GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO: Mr. A.P. Kohut
Sr. Geological Engineer
Groundwater Section
Hydrology Division
Water Investigations Branch

FROM: M. Zubel
Geological Engineer
Groundwater Section

May 1 1978

SUBJECT: Town of Williams Lake Water Supply
- Further Groundwater Development

OUR FILE 93-B-1

YOUR FILE

INTRODUCTION

In a memorandum dated March 9, 1978 to Mr. P.M. Brady, Director of the Water Investigations Branch, Mr. H.D. DeBeck, Comptroller of Water Rights, has requested that the Groundwater Section outline a recommended program for further groundwater investigation and development. Since the prospects for the development of additional wells in the Scout Island aquifer are excellent, this report will only consider the feasibility and method of further developing this aquifer.

RESULTS OF PREVIOUS DEVELOPMENTS

Previous groundwater investigations (Foweraker, 1967; Callan, 1968), including geologic mapping and test drilling, indicate that Scout Island is underlain by a confined or semi-confined aquifer which is probably linear in shape with its long axis extending eastward beneath Williams Lake. The first production well on Scout Island was installed and tested in 1968. The results of initial pump testing indicate that an aquifer transmissivity of 620,000 USgpd/ft. and a storage coefficient of $1 x 10^{-4}$ appear to be representative of the aquifer. Since 1968, two more production wells have been installed on Scout Island. Together, these three wells (Figure 1) have a capacity of drawing approximately 4,000 USgpm from the aquifer. The theoretical resulting drawdown and well interference effects for the wells pumping at recommended maximum rates for 100 days are summarized on Table 1.

HYDROGRAPH ANALYSIS

A hydrograph analysis of the Scout Island observation wells WR85-69 and WR85A-69 has been made to determine the effects production pumping has had on the Scout Island Aquifer. Figure 2 shows the hydrograph of observation well WR85-69 which had been automatically recording the water levels in the observation well from January 1970 to February 1973. Figure 3 shows the hydrograph of observation well WR85A-69 from March 1973 to December 1977.

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From January 1970 to March 1971, the observation well WR85-69 hydrograph (Figure 2) reflects the seasonal fluctuations of the non-pumping water level from 13.2 feet to 14.6 feet below ground level. From July 1971 to February 1973, this hydrograph reflects the effects of Well No. 1 pumping activities upon observation well WR85-69. It is evident that by the end of 1972 this initial pumping lowered the water level in the observation well by approximately 7 feet. However, the hydrograph does not necessarily indicate the aquifer is being mined since the recovered non-pumping water level has not been available due to the continuous pumping activity of well no. 1. Indications are that a new equilibrium level was being established under the pumping conditions at that time. In February 1973, observation well WR85-69 was abandoned and subsequently observation well WR85A-69 (see Figure 1) was used to monitor the water levels.

The hydrograph of observation well WR85A-69 begins in March 1973. When production well no. 2 began pumping in June 1973, the water level in this observation well declined 3 feet. The hydrograph period between November 1974 and December 1977 indicates a relatively stable trend in the water table level. Assuming that the pumping rates have been constant, the stable trend suggests that the aquifer has reached equilibrium conditions. This further suggests that the aquifer yield to the production wells is being recharged and the aquifer is not being mined. On the basis of this analysis, it would be possible, therefore, to install additional large capacity production wells at Scout Island.

ADDITIONAL PRODUCTION WELLS - DISCUSSION

Table 1 shows the theoretical drawdown and well interference effects for production well nos. 1, 2 and 3. Production well no. 3, capable of supplying 2,000 USgpm and which was constructed in 1976, has not yet been put into continuous production. However, an analysis of the data from Table 1 indicates that production well no. 3 would theoretically utilize 28% of its available drawdown as a result of the combined pumping activities of production well nos. 1, 2 and 3. To determine what effect additional wells (pumping at 2,000 USgpm each) would have on the available drawdown of production well no. 3, a theoretical analysis of 8 additional wells has been made (Table 2, Parts A, B). Table 2 (Part B) indicates that 8 additional wells, located as shown on Table 2 (Part A), each pumping 2,000 USgpm and each having an available drawdown of 130 feet, would increase the percentage of available drawdown utilized in production well no. 3 to 67%. This figure (67%) is considered to be the practical limit of drawdown utilization at this time. On this basis, it would be possible to install 8 additional wells providing a possible combined yield of 20,000 USgpm.

