Alberta Research Council
Open File Report 1968-6

MEMO ON THE EFFECT OF THE SUMP ON THE DEWATERING OF THE OVERBURDEN IN G.C.O.S. LEASE 86

by

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July 3, 1968

Alberta
RESEARCH COUNCIL

The purpose of this memo is to evaluate the effect of the sump survey being dug on the Great Canadian Oil Sands Lease 86 for the purpose of dewatering the overburden. The survey, at the present is being pumped at a rate averaging approximately 1.36 million gallons a day for the week of June 16 to 22. It should be emphasized at the outset that due to the short period of time in which I have been studying the ground water in the overburden, any conclusions arrived at in this memo should be considered as opinions which are not based on sufficient information and which will probably be revised at a later date.

The only records in the effect of the sump survey on the ground water in the overburden is provided by thirteen observation wells, two of which have been destroyed before this date. As of June 15 the following observation wells have recorded the effect of the survey by a drop in the water level in these: P1, P4, P8, P11, P14, P15, CH 117, and CH 122. The other observation wells do not appear to be affected by the sump survey. (See fig. 1 to 13). The approximate border of the cone of depression produced by the sump survey is shown in figure 16. It is in the shape of an ellipse with the long axis oriented circuted in a southwest-northeast direction. One factor that controls the shape of a cone of depression is the relative peruseability of an aquifer. If this is the cause of the elongated cone of depression in the overburden, it would mean that the permeability of the overburden is greater in a southwest-northeast direction in the vicinity of the sump survey. The shape of the cone of depression coincides with the A1 and B1 sand deposits (fig. 14, 15 and 16) as mapped by Linkens (1965). These sands are reported to have a peruseability between >50 and 1×10^5 ft/year by Materials Testing Laboratories as compared with the overlying BII, AII sand which have a reported permeability ranging between 0.2 and 50 ft/year. Thus it seems probable that the elongation of the cone of depression is caused by the greater permeability of the AI and BI sands.

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The fact that a cone of depression is formed as a result of pumping indicates that the pumping has dewatered part of the overburden. Also observation well records indicate that the cone of depression is still expanding, therefore the sump is being pumped in excess of ground water recharge. A steady state is reached when the pumping at the sump is just coping with recharge. When this state is reached the cone of depression remains essentially stationary. At the present it cannot be predicted when this condition will be reached.

Whether the sump is the most economical method of dewatering the overburden cannot be decided at the present. Before such questions can be answered more observation wells will have to be drilled, pump test conducted and the direction of ground water movement determined. From the limited present knowledge of the ground water condition, it appears that a sump dug in a direction perpendicular to the present sump may have greater advantages than the extension of the present sump southwestward. Before these advantages can be evaluated two assumptions have to be made. 1. That the AI and BI sands actually are more permeable than the other sands. This assumption is not unreasonable. 2. That the direction of ground water movement in the southern portion of Lease 86 is from the southwest. In the case of a flat sloping topography with homogeneous isotopic substratum and a uniform distribution of precipitation it has been found that the horizontal component of the ground water flow will be in the downslope direction. If this ideal condition can be used to predict the general direction of ground water flow in this area, then the ground water would be flowing from the southwest in the southern part of the lease. If these two assumptions are correct then there are some advantages to having a sump ~~drop~~ dug perpendicular to the present sump. One advantage of the new ~~survey~~ sump is that it would make use of more permeable material instead of removing it. A second advantage is that the

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proposed sump would intercept recharge entering the lease from the southwest and thus preventing it from entering the overburden northeast of the ~~survey~~ SUMP. A third advantage is that most of the water that will be removed by the new sump will be from the overburden within the lease, while an extension of the present ~~survey~~ sump will dewater a large portion of the overburden outside the lease.

Again it should be made clear that the information available is insufficient to place much confidence on the above discussion. Until such information is gathered and interpreted no definite conclusions can be reached.

AK/gsh

c.c. R. McClements Jr.
J. E. Gilbert
S. Winzer
W. G. Bahan.

Elevation of ground below pipe 1074.8
Bottom of well set at 42 ft.

(Approximate) Hydrograph

Fig. 11

HYD

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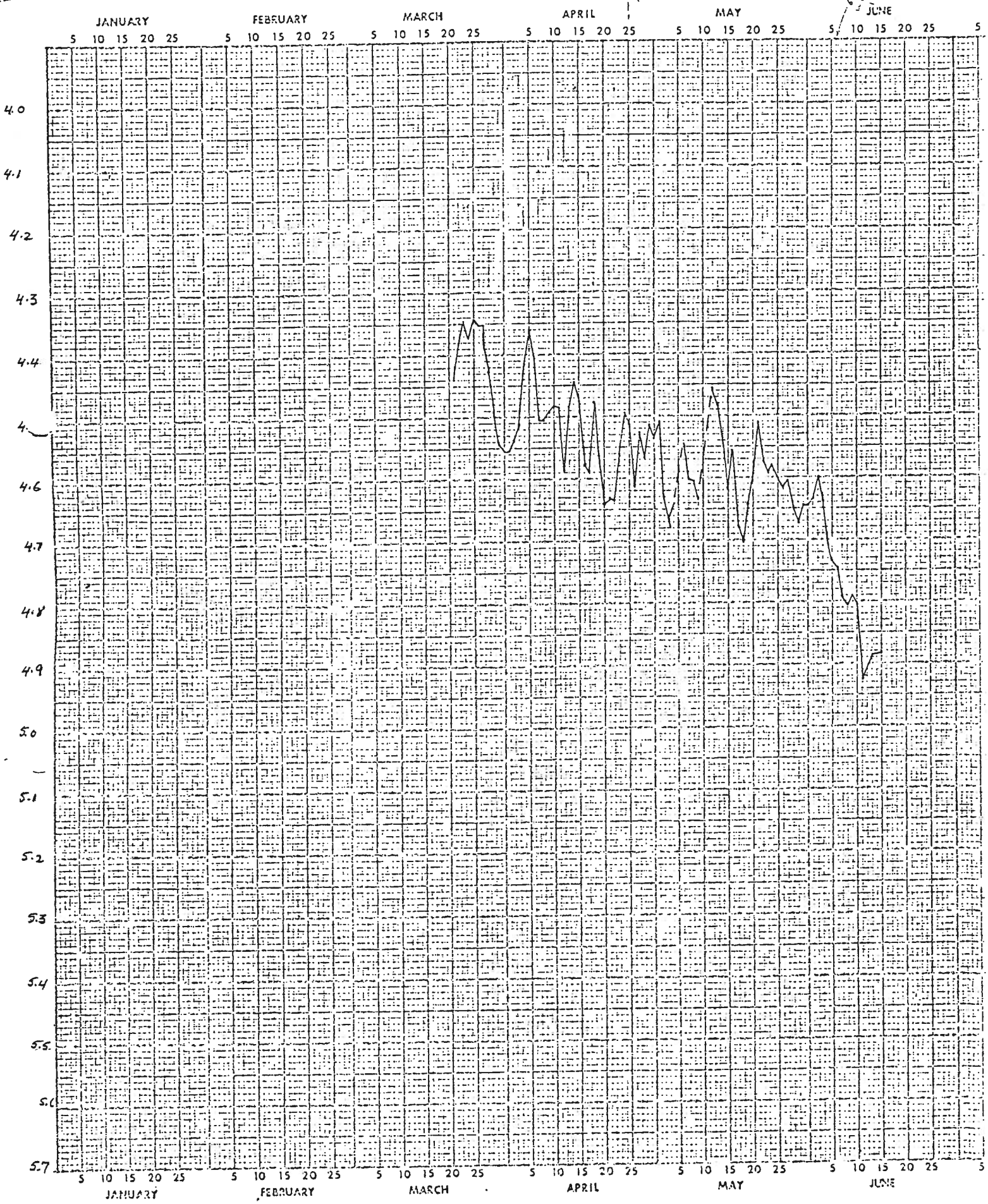

