GOVERNMENT OF BRITISH COLUMBIA

MEMORANDUM

TO: J. C. Foweraker, Head
Groundwater Section
Hydrology Division

Water Investigations Branch

FROM: W. S. Hodge
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Groundwater Section

August 8 19 77

SUBJECT: Observation Wells Established for the Kingswood Well Test - March 17-30, 1977

OUR FILE: 0183613-B

YOUR FILE:

Introduction

Further to Mr. E. Tradewell's memorandum of April 28, 1977, File 0239013, an attempt here has been made to determine whether water levels in observation wells, established in the Kingswood well area were or were not affected from the recent well test. Some interference figures have been previously calculated by Mr. E. Tradewell (April 28,1977, File 0239013) using transmissivity values taken from match point determinations for wells WR-106-72-75 (K. Pleasance) and WR-125-77 (L. Vrebosch). These wells are obviously affected from the Kingswood pumping. Four of the wells monitored during the duration of the Kingswood well test were established specifically for the well test and three were established previously as part of the normal observation well network.

Kingswood Well Test

A well test was performed on the Kingswood well in North Saanich (Well #1, Rg. 1W, Section 17). The test began March 17, 1977 at 1330 hours and terminated March 30, 1977 at 1000 hours. Two power failures occurred during the later part of the test, the first after 12,630 minutes (8.7 days) and the second after 15,510 minutes of pumping (10.7 days). For analytical purposes the test is considered to have terminated immediately after the first power failure. The well was pumped continuously at a near constant rate of 250 USgpm throughout the test.

Seasonal Water Level Fluctuations

Water levels in bedrock wells on the Saanich Peninsula were approaching peak levels at the time of the well test or in some cases beginning on their seasonal decline. Although water levels may have been declining, the well interference noted was probably less than that which would have occurred if the test were performed during the drier summer months when water levels would be at their seasonal lowest. The only significant rainfall to fall during the well test was on March 25, 1977 when 29 millimetres of rainfall occurred (1.15") recorded at Victoria International Airport.

APK 11/8/77 H.I. HUNTER 11/8/77 J.C. FOWERAKER 26 Aug/77

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Observation Wells

During the pumping of the Kingswood well (May 17-30, 1977), seven bedrock observation wells were monitored either with automatic water level recorders or manually tape read to record any interference in proximity to the area of pumping. Of the seven wells monitored, three are presently on the observation well network, all equipped with water level recorders, and four were established specifically for the well test, three monitored manually, and one equipped with an automatic recorder (note attached well location map). Mr. K. Pleasance's well (WR-106-72-75) was originally included on the normal network, however the water level recorder was removed in August 1975 in order to use the well for domestic purposes. This well was monitored manually each day (March 17-April 15, 1977) to record any interference that may be caused from the Kingswood well test. Unfortunately water levels were not taken on the Marco, Stern, or Mailleue wells prior to the well test and it is therefore difficult to interpret these water level plots from what may be seasonal water level fluctuation and what may be interference.

Pemberton Holmes Well - Rg. 1W, Section 18, #3, North Saanich

This well has been established as part of the normal observation well network, and normally equipped with a 31-day weight drive recorder installation (WR-119-75). This recorder was removed and replaced with an 8-day wind-up installation from March 18-May 2, 1977 in order to more clearly interpret any interference from the Kingswood pumping.

Between the period March 18-March 30, 1977 a decline of 1.33' was recorded (note attached water level plot). This decline is believed to be directly attributed to the Kingswood well test. In comparison, the water level for the same period 1976 has risen approximately 0.21' with no significant decline in water level noted until early May. This decline is normal and believed to be caused in part by both seasonal and the pumping of the Kingswood well for irrigation purposes (275-300 USgpm ?). The second peak noted on the plot can probably be attributed to either water level recovery after the power failure or perhaps aquifer recharge from rainfall (March 25th - 1.15").

After completion of the well test on March 30 the well appears to recover, peaking March 31 around 1800 hours and then generally stablizing until around April 20 when the well appears to slowly decline until early May when water level begins to fall rapidly.

R. Stern Well - Rg. 1W, Section 19, #6, North Saanich

This well was monitored manually every 2 or 3 days during the duration of the well test. A steady decline in water level is noticed with a total decline of approximately 2.60' occurring during the test. The well was in a flowing state on March 18, 1977. It would appear that some degree of interference is exhibited here however manual readings prevent a detailed analysis being done. This well is similar in depth to the Pemberton Holmes well however unfortunately no detailed log of the well is presently available. At the time of investigations the well was not being used.