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Mr. A.P. Kohut May 1, 1978

ADDITIONAL PRODUCTION WELLS - RECOMMENDED PROGRAM

A recommended program for further development of the aquifer would be as follows:

1) Selection of a drill site, located at least 100 feet from production well no. 3.

2) Drilling and construction of a 200-foot, 16-inch diameter well, designed for 2,000 USgpm.

3) Developing, followed by constant rate pump testing for a minimum of 24 hours at 2,000 USgpm, using production well nos. 1, 2, 3 and observation well WR85A-69 as monitoring wells. Drawdown and recovery measurements should be taken according to standard procedures to facilitate determination of aquifer characteristics and any boundary effects.

4) Continued monitoring of the drawdowns and pumping rates of well nos. 1, 2, 3, 4 and observation well WR85A-69 under production conditions.

5) Regular annual water quality sampling of all production wells.

6) Drilling and construction of additional 16-inch wells as required (theoretical maximum of 7 additional wells), in conjunction with continued monitoring of the aquifer.

REFERENCES

Callan, D. 1968. "Test Production Well #1 - Summary and Recommendations" (December). Groundwater Section File 93-B-1.

Callan, D. 1969. "Aquifer Evaluation, Scout Island, Williams Lake" (November). Groundwater Section File 93-B-1.

Foweraker, J.C. 1967. "Notes on Surficial Geology, Well Logs and a Proposed Rotary Test Drilling Program at Williams Lake" (October). Groundwater Section File 93-B-1.

Marc Zubel

M. Zubel
Geological Engineer
Groundwater Section

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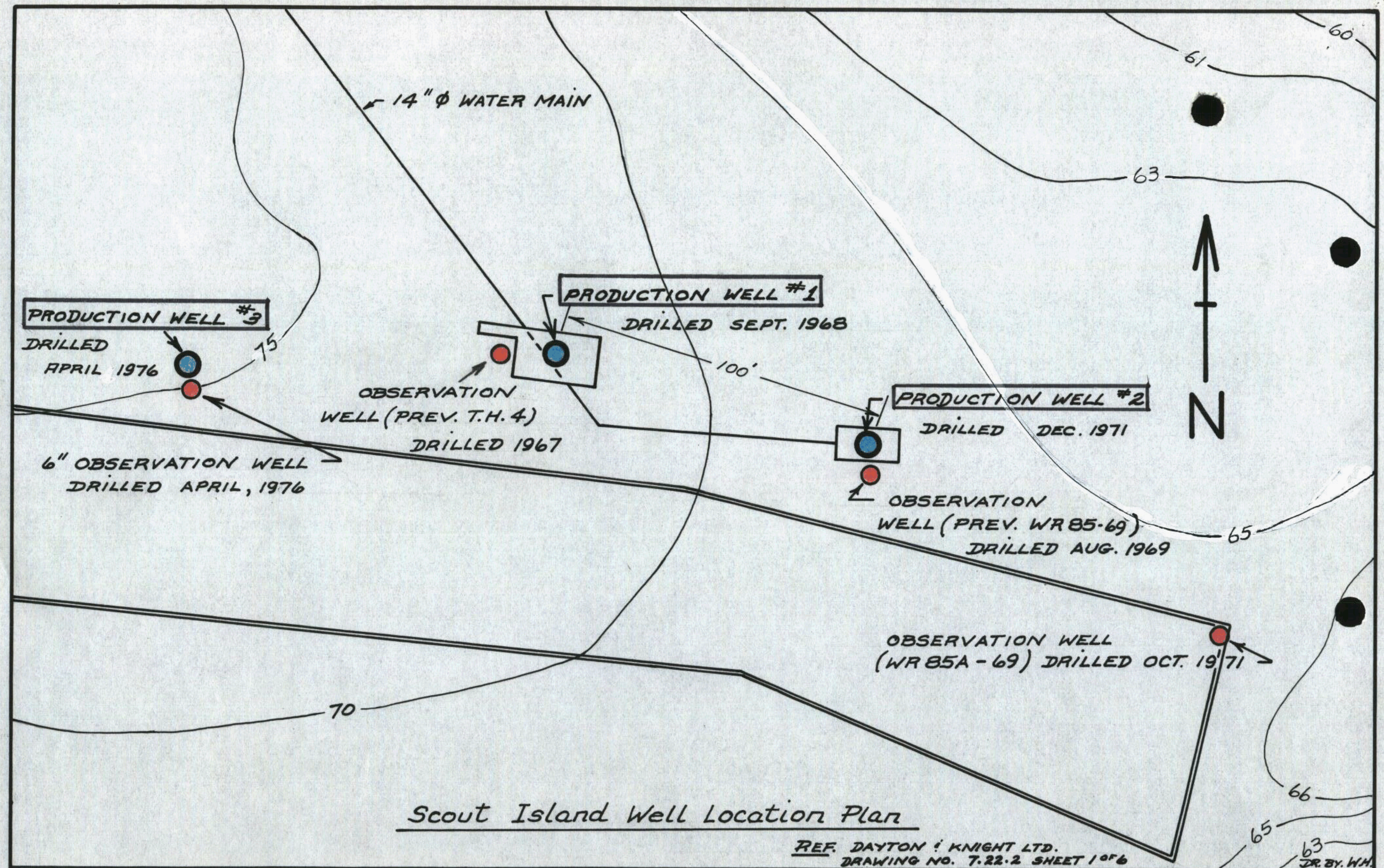
Attachs.



