INVESTIGATIONS

Geology and Ground Water Resources, Rocky Point Interchange Vicinity Cowlitz County, Washington

state of washington
department of ecology
daniel j. evans
governor
john a. biggs
director
olympia, washington
october, 1971

STATE PRINTING PLANT OLYMPIA, WASHINGTON

An investigation of the geology and ground-water resources in the vicinity of the Rocky Point to Toutle River Interchange in Cowlitz County, was conducted during July 1971 in order to determine the quantity and quality of ground water available for the replacement of wells destroyed by highway construction. Prepared by Paul A. Eddy, Office of Technical Services, Department of Ecology, Olympia, Washington, July 1971.

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Purpose and Scope of the Investigation

This study was initated upon receipt of a letter dated June 24, 1971 sent by the Chief Right of Way Agent, Department of Highways, requesting information about present and future ground-water availability and possible replacement of well in question by a well nearby.

The scope of this study was set to include several determinations which are:

1. Ascertain the availability of ground water to the present site.

2. Conduct a pump test in order to obtain specific information about the well behavior.

3. Sample well in question and proposed replacement well for water quality.

The study consisted of a general geologic reconnaissance of the area and a pump test of the well in question. Additional information was obtained from the files of the Department of Ecology.

Location and Topography of the Area

The well in question lies geographically near the southwestern edge of Cowlitz County and is within Township 8 North, Range 2 West of the Willamette Meridian, Section 14. The altitude of the well is approximately 60 feet above sea level and is on the north side of an east-west valley containing an unnamed stream which is tributary to the Cowlitz River. The well is located approximately 100 feet to the north of a rental unit which is about 200 feet west of the well owners home. (Fig. 1)

Geology and Ground Water

The geology of this area consists of two primary rock units and they are as follows:

Sedimentary and Volcanic Rocks of Eocene Age

In Cowlitz County, three formations of Eocene age are exposed, namely the Cowlitz Formation (Henricksen, 1956), the Goble Volcanic Series (Warren, Norbisrath, and Grivetti, 1945), and the Hatchet Mountain Formation (Roberts, 1958). For the purposes of this report these formations are included in the unit "sedimentary and volcanic rocks." These rocks are mostly marine in origin but include brackish-water and nonmarine deposits. They consist of sandstone, siltstone, basalt flows, and volcanic breccia, and include some carbonaceous layers and coal seams. The sedimentary deposits are extensively weathered where exposed; feldspars are altered almost entirely to clay.

The sedimentary and volcanic rocks of Eocene age are not an important aquifer because of their poor water-bearing characteristics. Movement of water at appreciable rates in the unit is restricted to joints, and numerous small springs issue where these joints intersect the land surface. Ground-water availability and hydraulic conditions in these rocks are extremely variable.

Yields range from 2-200 gpm (gallons per minute), and water levels in adjacent wells in the jointed sedimentary rocks may have differences of more than 100 feet. Differences of that magnitude imply that there is poor continuity in the ground-water system in those rocks, and that individual wells tap isolated water bodies rather than one large system.

Alluvium of Pleistocene Age

The lower reaches of all the major stream valleys in Cowlitz County are partly filled with alluvium, which in general consists of gravel, sand, and silt. The alluvium ranges in thickness from less than 10 feet in the uplands and small valleys to more than 300 feet near the mouth of the Cowlitz River.

The alluvial materials are the most productive sources of ground water in Cowlitz County and are tapped by the most wells. They are very permeable in most places but permeability decreases as the amount of clay and silt in them increases. Yields of wells tapping these materials are as great as 3,000 gpm, and drawdowns of the water level in pumping wells generally are no more than about 40 feet (Myers, 1970).

The stratigraphic unit in which this well is located is the Pleistocene Alluvium deposits within valley floors. It has been indicated large yields can be obtained from this sand and gravel which is the result of reworking the alluvium deposits and the top of the Eocene rock unit. This alluvial unit within the unnamed stream valley is probably not over 100 feet thick and apparently lies unconformable over the "sedimentary and volcanic rock of Eocene age."