Approved by

Date

HYD

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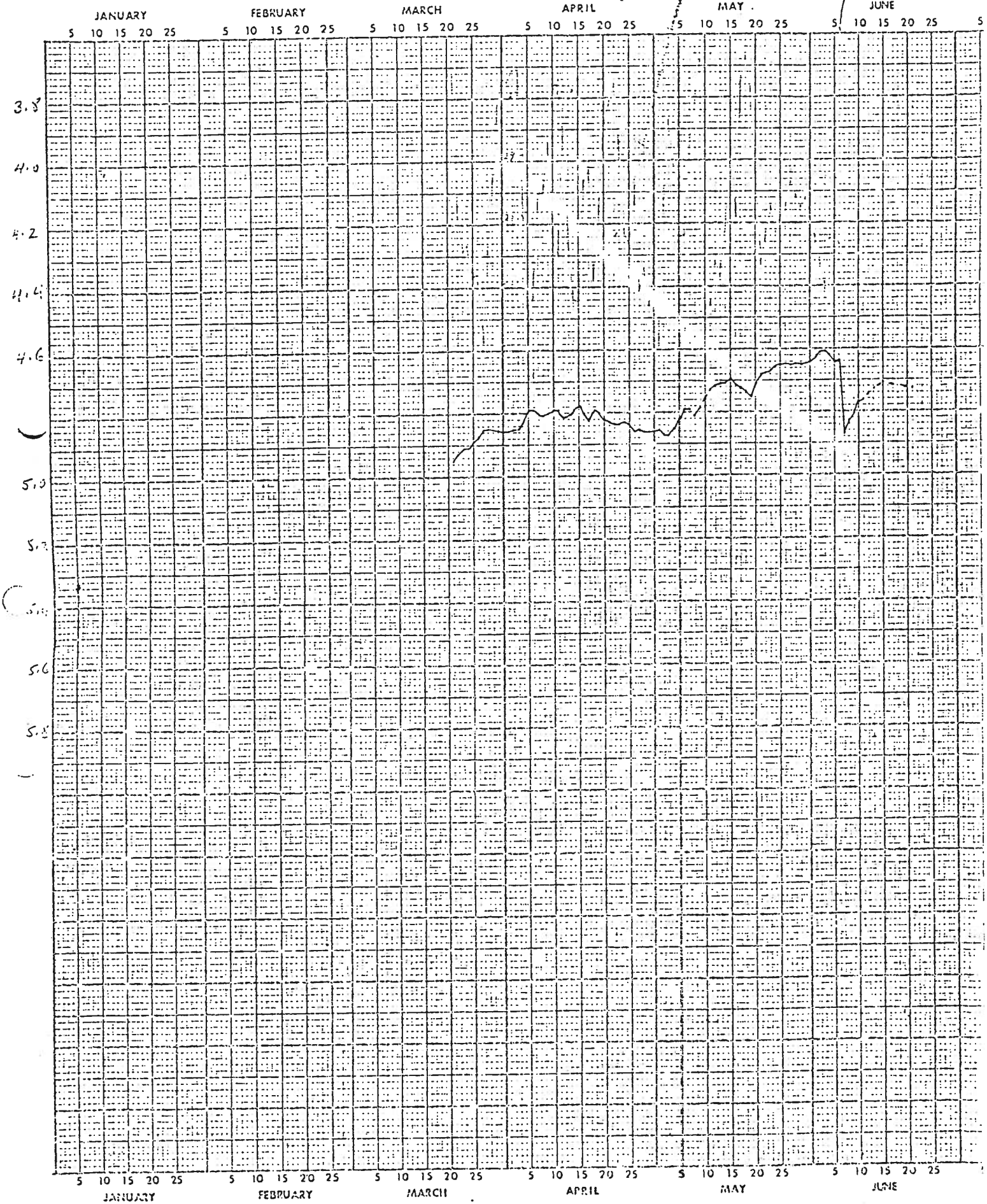
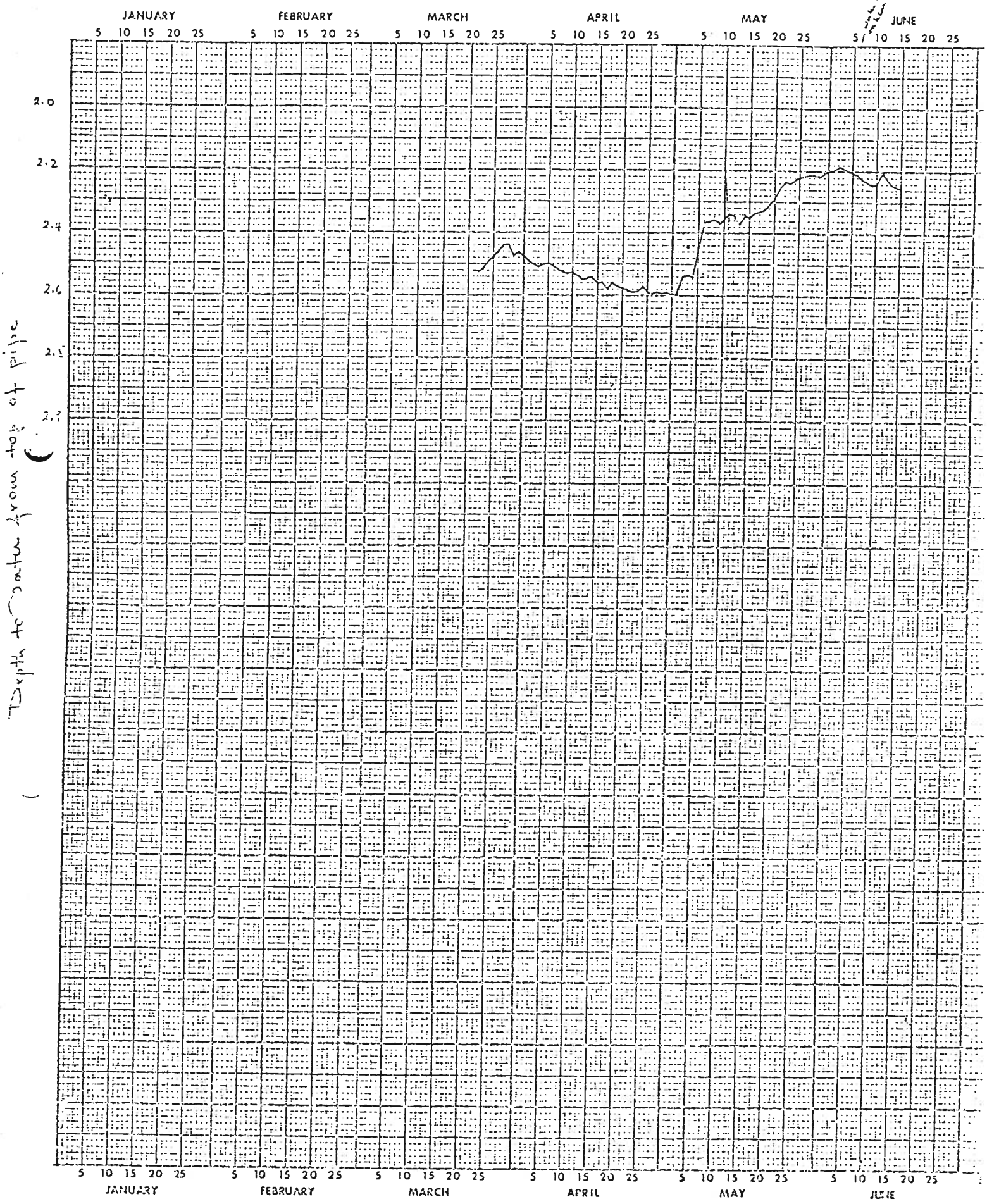