Scout Island Well Location Plan

REF. DAYTON & KNIGHT LTD. DRAWING NO. 7.22.2 SHEET 1 OF 6

DR. BY. W.H.

BRITISH COLUMBIA MINISTRY OF THE ENVIRONMENT ENVIRONMENTAL AND ENGINEERING SERVICES WATER INVESTIGATIONS BRANCH	TO ACCOMPANY REPORT ON Town of Williams Lake, Water Supply - Further Groundwater Supply	SCALE: VERT. 1" = 40' HOR. 1" = 40' DATE: APRIL 1978 MARC ZUBEL, ENGINEER FILE No. 93-B-1 DWG. No. Figure 1

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TABLE 1

DRAWDOWN AND WELL INTERFERENCE EFFECTS FOR PRODUCTION WELLS 1, 2, 3 - SCOUT ISLAND AQUIFER, WILLIAMS LAKE

Well No.		1	2	3
Period of Pumping (Days)		100	100	100
Pumping Rate (USgpm)		720	1200	2000
Specific Capacity (USgpm/ft.) (Extrapolated from Pump Test Data)		70	75	70
Drawdown in Well (Ft.) (No Interference)		10.28	16.00	28.57
Drawdown at Distance r (Ft.) Away From Well	r=100	2.22	3.71	6.17
	r=200	2.04	3.41	5.68
Interference Drawdown Due to Other Wells (Ft.)	Well 1	-	2.22	2.22
	Well 2	3.71	-	3.41
	Well 3	6.17	5.68	-
Total Drawdown (Ft.)		20.16	24.08	34.20
Available Drawdown (Ft.)		162	137	121
% of Available Drawdown Utilized		12	18	28

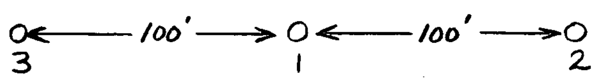

TABLE 2 (PART A)

