M.J.Gobert

J. S. Richards

North Virden Scallion Field

June 9, 1959.

Proposed Water Flood

While any use of Assinniboine River as a water source for the proposed flood is probably two years in the future, I would think it advisable to determine, as soon as possible, the authorities whose consents are required.

Obviously no estimates of ~~revenues~~ VOLUMES involved are available but assuming 80 wells, at 150 barrels per day, would result in 420,000 gallons per day withdrawals. This may be an insignificant figure and no consent required but feel that this avenue should be explored now rather than to wait until the need arises.

150
80
12000
60000
420000

INTER-DEPARTMENTAL

MEMORANDUM

PROVINCE OF MANITOBA

FROM Director of Mines

TO Mr. M. J. Gobert,
Senior Petroleum Engineer.

ATTENTION

SUBJECT North Virden Scallion Field -
Proposed Water Flood.

DATE June 12, 1959.

At the time of the Public Hearing held last November, I inquired of Mr. B. E. Hogarth, Director of Water Resources, in regard to the matter of water supply, raised in your memorandum of June 9th. At this time, Mr. Hogarth confirmed your impression that the quantity of water was too small to raise any serious problems. He further advised that the Water Resources Branch was the proper place to obtain the consent for such withdrawals. Since receipt of your memorandum, I have again confirmed this understanding.

Probably, as soon as it appears that this project is definitely proceeding, the operating companies should make some form of application to the Water Resources Branch in this connection.

J. S. Richards.

JSR/lsm

COPY

November 20, 1958.

Mr. L. A. Swanson,
Vice-President,
Producing,
The California Standard Company,
Medical Arts Building,
Calgary, Alberta.

Dear Mr. Swanson:

Since the Public Inquiry, held November 13, 1958, in Winnipeg, the Board has given further consideration to your application in respect to the proposed North Virden Scallion Pilot Water Flood.

After again reviewing all the relevant factors, the Board finds that it cannot alter the decision set out in my letter of October 8th, namely, that, in view of the large number of freehold interests which will be involved, some form of unitization is essential to ensure that the mineral owner's equity will be protected.

The Board also wishes to express a willingness to be of every assistance possible in any plan you may initiate to achieve unitization, and to minimize delay in proceeding with the Pilot Water Flood Plan.

Yours very truly,

J. G. Cowan,
Chairman.

JSR:DB

c. c. to: Mr. M. J. Gobert,
Member.

Suggested Letter
to all Operators:

As a result of the Public Inquiry, held in Winnipeg, Manitoba, on November 13, 1958, the Board has:

1. Approved the application of The California Standard Company, to convert the well known as Calstan Pierson Prov. 10-11-3-29, in the Pierson Field, to salt water disposal in the Mississippian Mission Canyon Formation, subject to certain conditions;

2. Decided that present Board Order No. 33A, in respect to the maximum permissible rate of production in the West Routledge Field, shall remain in effect, including the application of all Water-Oil penalties as of January 1, 1959, until additional production history has indicated a need for further review at a Public Inquiry;

3. Approved the application of The California Standard Company to continue the use of its present facilities outside the West Routledge Field for the disposal of produced salt water;

4. Approved the application by The California Standard Company to expand the Daly Pilot Water Flood, subject to certain conditions.

With respect to Item (5) of the agenda of the said meeting, an application to unitize a portion of the North Virden Scallion Field was not received, and The California Standard Company has withdrawn its application for a Pilot Water Flood.

Yours very truly,

J. G. Cowan,
Chairman,
The Oil and Natural Gas
Conservation Board.

THE CALIFORNIA STANDARD COMPANY

L. A. BRANSON
VICE PRESIDENT
PRODUCTION

CALGARY, ALBERTA

October 30, 1958.

Mr. J.G. Cowan, Chairman,
The Oil & Natural Gas Conservation Board,
Department of Mines & Natural Resources,
Province of Manitoba,
WINNIPEG 1, Manitoba.