Checked by

Approved by

Date

RESEARCH COUNCIL OF ALBERTA, GROUNDWATER DIVISION



Plotted by _____ Checked by _____ Approved by _____ Date _____

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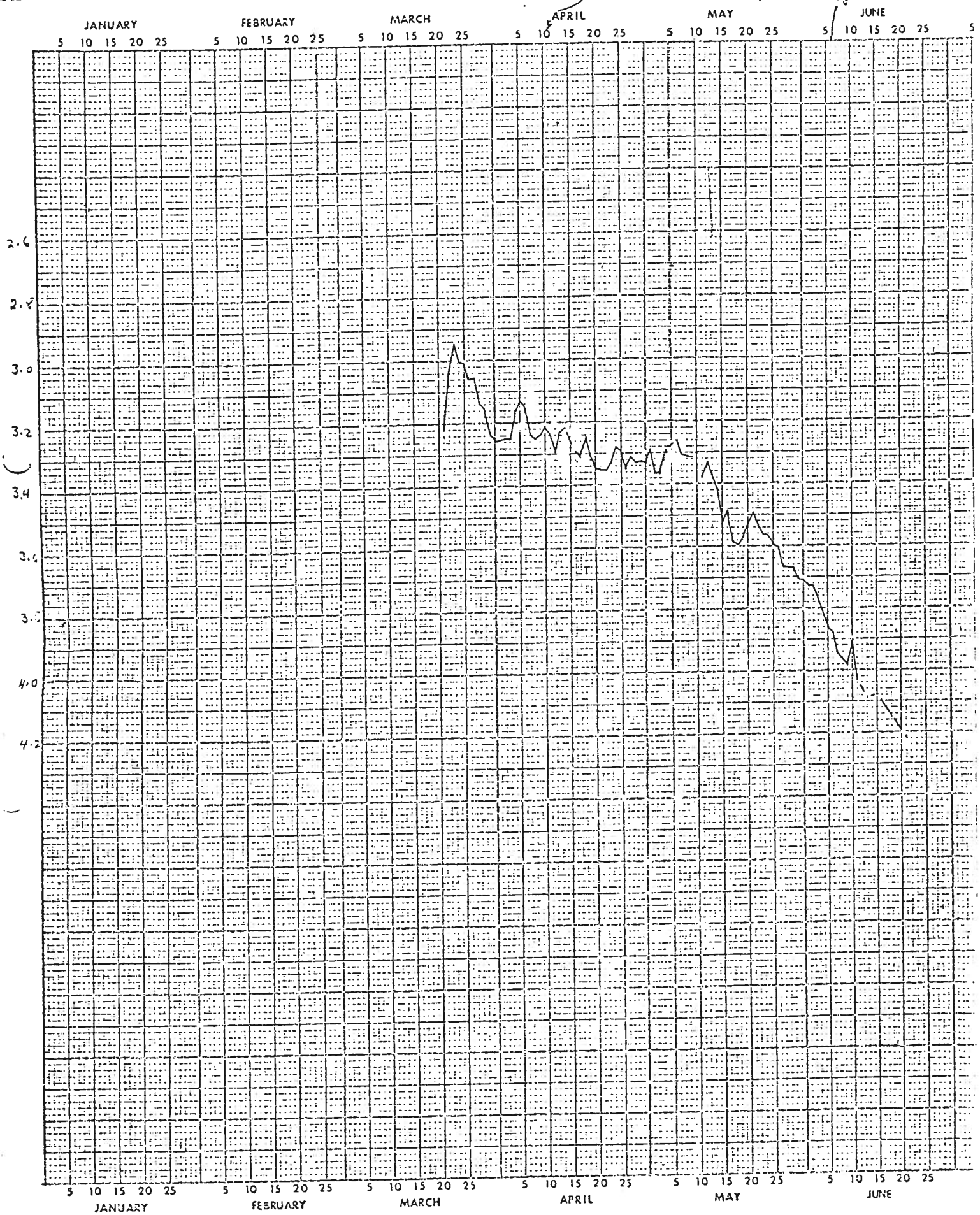

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Ground elevation: 1062.8 ft
Bottom of well set at 32 ft

Approximate well hydrograph for P5

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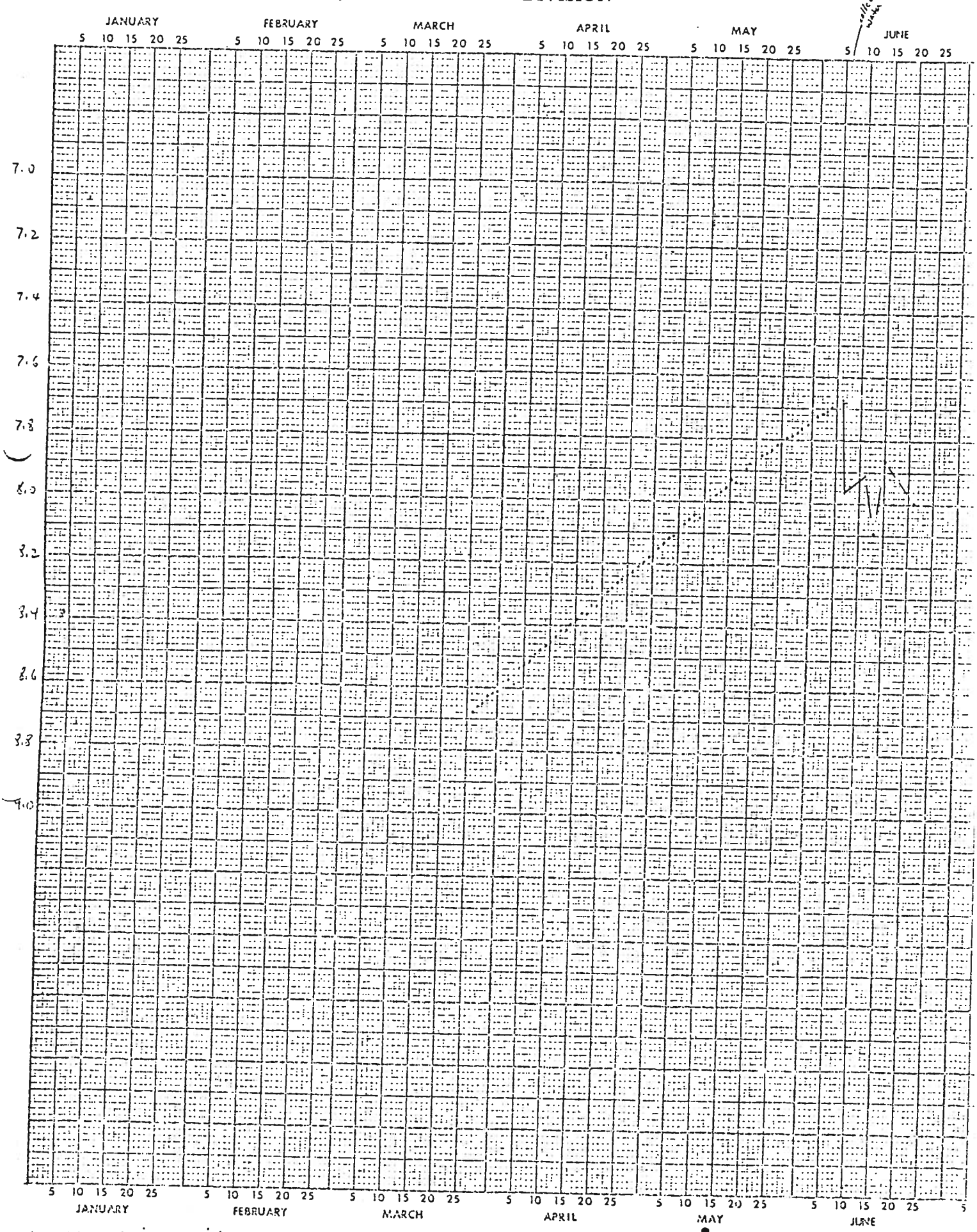


