates to the magnitude of the supply that can be sustained,
- **quality** - determines for what purposes the water can be used.

In terms of these factors, there are few locations in Davis County where the availability of ground water is not limited to some degree. The most common limitation is poor water quality, that is, highly mineralized ground water. Secondary limitations are generally related to poor distribution, small yields from some sources, and poor accessibility due to the great depth to more adequate sources.

Occurrence of Ground Water in Davis County

The occurrence of ground water is influenced by geology -- the position and their physical and chemical make-up. Geologic units that store and transmit water and yield appreciable amounts to wells are called aquifers. The best aquifers are usually composed of unconsolidated sand and gravel, porous sandstone, and porous or fractured limestone and dolostone. Other units with materials such as clay and silt, shale, siltstone, and mudstone yield little or no water to wells. These impermeable units are called aquicludes or aquitards and commonly separate one aquifer unit from another.

In Davis County there are four principal aquifers from which users obtain water supplies. The loose, unconsolidated materials near the land surface comprise the surficial aquifer. Below this there are three major rock aquifers -- the Mississippian, the Devonian, and the Cambro-Ordovician aquifers. Figure 1 shows the geologic relation of these beneath the county. Each of the aquifers has its own set of geologic, hydrologic, and water quality characteristics which determine the amount and potability (suitability for drinking) of water it will yield.
Surficial Aquifers

Unconsolidated deposits at the land surface are comprised of mixtures of clay, silt, sand, gravel, and assorted boulders. The water-yielding potential of surficial deposits is greatest in units composed mostly of sand and/or gravel. Three types of surficial aquifers are used: the alluvial aquifer, the drift aquifer, and the buried channel aquifer.

The alluvial aquifer consists mainly of the sand and gravel transported and deposited by modern streams and makes up the floodplains and terraces in major valleys. Alluvial deposits are shallow, generally less than 50-60 feet and thus may be easily contaminated by the infiltration of surface water.

The drift aquifer is the thick layer of clay to boulder size material deposited over the bedrock by glacial ice which invaded the county at least twice in the last two million years. The composition of the glacial drift varies considerably and in many places does not yield much water. There are, however, lenses or beds of sand and gravel within the drift which are thick and widespread enough to serve as dependable water sources. These lenses are difficult to locate because they are irregular in shape and buried within the drift deposits. Usually one or two sand layers can be found in most places that will yield minimum water supplies for domestic wells.

The buried channel aquifer consists of stream alluvium of partially filled valleys that existed before the glacial period. The valleys were overridden by the glaciers and are now buried under glacial and recent alluvial deposits.

The distribution, yield, and water quality characteristics for the surficial aquifers are summarized in Figures 2, 9, and 13. An indication of accessibility can be obtained by comparing the elevations of the top (the land surface) and the bottom (the bedrock surface) of the surficial deposits from Figures 4 and 5. The thickness of the glacial drift and the depth of the buried channels are determined by subtracting the elevations at selected locations.

Rock Aquifers

Below the surficial materials is a thick sequence of layered rocks formed from deposits of rivers and shallow seas that have covered the state within the last 600 million years. The geologic map (Figure 3) shows the geologic units which form the top of this rock sequence. These rocks are Pennsylvanian in age and are shales. Although the Pennsylvanian rocks usually act as an aquiclude, there are locally sandstone layers (particularly in the northwestern area of Bloomfield 30-90 feet thick and going south east to Pulaski 5-10 feet thick) which supply small yields to domestic wells. The Pennsylvanian rocks are found generally underlying the whole county, except for a couple of patches in north-central and northeast parts of the county (refer to Figure 3). They are found to be the thickest in the southwestern corner, up to 230 feet thick and in the extreme northwest corner, up to 210 feet.

Underlying the Pennsylvanian aquiclude is a sequence of older rocks, portions of which form the three major rock aquifers in Davis County. This sequence and its water-bearing characteristics are shown in Table 1.
Figure 1

BLOCK DIAGRAM SHOWING THE GEOLOGY OF DAVIS COUNTY
Examples of the rock units encountered in several wells at various locations in Davis County are indexed and illustrated in Figures 7 and 8. The geologic unit that supplies ground water and the rate of yield are shown for each well.