Dear Mr. Cowan,

Re: The California Standard Company Application
for a Pilot Water Flood Scheme - North Virden
Scallion Field

The California Standard Company having received your letter dated October 8, 1958, regarding the above subject, is extremely concerned over the problems which arise as a result of your request for a unitization proposal. It is therefore believed desirable to present some relevant facts together with our reasons for concern prior to the date of the Public Hearing.

As you are no doubt aware, The California Standard Company, concurrent with making the application, has diligently proceeded with obtaining consents from the mineral owners for permission to convert certain producing wells into water injection wells in the Water Flood area. The following review indicates the present status of consents obtained.

S.W. ¼	22-11-26 W1	83-1/3%
N.W. ¼	15-11-26 W1	96%
S.W. ¼	15-11-26 W1	100%
S.E. ¼	15-11-26 W1	75%
N.E. ¼	15-11-26 W1	100%

HE/y Lic. 16
Crown Land.

No difficulty is anticipated in obtaining the remaining 16-1/3% consents in the S.W. ¼ of 22-11-26. The above status reflects the interest and desire of a large majority of the mineral owners to proceed with the water flood scheme as proposed. There appears little doubt as to the urgency of this matter, in that early institution of pressure maintenance is necessary if the current decline in production in the field is to be arrested.

Our past experience in unitization of various fields has shown that a period of one, two or three years may lapse before an agreement is concluded, depending on the complexity of the reservoir. It is submitted that the North Virden Scallion reservoir is a complex one and that an attempt to unitize the Pilot Water Flood area would delay the implementation of water injection by a period of at least one year. Even then there is the possibility that complete unanimity may not be obtained which could further delay water flooding.

The main purpose of unitization, we believe, is to affect the operation of two or more leases within a pool as a single, consolidated property with no regard to man-made lease boundaries, in order to promote conservation and increase oil recovery. A unitization agreement provides for the sharing of obligations and benefits so incurred and defines a basis on which the oil and other products produced will be shared. The agreement does not necessarily ensure the mineral owner's equity. It is possible that subsequent to unitization, reservoir performance may not conform with the basis used to calculate equities; however, the opportunity to amend the basis of participation is irrevocably lost to all interest owners since the unitization agreement is bound by ordinary rules of contract.

Objections to the proposed pilot water flood appear to be based on the assumption that failing complete success in any one particular well, then that well is completely lost. Objections on this basis are unrealistic for the following reasons:

1. Modern technology permits a high degree of efficiency in the control of water flood projects.

2. The California Standard Company will maintain daily performance records in order that any action necessary to ensure the success of the project may be taken without delay.

3. The Conservation Board will be kept fully informed of the progress and performance of the project so that if in the Board's opinion principles of conservation, equity and good engineering practice are not being followed, necessary action may be taken immediately.

We believe the majority of mineral owners by giving their contents have shown confidence that the above situation will provide sufficient control and ample protection of their equities.

On the basis of the above, we would respectfully request that the Board reconsider our original proposal. Having reconsidered the matter should the Board decide to give conditional approval subject to

unitization of the water flood area, The California Standard Company will be forced to ask for an indefinite postponement of the application for this project.

Yours very truly,

L. A. SWANSON

JZ•pcp

Director of Mines

Mr. J. G. Cowan, Q.C.,
Deputy Minister.

Oil and Natural Gas -
Proposed Pilot Water Flood -
North Virden Scallion Field.

October 8, 1958.

In accordance with our verbal understanding, I am attaching, hereto, for your signature, suggested letter to Mr. L. A. Swanson, of The California Standard Company, in respect to the Conservation Board's decision.

We are requesting the Company to come forward with the unitisation agreement in respect to the suggested Pilot Water Flood in the North Virden Scallion Field.

J. S. Richards.

JSR:db

c. c. to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

DEPARTMENT OF MINES
& NATURAL RESOURCES
OCT - 9 1958
DIRECTOR OF MINES

October 6, 1958.