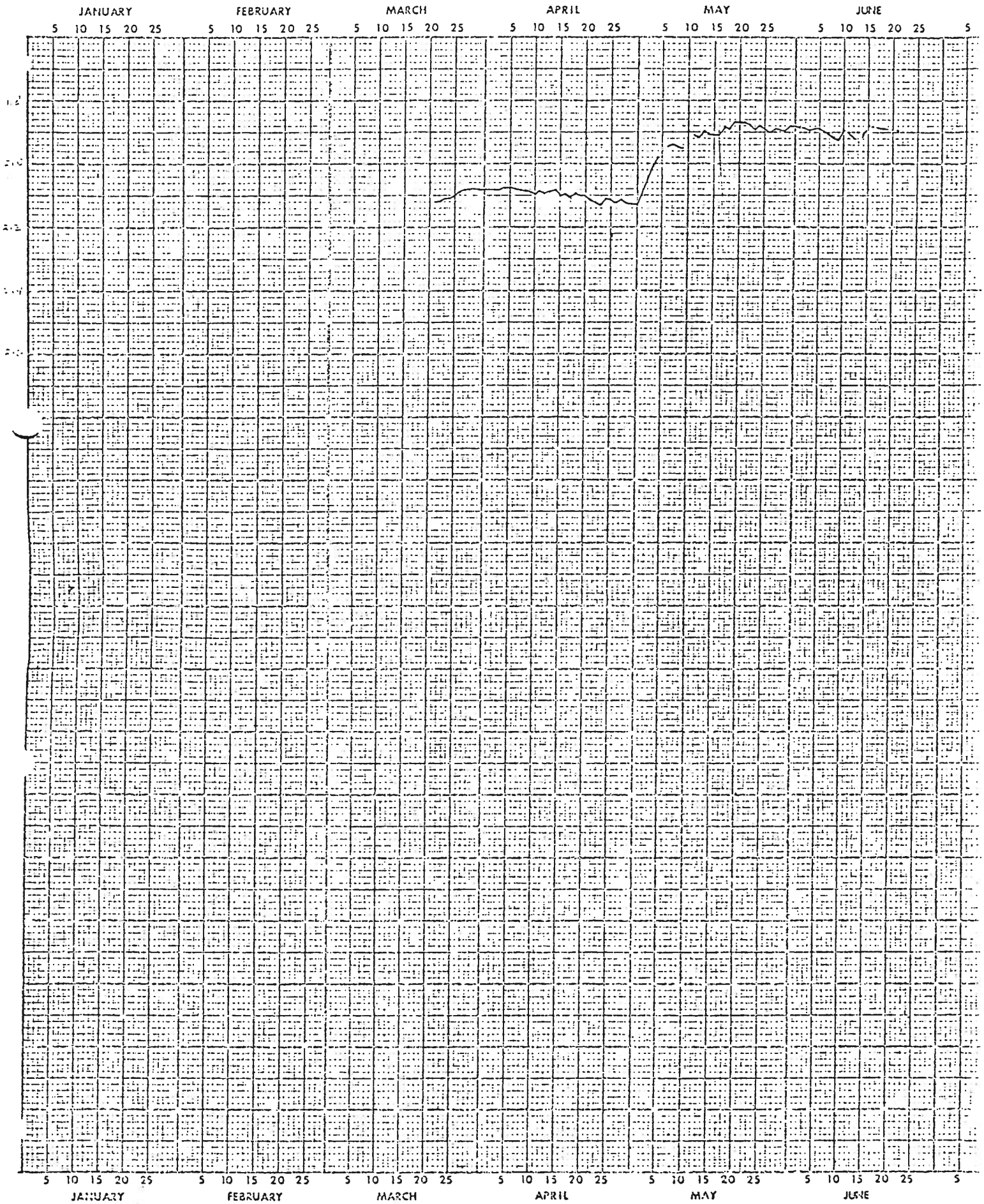
Depth (metres) from top of pipe

Plotted by [illegible] Checked by _____ Approved by _____ Date _____

RG

HYDR

ESEARCH COUNCIL OF ALBERTA, GROUNDWATER DIVISION



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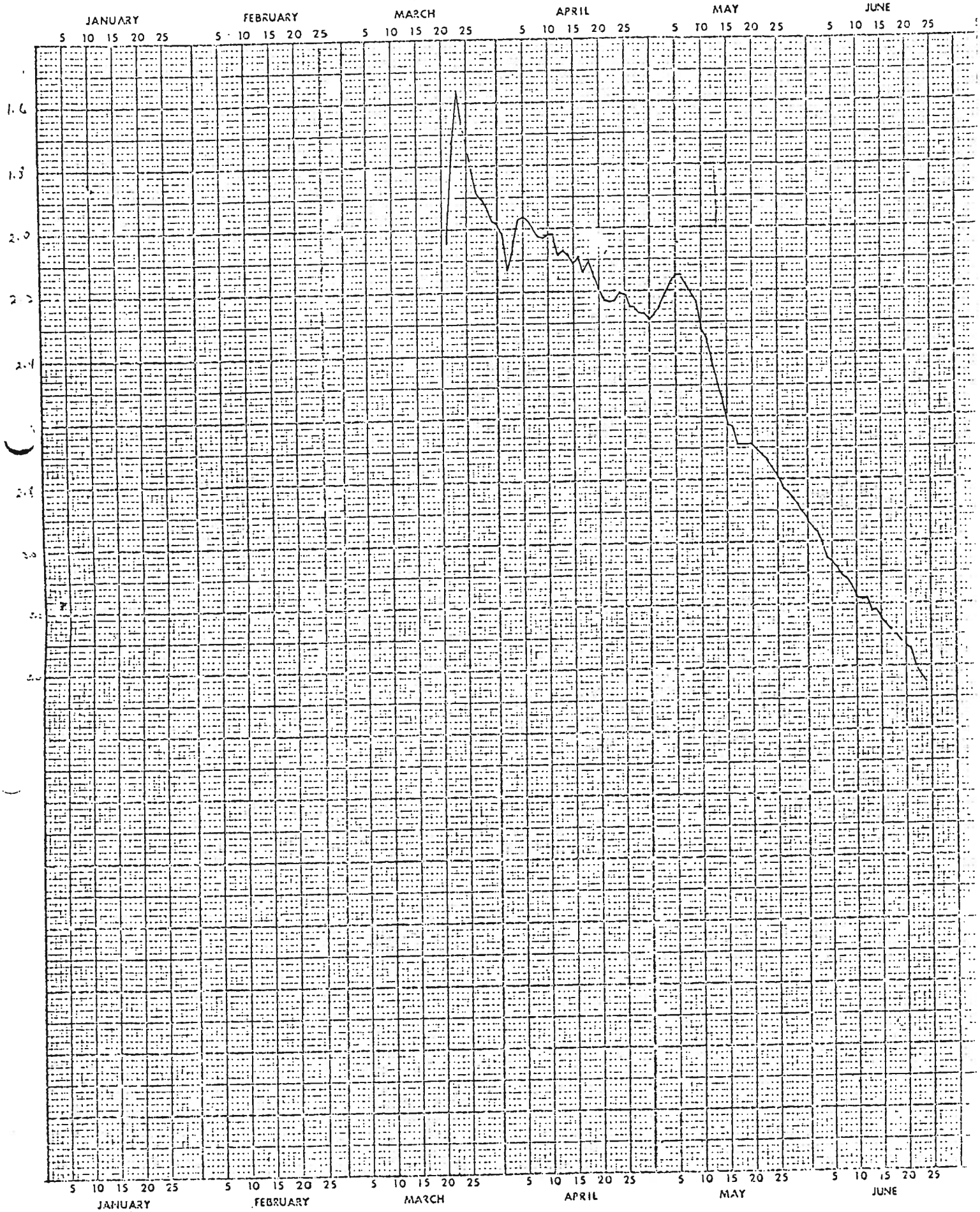
RESEARCH COUNCIL OF ALBERTA, GROUNDWATER DIVISION