THEORETICAL DRAWDOWN AND WELL INTERFERENCE EFFECTS

FOR ADDITIONAL PRODUCTION WELLS

SCOUT ISLAND AQUIFER, WILLIAMS LAKE

Well No.		1	2	3	4-11
Period of Pumping (Days)		100	100	100	100
Pumping Rate (USgpm)		720	1200	2000	2000
Specific Capacity (USgpm/ft)		70	75	70	70*
Drawdown in Well (ft.) (No Interference)		10.28	16.00	28.57	28.57
Drawdown at Distance r (ft) Away From Well					
	r=100	2.22	3.71	6.17	6.17
	r=141	2.13	3.55	5.92	5.92
	r=200	2.04	3.41	5.68	5.68
	r=224	2.01	3.35	5.58	5.58
	r=282	1.95	3.25	5.41	5.41
	r=300	1.93	3.21	5.36	5.36
	r=316	1.92	3.20	5.33	5.33
	r=361	1.89	3.14	5.24	5.24

*Estimated on the basis on Well #3 pump test data.

THEORETICAL LAYOUT OF ADDITIONAL PRODUCTION WELLS

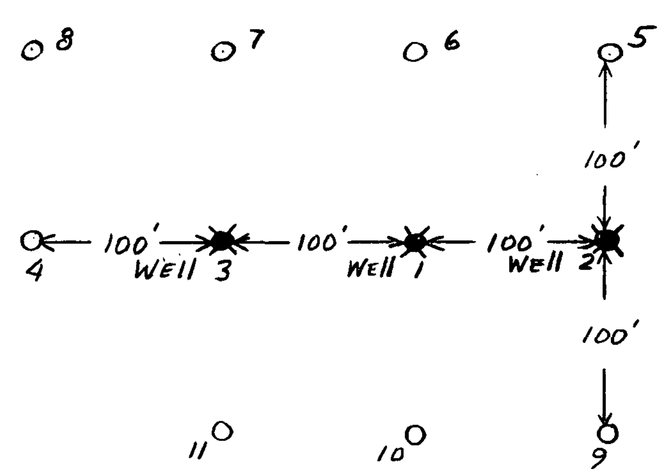

TABLE 2 (PART B)

Well No.	1	2	3	4	5	6	7	8	9	10	11
Interference Drawdown (ft) Due To:											
Well 1	-	2.22	2.22	2.04	2.13	2.22	2.13	2.01	2.13	2.22	2.13
Well 2	3.71	-	3.41	3.21	3.71	3.55	3.35	3.20	3.71	3.55	3.35
Well 3	6.17	5.68	-	6.17	5.58	5.92	6.17	5.92	5.58	6.17	6.17
Well 4	5.68	5.36	6.17	-	5.33	5.58	5.92	6.17	5.33	5.58	5.92
Well 5	5.92	6.17	5.58	5.33	-	6.17	5.68	5.36	5.68	5.58	5.41
Well 6	6.17	5.92	5.92	5.58	6.17	-	6.17	5.68	5.58	5.68	5.58
Well 7	5.92	5.58	6.17	5.92	5.68	6.17	-	6.17	5.41	5.58	5.68
Well 8	5.58	5.33	5.92	6.17	5.33	5.68	6.17	-	5.24	5.33	5.58
Well 9	5.92	6.17	5.58	5.33	5.68	5.58	5.41	5.24	-	6.17	5.68
Well 10	6.17	5.92	5.92	5.58	5.58	5.68	5.58	5.41	6.17	-	6.17
Well 11	5.92	5.58	6.17	5.92	5.41	5.58	5.68	5.58	5.68	6.17	-
Total Drawdown (ft)	67.44	69.93	81.63	79.82	79.17	80.70	80.83	79.31	79.08	80.60	80.24
Available* Drawdown (ft)	162	137	121	130	130	130	130	130	130	130	130
% of Available Drawdown Utilized	42	51	67	61	61	62	62	61	61	62	62

*Available drawdown for Wells 1, 2, 3 based on well construction and static water level prior to pumping. Available drawdown for Wells 4-11 are assumed, based on available drawdown in Wells 1, 2, 3.

