


Senior Thesis

An Examination of the Surficial and Bedrock Geology of the Lucerne Area of Knox
County, Ohio, and the Surrounding Area

by
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1996

Submitted as partial fulfillment of
the requirements for the degree of
Bachelor of Science in Environmental Geology
at the Ohio State University,
Spring Quarter, 1996.

Approved by:


Dr. Garry McKenzie

ABSTRACT

This report focuses on the surficial and bedrock geology of the Lucerne area of Knox County, Ohio. The surficial geology constitutes large glacial deposits of sand and gravel amongst many assorted layers of clay. The large sand and gravel bodies comprise a very productive buried valley aquifer. The bedrock of the entire region is the Cuyahoga Formation, specifically the Wooster shale and the Black Hand sandstone, which are lateral equivalents of each other. In this region the Black Hand sandstone is the predominant bedrock facies, and it too is a very productive aquifer. The Lucerne area, as well as the county in general, has extensive ground-water resources.

INTRODUCTION

The purpose of this report is to understand the surficial geology and bedrock geology of the Lucerne area of Knox County, Ohio. By understanding this geology, I plan on making conclusions about the ground-water/surface hydrology in order to evaluate the resource potential of the region. Several cross sections (see appendix) were made from numerous well logs in the area to graphically show what the subsurface makeup of the area was.

LOCATION

Lucerne is located on the far west edge of Wayne Township, Knox County, Ohio. It is bordered by Morrow County, which is less than one mile due west. There is not much located in the area except some residential properties and a recent development by Del-Co Water Company where it is pumping water from Knox County into Morrow County. The area studied in this report extends far beyond Lucerne as I was trying to encompass the majority of the buried valley in my cross sections. For the most part the buried valley and the Kokosing River, which flows right through Lucerne, followed the same path.

DESCRIPTION OF SECTIONS

The majority of the well logs showed a characteristic pattern of about two to three feet of topsoil, followed by a variable-thickness clay layer. Below the clay typically was a thick layer of sand and gravel (see appendix). There were exceptions, of course, but this is the pattern I tended to find. The bedrock was all Cuyahoga formation, namely the Black Hand sandstone. There tended to be a region in the section where the lithology was unknown between the base of the well log and the bedrock surface. This was unfortunate although not really avoidable. I simply have to make educated guesses as to what might lie in this region.