The relative accessibility of ground water in rock aquifers depends on the depth to the aquifer. The deeper a well must be, the greater the cost for well construction and pumping. The depths to and thicknesses of units at specific sites will vary somewhat because of irregularities in the elevation of the land surface and in the elevation of the underlying rock units. Estimates of depths and thicknesses can be made by comparing Figure 4 with the maps of aquifer elevations in Figures 10, 11 and 12. The range in depth below land surface to the top of the county's principal bedrock aquifers is given for each township in Figure 6.

A second factor affecting ground water accessibility is the level to which the water will rise in a well (the static water level). Throughout the county water in the rock aquifers is under artesian pressure and rises in the well once the aquifer is penetrated. This can reduce the cost of pumping. Average static water levels for Davis County wells are shown in Figures 10, 11 and 12.

Average rates of yield and water quality characteristics for each of the aquifers are summarized in the maps in Figures 10, 11, 12, 13, 14 and 15.
<table>
<thead>
<tr>
<th>Age</th>
<th>Rock Unit</th>
<th>Description</th>
<th>Thickness Range</th>
<th>Hydrogeologic Unit</th>
<th>Water-Bearing Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary</td>
<td>Alluvium</td>
<td>Sand, gravel, silt and clay</td>
<td>Fair to large</td>
<td>Surficial aquifer</td>
<td>Fair to large yields (25 to 100 gpm)</td>
</tr>
<tr>
<td></td>
<td>Glacial drift</td>
<td>Predominantly till containing scattered irregular</td>
<td>0-320 (feet)</td>
<td>Low yields</td>
<td>Low yields (less than 10 gpm)</td>
</tr>
<tr>
<td></td>
<td>(undifferentiated)</td>
<td>bodies of sand and gravel</td>
<td></td>
<td></td>
<td>Small to large yields</td>
</tr>
<tr>
<td></td>
<td>Buried channel</td>
<td>Sand, gravel, silt and clay</td>
<td>Fair to large</td>
<td>Aquiclude</td>
<td>Low yields only from limestone and sandstone</td>
</tr>
<tr>
<td></td>
<td>deposits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsylvanian</td>
<td>Des Moines Series</td>
<td>Shale; sandstones; mostly thin</td>
<td>0-250</td>
<td>Aquiclude</td>
<td>Low yields only from limestone and sandstone</td>
</tr>
<tr>
<td></td>
<td>Meramec Series</td>
<td>Sandy limestone</td>
<td></td>
<td>Mississippian</td>
<td>Fair to low yields</td>
</tr>
<tr>
<td></td>
<td>Osage Series</td>
<td>Limestone and dolostone</td>
<td>150-500</td>
<td>Devonian aquifer</td>
<td>Does not yield water</td>
</tr>
<tr>
<td></td>
<td>Kinderhook Series</td>
<td>Limestone, oolitic, and dolostone, cherty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Devonian</td>
<td>Maple Mill Shale</td>
<td>Shale and siltstone; limestone in lower part</td>
<td>80-125</td>
<td>Devonian aquiclude</td>
<td>Does not yield water</td>
</tr>
<tr>
<td></td>
<td>Sheffield Formation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lime Creek Formation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cedar Valley Limestone</td>
<td>Limestone and dolostone; contains evaporites (gypsum)</td>
<td>125-250</td>
<td>Devonian aquifer</td>
<td>Fair to low yields</td>
</tr>
<tr>
<td></td>
<td>Wapsipinicon Formation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Galena Formation</td>
<td>Dolostone and chert</td>
<td></td>
<td>Minor aquifer</td>
<td>Low yields</td>
</tr>
<tr>
<td></td>
<td>Decorah Formation</td>
<td>Limestone, dolostone and thin shale includes sandstone in SE Iowa</td>
<td>650-850</td>
<td>Aquiclude</td>
<td>Does not yield water</td>
</tr>
<tr>
<td>Ordovician</td>
<td>Plateville Formation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>St. Peter Sandstone</td>
<td>Sandstone</td>
<td></td>
<td>Cambridian-Ordovician aquifer</td>
<td>Fair yields (over 500 gpm)</td>
</tr>
<tr>
<td></td>
<td>Prairie du Chien</td>
<td>Dolostone, sandy and cherty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Formation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambrian</td>
<td>Jordan Sandstone</td>
<td>Sandstone</td>
<td>50-95</td>
<td>Aquitard</td>
<td>Low yields</td>
</tr>
<tr>
<td></td>
<td>St. Lawrence Formation</td>
<td>Dolostone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Franconia Sandstone</td>
<td>Sandstone and shale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dresbach Group</td>
<td>Sandstone</td>
<td></td>
<td>Dresbach aquifer</td>
<td>High to low yields</td>
</tr>
<tr>
<td>Precambrian</td>
<td>Undifferentiated</td>
<td>Coarse sandstones: crystalline rocks</td>
<td></td>
<td>Base of ground-water reservoir</td>
<td>Not known to yield water</td>
</tr>
</tbody>
</table>
Figure 2