Pump Test Data

The pump was a Jacuzzi 1 H.P. model CBC 1002x5C submersible which yielded 5 gpm of water during the following time intervals:

20 minutes into test	60 minutes into test
17 seconds	17 seconds
19 "	18 "
18 "	18 "
18 "	
18 "	

There were no air bubbles in the discharge water.

Listed below is the response of this well to pumping. The well was turned on at 2:00 PM after having not pumped for 3 minutes. July 29, 1971

Pumping Data	Water Level Below Top of Casing in Feet	Remarks
0 Seconds	27.0	Pump on 2:00 PM
30 "	32.4	
60 "	39.4	
120 "	42.3	
150 "	44.5	
180 "	46.6	

210 seconds	48.0	
240 "	49.4	
270 "	50.0	
300 "	50.6	
330 "	51.1	
6.0 Minutes	51.6	
6.5 "	51.9	
7.0 "	52.2	
7.5 "	52.4	
8.0 "	52.6	
8.5 "	52.8	
9.0 "	52.8	
9.5 "	52.9	
10.0 "	52.8	
11.0 "	52.8	Well appears to be settling
11.5 "	52.8	down
12.0 "	52.9	
13.0 "	52.9	
15.0 "	53.1	
18.0 "	53.3	Yield measured
25.0 "	54.0	
30.0 "	54.4	
37.0 "	54.9	
55.0 "	55.7	
1 Hour	55.9	Yield measured
1 Hour 15 Min.	56.5	No air being pumped
1 Hour 20 Min.	56.7	
1 Hour 40 Min.	57.2	No air being pumped
2 Hours	57.6	Pump off

Recovery data

Time	Water Level
4:00 PM	57.6
15 Seconds	53.9
30 "	50.5
45 "	49.1
60 "	47.2
75 "	45.1
90 "	43.8
105 "	42.5
120 "	41.3
150 "	40.2
165 "	39.4
180 "	37.8
240 "	35.8
300 "	35.0
7.0 Minutes	34.3
11.5 "	32.9
15.0 "	32.6
17.0 "	32.4
25.0 "	31.8
30.0 "	31.4
45.0 "	30.8

Conclusions

Over the two hour pump test this well produced approximately 2000 gallons of water. Although the well was continuing to decline, it would, unless boundries were encountered, continue to produce this quantity, based on a straight line drawdown, for an additional 5 hours. (Figure 2)

The specific capacity of the well is approximately 0.5 gallons per minute per foot of drawdown based on the conducted pump test. (Figure 3)

This well will produce the required water of 2400 gallons per day (4 person family, 200 gallons per person per day, 3 families) pumped on a continuous basis. The well will, in all probability, produce in excess of 6000 gallons per a 6 hour period, projecting drawdown based on data from the pump test which was run.

The sample of water tested by the County Health Office indicated that the (M.F.) of bacteria of the coliform group had a count of zero. Since there is no contamination by non-pathogenic coliform, the risk of contracting a disease by drinking the water is also virtually zero. However, this does not mean that the well cannot be contaminated at a later date, it only indicates that the well was not contaminated during the testing period. Tests run on water samples from this well and the well owned by Al Brock are listed below.

Name	Conductivity mmh as/cm	Hardness ppm as $CaCO_3$	Iron ppm	Magnesium ppm	Calcium ppm	Manganese ppm	Coliform Nr/10 ml
Hale	343	110	0.5	4.1	22.0	0.1	0
Brock	345	118	13.0	4.1	22.0	0.4	0

It is impossible to determine by the conducted pump test the maximum capacity of this well, but it does indicate that a replacement well will have to produce at least 15 gallons per minute, for an extended period of time (3 hours ±) in order to replace the existing well. This quantity will serve the needs of three households if required.

The quality of water from the Brock well is lower in that it has 13 ppm iron (Fe) and 0.4 ppm manganese (Mn). The Washington State Department of Health recommends that iron be less than 0.3 ppm and manganese 0.05 ppm. Both wells are high in these metals, but the Brock well is much higher than the Hale well.