Mr. L. A. Swanson,
Vice-President,
Producing,
The California Standard Company,
Medical Arts Building,
Calgary, Alberta.

Dear Mr. Swanson:

Since our meeting of September 12th, the Board has held two additional meetings to consider your excellent presentation in respect to the proposed North Virden Scallion Pilot Water Flood.

After reviewing all the relevant factors and, particularly, in view of the very large number of freehold interests which will be involved, the Board is of the opinion that some reasonable form of unitization is essential to ensure that the mineral owner's equity will be protected.

Therefore, it is requested that you draft a suggested unitization agreement, and forward it to Sun Oil Company and Canadian Superior Oil of California, Ltd., for consideration. It is also requested that four copies of your proposal be forwarded to the Board, as soon as available.

The Board will give further consideration to this matter at a Public Hearing, to be held at 9.30 a.m., Central Standard Time, in Room 352, Legislative Building, Winnipeg 1, Manitoba, on November 13, 1958.

Yours very truly,

DEPARTMENT OF MINES
& NATURAL RESOURCES
OCT - 9 1958
DIRECTOR OF MINES

"J. G. COWAN"

J. G. Cowan,
Chairman,
The Oil and Natural Gas
Conservation Board.

JSR:DB

sgd. and sent 8/10/58.

c. c. to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

McDANIEL CONSULTANTS LTD.
Oil and Gas Reservoir Evaluations

R. R. McDANIEL, P. ENG.
TELEPHONE AMHERST 5-1683

231 EIGHTH AVENUE WEST.
CALGARY, ALBERTA

October 2, 1958

Mr J. G. Cowan
Chairman
The Oil and Natural Gas Conservation Board
Department of Mines and Natural Resources
Winnipeg, Manitoba

Dear Sir:

In regard to your letter of September 25, 1958 we have not received a copy, if one exists, of the California Standard's suggestions as to equity considerations for the proposed pilot water flooding scheme in the North Virden Scallion field. In order to relate our thinking on the subject the initial California Standard proposal of establishing allowables has been taken as their suggestion for maintaining equities. We must also point out that this discussion is predicated on what we believe to be engineering principles.

The establishment of equity in any water flooding scheme is a difficult task. It may be argued that each lease should be treated as a separate unit. Under such a concept it would, in effect, be assumed that each lease comprises a separate operating unit and the operation of such a lease would not effect or be effected by operations on adjacent leases. This concept is reasonably applicable where an injection well is drilled in the centre of a lease (a five spot well on a quarter section that has four 40-acre wells) or where the lease is sufficiently large to provide a "fire guard" type arrangement. It may be seen that where such ideal conditions do not exist, as is the case in question, much more complex problems arise. Water flooding

on a pattern basis can evolve some erratic results. (Eg. it is not uncommon that water breakthrough will occur in wells which are not the closest to the injection well or wells.) The effect of channeling is often unpredictable.

In view of these possible conditions there is little doubt that a reasonable form of unitization effects the fairest equity arrangement. The plan of allocating on the basis of allowables, as suggested by California Standard, would appear to have a number of drawbacks. It may be seen that if on any one quarter section two wells are converted to injection wells and if one of the producing wells were to have severe water breakthrough then a definite problem would arise. Although such breakthrough could be the result of water channeling from injection wells on the lease in question it might also be from injection wells on adjacent properties. There would be no way in which such an inequity could be rectified under the proposed allowable allocation. It is also noteworthy that the wells in and around the proposed pilot water flood area are all producing at rates substantially below existing and proposed allowables. There is no guarantee that all the wells would reach these allowables rates or the same proportion of allowables. As a result even if water breakthrough did not occur severe inequities could still arise.

It is our belief that some expedient method of allocating production in and around the proposed pilot water flood area may result in considerable inequities. It is also evident that, from an over-all field basis, unitization would be the most realistic method of providing a fair basis of equity. It is noteworthy, however, that even with unitization some inequities will no doubt occur. It is believed, however, that any severe loss would be prevented.