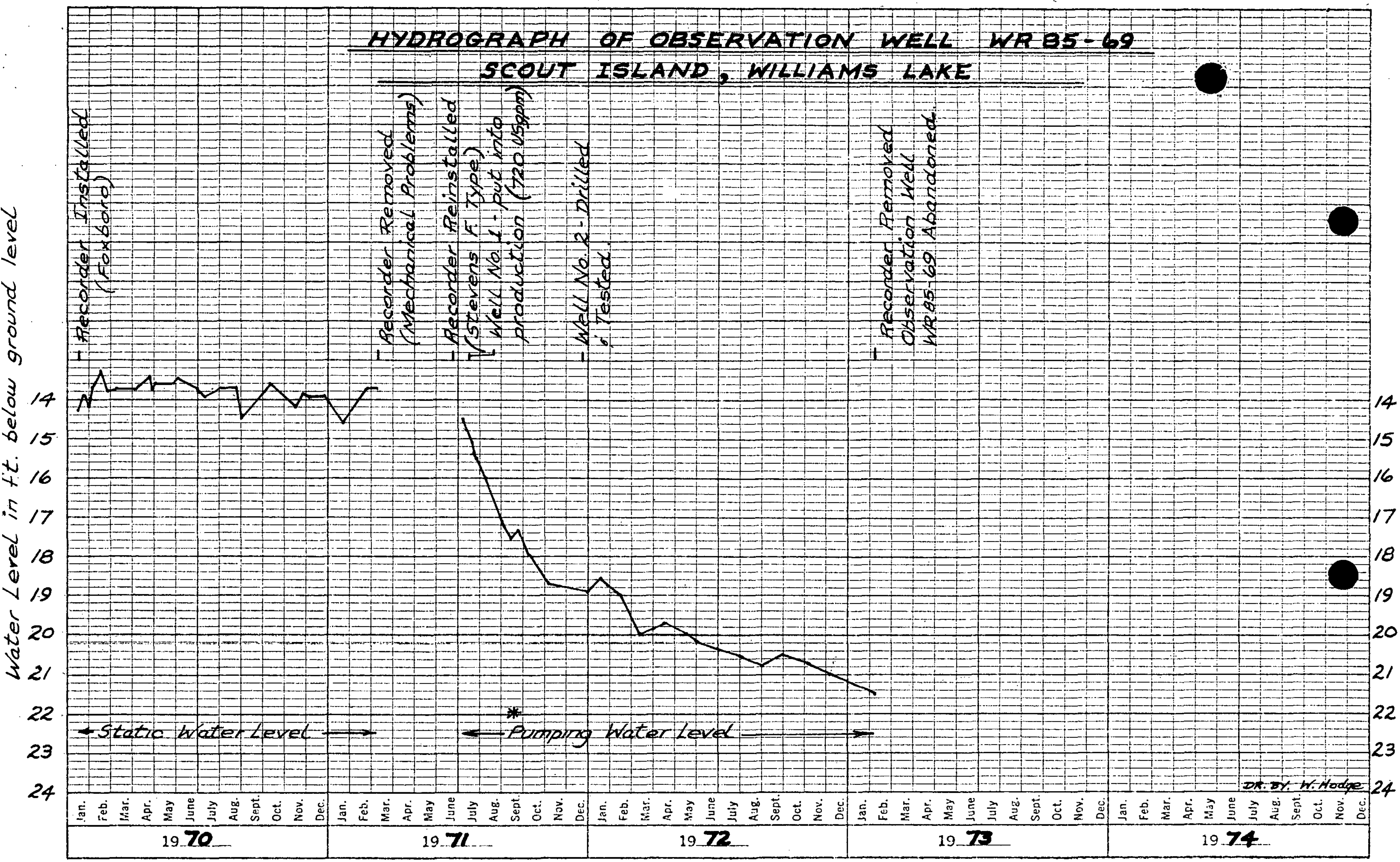

Figure 2.

Note:
* Pumping water level refers to the water level readings when the pump is ON.