Therefore, unless a unit is placed on the Brock well in order to reduce the high concentrations of these metals, it is not recommended as a replacement well.

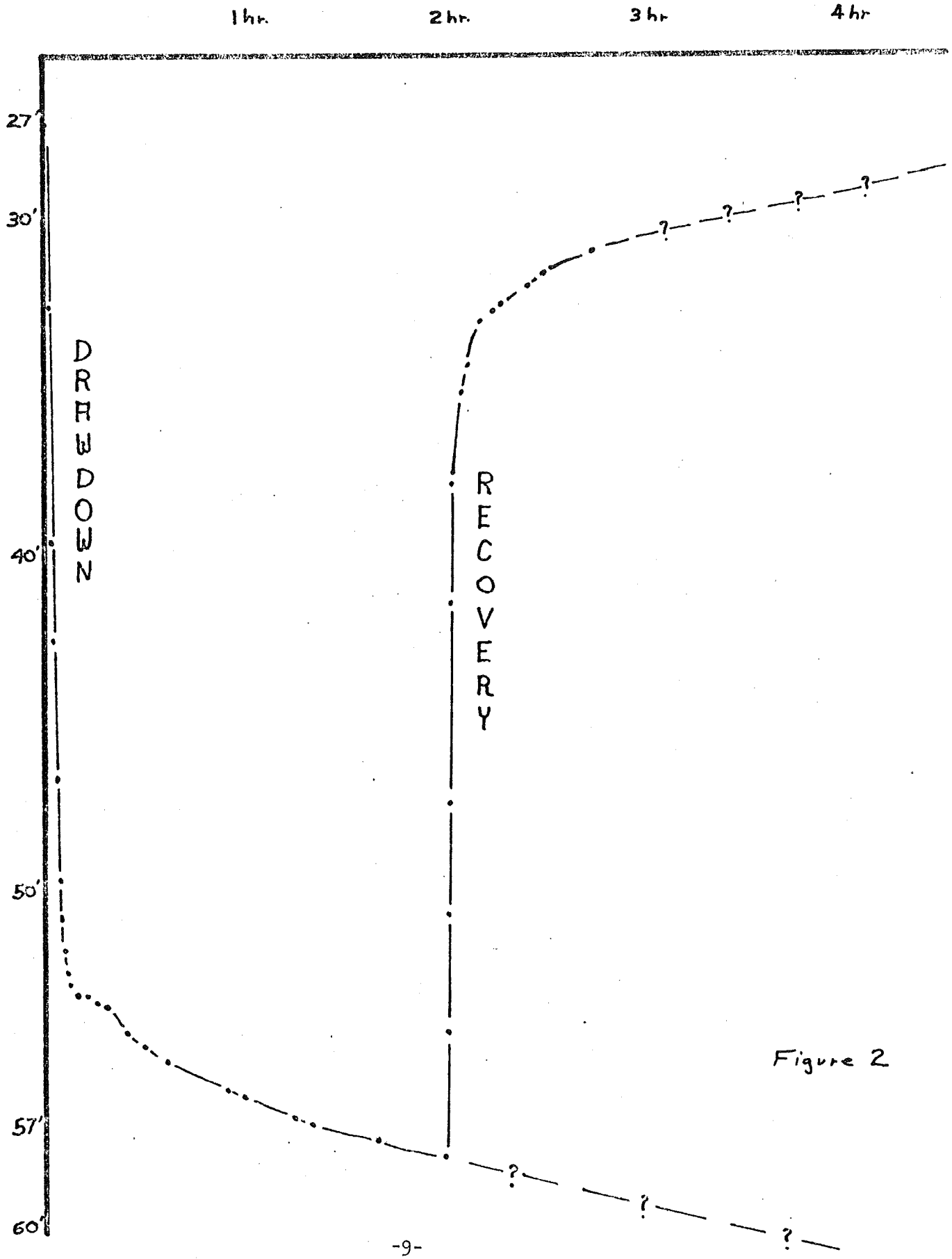

Figure 2

9-185—July 1935
Revised

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES BRANCH

WELL SCHEDULE

Date July 28, 1971 Field No. ____

Record by RPH Office No. ____

Source of data Field

1. *Location:* State Wash County Cowlitz
   Map Kelso
   SE ¼ NW ¼ sec. 14 T 3 N R 2 W
2. *Owner:* Wm. Hale Address [illegible] Kelso 98626
   Tenant ____ Address ____
   Driller McGhee Address Kelso
3. *Topography* Hillside
4. *Elevation* 60 ft. above LSD
5. *Type:* Dug, drilled, driven, bored, jetted 1953
6. *Depth:* Rept. 84.5 ft. Meas. ____ ft.
7. *Casing:* Diam. 6 in., to ____ in., Type [illegible]
   Depth 54 ft., Finish ____
8. *Chief Aquifer* Sand & Gravel From 61 ft. to 72 ft.
   Others ____
9. *Water level* 22.0 ft. rept. (meas) 7-28 1971 above (below) TC
   ____ which is [illegible] ft. above below surface
10. *Pump:* Type Sub (Jacuzzi) Capacity 15-25 G. M.
    Power: Kind [illegible] Horsepower 1
11. *Yield:* Flow ____ G. M., Pump 15 G. M., Meas., Rept. Est. ____
    Drawdown 30.6 ft. after 2 hours pumping 15 G. M.
12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs. ____
    Adequacy, permanence ____
13. *Quality* ____ Temp ____ °F.
    Taste, odor, color good, none, none Sample (Yes) No
    Unfit for ____
14. *Remarks:* (Log, Analyses, etc.) ____

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Fig. 3

