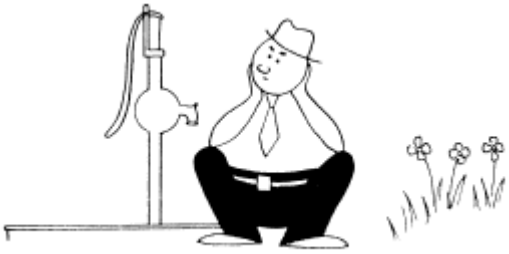
Pamphlet 2

"YOU NEVER MISS THE WATER---"



A FEW POINTERS ON GROUND WATER SUPPLIES

by

Jean L. Slaughter, Editor
James M. Campbell, Illustrator

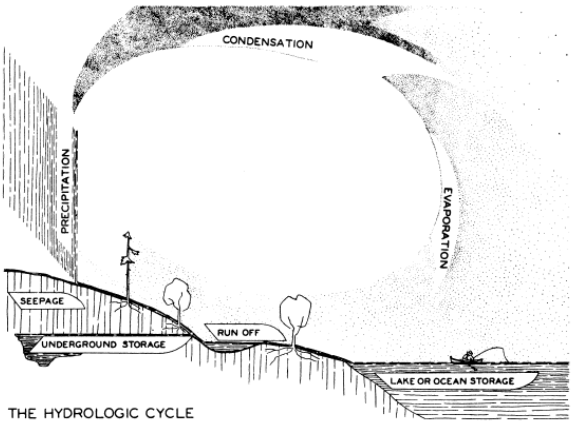
State of Michigan
Department of Natural Resources
Geological Survey Division
1952

The never-ending cycle of water -- from sea, to land, and back to sea again -- is continually being interrupted by man. If the natural behavior of the water cycle is disrupted too much by man's exploitation and lack of understanding of this dynamic resource, it is up to man to assist nature in repairing the damage and to plan for future, wiser use.

It is usually after man feels the consequences of misuse of a resource that he begins to realize the true meaning of conservation:

Provide the greatest possible use of the resource -- for the greatest number of people --

FUTURE GENERATIONS as well as present.

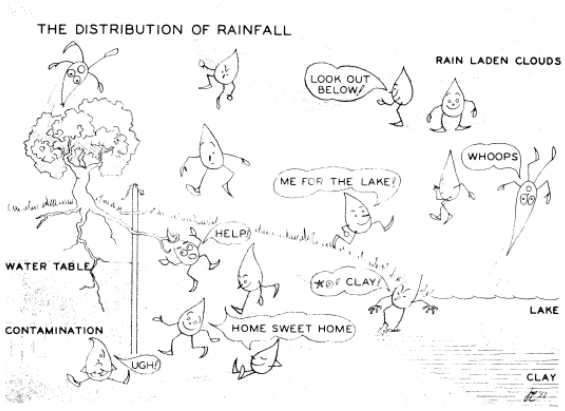


THE HYDROLOGIC CYCLE

Directly or indirectly, the source of our water supply is precipitation from clouds of oceanic origin.

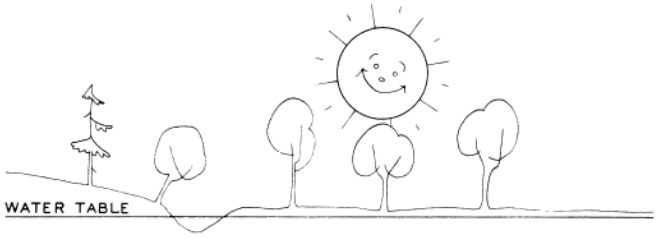
Runoff, evaporation, and vegetation demands usually leave only a small percentage of annual rainfall available for ground water recharge.

Abuse of watersheds accelerates runoff at the surface and further reduces the percentage which reaches the subsurface storage formations. Proper tillage of the soil and protection by adequate cover speed up beneficial infiltration.