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J. Marco - Rg. 1E, Section 19, #8, North Saanich

This well was also monitored manually every 2 or 3 days during the duration of the well test. Once again the taking of manual readings prevents detailed analysis being done. It is interesting to note the water level did not begin to decline until March 21 and continued to decline to around April 6. The water level reading taken on March 28 is questionable and may have been a pumping level rather than static. This well was in use at time of investigation.

G. Mailleue - Rg. 1W, Section 20, #25, North Saanich

An automatic water level recorder was installed on this well for the period March 18-April 27, 1977. The water level plot shows a steady decline. As no preveious water level readings were taken on this well it is difficult to contribute this decline to Kingswood pumping. It would, however, appear to have some degree of hydraulic connection to the Kingswood well because of proximity to the Vrebosch well. Continuous monitoring of this well may support this theory. Mr. Mailleue has agreed to take daily manual water level readings on this well and forward to us upon request.

On August 2nd he was contacted and daily readings have been taken since early May showing a steady decline in water level.

The water level recorder was removed April 27, 1977.

K. Jones - Rge. 1E, Section 15, #7, North Saanich

An automatic water level recorder was previously installed on this well as part of the normal observation well network (WR-118-75). A 31-day weight drive recorder was replaced with an 8-day wind-up installation from March 17-April 6, 1977 in order to interpret more clearly any interference that might have occurred from the Kingswood pumping. No interference was noted and in fact water level rose steadily during the duration of the well test. The water level rose 1.70' between March 17 and April 6, 1977. The 8-day wind-up recorder installation was replaced with the normal 31-day weight drive installation April 6, 1977.

L. Vrebosch - Rge. 1W, Section 20, #23, North Saanich

An automatic water level recorder was previously installed on this well as part of the normal observation well network (WR-125-77). The amount of interference caused from the Kingswood well test has previously been determined as in excess of 14 feet. (Tradewell - April 28, 1977; File 0239013). After termination of the well test the water level in the Vrebosch well continued to decline a further 0.36' over the next 36 hours. At this point oscillation occurred for 16 hours and then the well began to recover steadily between 0.33'-0.79' every 2 days. Recovery continued at this rate until around April 21, 1977 (Water level here was approximately 13.14' below ground level). The water level began to stabilize until

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around May 3rd where the water level peaked and began to decline once again. In mid-May the Kingswood well was again started for the irrigation season and the Vrebosch well was seen to decline more rapidly at this point. Presently the water level is continuing to decline. The July 27, 1977 water level reading was recorded as 47.04' below ground level.

K. Pleasance - Rge. 1W, Section 20, #14, North Saanich

As previously mentioned this well was originally included on the normal observation well network from 1972-1975. During the Kingswood well test manual water level readings were taken every day and were continued until April 15, 1977. Direct interference from the Kingswood pumping was shown with a total drawdown of over 16 feet occurring during the well test. Upon completion of the test, water level continued to decline for a further 19 hours or so prior to the start of recovery. The well recovered almost 10 feet between March 31 and April 15, 1977.

Periodical water level readings are being taken on this well. The latest reading is 60.30' taken on July 19, 1977.

Conclusions and Recommendations

(1) Four wells were monitored manually and three wells were equipped with automatic recorders to record possible interference from the recent Kingswood well test.

(2) Both the Vrebosch (WR-125-77) and the Pleasance (WR-106-72-75) wells have shown direct interference from the well test.

(3) The Pemberton Holmes well (WR-119-75) has shown what appears to be interference from the well test, although the hydraulic connection is perhaps not as direct as seen in the Vrebosch and Pleasance wells.

(4) Interpretation of the Stern and Marco plots is difficult as manual readings were only able to be recorded once every 2 or 3 days. The Stern well does however, show a definite decline during the well test and this could possibly be attributed to the Kingswood well test.

(5) The Jones well has shown no interference from Kingswood pumping and in fact water level rose significantly during the well test.

(6) The Mailleue well declined steadily during the well test and although this decline may have been caused from Kingswood pumping the hydraulic connection may again be not as direct as seen in the Vrebosch and Pleasance wells.