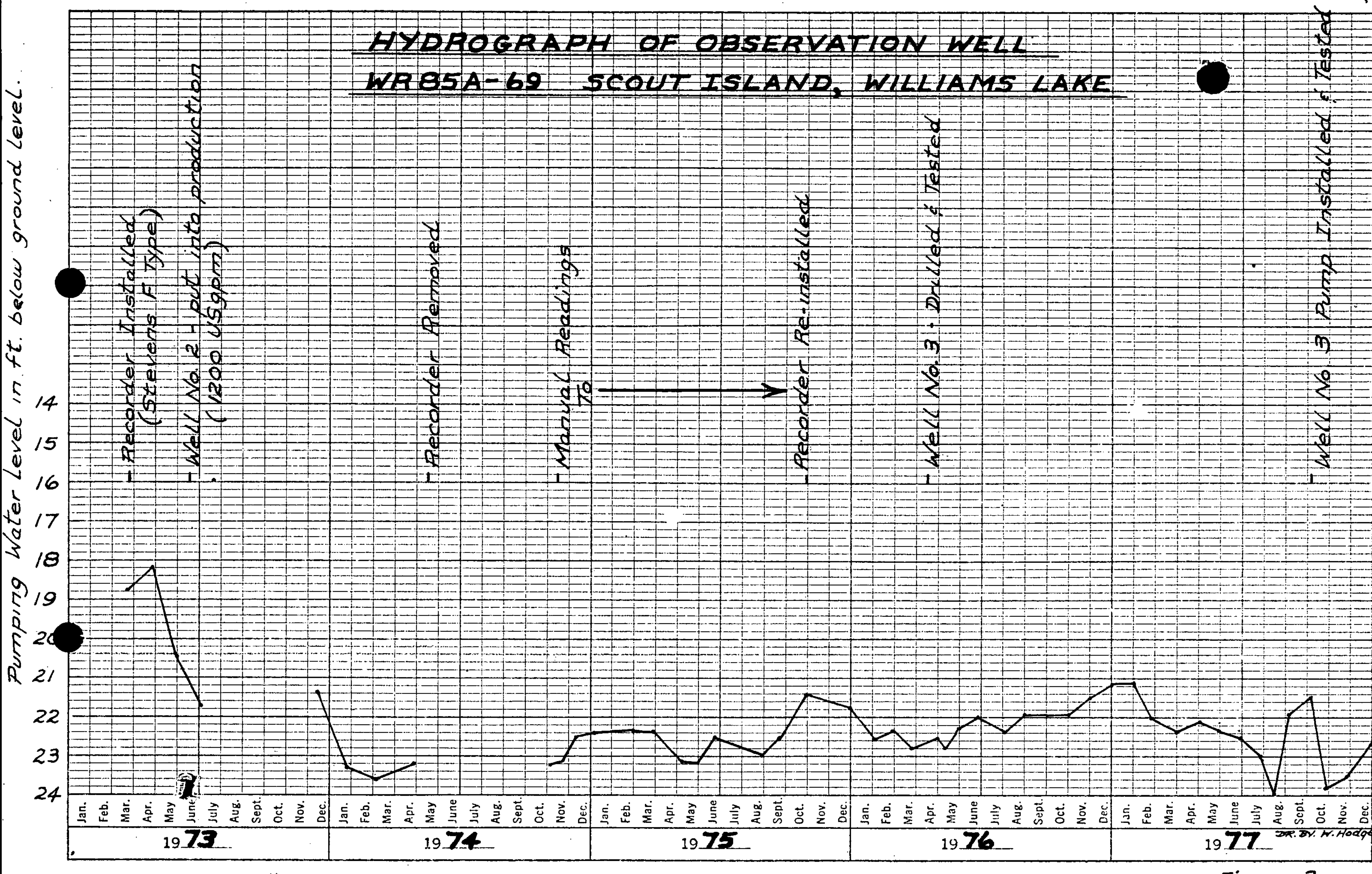

Figure 3.

Note:
Pumping Water levels refer to the water level readings when the pump(s) is (are) on.