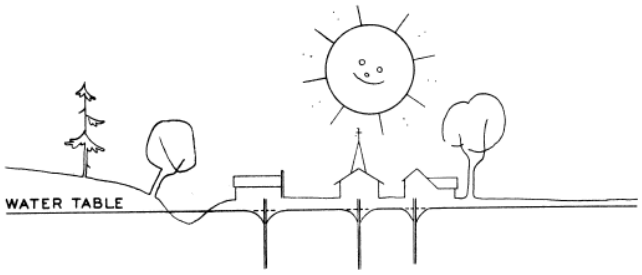
1. Water levels decline locally in response to pumping. This "drawdown" is necessary to cause water to flow toward the well.

Severe lowering can often be relieved by better distribution of wells.



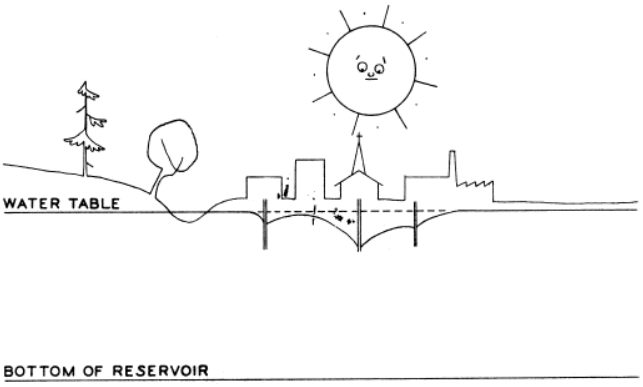
ORIGINAL CONDITION

2. In the early days of this village, wells did not interfere.



VILLAGE – PRIVATE WELLS

3. A larger production well was added, and the circles of influence overlapped. Each well is attempting to pump water that another well is also attempting to pump

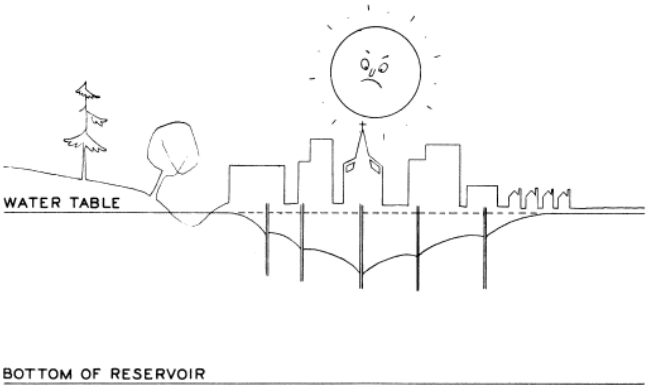


MUNICIPAL SUPPLY WITH OBVIOUS DRAWDOWN

4. The town recognized the need for more water, and more wells were drilled, but it did not recognize the need for spacing the wells far enough apart to avoid excessive interference.

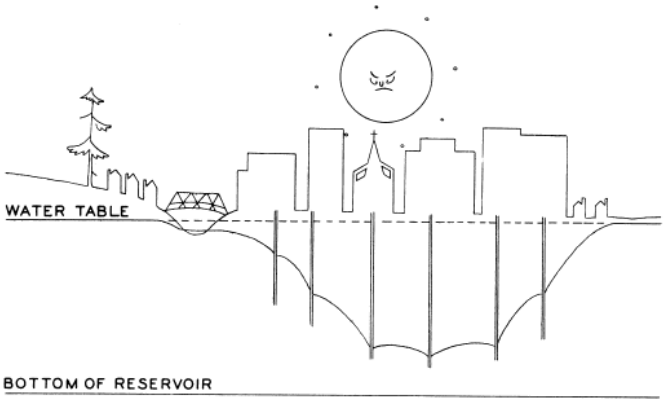
Water levels declined farther and farther and pumpage costs became higher and higher.

It was necessary for shallow wells to be deepened, and for pump settings to be lowered on the deep wells.



INDUSTRIAL AND MUNICIPAL EXPANSION – INCREASED DRAWDOWN

5. Local over-development is taking place in Michigan, but depletion of ground water resources by heavy pumping is not yet a major problem as it is in some sections of the Country.