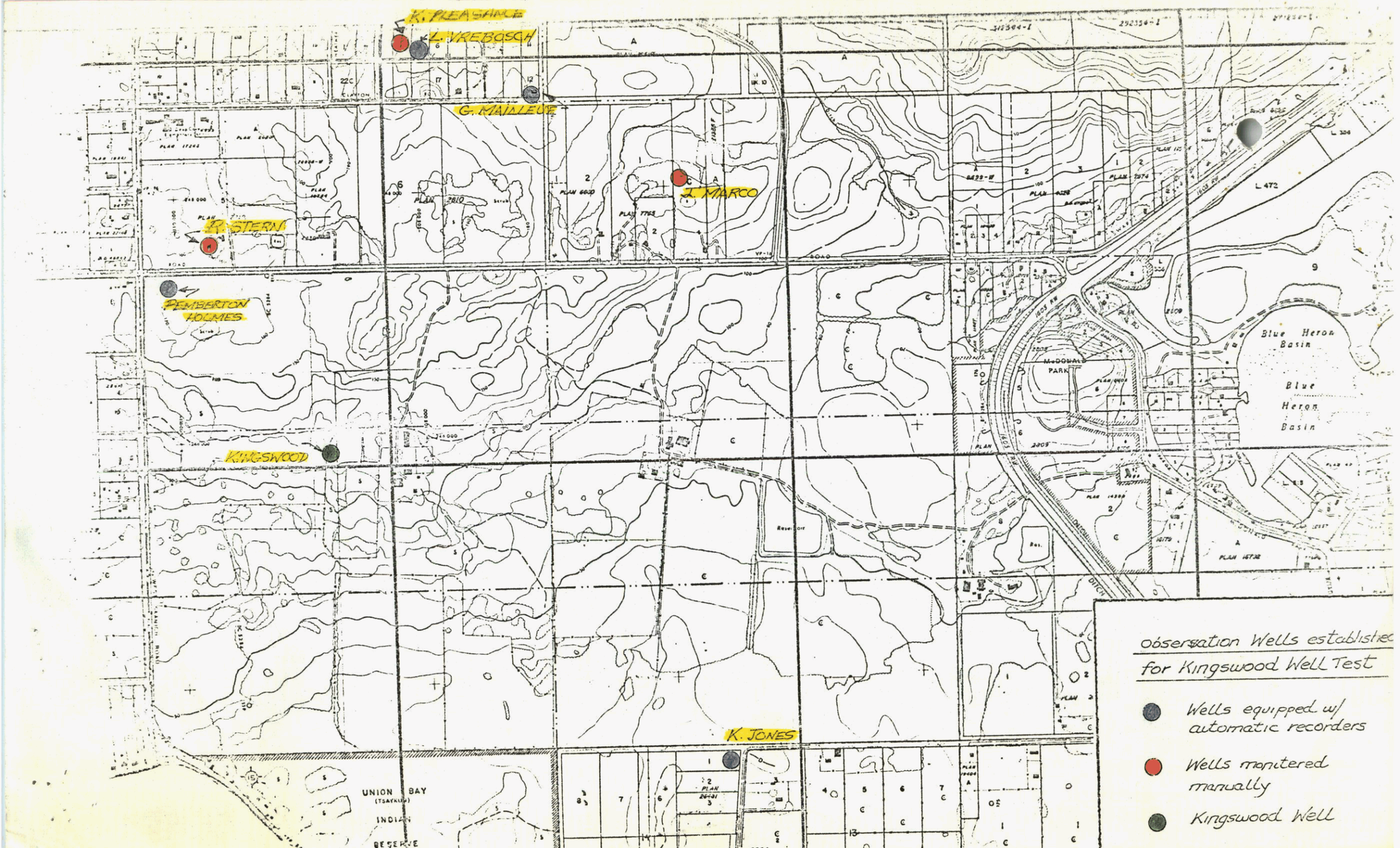
(7) If it is possible in the future when attempting to record well interference in an area of pumping, manual water level readings should be taken at least twice per day in monitoring wells in order to make interpretation easier.

(8) Once monitoring wells are established to record possible well interference, daily water level readings should be taken at least one week prior to a future well test in order to obtain some history of water level fluctuation. This exercise would allow possible well interference to be seen more readily.