APPENDIX 11

REQUEST LETTER

PAGE 12

June 24, 1971

Mr. John Biggs, Director
Department of Ecology
Water Resources Division
Olympia, Washington 98501

Re: SR 5, Rocky Point to Toutle River
Interchange Vicinity
Parcel No. 4-1652

Dear Sir:

Attached hereto are maps illustrating the location of the premises owned by William T. Hale, et ux, which has been conveyed to the State in connection with the above referenced project. (See copy of deed also attached.)

In the negotiated settlement of the above parcel, a "Well Agreement" was entered into whereby the owner would contract with others for the replacement of his water system and the cost of said replacement would be paid by the State to the extent necessary to establish an equal system to the existing.

In order to provide the State with the needed information, we request your Department's assistance in making a test of the well as to volume and potability.

For purposes of arranging for, and accomplishing this test, our Mr. John Logan, in Vancouver (Scan phone 8-732-1251) stands ready to assist you in any way necessary.

Thank you for your help in this matter.

Very truly yours,

G. H. ANDREWS
Director of Highways

By: KEITH L. DENSLEY
Chief Right of Way Agent

GHA:mcj
DES
Enclosure

REFERENCES

Myers, D.A., 1970, Availability of Ground Water in Western Cowlitz County, Washington: Washington Department of Ecology Water-Supply Bulletin No. 35, pgs. 8, 9, 11.

Washington State Department of Health - Bulletin ES No. 4, pgs. 10, 28, 29.