SURFICIAL MATERIALS

Legend:

- Alluvium
- Glacial Drift
- Buried Channels
Figure 3
GEOLOGIC MAP

Pennsylvanian aquiclude
Mississippian aquifer - Upper Part
Figure 4

ELEVATION OF LAND SURFACE IN FEET ABOVE MEAN SEA LEVEL
Figure 5
ELEVATION OF BEDROCK SURFACE IN FEET ABOVE MEAN SEA LEVEL

[Map showing the elevation of bedrock surface in feet above mean sea level with various shaded regions indicating different elevation ranges.]
Figure 6
RANGE IN DEPTH TO DAVIS COUNTY'S PRINCIPAL ROCK AQUIFERS

<table>
<thead>
<tr>
<th>Layer Type</th>
<th>R. 15 W.</th>
<th>R. 14 W.</th>
<th>R. 13 W.</th>
<th>R. 12 W.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-400</td>
<td>0-200</td>
<td>0-300</td>
<td>200-300</td>
</tr>
<tr>
<td>MISSISSIPPIAN</td>
<td>0-500</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
</tr>
<tr>
<td>DEVONIAN</td>
<td>650-1000</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
</tr>
<tr>
<td>CAMBRO-ORDOVICIAN</td>
<td>1800-2000</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
</tr>
<tr>
<td></td>
<td>0-400</td>
<td>0-200</td>
<td>0-300</td>
<td>200-300</td>
</tr>
<tr>
<td>MISSISSIPPIAN</td>
<td>200-500</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
</tr>
<tr>
<td>DEVONIAN</td>
<td>800-1100</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
</tr>
<tr>
<td>CAMBRO-ORDOVICIAN</td>
<td>1900-2200</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
</tr>
<tr>
<td></td>
<td>100-300</td>
<td>200-300</td>
<td>100-300</td>
<td>200-300</td>
</tr>
<tr>
<td>MISSISSIPPIAN</td>
<td>200-600</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
</tr>
<tr>
<td>DEVONIAN</td>
<td>850-1100</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
</tr>
<tr>
<td>CAMBRO-ORDOVICIAN</td>
<td>2000-2200</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
</tr>
<tr>
<td></td>
<td>100-200</td>
<td>100-200</td>
<td>100-200</td>
<td>100-200</td>
</tr>
<tr>
<td>MISSISSIPPIAN</td>
<td>200-400</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
<td>MISSISSIPPIAN</td>
</tr>
<tr>
<td>DEVONIAN</td>
<td>850-1050</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
<td>DEVONIAN</td>
</tr>
<tr>
<td>CAMBRO-ORDOVICIAN</td>
<td>2000-2200</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
<td>CAMBRO-ORDOVICIAN</td>
</tr>
</tbody>
</table>
Figure 7
INDEX MAP FOR TYPICAL WELLS IN DAVIS COUNTY
Figure 8
TYPICAL WELLS IN DAVIS COUNTY

1. Raymond Howard
2. Dr. K.G. Cook
3. Delbert Horman
4. J.C. Wisdom #1
5. S.C. Rogers
6. Boy Scout Camp
7. Pulaski Town Well

EXPLANATION
- Glacial Drift
- Shale
- Limestone-Dolostone
- Sand-Sandstone
- Chert
- Gypsum-Anhydrite

- Water Producing Unit
- Y Yield in gal/min
- NS No Sample
- Qp Quaternary-Pleistocene
- P Pennsylvanian
- M Mississippian
- D Devonian
- O Ordovician
- C Cambrian
Figure 9

SURFICIAL AQUIFERs

Water Levels

Water levels in the surficial aquifers are difficult to analyze, water rises to different levels in wells drilled into alluvial, buried-channel, and drift aquifers. The water table in the drift aquifer generally slopes from high land areas toward the streams and, changes noticeably throughout the year. Levels in drift and buried-channel aquifers respond rapidly to recharge from precipitation. Water levels in the alluvial aquifer fluctuates somewhat similar to those in the drift and buried-channel aquifers; however, the main influence on the alluvial aquifer is the stage (level) of the associated streams. Water levels will be high during periods of high stream stage and low during the low-stage periods.