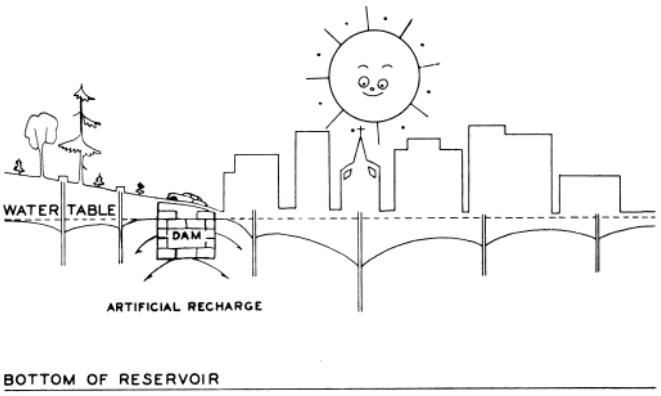
LOCAL OVERDEVELOPMENT

Proper spacing of wells is the important factor in preventing overdevelopment.

In some localities it is possible to artificially recharge depleted ground water reservoirs by diverting or spreading river water over the surface of the ground.

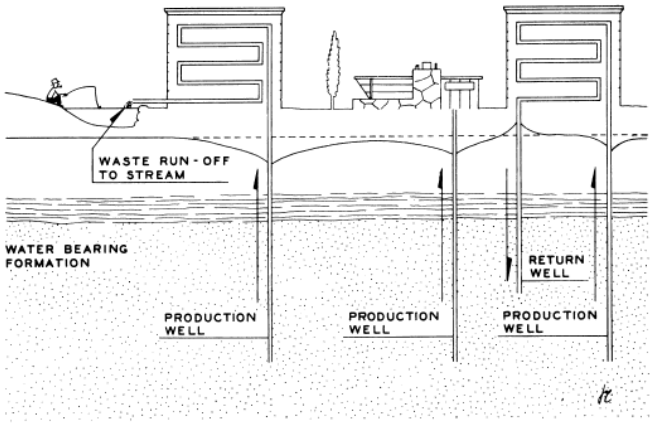
6. Methods have been developed by which the safe water yielding capacity of underground formations can be evaluated.

By pumping one well at a constant rate for several hours and carefully measuring the drawdown in nearby observation wells at frequent intervals, determinations can be made of the ability of a formation to yield water, of probable water levels at a future date, and of proper spacing for additional wells.



CORRECTION OF LOCAL OVERDEVELOPMENT

Except for sanitary requirements in public water supply, virtually no state laws in Michigan govern the production of water from wells.



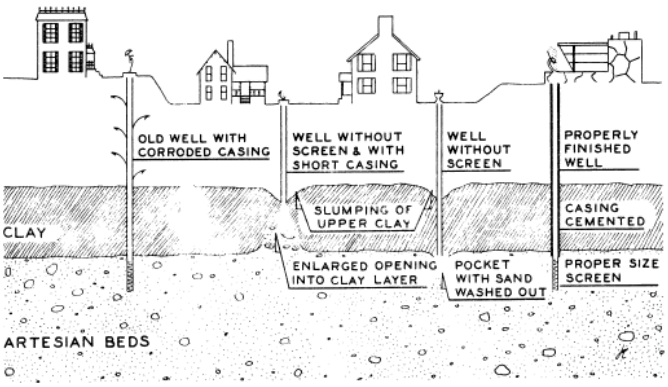
CONSERVATION OF GROUND WATER BY AIR CONDITIONING SYSTEMS WHICH UTILIZE WATER AS A COOLING MEDIUM

A few cities in the Country require that well water used in closed air-conditioning systems be returned to the ground. Other cities are considering ordinances of a similar nature.

An uncased hole in the clay formation overlying an artesian bed will lead to hole erosion and eventual formation collapse.