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Approximate well location

E10

H

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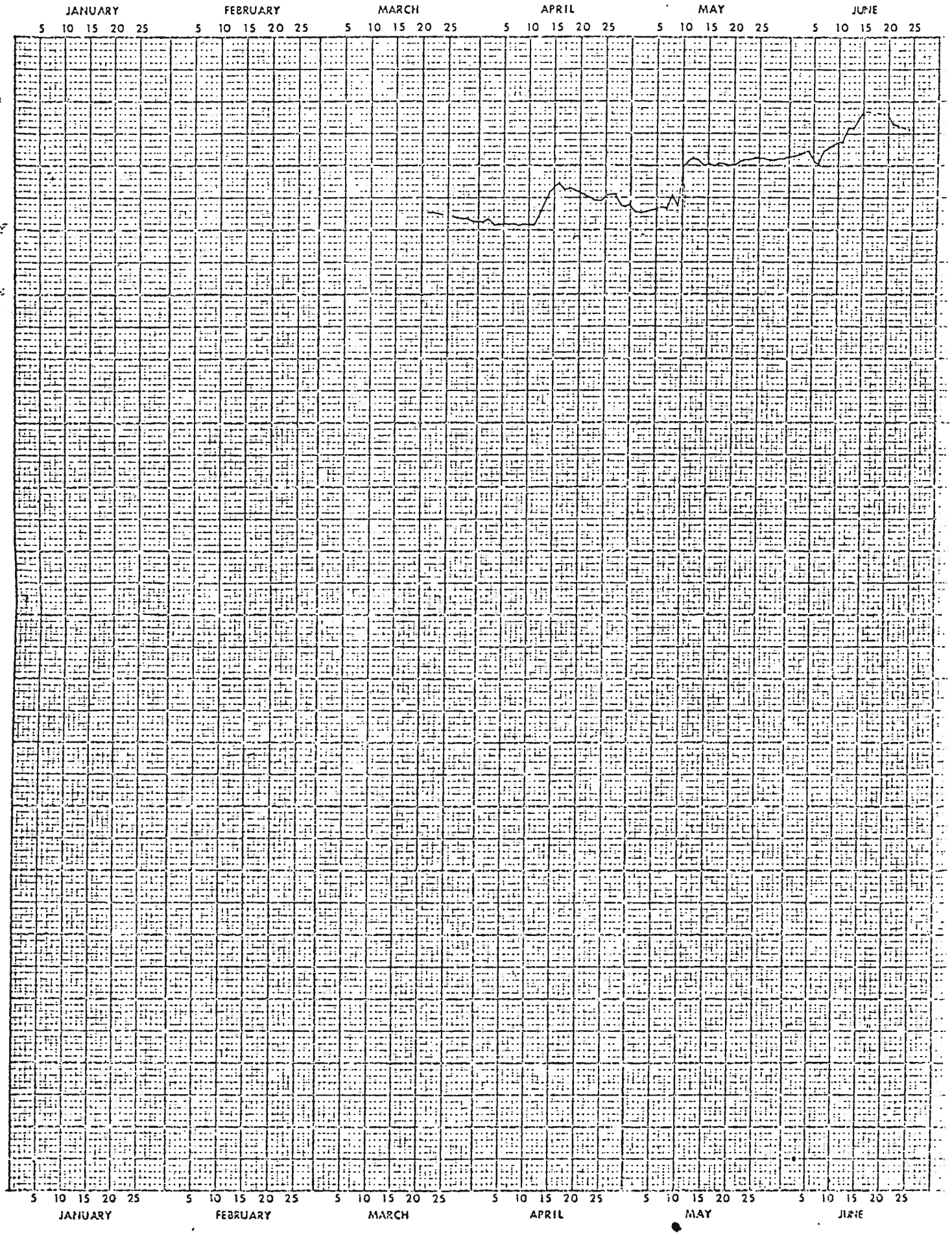

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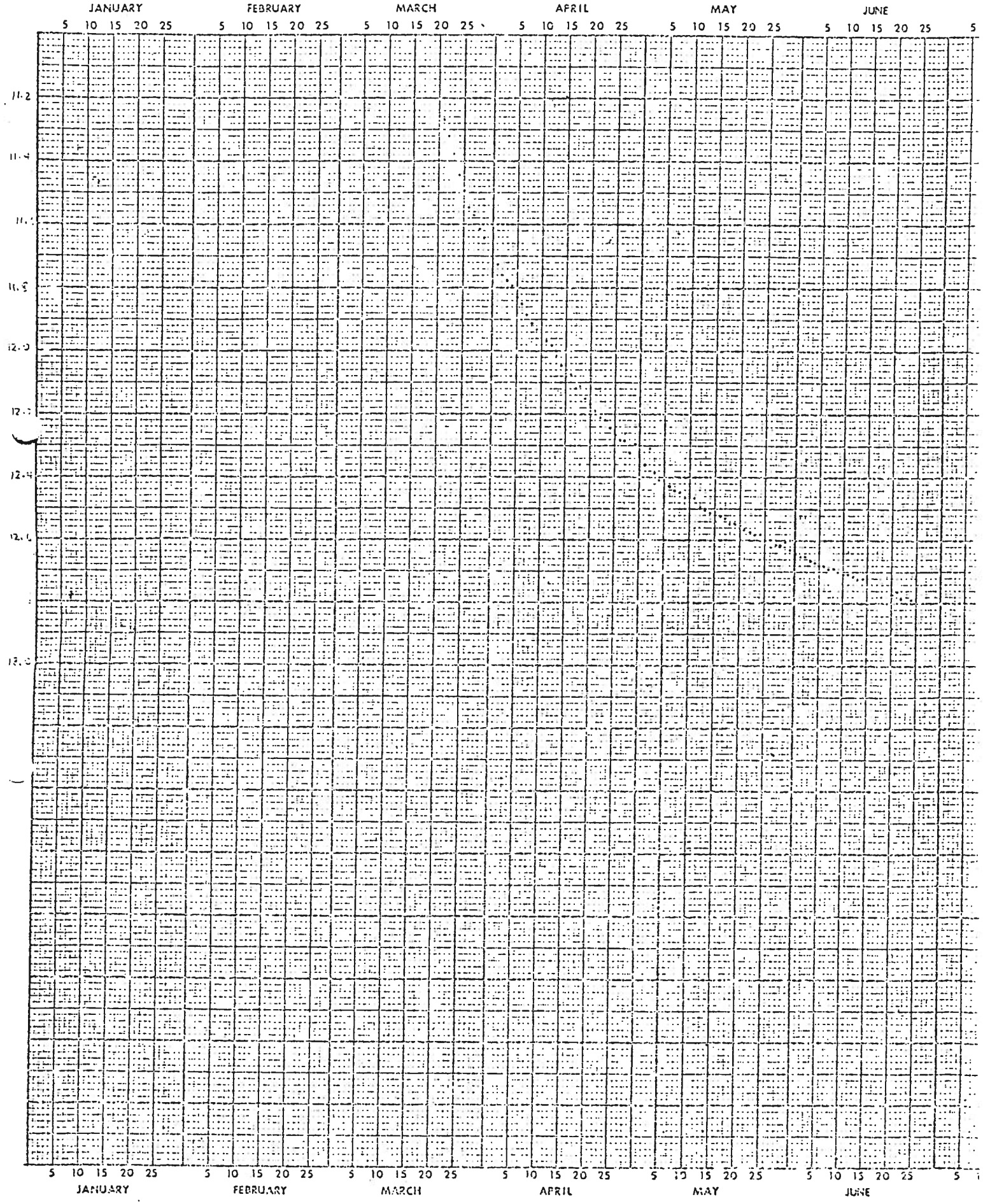
HYD