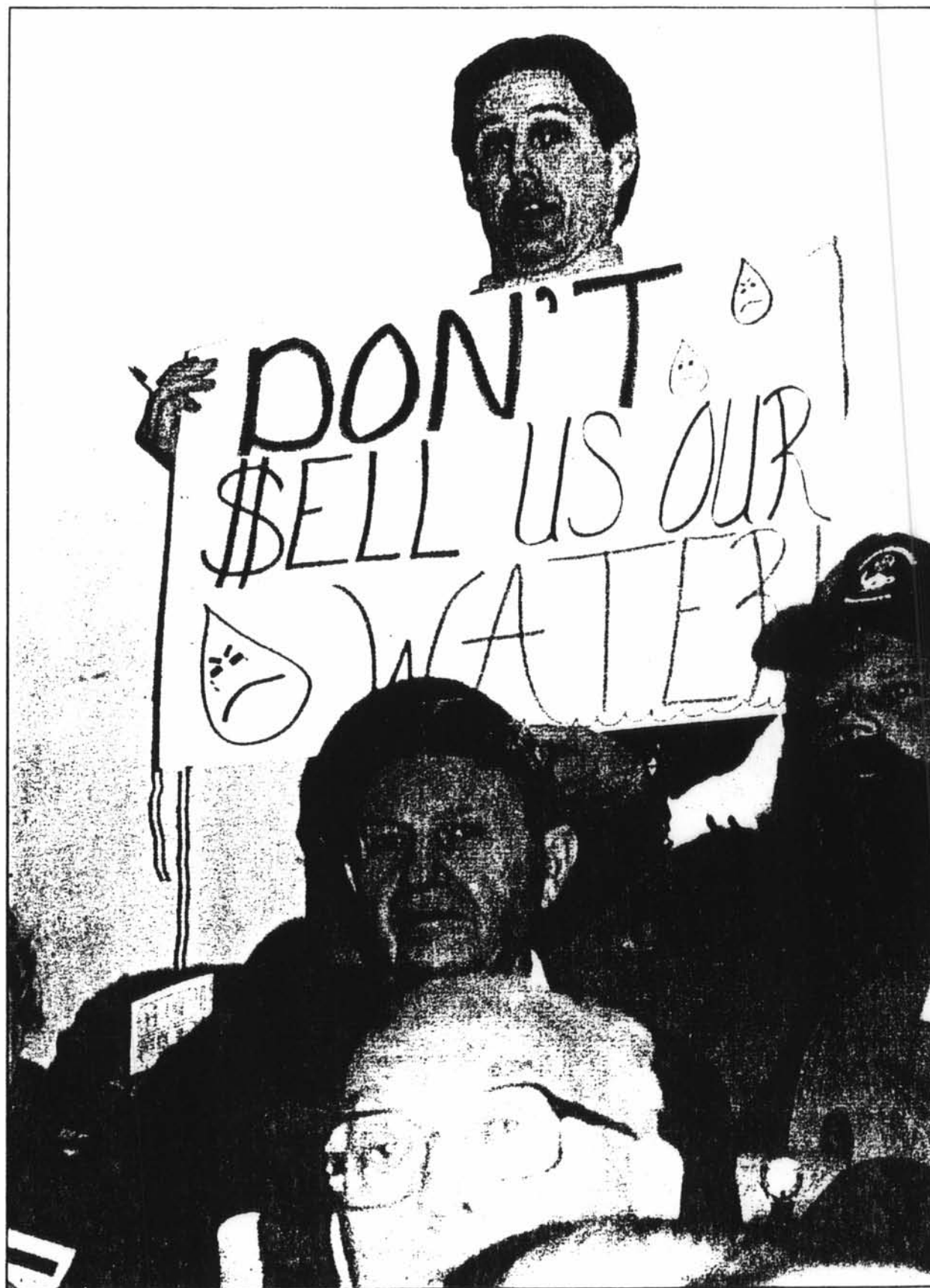
INTERPRETATION

From what I can tell from the well logs and the cross sections I have made from them, I am certain that the Lucerne area is very rich in water resources. There has been concern that the Del-Co operation will drastically affect the region's ground-water supply (see appendix). By studying the area's geology, I have come to the conclusion that Del-Co likely will not cause any serious problems to the resource potential in the Lucerne region.

REFERENCES

Root, Samuel I., 1958, Geology of Knox County: unpublished dissertation,
The Ohio State University, 302 p.

van der Meer, Jaap J.M., 1987, Tills and Glaciotectonics: A.A.Balkema Press,
Boston, 270 p.



David Gregg, an East Knox High School teacher, made his stance visible during a Wednesday night public meeting with Del-Co Water and local officials. More than 150 East Knox High School students signed the back of Gregg's sign in support of his message. (Photo by Scott Jarrett)

DEL-CO WATER COMPANY ANSWERS YOUR QUESTIONS.

Many Knox County Residents are understandably curious about Del-Co's operations, so we have undertaken this method to see that as many people as possible receive correct information about our operations and intentions. We sincerely hope that this will answer your questions and concerns.

Q. WHO IS DEL-CO?

A. Del-Co Water Company, Inc. (Del-Co) is a rural water association incorporated as a non-profit corporation under Ohio law and owned and controlled by its members and customers.

Q. WHAT IS DEL-CO'S BUSINESS AND WHAT GOVERNMENT AGENCIES OVERSEE DEL-CO'S WATER OPERATIONS?

A. Del-Co was organized by farmers and rural residents in Delaware County for the purpose of bringing quality, potable water to rural residents primarily for residential and agricultural purposes. As businesses have located within the area served by Del-Co, Del-Co has also met their needs for water for domestic purposes; but Del-Co's primary thrust continues to be to serve residential and agricultural customers. Del-Co receives funding from the Farmers Home Administration (FMHA), and its operations are subject to the water quality standards of the federal and state departments of health and environmental protection.