The problem of time in regard to forming a unit even around the proposed pilot water flood area could be of a critical nature. It may be possible that some scheme can be arrived at whereby a fair division and protection of equities is effected. It is our opinion that the powers of your Board to act on such a basis should be analysed so as to determine whether such a decision is possible.

Assuming your Board has the over-all powers to approve the project in principal and establish equities by setting allowables

then we would have the following questions:

1. If the scheme is approved as being in the interests of Conservation is it the concern of the Board that equities be maintained?

2. If equities can be disregarded would not California Standard be liable for any actions it takes even though the Board has approved the scheme in principle?

3. If equities can be disregarded can the Board transfer allowables from one lease to another?

4. If equities are of concern to the Board, is it the Board's policy to require 100 percent approval by all owners before any project can be commenced.

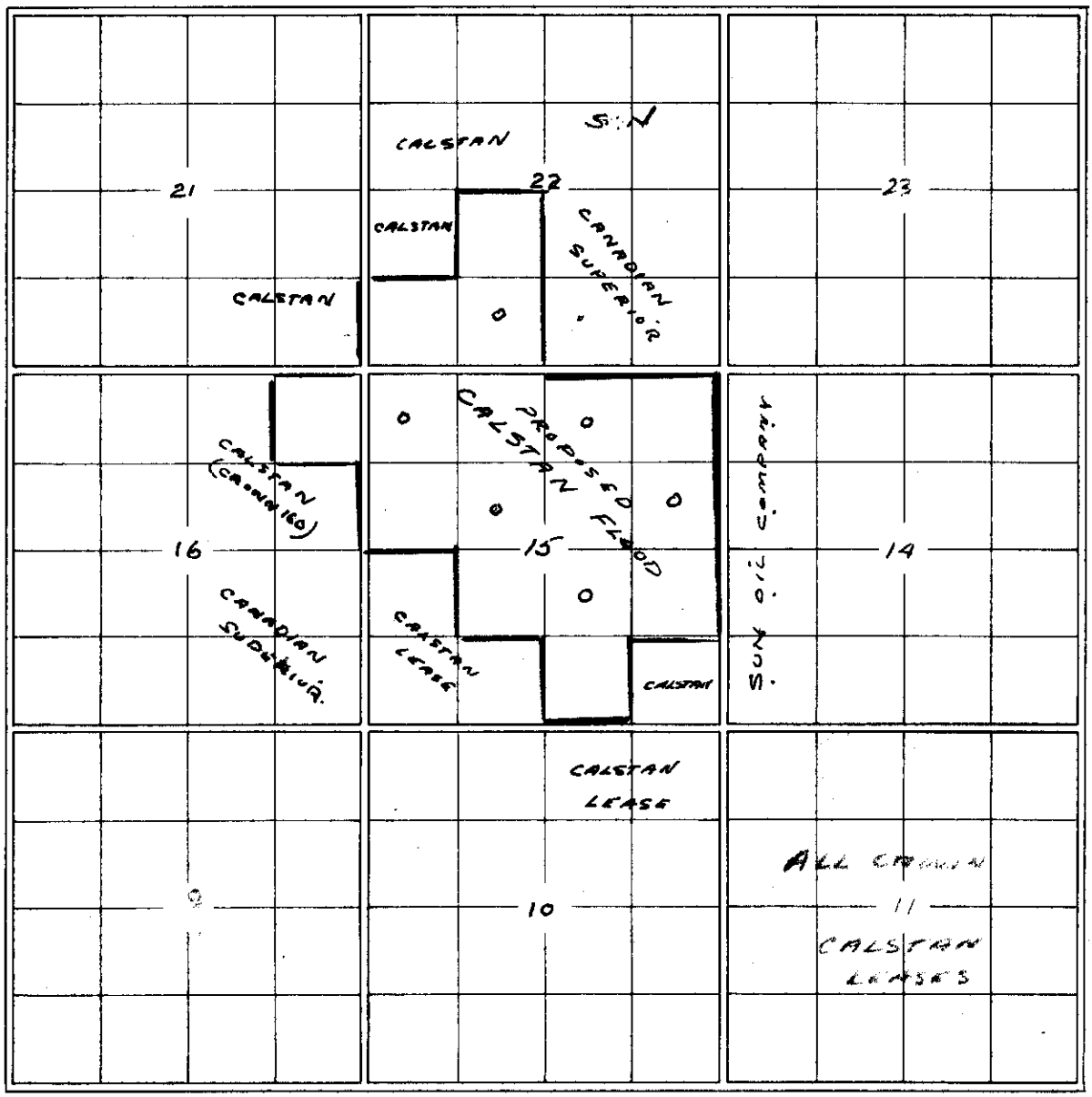
In regard to these questions it is our opinion as laymen that if the Board's only concern is conservation and the problem of equities is disregarded then should California Standard, having shown a willingness to carry out the project without full approval of all owners, commence the project on the basis of an approval of the conservation principles they would be liable for damage or harm to the wells and leases in question. We can foresee that although such an approach would probably hasten the commencement of the project it might create severe difficulties through injunctions etc. by the abstaining owners in the area. It can be seen that if such actions were to occur then the project might be greatly delayed and in effect the broad concept of conservation defeated. The question of transferring allowables from one lease to another may be considered to be a form of compulsory unitization unless all interest owners are in agreement. It is readily evident that the powers and/or policies of the Board are in question.