Plotted by C. Kahl Checked by _____ Approved by _____ Date _____

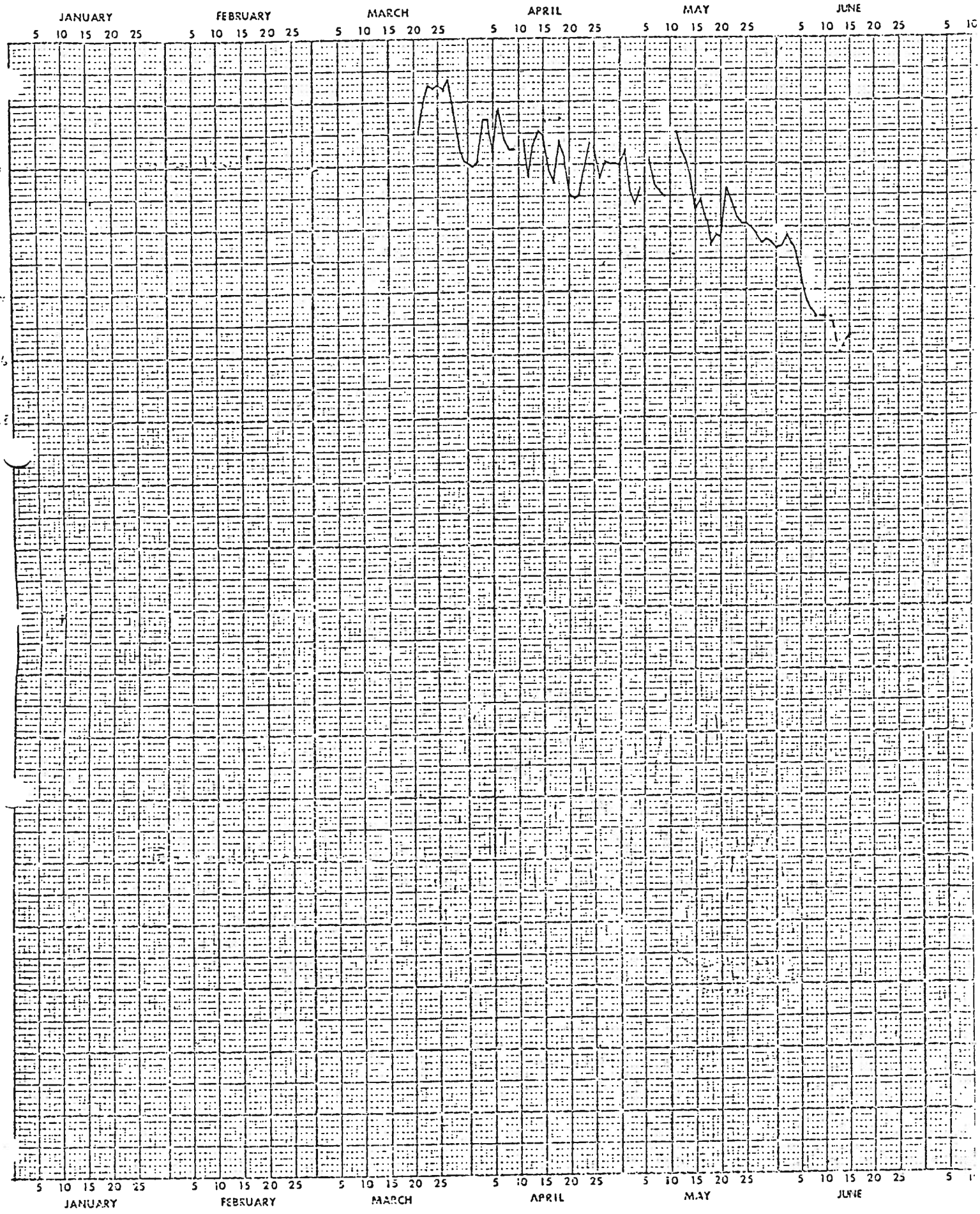


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Fig. 10

Ground elevation: 1073.65 ft
Top of well set at 63' below surface

approximate well hydrograph for P15

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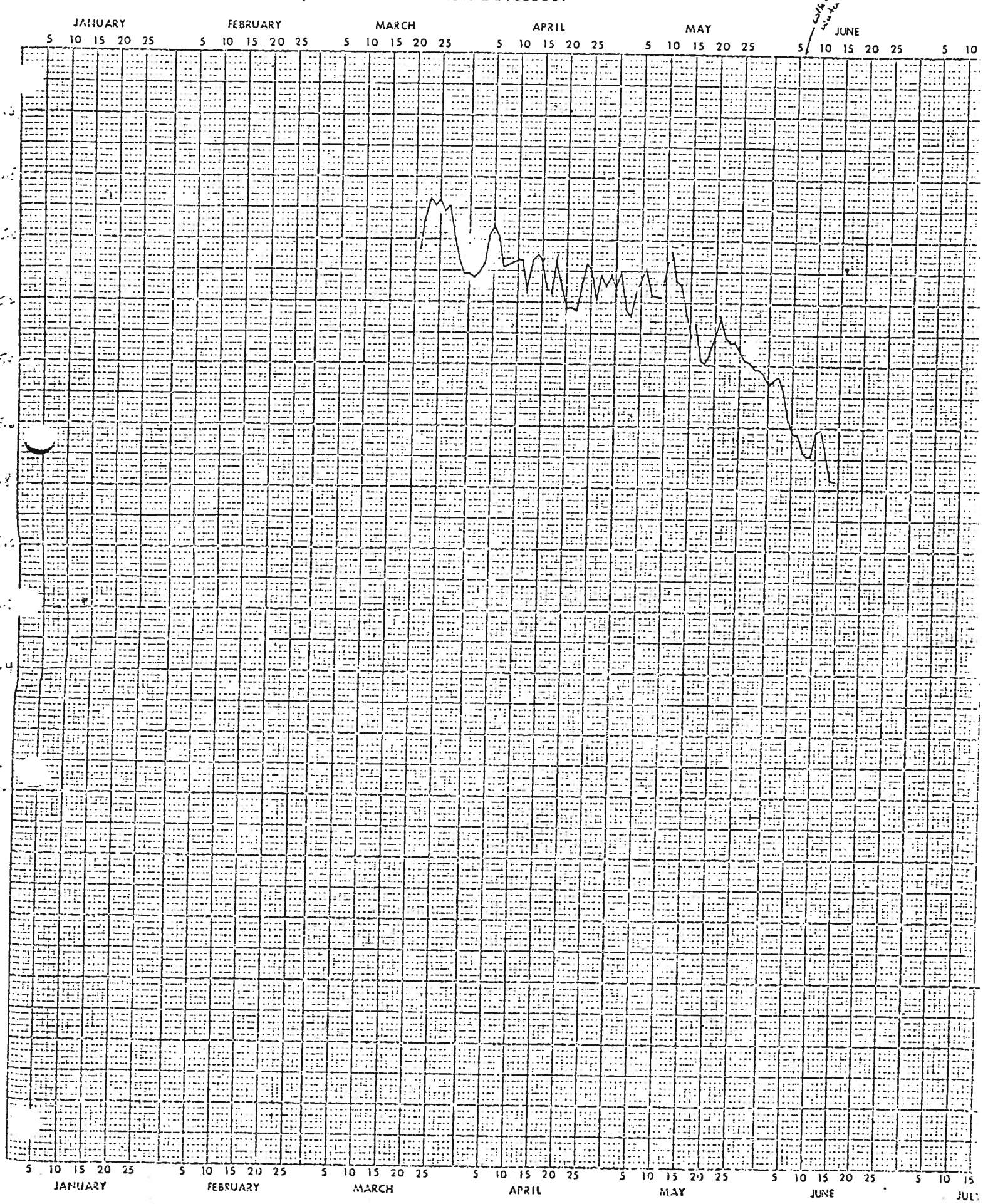
HYDROG



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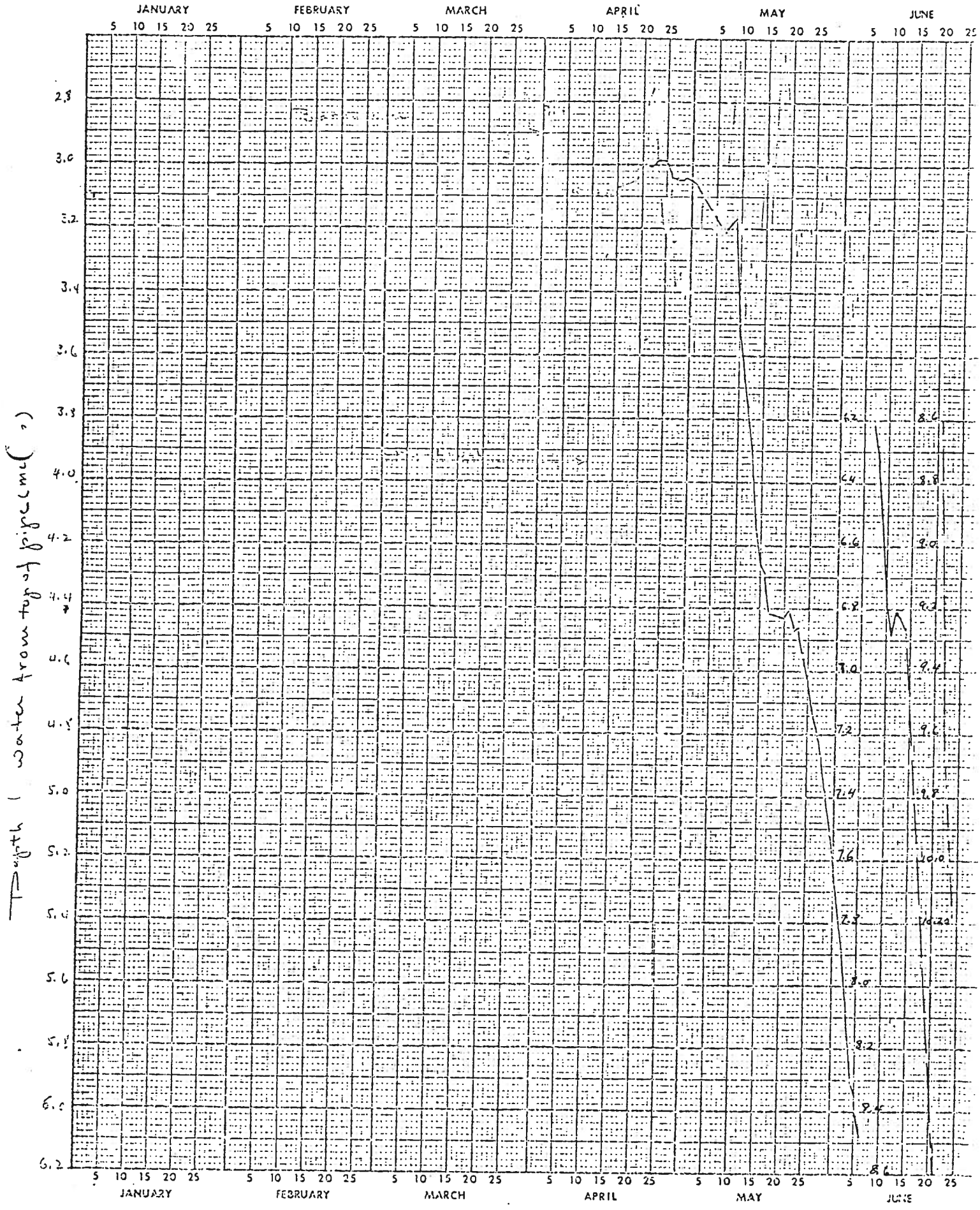

Plotted by Linda Kabell Checked by _____ Approved by _____ Date _____

Fig. 12.