W. S. Hodge.

W. S. Hodge
Engineering Assistant

WSH/dmc


K. PLEASANCE
L. VREBOSCH
G. MAINLEUS
J. MARCO
R. STERN
PEMBERTON HOLMES
KINGSWOOD
K. JONES
UNION BAY (TSAYKUM) INDIAN RESERVE
Blue Heron Basin
Blue Heron Basin
McDONALD PARK
Observation Wells established for Kingswood Well Test
Wells equipped w/ automatic recorders
Wells monitered manually
Kingswood Well

Kingswood Well Pumping Record June 20, 1977 -

Date	Well	Meter Reading	(U.S. gpm) Pumping Rate	Pumping W.L.	Static W.L.
June 20/77	Kingswood	-0-	not pumping	—	—
July 6/77	"	4,319,000	335	—	—
July 13/77	"	—	295	—	—
July 19/77	"	8,172,000	not pumping		45.60
July 27/77	"	9,334,000	185	86.30	—
Aug 4/77	"	10,833,000	175	80.92	—
Aug 10/77	"	12,006,880	128	76.71	

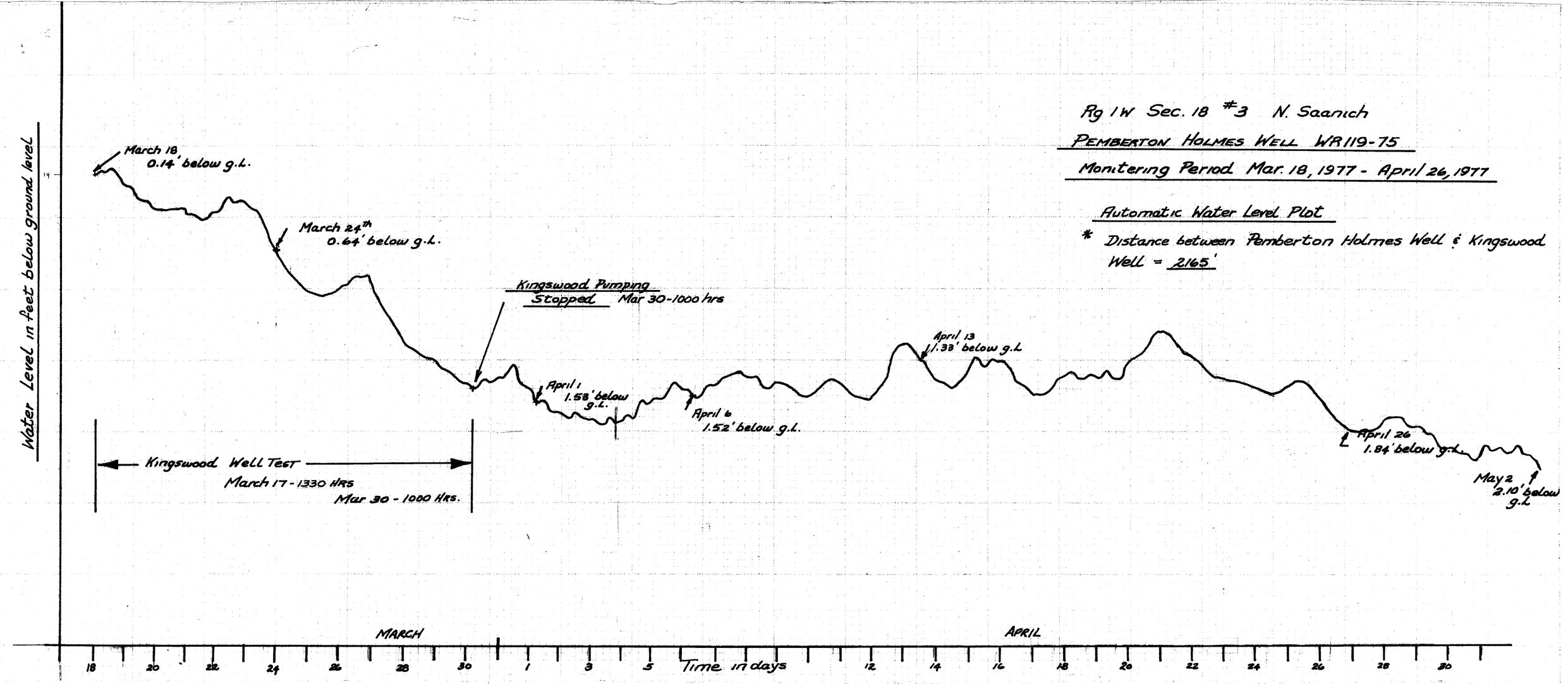
K. Pleasance Well	L. Vrebosch Well
55.60	
60.30'	
	47.30'
60.71'	53.63'
61.67	54.59