Q. FROM WHAT SOURCES IN KNOX COUNTY DOES DEL-CO INTEND TO WITHDRAW WATER?

A. Del-Co plans to develop three production wells on the property it now owns in Wayne Township, Knox County, Ohio.

Q. WILL DEL-CO'S OPERATIONS AFFECT CURRENT CITY OR VILLAGE WATER SUPPLIES IN KNOX COUNTY?

A. No, Del-Co will have invested over \$300,000 in the two pumping tests and monitoring of wells to be assured that city, village, and rural wells will not be affected.

Q. WILL DEL-CO OPERATIONS AFFECT RURAL WATER WELLS? IF SO, OVER WHAT AREA AND HOW EXTENSIVE?

A. Most residents will not notice any change with their well operation. Wells within a one mile radius may notice a minor water level change but not sufficient to interfere with their normal operation.

Q. IF WELLS ARE AFFECTED, HOW WILL DEL-CO COMPENSATE THOSE WELL OWNERS?

A. If it is determined that Del-Co's operations have affected a well water supply, then certainly Del-Co will accept the responsibility to correct the problem.

Q. WHAT PERCENTAGES OF THE WATER DEL-CO INTENDS TO WITHDRAW WILL BE USED FOR RESIDENTIAL; COMMERCIAL; INDUSTRIAL; AND "OTHER" USES?

A. 85% Residential. 13% commercial and industrial. 2% schools.

TION GROWTH NEEDS OF KNOX COUNTY?

A. A large percentage of water that comes in the form of precipitation to Knox County is not captured and used at the present time. This is an available source for future growth. Knox County can exhibit significant growth prior to stretching the water resources of the county.

Q. WHO DECIDES, AND UPON WHAT BASIS, WHO GETS TO TAKE HOW MUCH WATER?

A. Any land owner legally entitled to take water from an aquifer or river or any other natural source is subject to reasonable limitations and cannot unreasonably interfere with the rights of the other landowners similarly situated.

Q. DEL-CO SAYS IT WILL SUPPLY KNOX COUNTY USERS WHERE FEASIBLE. WHAT DETERMINES WHETHER IT IS FEASIBLE?

A. The feasibility of supplying water to any particular user or customer is first and foremost an economic question. The distance from existing facilities, the quantity of water required, and the cost of extending or enlarging existing facilities to render service are the primary factors determining the economic feasibility of serving any particular customer. In addition, there are legal considerations where the customer or customers requesting service are located within a municipality. In that event, the consent of the municipality is required. In unincorporated areas, however, the decision to serve is primarily dependent upon the economic feasibility of the proposed service.

Q. WILL LOCAL RESIDENTS END UP BUYING-BACK WATER FROM DEL-CO?

A. No. Knox County residents will not be under any obligation to purchase water from Del-Co. However, should a Knox County resident desire to purchase water from Del-Co and should service to that resident be feasible, the the price for the water would be Del-Co's actual cost of obtaining, treating and delivering the water to the resident. Del-Co is a non-profit corporation and its Code of Regulations prevents it from retaining any revenues in excess of expenses beyond a reasonable reserve.

Q. WHAT IS AN AQUIFER?

A. An aquifer consists of deposits of sand and gravel below the earth's surface. The depth of the sand and gravel may vary. These sand and gravel deposits store water in the spaces between the sand and gravel particles.

Q. FROM WHERE DOES THE WATER IN THE AQUIFER COME?

A. From precipitation or rainfall. Rain falls on land surfaces and infiltrates into the ground to reach the aquifer.

Q. WILL DEL-CO TAKE WATER DIRECTLY FROM THE KOKOSING RIVER, AS WELL AS FROM THE UNDERGROUND AQUIFER?

A. No, Del-Co has no plans to take water from the Kokosing River or to alter the river in any way.

Q. WILL DEL-CO'S OPERATIONS AFFECT THE AMOUNT OF WATER IN THE KOKOSING RIVER? IF SO, IN WHAT WAY? WILL IT AFFECT THE KOKOSING'S CHANCES OF BEING NAMED A SCENIC RIVER?