Contrary to popular thought, most flowing wells in sand and gravel should be equipped with screens. Screening prevents the washing out of sand gravel, and clay to such

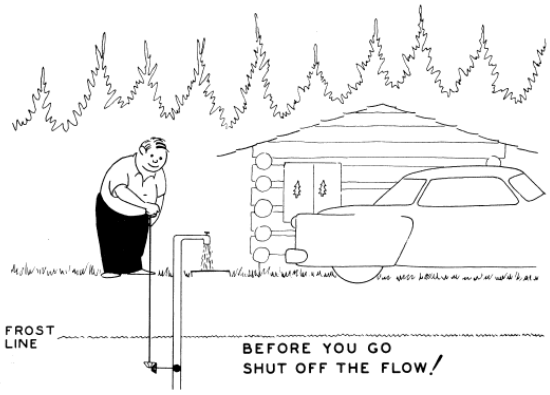
a point that a cavernous condition develops and the confining roof layer collapses. If the confining stratum above is damaged and much of the pressure is released at this point, flowing wells throughout the artesian basin may fail.



ARTESIAN AREA DAMAGE

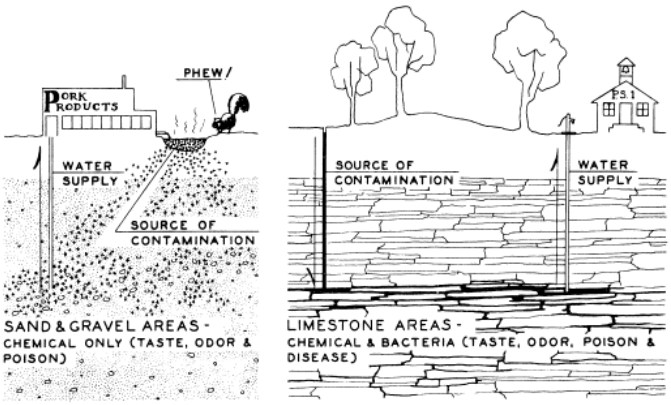
Every new well in a flowing well district relieves pressure in the water-bearing formation and therefore tends to reduce the pressure in other wells.

If too many wells are permitted to flow unrestricted in the lower portions of an artesian area, the wells at higher elevations may cease to flow. When some of the wells are pumped, the flow from even the lower wells may decline or cease.

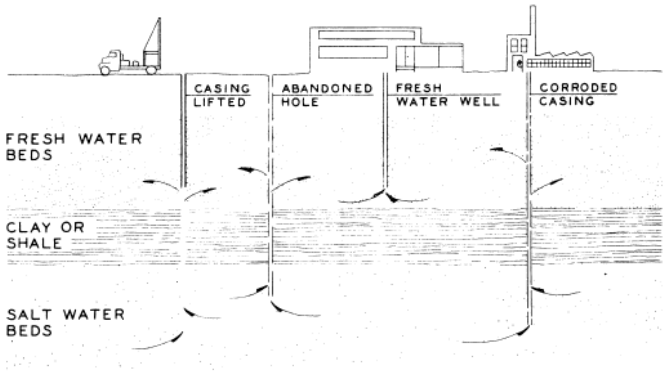


One of the greatest threats to our ground-water resources is chemical contamination. Once a stable poisonous or bad tasting chemical reaches the ground waters, it mingles and travels with them wherever they go. The ground has no filtering effect on chemical contaminants as it does for bacteria. Migration of chemical pollution has been traced for a distance of three miles in one Michigan locality.

Dumping of untreated chemicals upon the ground, into pits or unplugged wells is a serious matter which warrants careful supervision and regulation. The Michigan Water Resources Commission should be asked for assistance in determining the proper treatment of chemical waste and the possible detrimental effects upon ground waters.