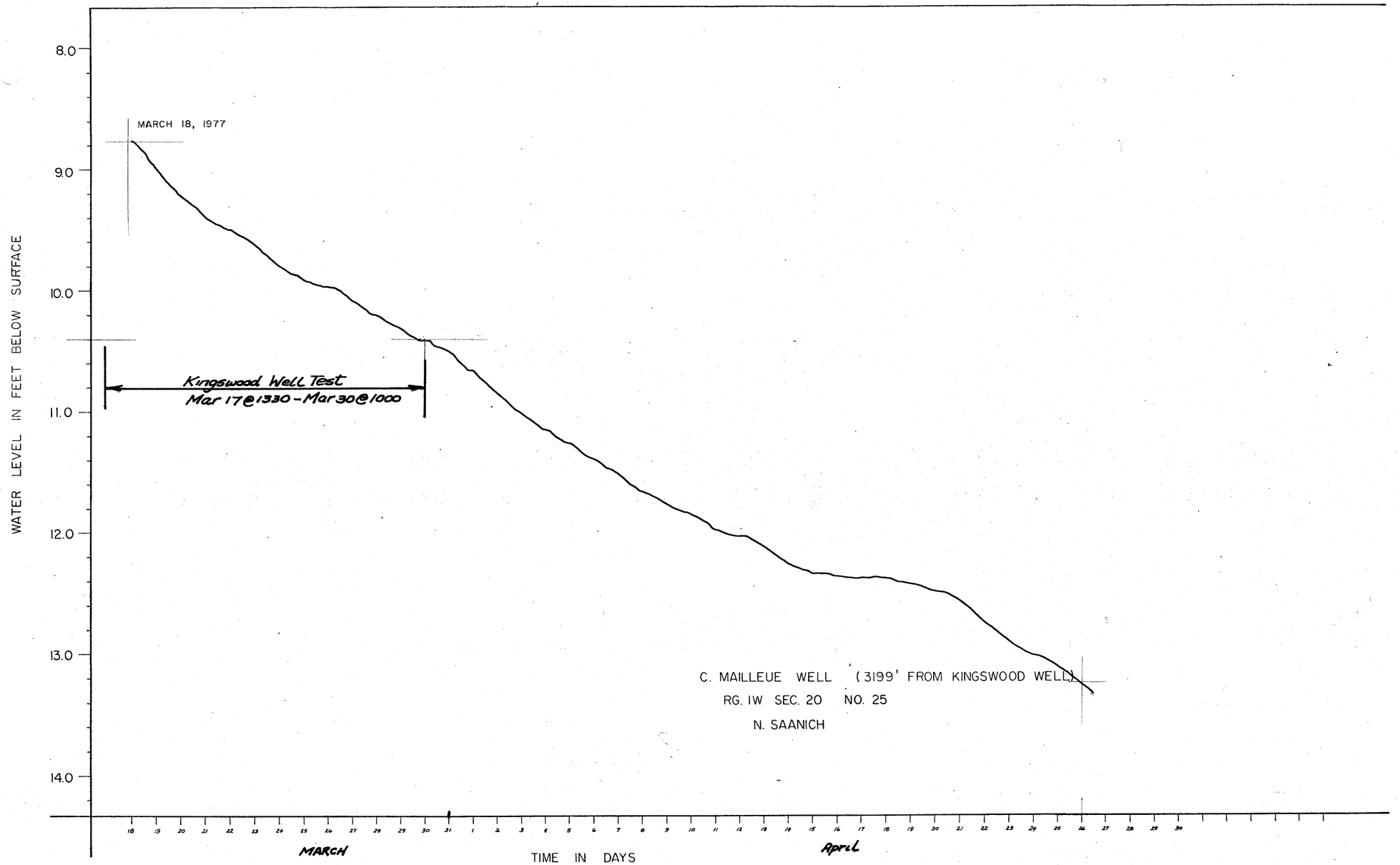
Average P.R. between July 6 - July 19/77 (13 days) = 215 USgpm.

Average P.R. between June 21/77 - July 6 (16 days) = 187 USgpm.

Average P.R. between June 21/77 - July 27 (37 days) = 175 USgpm

Average P.R. between June 21/77 - July 19 (29 days) = 195 USgpm


Rg 1W Sec. 18 #3 N. Saanich
PEMBERTON HOLMES WELL WR119-75
Monitering Period Mar. 18, 1977 - April 26, 1977
Automatic Water Level Plot
* Distance between Pemberton Holmes Well & Kingswood Well = 2165'
Water Level in feet below ground level
March 18 0.14' below g.l.
March 24th 0.64' below g.l.
Kingswood Pumping Stopped Mar 30-1000 hrs
April 1 1.58' below g.l.
April 6 1.52' below g.l.
April 13 1.33' below g.l.
April 26 1.84' below g.l.
May 2 2.10' below g.l.
Kingswood Well Test
March 17 - 1330 HRS
Mar 30 - 1000 HRS.
MARCH
APRIL
Time in days
18 20 22 24 26 28 30 1 3 5 12 14 16 18 20 22 24 26 28 30