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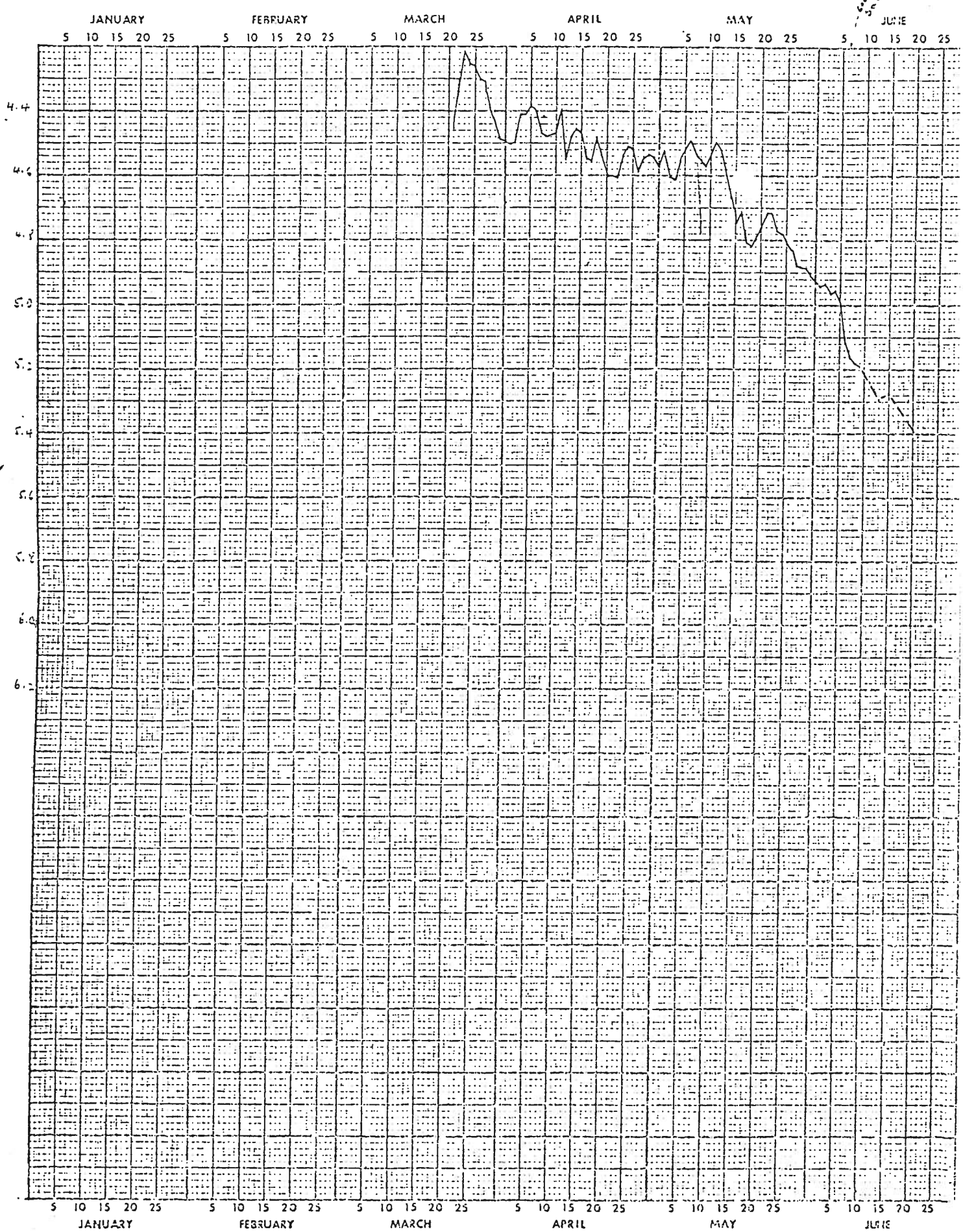