In preparing this review we have attempted to point out the equity problems which are apparent to us as laymen in regard to the policies and powers of your Board. It has not been our intention to recommend policies but to openly discuss the problem from an engineering standpoint. We trust, however, that the discussion contained herein will be found of assistance in your consideration of this matter.

Sincerely yours,

McDANIEL CONSULTANTS LTD.

per R. R. McDaniel, P. Eng.



Twp 11

Rge 20 W.

OFFSET LEASES TO FLOOD AREA. (PROPOSED)

NE 1/4	- Sec 10	CALIFORNIA STANDARD
W 1/2	- Sec 14.	SUN OIL COMPANY
SE 1/4	- Sec 22.	CANADIAN SUPERIOR
W 1/2	- Sec 22.	CALIFORNIA STANDARD.
SE 1/4	- Sec. 21	CALIFORNIA STANDARD.
NE 1/4	- Sec. 16 (CROWN)	CALIFORNIA STANDARD.
SE 1/4	- Sec. 16	CANADIAN SUPERIOR
SW 1/4	- Sec. 15	CALIFORNIA STANDARD.

Flood

M.J. Gobert

J.G. Cowan, Q.C.
Chairman
The Oil & Natural Gas
Conservation Board.

The California Standard Company
Proposed Pilot Flood

October 2, 1958

In the absence of the Deputy Chairman and since Mr. Carl Young phoned me from Calgary this morning, I am taking the liberty of offering my comments on your memo of September 30, a copy of which has been passed to me.

Until the time of the Public Hearing July 3, 1958, I believe I am correct in stating that the company's only contact, with respect to this subject, has been with myself. Therefore, any misapprehension under which they had been operating, to that date, would have arisen from my statements to them. However, I can state quite frankly that I do not feel that this has happened.

Mr. J. G. Trowell was in my office on May 2, 1958, and informed me, for the first time, that a flood study had been compiled; that he believed the Company had secured certain consents, and that this time the Company were not executing side agreements as they did in the Daly Field. He further admitted, confidentially, that he had forced Mr. Zedde to admit that inequities in the scheme did exist and to Mr. Trowell's expressed concern, Mr. Zedde had glossed this over with the statement that these would exist only until such time as the whole field was flooded, although any loss suffered up until that time could never be recovered.