Water levels in the drift aquifers commonly are from 10 to 50 feet below the land surface, and those in the buried-channel aquifers have been reported to be as low as 175 feet below the land surface. The water levels in alluvial wells are from 4 to 20 feet below the flood-plain surface and the depth to the water surface will be accordingly deeper in wells located on terrace surfaces.

Water yields to wells in gallons per minute

- Below 20
- 20-100
- 100-500
Figure 10

MISSISSIPPIAN AQUIFER

Elevation of Mississippian Aquifer in feet above mean sea level

Water levels in wells in feet above mean sea level

Upper-Part

Water yields to wells in gallons per minute

- Below 20
- 20-50

Dissolved solids content in milligrams per liter (mg/l)*

- 500-1000
- 1000-2500
- Above 2500

* Other water quality data in Figure 13
MISSISSIPPIAN AQUIFER

Lower Part

Water yields to wells in gallons per minute

Below 20

Dissolved solids content in milligrams per liter (mg/l) *

- 1000-2500
- 2500-5000
*Other water quality data in Figure 14
Figure 11

DEVONIAN AQUIFER

Elevation of the Devonian Aquifer in feet above mean sea level

Water levels in wells in feet above mean sea level

--- 50 foot contour

Water yields to wells in gallons per minute

Dissolved solids content in milligrams per liter (mg/l)*

*Other water quality date in Figure 15
Figure 12

CAMBRO-ORDOVICIAN (JORDAN) AQUIFER

Elevation of the Jordon aquifer in feet above sea level

Water levels in wells in feet above mean sea level

Water yields to wells in gallons per minute

- 500-1000
- Above 1000

Dissolved solids content in milligrams per liter (mg/l)*

- 1000-1500

*Other water quality data in Figure 15
To the user, the quality of ground water is as important as the amount of water that an aquifer will yield. As ground water moves through soil and rock materials, it dissolves some of the minerals which, in turn, affect water quality. In addition to mineral content, bacterial and chemical contamination may be introduced through poorly constructed wells and seepage from other pollution sources.

Recommended standards for common water constituents are described in the table above. These are rationally accepted as guidelines for acceptable drinking water supplies. Limits for uses other than drinking often differ from these. For instance, water that is unacceptable for drinking and household use may be completely satisfactory for industrial cooling.

From analyses of ground water averages (A) and ranges (R) of values in milligrams per liter (mg/l) for several mineral constituents are summarized in Figures 13, 14 and 15 for the 4 major aquifers in Davis County. Recommended concentrations for some constituents are often exceeded without obvious ill effects, although the water may be unpalatable. Water quality analyses for individual wells should be obtained to determine if concentrations of constituents that affect health are exceeded.
Surficial aquifers yield water which is least mineralized and of good quality. The alluvial and drift aquifers yield good quality water and in large amounts. The dissolved solids content tends to be a bit high, but is acceptable for drinking purposes if no other water is available. Water temperatures average 54°F (12.0°C) and the range of temperatures is from 48°F to 58°F (9.0°C to 14.5°C).

Good to fair water quality is available in the upper part of the Mississippian in area 1 and area 2 which is acceptable for many uses. The water is more highly mineralized than that typically found in the surficial aquifers and is usually very hard. The dissolved solids content gets increasingly higher from areas 1 to 3, where it is very high, and the sulfate concentrations also increase to where they greatly exceed recommended standards. Average water temperature is 55°F (13°C) and the range of temperatures is from 51°F to 60°F (10.5°C to 15.5°C).
Water in the lower part of the Mississippian aquifer is generally of poorer quality than found in the upper part. Throughout the county the water is exceptionally hard and sulfate concentrations greatly exceed recommended values. Total dissolved solids are extremely high and fluoride content is high in area 2. Average water temperature is 55°F (13°C), and the range of temperature from 51°F to 60°F (10.5°C to 15.5°C).
For the Devonian aquifer in this county, which is not a potable water source, there is no immediate data available, but from data extrapolation of nearby counties, the water quality is found to be very poor. The water is highly mineralized with sulfate, sodium, iron and manganese and has a very high content of dissolved solids, most likely in excess of 10,000 mg/l. Water temperatures are higher than that from the Mississippian aquifers sources averaging 60°F (15.5°C) and with a temperature range of 54°F to 64°F (12.0°C to 18.0°C).