A. During the seven day pump test conducted by Del-Co, the Kokosing River level was monitored and no noticeable drop in level was noticed. To Del-Co's knowledge, Del-Co's operations will not affect the Kokosing's chances of being classified as a scenic river.

If you have any additional questions please contact us at Del-Co Water Company, 6773 Olentangy River Road, Delaware, Ohio 43015,

and we will promptly respond. We look forward to being a valued citizen of this beautiful county.

Mount Vernon News

OPINION

Kay Culbertson
Publisher

Elizabeth Lutwick
Assistant Publisher

Robert G. Nitzel
Editor

Commentary

September 11, 1995

Del-Co Water explains position on Knox wells

Editor, the News:

After reading the Letter to the Editor in the Mount Vernon News on Aug. 22, 1995, and the quote by Mr. Bill Lintz during the grange-hosted meeting held in Fredericktown on Aug. 16, 1995, I feel the residents of Knox County should know the real facts about Del-Co Water Co. and the two pumping tests conducted in Wayne Township.

The real facts are that the well at Mr. Lintz's property was very marginal before Del-Co Water did anything on its property and the first test well was not a pumping well but only a two-inch observation well. In fact, Mr. Lintz's pump was replaced by him before any water at all had been withdrawn from the pumping test well so the well could not possibly have affected his pump as claimed by Mr. Lintz. Mr. Lintz's well was moni-

ed" as stated by Mr. Lintz. The Morco Water Co. and the Morrow County Prosecutor had the man removed from a public right of way and not private property. Del-Co was not involved and has no reason to withhold this information from the news media as stated by Mr. Lintz.

Further, Del-Co Water Co. does not buy easements from property owners nor "appropriate it by eminent domain." The property owners voluntarily grant easements for installing the water line because they wish to have water and/or because their property value is increased. If they so refuse, then the water line is laid in public right of way. At the present time, Del-Co Water Co. has approximately 500 miles of water pipe on private property serving over 12,000 customers all of which was voluntarily obtained.

tored by personnel from the Ohio Department of Natural Resources during the seven-day pump test in September 1994, and again during the 14-day pumping test in July 1995. It may be noted that results of this monitoring were officially recorded by the Ohio Department of Natural Resources. These results indicate no adverse effect on Mr. Lintz's well due to our testing. By Mr. Lintz's own admission, the well in question is 80 years old and seven people are using water from this well. After 80 years of use, the well and well screen have become encrusted by iron and calcium deposits — that is the problem. The fact is no other well or household in the immediate area or distant area of the testing pumping well have been without water.

The statements attributed to me by Mr. Lintz at the January meeting regarding Del-Co's ability to provide water to its tanks at Galena, Interstate 71 & U.S. 36 and I-71 & Ohio 61, are false. The facts are that Phase II of Morco was being bid at the time and the water towers Mr. Lintz referenced to were under contract. Del-Co does have sufficient water to fill these tanks and always has. Del-Co presently has two treatment and pumping plants with combined capacity of 11 million gallons per day while its total average demand is only 5 to 6 million gallons per day.

With respect to Mr. Lintz's statement that Del-Co expects to begin operating a pumping station in Knox County next year, the fact is that if the design of a Knox County water plant was started today and approval of the design by the Environmental Protection Agency and other state agencies was granted in normal time, and the project bid and contract awarded, it would be a minimum of three years before such a plant would be complete.

Further, Del-Co did not have "a Morrow County property resident falsely and illegally arrest-

Further, it is untrue that Del-Co trenching has cut and damaged hundreds of home and business septic systems and leach beds. Water lines are installed as near the public right of way as possible. Most septic tanks and leach beds are located in the back or side yards of property. If a tile of any kind is damaged, it would be repaired to original condition. If Del-Co did not treat property owners fairly, we would not have 91 percent of our water lines on private property.