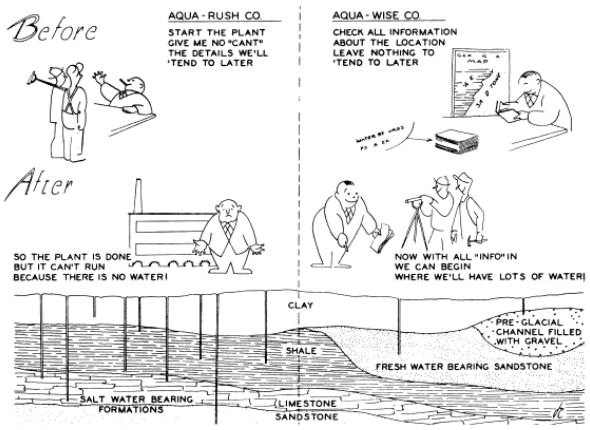


CONTAMINATION FROM SURFACE



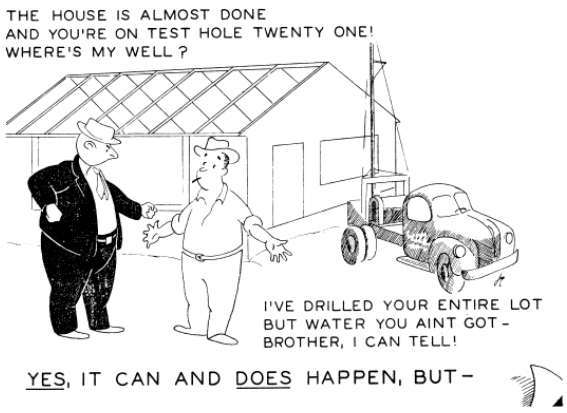
SALT CONTAMINATION

Numerous salt wells and coal borings of earlier days in Michigan were never plugged when they were abandoned, thus, deeper salt waters were permitted to rise and spread locally throughout fresh water-bearing formations. In a few areas, it is now very difficult to find fresh ground water supplies.



Other than the legislation which provides for the careful plugging of any abandoned oil or gas test or production

well, no Michigan law requires the plugging of abandoned wells and test wells. Our underground water resources are still left largely unprotected from the threat of salt water contamination.



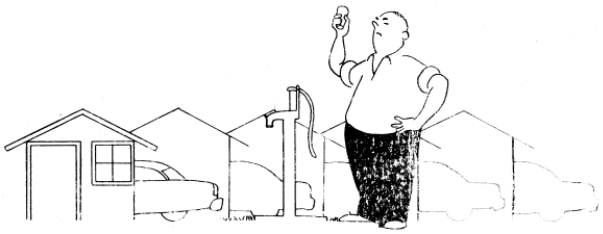
DON'T LET IT HAPPEN TO YOU!

Michigan for the most part is blessed with abundant sources of ground water supply, *BUT* in some localities geological conditions limit the development of good supplies. How does one learn the conditions and possibilities at a location before actually drilling a well? The following pages give a few of the ways appraisal can be made and how trouble like this avoided.

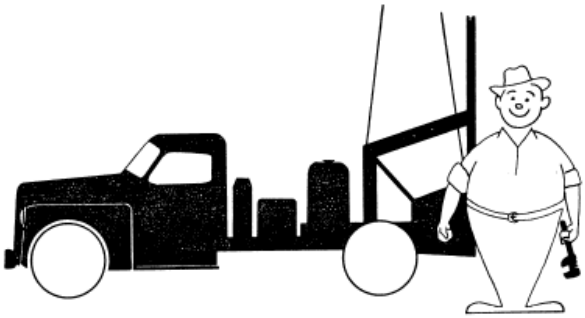
Get to know your neighbors -- and their water wells. Most folks are proud of their wells and will gladly tell you about them.

Talk to the drillers who work in the area. They're the men who construct 'em.

Drop a line to the Michigan Geological Survey, Lansing, giving the exact location of your building site and other pertinent data. Geologists whose specialty is the study of ground water resource problems will do their best to advise you and your driller.



If yours is a public water supply other than municipal, also consult with your County Health Department for standards and regulations. Municipalities should consult the Michigan Department of Health in Lansing.



A properly constructed water well is the result of the skilled workmanship of an artisan -- the water well driller. There is *MUCH* more to it than just punching a hole in the ground. The selection of a competent and reputable driller is one of the most important phases of developing a water supply.

The nucleus of a water system is the well. Be wise in the selection of the supplies used in its construction. Quality and adequate capacity can save many a "headaching" problem.