This deep aquifer yields water of relatively good quality compared to the other rock aquifers. The water is noticeably hard and exceeds recommended standards for sulfates, fluorides and dissolved solids, but it is not as highly mineralized as that from parts of the Mississippian and Devonian aquifers. Water temperatures are higher than other rock aquifer sources averaging 72°F (22°C) and with a temperature range from 68°F to 76°F (20.0°C to 24.5°C).
RECOMMENDATIONS FOR PRIVATE WATER WELLS

Contracting for Well Construction

To protect your investment and guarantee satisfactory well completion, it is a good idea to have a written agreement with the well driller. The agreement should specify in detail:

- size of well, casing specifications, and types of screen and well seal
- methods of eliminating surface and subsurface contamination
- disinfection procedures to be used
- type of well development if necessary
- test pumping procedure to be used
- date for completion
- itemized cost list including charges for drilling per foot, for materials per unit, and for other operations such as developing and test pumping
- guarantee of materials, workmanship, and that all work will comply with current recommended methods
- liability insurance for owner and driller

Well Location

A well should be located where it will be least subject to contamination from nearby sources of pollution. The Iowa State Department of Health recommends minimum distances between a new well and pollution sources, such as cesspools (150 ft.), septic tanks (50 ft.), and barnyards (50-100 ft. and downslope from well). Greater distances should be provided where possible.

The well location should not be subject to flooding or surface water contamination. Select a well-drained site, extend the well casing a few feet above the ground, and mound earth around it. Diversion terraces or ditches may be necessary on slopes above a well to divert surface runoff around the well site.

In the construction of all wells care should be taken to seal or grout the area between the well bore and the well casing (the annulus) as appropriate so that surface water and other pollutants cannot seep into the well and contaminate the aquifer.

Locate a well where it will be accessible for maintenance, inspection, and repairs. If a pump house is located some distance from major buildings and wired separately for power, continued use of the water supply will not be jeopardized by fire in major buildings.
Water Treatment

Water taken from a private well should ideally be tested every six months. The University Hygienic Laboratory will do tests for coliform bacteria, nitrate, iron, hardness, and iron bacteria in drinking water for private individuals. Special bottles must be used for collecting and sending water samples to the laboratory. A sample kit can be obtained by writing to the University Hygienic Laboratory, University of Iowa, Oakdale Campus, Iowa City, Iowa 52242. Indicate whether your water has been treated with chlorine, iodine, or bromine; for different sample bottles must be used for treated and untreated water. The charge for the bacterial test is $3.00; for iron hardness and nitrate, it is $3.00; and for iron bacteria, $5.00. If your well is determined to be unsafe, advice for correcting the problem can be obtained from your county or state Department of Health. Several certified private laboratories also run water analyses.

Shock chlorination is recommended following the construction and installation of a well and distribution system and any time these are opened for repairs or remodeling a strong chlorine solution is placed in the well and complete distribution system to kill nuisance and disease-causing organisms. If the first shock chlorination does not rid the water supply of bacteria it should be repeated, if this does not solve the problem the well should be abandoned or the water should be continuously disinfected with proper chlorination equipment.

Since most of the ground waters in Davis County are mineralized, water softening and iron removal equipment may make water more palatable and pleasant to use. Softened water contains increased sodium, contact your physician before using a softener if you are on a sodium-restricted diet. Chlorination followed by filtration will remove most forms of iron and iron bacteria. Iron bacteria has no adverse effect on health but will plug wells, water lines, and equipment and cause tastes and odors. Iron removal equipment can be used if problems persist.

Well Abandonment

Wells taken out of service provide easy access for pollution to enter aquifers supplying water to other wells in the vicinity. Unprotected wells may also cause personal injury. Proper abandonment procedures should be followed to restore the natural condition that existed before well construction and prevent any future contamination. Permanent abandonment requires careful sealing. The well should be filled with concrete, cement grout, or sealing clays throughout its entire length. Before dug or bored wells are filled at least the top 10 feet of lining should be removed so surface waters will not penetrate the subsurface through a porous lining or follow cracks in or around the lining. The site should be completely filled and mounded with compacted earth.