Since the matter of consents was not discussed other than for Mr. Trowell's statement of what the Company policy was and his belief as to the consents already secured, I do not feel that the Company could present a valid argument that I had mislead them on this.

As to the Board's position, I have reviewed the transcript of the Public Hearing held on July 3, 1958, and have found no statements by the Board indicating that mineral owners consents would be accepted. Indeed, by letter of August 21, the Board notified the Company that "The Board is of the opinion that equity can only be established by unitization of a proposed flood area".

As you are aware, immediately upon receipt of the above letter, the Company took it upon themselves to call our Consulting Engineer and verbally chastised him most severely for the advice and guidance he had obviously given us.

From August 21st to the date of the meeting in your office on September 12th, I do not believe the Company made any effort to work out a unitization scheme and I have been told confidentially again, that the senior officials of the Company made every effort to have Mr. Knox change his holiday plans so that he could attend the Mine Ministers Conference and discuss this matter with yourself and the Deputy Chairman. This, Mr. Knox refused to do.

As to the September 12th meeting, such a wide variety of subjects were discussed I frankly cannot say what impressions were left with the Company as to the Board's attitude towards consents.

The Company are quite aware that Alberta and Saskatchewan require unitization, indeed have made provision by Statute for Compulsary Unitization. This, one must believe, has been done with the full knowledge and consent of the Canadian Petroleum Association. Further, they have participated in such programs and are fully cognisant of the benefits.

To the best of my knowledge, there are no payments involved in securing consents and, as I recall, the meeting in your office, one of the senior officials inadvertently made the remark that "the mineral owners might be very willing to climb on the band wagon if they were guaranteed a share of the pooled area production", as they would be under unitization. As it is, they are signing consents which simply grant the Company the right to flood their wells with no provision for sharing in production.

A pertinent example of practice in other Provinces is that of the Bone Creek Field. A 5-spot Pilot Flood was proposed in August 1957, the Engineering Brief was heard on April 11, 1958, and the Company concerned, Canadian Delhi Oil Ltd., were asked to unitize the complete Bone Creek Field. This was done and after the hearing on September 10, 1958, the 5-spot Pilot Flood was approved.

In the telephone conversation with Mr. Young, he stated that the Company had not yet secured all the consents and agreed that if they were asked to unitize the Flood area the matter would be expedited to some extent by the fact that the various owners had already been located in securing consents. He also volunteered the information that those owners non-resident in Manitoba had not been contacted as yet.

I must apologize for commenting on a memo addressed to Mr. Richards and also as to the length of the comments. However, I do feel that the Board members, individually and collectively, have in no way mislead the Company.

Further, with the possibility of appearing to protest too much, feel very strongly that protection of equity interests can be assured only by unitisation of the Pooled Area and that -

(a) if a mineral owner will sign a blank consent to flood his wells without any stated provision for sharing in production;

(b) he will very readily agree to a plan which specifies, to the fourth decimal place, his share in the total production from the pooled area.

(c) the Board has a greater responsibility to protect equity interests in this Province where the freehold interests far outnumber the Crown interests and the freehold interests of other Provinces requiring unitisation.

(d) since the Company had initiated and proceeded with the securing of consents and, I have been informed, had indeed secured approximately 50 per cent of these consents prior to the submission to the Board, no criticism can be made for the Board's not suggesting unitisation prior to the submission at the July 3 Public Hearing.

c.c. J.S.Richards

Copy

Copy to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

INTER-DEPARTMENTAL
MEMORANDUM

PROVINCE OF MANITOBA

FROM J. G. Cowan,

TO Mr. J. S. Richards,
Director of Mines.

ATTENTION

SUBJECT North Virden Scallion Field

DATE September 30, 1958.

I have your memoranda of September 22nd and September 25th in connection with the above matter. As a matter of fact on perusing Mr. McDaniel's letter, it occurred to me also that he should be requested to comment on the equity, phases, etc. I note that you have taken the necessary steps in this connection and I have forwarded the letter to Mr. McDaniel.