8.0
9.0
10.0
11.0
12.0
13.0
14.0
WATER LEVEL IN FEET BELOW SURFACE
MARCH 18, 1977
Kingswood Well Test
Mar 17@1330 - Mar 30@1000
C. MAILLEUE WELL (3199' FROM KINGSWOOD WELL)
RG. IW SEC. 20 NO. 25
N. SAANICH
18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
MARCH
April
TIME IN DAYS

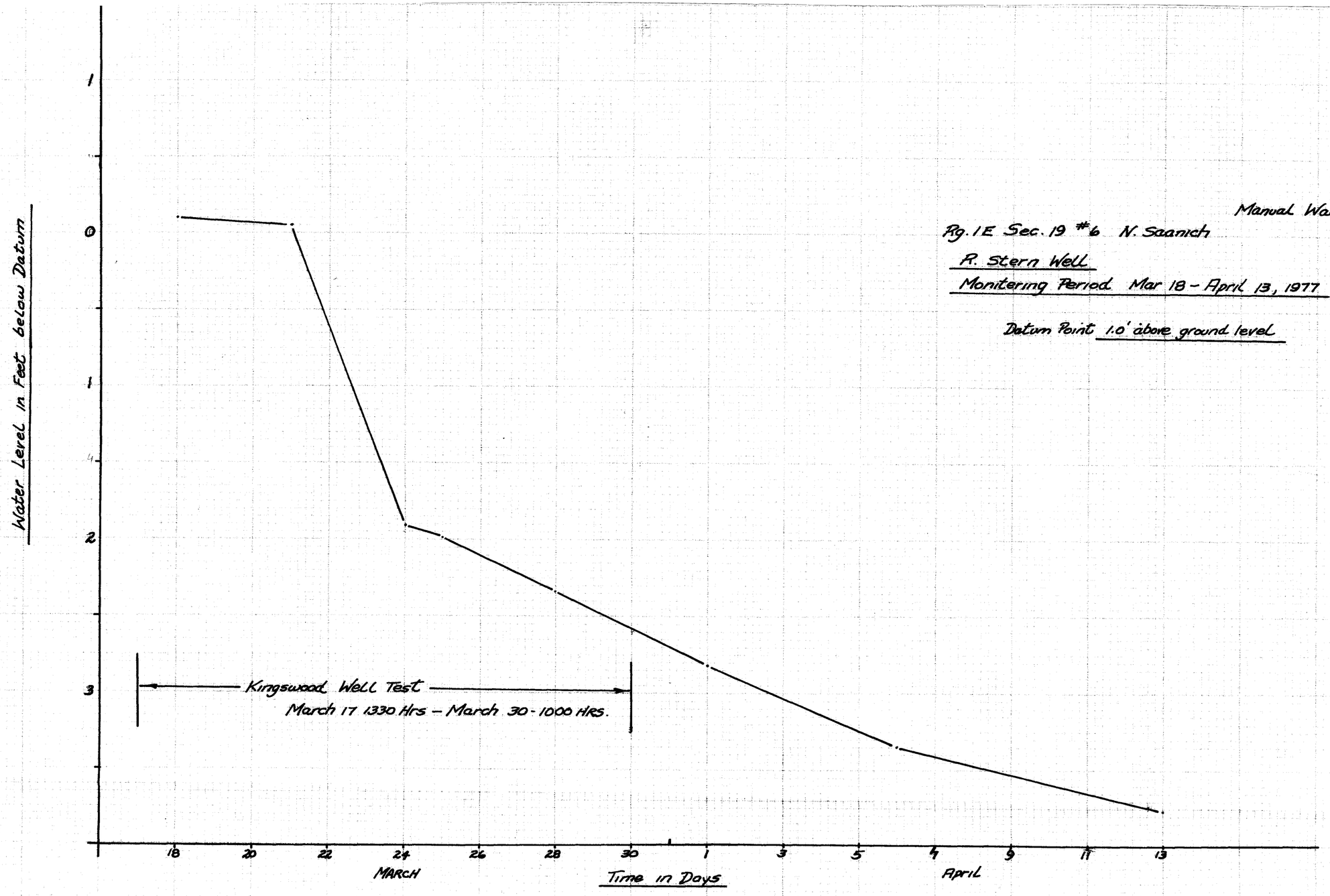
Manual Water Level Plot