ABANDONED WELLS SHOULD NEVER BE USED FOR DISPOSAL OR SEWAGE OR OTHER WASTES.
SOURCES OF ADDITIONAL INFORMATION

In planning the development of a groundwater supply or contracting for the drilling of a new well, additional information is often required. This section lists several types and sources of information.

State Agencies

Iowa Department of Natural Resources
Environmental Protection Division
Wallace Building
Des Moines, IA  50319-0034
(515)-281-8666

(Pollution problems, public drinking water, wastewater treatment, water quality, assistance to local communities, protection of surface and underground reservoirs, allocates water use, permits water use of 25,000 or more gallons per day)

Environmental Protection Division
Regional Office No. 6
117 N. 2nd Avenue
Washington, IA  52343
(319) 653-2135

(Municipal water supplies and waste water treatment routine sanitary inspections, local pollution problems, assistance to communities)

Energy and Geological Resources Division
Geological Survey Bureau
123 North Capitol Street
Iowa City, IA  52242
(319) 335-1575

(Geologic and groundwater data repository, consultant for well problems, well forecasting, hydrogeologic research, and related services)

Iowa Department of Public Health
Lucas Building
Des Moines, IA  50319
(515) 281-4942

(Promotes public health hygiene and sanitation; programs of health education, quality of health care)

University of Iowa Hygienic Laboratory
University of Iowa
Oakdale Campus
Iowa City, IA  52242
(319) 335-4500

(Water analyses)

Cooperative Extension Service
Iowa State University
Ames, IA  50011
(515) 294-4569

(Advice on water system design and maintenance)
Well Drillers and Contractors

The listing provided here was drawn from an Iowa Geological Survey mailing list and yellow pages of major towns in phone books. Those selected are within an approximate radius of 50 miles of Davis County. For a statewide listing contact either the Iowa Water Well Drillers Association, 4350 Hopewell Ave., Bettendorf, Iowa 51712, (319) 355-7528 or the Iowa Geological Survey, (319) 338-1173.

Bailey Well Co.
203 East Main
New London, Iowa 52645

Brooks Well and Pump Co.
Knoxville, Iowa 50138

Douglas Bruinekool
Bruinekool Well Co.
Pella, Iowa 50219

Dwayne Bruinekool
Bruinekool Well Co.
Oskaloosa, Iowa 52577

Campbell Well
701 South Columbia
Bloomfield, Iowa 52537

Detrick Well Co.
R.R. #1
New London, Iowa 52645

Hopson Well Drilling
R.R. 1
Hamilton, Illinois 62341

Kramer Well Co.
Mt. Pleasant, Iowa 52641

Neal Lyon Well Co.
Salem, Iowa 52649

Schilicher Bros. Well
Hwy. 34 West
Fairfield, Iowa 52556

Schilicher Well Co.
P.O. Box 207
Donnelson, Iowa 52625

Schmeiser Well Co.
1111 Hagemen St.
Burlington, Iowa 52601

Snook Well Co.
Promise City, Iowa 52583

Wilson Well Co.
R.R. #3
Burlington, Iowa 52601
Topographic Maps (Available from the Iowa Geological Survey)

<table>
<thead>
<tr>
<th>Map Title</th>
<th>Date (Published)</th>
<th>Scale</th>
<th>Contour Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blakesburg</td>
<td>1968-(76-1)*</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Blakesburg NE</td>
<td>1968-(76-1)</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Ottumwa South</td>
<td>1956</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Agency</td>
<td>1956</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Eldon</td>
<td>1965</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Unionville</td>
<td>1968</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Paris</td>
<td>1968</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Selma</td>
<td>1965</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Milton</td>
<td>1970</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Brock</td>
<td>1970</td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Ottumwa South SW</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Ottumwa South SE</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Moulton NW</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Moulton NE</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Pulaski NW</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Pulaski NE</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Moulton SW</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Moulton SE</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Pulaski SW</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
<tr>
<td>Pulaski SE</td>
<td></td>
<td>1:24,000</td>
<td>10 ft.</td>
</tr>
</tbody>
</table>

*Map photoinspected 1976-no major culture or drainage changes observed
Useful Reference Materials