In the event that Mr. McDaniel strongly recommends unitization, I am afraid that I would have some reservation in connection with it.

The situation is that California Standard proceeded on the basis of obtaining consents from the mineral owners within the pilot flood area and appear to have been reasonably successful except in the case of S.W. 22-11-26 W.P.M. where the consents only cover 20% of the mineral ownership. The letter, however, indicates that they are contacting the balance of the owners and it may well be that ultimately a very substantial percentage of all the mineral owners will be obtained.

If we now insist on unitization it is my understanding that California Standard would have to go back to all the owners and obtain a completely new type of document.

While I am prepared to assume that not too many of the parties would perhaps insist on payment of further consideration for the new agreement, I am also prepared to assume that a certain number would definitely insist on being paid before they would sign.

However, apart altogether from any payments in cash that would have to be made, there is the work involved and the incidental expense in connection therewith which could be very considerable. I understand that a number of parties are non-resident which would mean that California Standard would have either to employ someone outside the jurisdiction competent to explain the agreements, etc. etc. or send their land man to contact them. I believe the latter is the usual course.

If the Board had given any intimation that we would insist on unitization, no doubt California Standard would have proceeded originally on that basis. The Board not having done so, California Standard is proceeding on the basis of consents of the mineral owners. While I would not for a moment argue that the Company had been in any sense of the word misled, they could perhaps well argue along this line.

I will be interested in your comments.

"J. G. Cowan"
J. G. Cowan.

DEPARTMENT OF MINES
& NATURAL RESOURCES
1959
ENGINEERING
DIVISION

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IN ER-DEPARTMENTAL

MEMORANDUM

PROVINCE OF MANITOBA

FROM Director of Mines

TO Mr. J. G. Cowan, Q.C.,
Deputy Minister.

ATTENTION

SUBJECT North Virden Scallion Pilot Flood

DATE September 22, 1958.

Attached hereto, copy of Mr. R. R. McDaniel's comments in respect to the letter forwarded by The California Standard Company, dated September 16th, relative to the above water flood.

You will note that the comments in the main, from the engineering point of view, agree that the proposed pilot flood should be approved. While Mr. McDaniel in his final paragraph states that he has not considered the equity aspects of this problem, I would infer that his reference to equity problems at the end of the preceding paragraph would indicate that he had some concern in this regard.

In accordance with our previous understanding, I suggest that we contact Mr. McDaniel and have him confirm our impression that in his opinion unitization is the only proper way to handle the equity problem. I believe it was agreed that this would be done as soon as we had heard from Mr. Goulding in regard to consents which he has obtained.

J. S. Richards.

JSR:lem
Enc.

c.c. Mr. M. J. Gobert, Senior Petroleum Engineer.

DEPARTMENT OF MINES & NATURAL RESOURCES
PETROLEUM ENGINEERING LIBRARY

Director of Mines

Mr. J. G. Cowan, Q.C.,
Deputy Minister.

North Virden Scallion Field

September 25, 1958.

Further to my memorandum of September 22nd, enclosed herewith, copy of a statement received from Mr. L. A. Swanson detailing the consents obtained from the mineral owners of the various quarter sections included in the company's Pilot Water Flood.

Also enclosed herewith, a suggested letter, for your signature, requesting Mr. McDaniel to supply his opinion in respect to the necessity for unitization in order to maintain equity between mineral owners.

J. S. Richards.

JSR:lsm
Enc.

c.c. Mr. M. J. Gobert,
Senior Petroleum Engineer.

DEPARTMENT OF MINES
& NATURAL RESOURCES
SEP 25 1958
PETROLEUM ENGINEERING
DIVISION

McDANIEL CONSULTANTS LTD.