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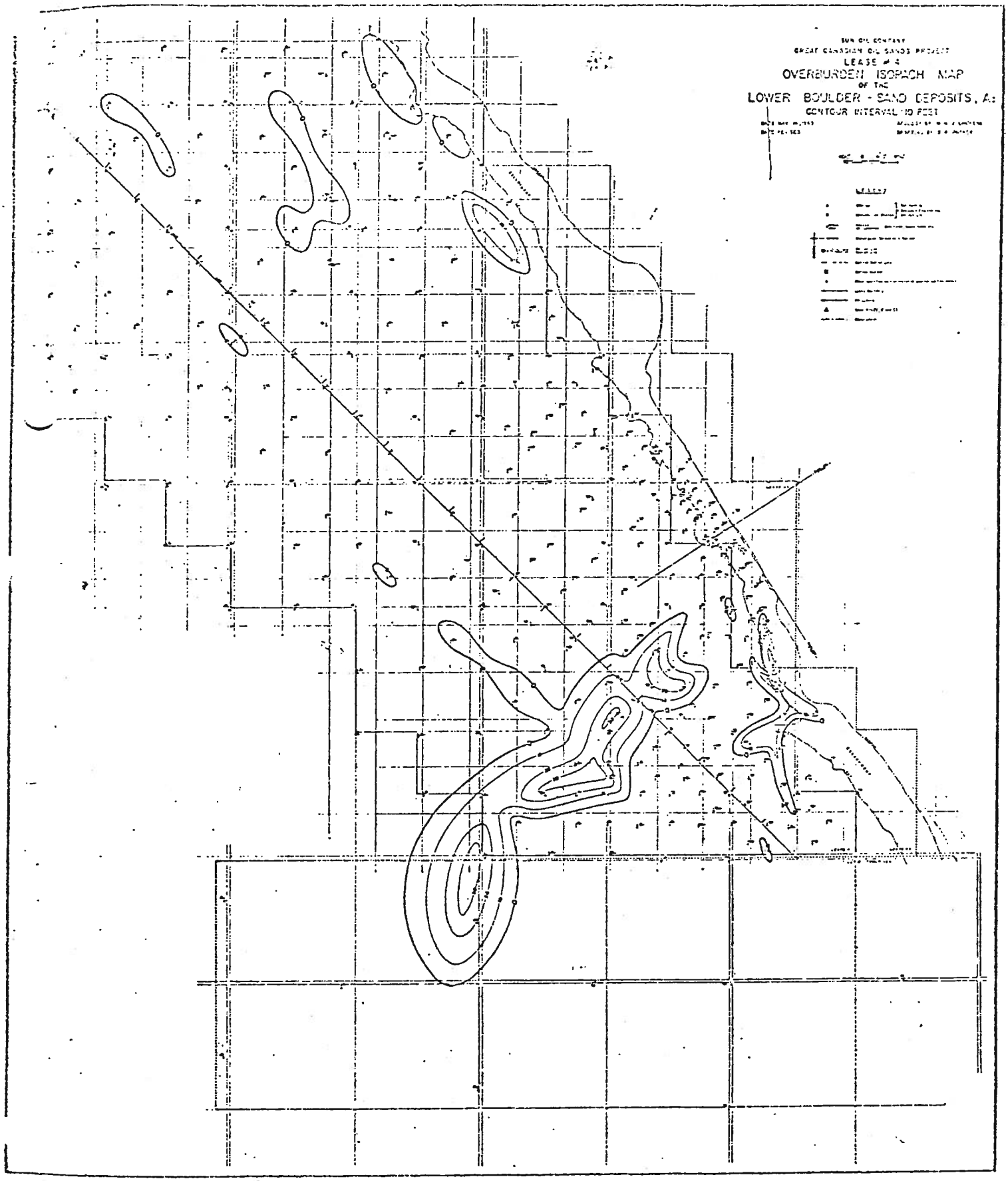
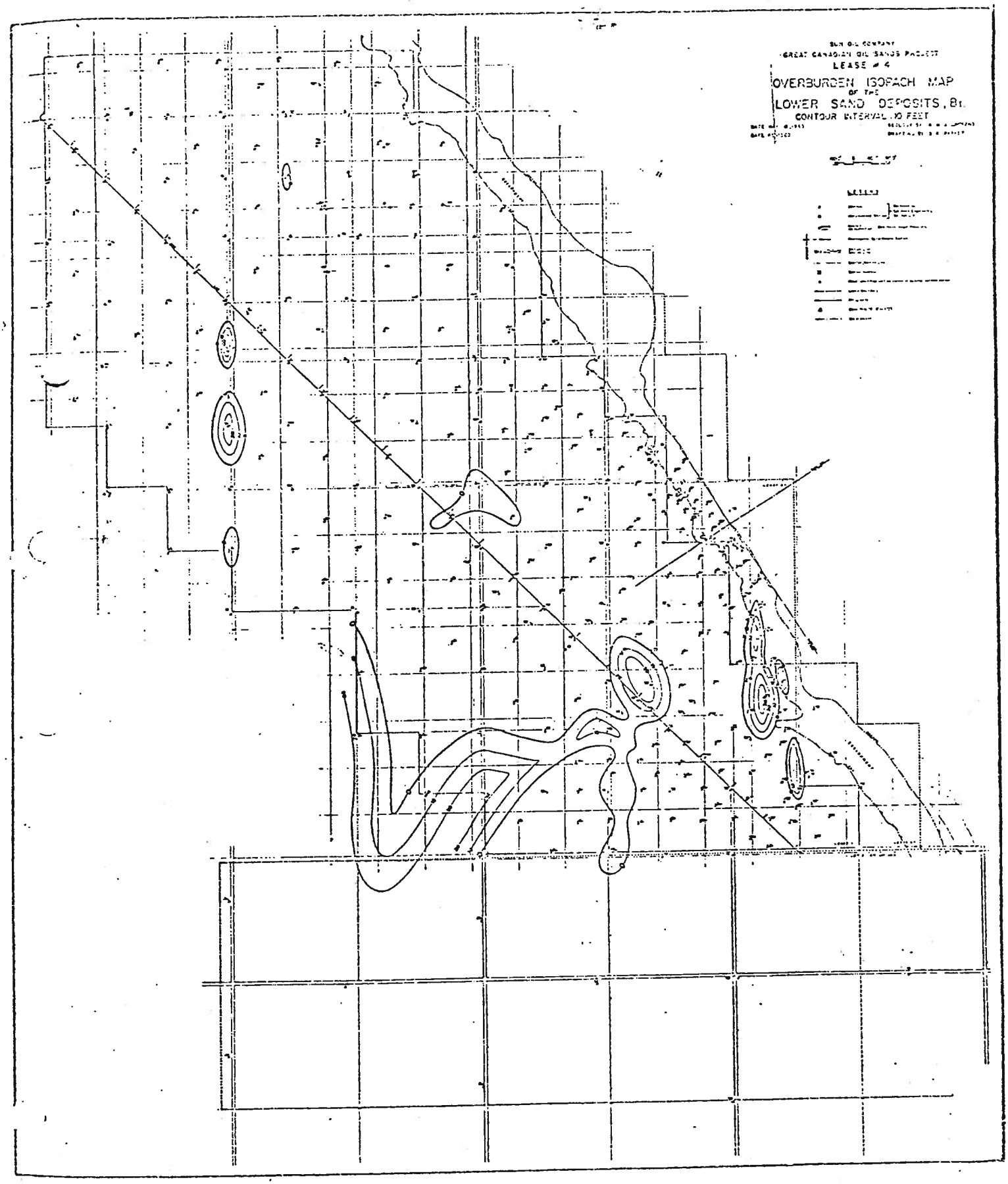

SUN OIL COMPANY
GREAT CANADIAN OIL SANDS PROJECT
LEASE #
OVERBURDEN ISOPACH MAP
OF THE
LOWER BOULDER - SAND DEPOSITS, A
CONTOUR INTERVAL 10 FEET

Fig 14


SUN OIL COMPANY
GREAT CANADIAN OIL SANDS PROJECT
LEASE # 4
OVERBURDEN ISOPACH MAP
OF THE
LOWER SAND DEPOSITS, Bt.
CONTOUR INTERVAL 10 FEET

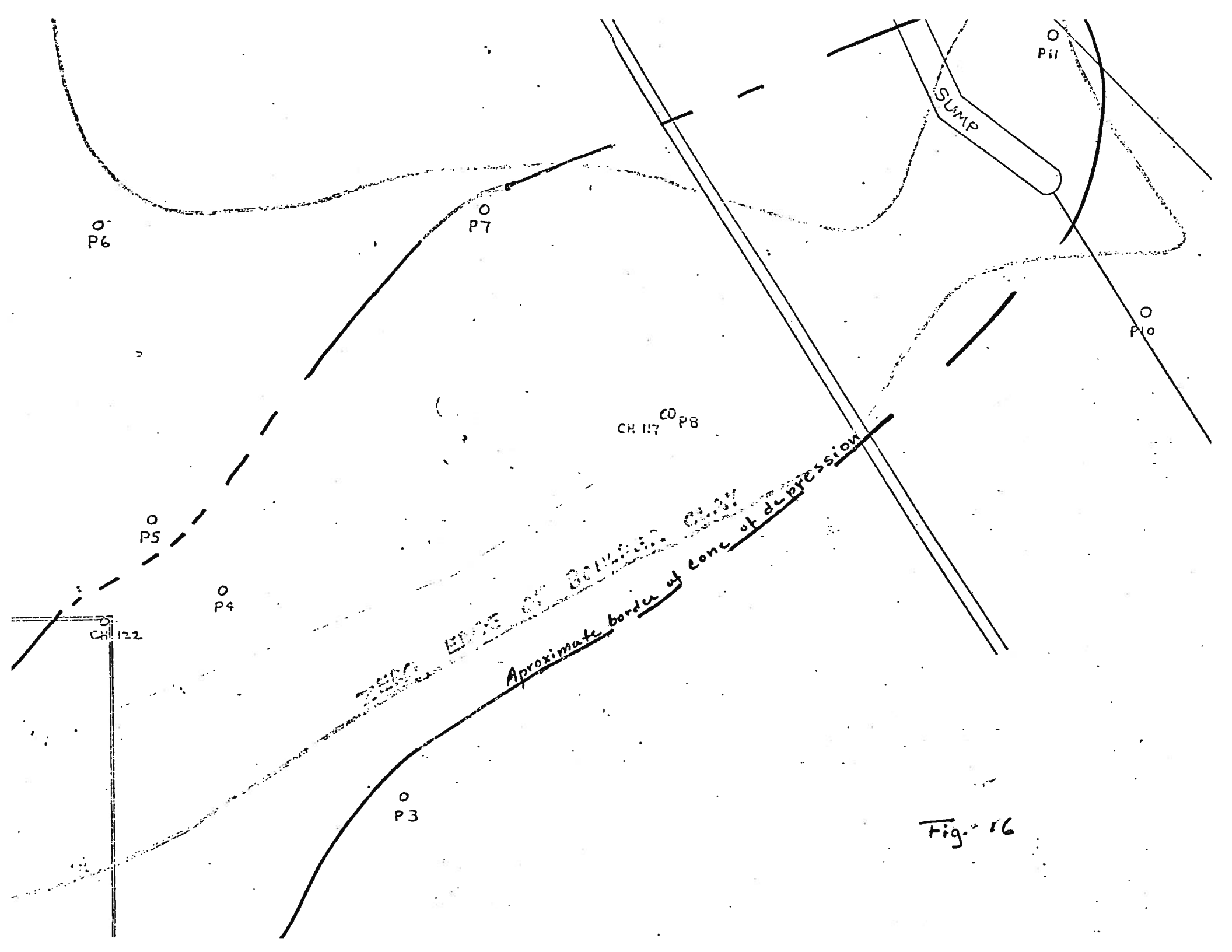

P11
SUMP
P6
P7
P10
CH 117
CO
P8
P5
P4
CH 122
Approximate border of cone of depression
P3

Fig. 16