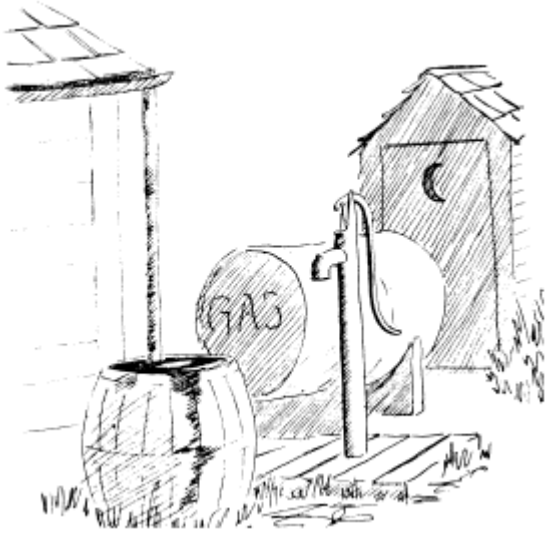
Even in this age of science, faith in "water witching" persists among many people. It has no scientific basis. For practically all our other needs we insist on factual scientific treatment, so why not for water? -- our most vital need.

If large quantities of water are required, a carefully planned test drilling program is usually advisable. New methods, rapidly becoming important tools in the search for ground water, give helpful clues to the most favorable sites on which to locate the test wells. One factor which permits a preview of "what is below" is that as formations of the earth vary considerably in composition, so also do they vary in their resistance to electrical current. Preliminary surveys often save both time and money.

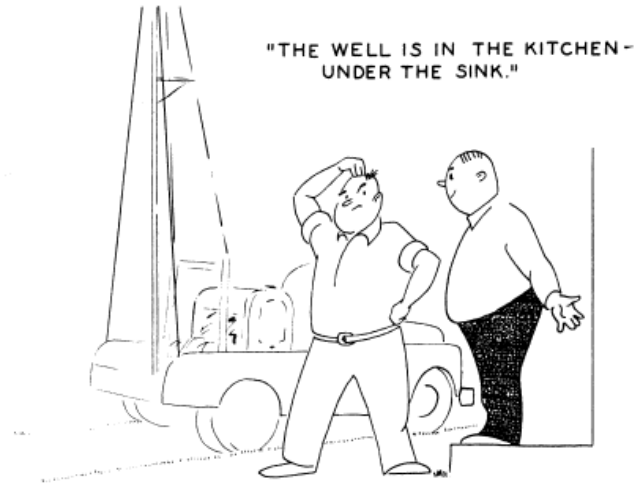
Where on your property to drill is a matter of common sense. After you have checked the geology, coordinate it with the following:

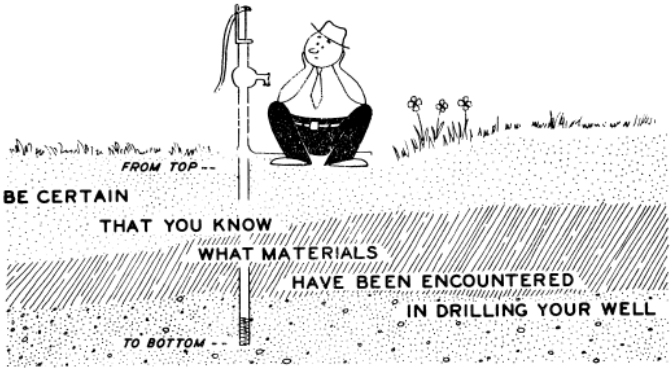
a. convenience

b. Proper isolation from any possible sources of contamination, such as sewers, septic tanks, barnyards outhouses, etc. -- including oil storage tanks.



c. maintenance





This is valuable information at the time of drilling, and for future reference, it is often a necessity that complete and accurate records are available.

The lack of a well record can be as troublesome as not having a birth certificate -- more so -- the well can't talk.

Just a few of the reasons to be in the know:

1. An intelligent choice of waterbearing formations can be made. Sometimes a formation which shows only fair promise of producing is by-passed in search of a better one on down. If no other is found, you can go right back to the first, because you know

WHAT it is

WHERE it is

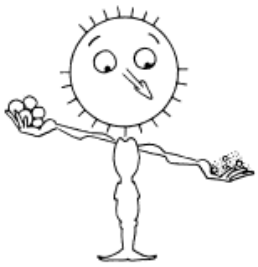
If samples are saved every five feet and at every change of formation, you know the story of the well even better.