Del-Co Water is a not-for-profit, member-owned utility. Our sole objective is to provide good, clean potable water to people who need and want it. Del-Co most certainly does not control the economy of Delaware or any other any other county. The company has grown because of the demand for water in developing areas. Morrow County has asked Del-Co Water to serve the areas within the county that desperately needed water including grade schools and a high school. Clinton Township trustees have asked Del-Co about the possibility of serving the township. A preliminary study of Hilliar Township has been completed and to date nearly 100 households have indicated interest in being served by a rural water system. In addition, a developer has contacted Del-Co to service a 200-home development in southern Knox County. It should also be known that Del-Co Water Co. has shared with the Knox County Commissioners, Wayne Township Trustees and the Ohio Department of Natural Resources all of the information gathered from the first pumping test. Also, the public library in Mount Vernon has a copy of the report for the public.

In closing, if anyone should have questions as to Del-Co Water Co.'s operations, please call me at (614) 543-7746; or write to Del-Co Water Co., 6773 Olen-tangy River Road, Delaware 43015.

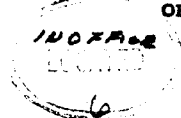
Tom Steward,
General Manager

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

No. 192795



County Knox Township Wayne Section of Township 2
 Owner John Bryant Address R-2 Fredericktown, O.
 Location of property 9 mi. W. Fredericktown, O.

CONSTRUCTION DETAILS

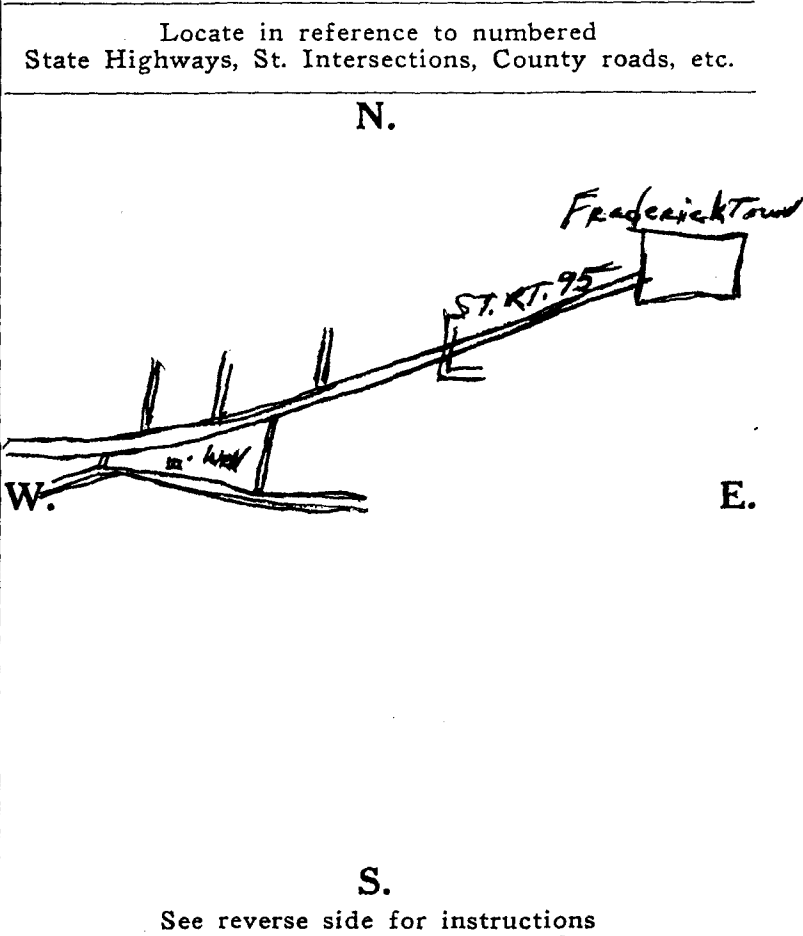
BAILING OR PUMPING TEST

Casing diameter 4" Length of casing 43' Pumping rate 10 G.P.M. Duration of test..... hrs.
 Type of screen..... Length of screen..... Drawdown 3 ft. Date.....
 Type of pump..... Developed capacity.....
 Capacity of pump..... Static level—depth to water 34' ft.
 Depth of pump setting..... Pump installed by.....
 Date of completion 21 Sept 57

WELL LOG

SKETCH SHOWING LOCATION

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	10 Ft.
Gravel	10	33
Sand Gravel	33	42
Gravel	42	43



S.
See reverse side for instructions

Drilling Firm Fred B. Fisher
 Address R-2 Fredericktown, O.