Rg. 1E Sec. 19 #6 N. Saanich

R. Stern Well

Monitering Period Mar 18 - April 13, 1977

Datum Point 1.0' above ground level

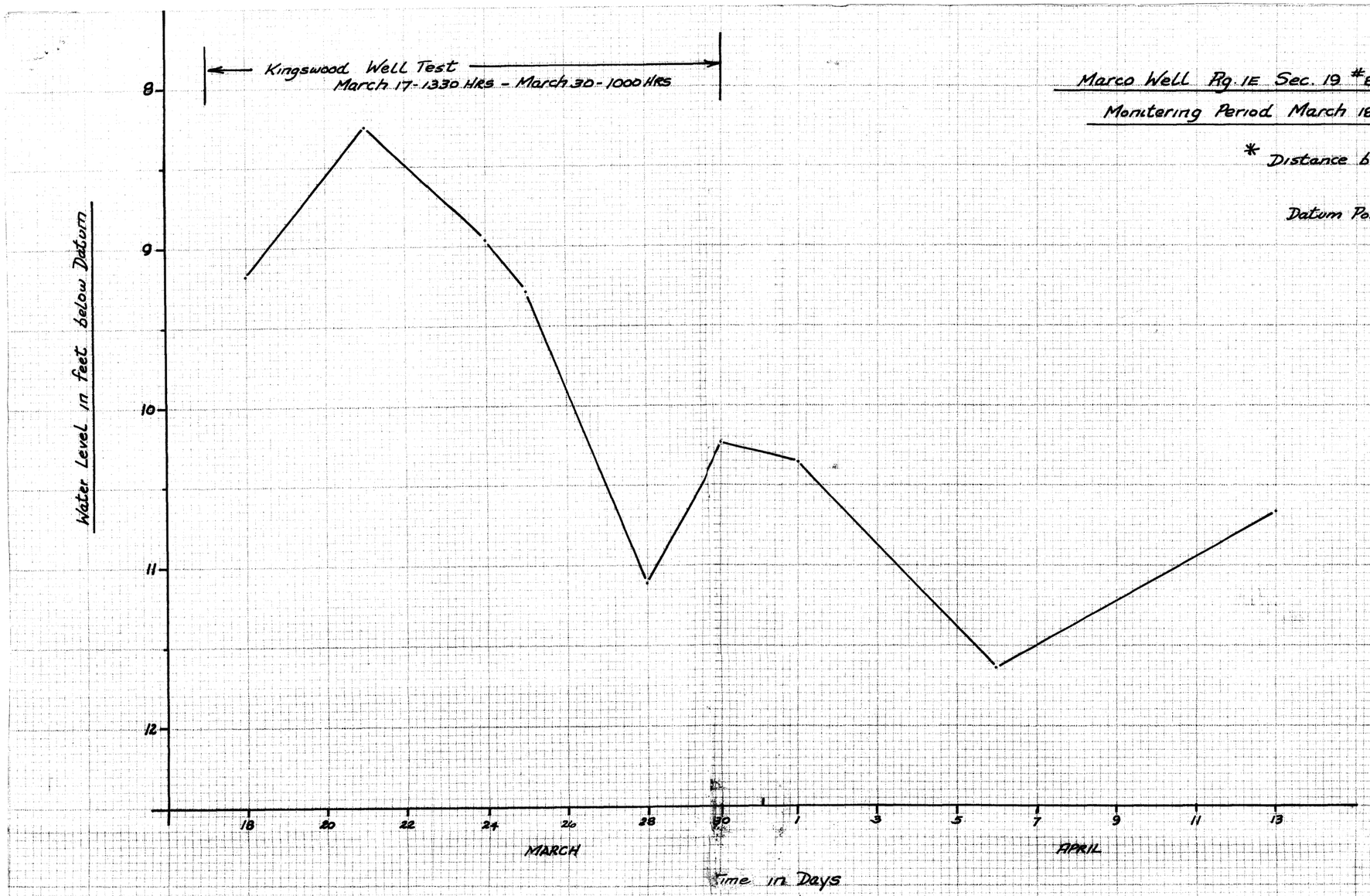


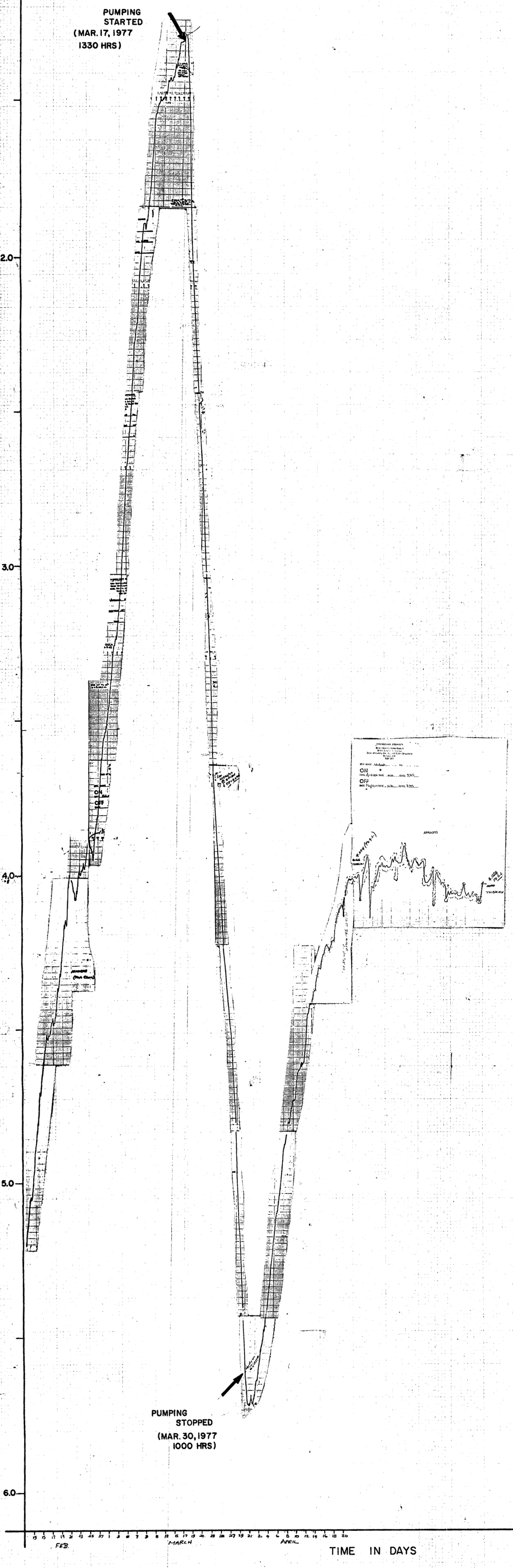
Marco Well Rg. 1E Sec. 19 *B N. Saanich Manual Water Level Readings

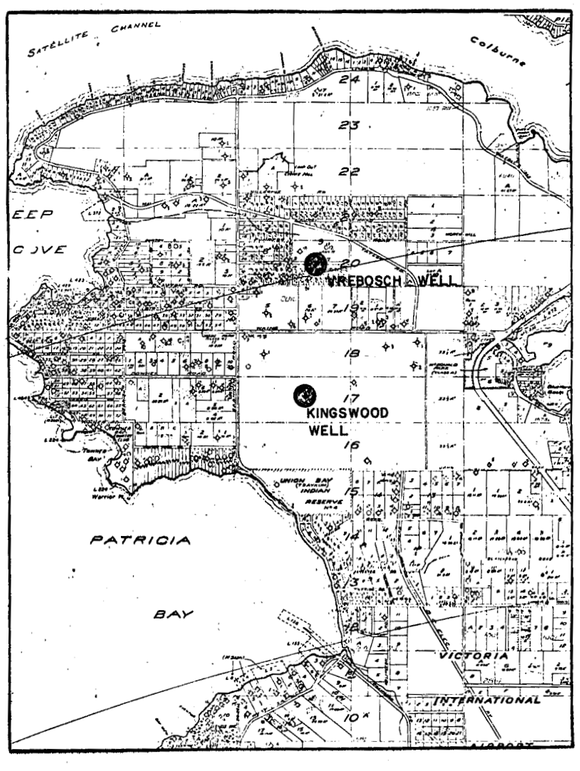
Monitering Period March 18 - April 13, 1977

* Distance between Kingswood Well & Marco Well = 3576'

Datum Point 0.5' above ground level







WR125-77 (VREBOSCH WELL)
SITE 1401395

AUTOMATIC RECORDER PLOT SHOWING BOTH SEASONAL WATER LEVEL INCLINE (FEB. 11 - MAR. 17) AND WATER LEVEL DECLINE AND RECOVERY CAUSED BY PUMPING OF THE KINGSWOOD WELL (250 USGPM) MAR. 17 1330 HRS - MAR. 30 1000 HRS