2. If a number of test wells are needed to find the location for a permanent well, much money can be saved by avoiding random drilling. Study of detailed records will place each test well scientifically.

3. In unconsolidated glacial drift the size of particles in waterbearing formations varies considerably. Your sand or gravel might have a size range like this:

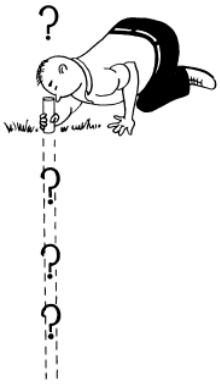
The selection of a screen with openings of the proper, size is important. The size can be determined from the samples collected by the driller.

Analyses of the proportional amounts of each grain size is the basis upon which proper size screen openings are chosen.



4. To put it into a few words, if all you know about a well is that it is a hole in the ground, repair jobs are anything but simple.

5. If you ever desire to sell your property, is the prospective buyer going to take your word that it is a "good well" and let it go at that? Not if he is wise.



6. A new neighbor may inquire about your well just as you requested information when you were getting started.

7. Compiled records of wells in an area give an overall picture of the regional geology. When regional water problems like over-development or pollution occur, they can be dealt with adequately. Without records only general assumptions can be made.

All water supplies in Michigan are subject to state statutes or regulations administered by the Director of Public Health. Act 294 of the Public Acts of 1965 and administrative rules adopted February 14, 1967, regulates the construction of private home water supplies. Copies of the act and rules may be obtained from local health departments or the Michigan Department of Public Health.

Records of wells submitted by well contractors in accord with Act 294 are on file and available for inspection from the Michigan Geological Survey. A sample record appears on the next page.

The Michigan Geological Survey and local health departments can be of assistance in well construction

planning.

GEOLOGICAL SURVEY SAMPLE No. W-2389

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County: Ingham | Twp.: Lansing | Fraction: SW¼ NE¼ SE¼ | Section No.: 12 | Town: 11 N/S | Range: 20 E/W

Distance And Direction from Road Intersections: On the NW corner of the intersections of Birch and Elm Roads

Street address & City of Well Location:

OWNER No.

3 OWNER OF WELL:
Address: Robert F. Jones, 800 Elm Road, Lansing, Michigan

4 WELL DEPTH: (completed) 85 ft. Date of Completion: aug. 7, 1967

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Threaded ☐ Welded ☐ Dia. 6 in. to 79 ft. Depth; Height: Above/Below surface 1 ft. Weight 19 lbs/ft. Drive Shoe? Yes ☒ No ☐

8 SCREEN: Type: Super Cr.-Brass Dia.: 5½" Slot 15 Length 6' Set between 79 ft. and 85 ft. Fittings: lead packer, bail bottom

9 STATIC WATER LEVEL 16 ft. below land surface

10 PUMPING LEVEL below land surface: 21 ft. after 6 hrs. pumping 20 g.p.m.; 24 ft. after 3 hrs. pumping 25 g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) 0.3 Chlorides (Cl) 10.0 Hardness 290

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☒ 12" Above Grade

13 GROUTING: Well Grouted? ☐ Yes ☒ No Material: ☐ Neat Cement ☐ Depth: From ft. to ft.

14 SANITARY: Nearest Source of possible contamination: 198 feet E Direction Sewer Type. Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: Manufacturer's Name: Briggs Model Number 22A HP ½ Length of Drop Pipe 21 ft. capacity 10 G.P.M. Type: ☐ Submersible ☒ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Soil	2	2
Sandy clay	15	17
Fine sand, dry	1	18
Clay, brown	17	35
Fine sand (water)	2	37
Clay with pebbles	35	72
Very fine sand	2	74
Fine sand (water)	5	79
Coarse sand (water)	3	82
Fine gravel (water)	3	85
Clay, blue	5	90

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Doe Drilling Co. (REGISTERED BUSINESS NAME) 7611 (REGISTRATION NO.)

Address: Rte #1, Fairview

Signed: John Doe (AUTHORIZED REPRESENTATIVE) Date: Aug 28, 1967

D67D 100M 9-66

GEOLOGICAL SURVEY COPY