Date 21 Sept 57
 Signed Fred B. Fisher

6

WELL LOG AND DRILLING REPORT

ORIGINAL

NO CARBON PAPER
NECESSARY -
SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

486407

OK

COUNTY MORROW TOWNSHIP CHESTER SECTION OF TOWNSHIP OR LOT NUMBER _____

OWNER CARL R. FISHER SR. ADDRESS R#2, FREDERICKTOWN, D.

LOCATION OF PROPERTY ON Co. Rd. 25 1/3 mi WEST of SR 314-N. SIDE, 2 mi S. of Chesterville

CONSTRUCTION DETAILS

Casing diameter 5 1/2 OD Length of casing 35'
Type of screen _____ Length of screen _____
Type of pump SUBMERSIBLE 1/2 HP
Capacity of pump 600+ p.H.R.
Depth of pump setting 32'
Date of completion Aug 22, 76

BAILING OR PUMPING TEST

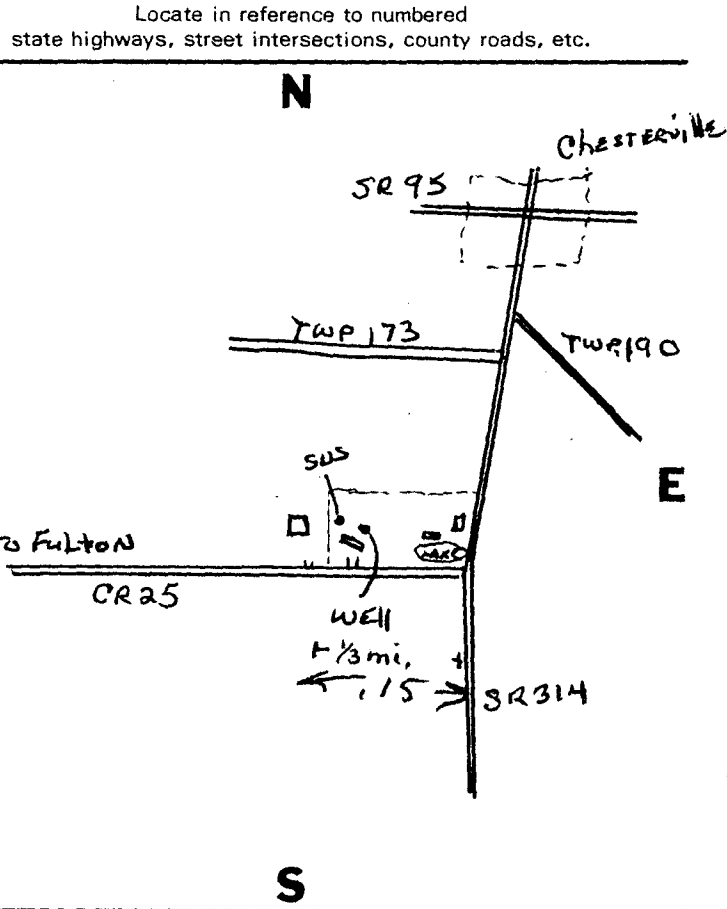
(specify one by circling)

Test rate 10 gpm Duration of test 1 hrs
Drawdown 5 ft Date Aug 12 76
Static level (depth to water) 19 ft
Quality (clear, cloudy, taste, odor) CLEAR TASTE OK
NO ODOR
Pump installed by FISHER

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
<u>TOP SOIL</u>	0 ft	1 ft
<u>Clay Till</u>	1	29
<u>SAND (MED)</u>	29	31
<u>SAND + GRAVEL</u>	31	34
<u>GRAVEL</u>	34	35

SKETCH SHOWING LOCATION



DILLING FIRM FISHER'S WATER WELL SERV DATE Aug 23 76
ADDRESS R#3 172 Mt. Carbon O SIGNED Terry K. Fisher

*If additional space is needed to complete well log, use next consecutive numbered form.

70