APPENDIX I

FIGURES 1 - 3

PAGES 7 - 10

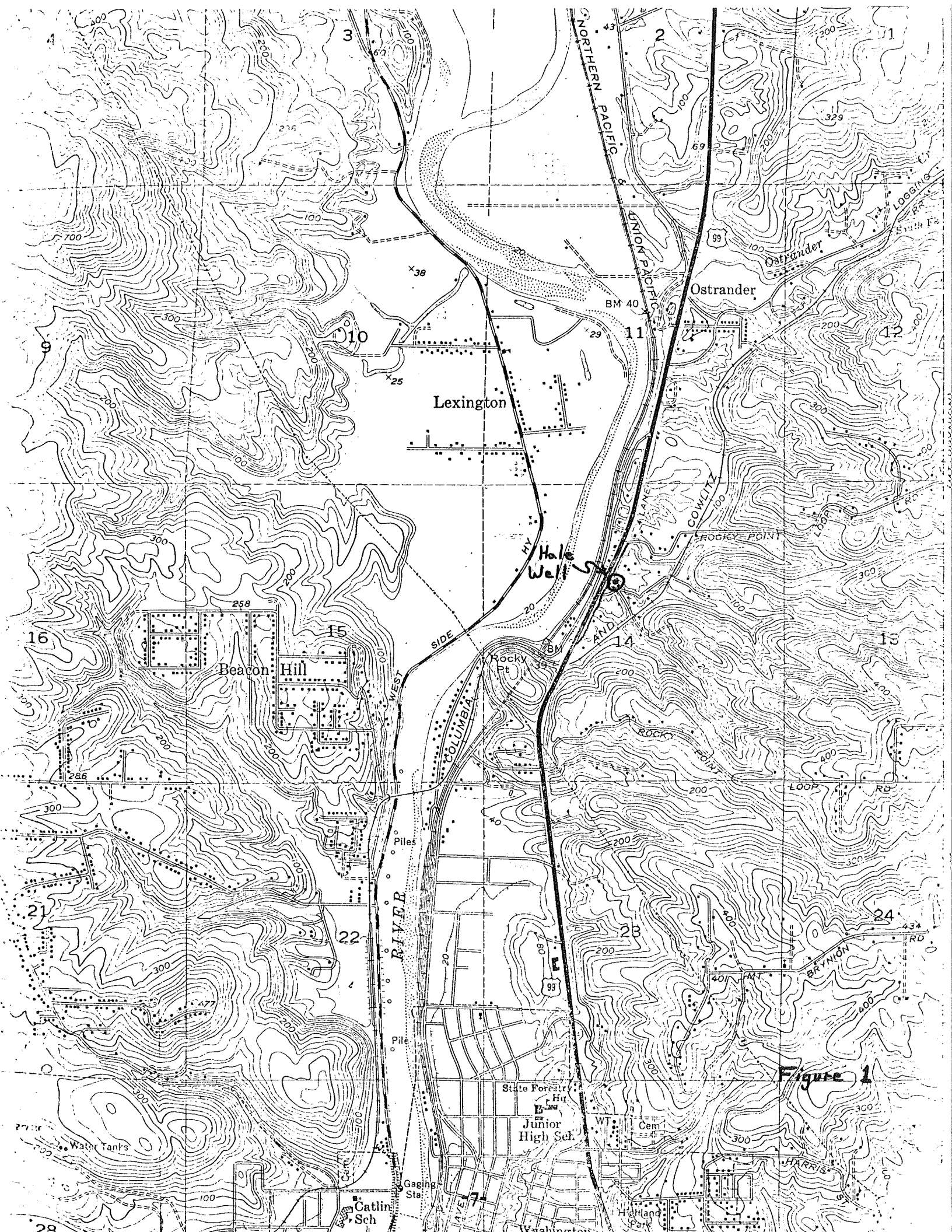
NORTHERN PACIFIC
UNION PACIFIC
Ostrander
Lexington
Hale Well
Beacon Hill
Rocky Pt
COLUMBIA RIVER
WEST SIDE HY
LANE
COWLITZ
ROCKY POINT LOOP RD
ROCKY POINT
BRYNION RD
Junior High Sch
State Forestry Hq
Water Tanks
Gaging Sta
Catlin Sch
Highland Park
Piles
Figure 1

Figure 1a.

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OLYMPIA

WASHINGTON
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DEPARTMENT OF HIGHWAYS
G. H. ANDREWS, DIRECTOR
HIGHWAY ADMINISTRATION BUILDING
OLYMPIA

DISTRICT OFFICES
NO. 1 SEATTLE 98108
6431 SO. CORSON AVE.
NO. 2 WENATCHEE 98801
P. O. BOX 98
NO. 3 OLYMPIA 98501
P. O. BOX 327
NO. 4 VANCOUVER 98663
4200 MAIN STREET
NO. 5 YAKIMA 98901
P. O. BOX 52
NO. 6 SPOKANE 99205
N. 2714 MAYFAIR ST.
NO. 7 BELLEVUE 98004
10506 N.E. 4TH ST.

June 24, 1971

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