Oil and Gas Reservoir Evaluations

September 19, 1958

C

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P

Y

J. S. Richards
Director of Mines
Department of Mines and Natural Resources
Mines Branch
Box 42, Legislative Building
Winnipeg, Manitoba

Dear Sir:

In regard to a letter dated September 16, 1958 addressed to your office from the California Standard Company we would like to provide the following comments.

Perimeter Flooding

The discussions held on September 12 greatly clarified the case against peripheral (perimeter) flooding. The letter expresses considerable concern over the number of injection wells required and makes a case for low injectivity in the flank area wells. We would tend to dismiss these two reasons as not being completely realistic objections. Firstly we doubt very much that anywhere near the number of wells indicated would be required for injection purposes. Secondly the low injectivity is based on the condition that water would only be injected into the oil zone sections of the formation. In such a project we would contemplate that the entire section would be opened and relatively high injection rates could no doubt be obtained.

The most valid objection to peripheral water injection would appear to be the apparent low permeability of the formation which effects only limited communication between wells in the

Central portion of the field. It was revealed in the discussions that a relatively strong water drive exists in the western portion of the field. The beneficial effect of this natural mechanism appears to be limited to this area because of the aforementioned low permeability conditions. In effect, although some edge wells are benefitting the pressure in the inside areas has declined appreciably. Although we believed that the majority of production has been derived as the result of water expansion, it may well be impractical to attempt pressure maintenance over a large area from the flanks of the reservoir. This would appear to be essentially a time problem and we can recognize California Standard's concern in this respect.

The difficulties in testing a peripheral water injection project and the concern over employing the eastern flank wells for injection purposes also appear to be realistic problems. Although we are willing to dismiss our feelings towards such a scheme on the basis of the aforementioned reasoning we are still of the opinion that a peripheral project may well be feasible in some areas of the field and the concept should not be arbitrarily omitted from future consideration.

COPY

Injection Below Oil-Water Interface

California Standard's argument against bottom water injection is predicated on the theory that there is not sufficient vertical communication to efficiently sweep the reservoir. Although their reasoning appears weighty no satisfactory answer was given to the fact that much greater volumes of oil have been produced than that which would be anticipated from the reservoir oil expansion. We are, therefore, not convinced that bottom water injection might not be the most effective method of pressure maintenance in this field. It is, however, a point which can be argued both ways and certainly can not be accurately assessed at this time. We, therefore, examined the two concepts from a practical standpoint insofar as the proposed pilot water flooding project is concerned.

Assuming that water were injected into the underlying water or aquifer portion of the reservoir and that uniform vertical communication exists then we believed the most efficient type of pressure maintenance would be effected. Should the vertical communication be limited or erratic in nature then sizeable volumes

COPY

of oil would be left in the reservoir which might otherwise have been recovered. The concept of pattern flooding is seldom as efficient as edge or bottom water mechanisms. Assuming only limited or erratic vertical communication then the injection of water into the oil zone sections would no doubt be the most efficient method of flushing the reservoir. In order to realistically present the problem a critical type analysis has been employed. Assuming uniform vertical communication exists and that water would only be injected into the oil bearing portions of the reservoir then we believe the following performance would probably occur. Firstly the injected water would probably tend to channel into the underlying water zone or aquifer and effect a combined type mechanism. Although it is possible that such a mechanism might not be as efficient as would be obtained with selective injection into the water zone, it is doubted that any great loss would occur. It is further believed that the injection of water into the pay zone section would probably provide more information on the performance characteristics and the possible pressure maintenance methods even though it might not be the most efficient method. The performance of the individual producing wells within the project area would probably reveal the nature of reservoir mechanism created.

On the basis of these considerations we would conclude that the proposed pilot flooding scheme might not only be the most efficient method of instituting pressure maintenance but would probably provide the greatest amount of information in the shortest period of time. In reaching this conclusion we believe that the proposed scheme be considered as an experimental type project which could be expanded or from which sufficient information would be gained to institute a more efficient scheme of pressure maintenance in the North Virden Scallion field.

Quarter Section Five Spot

It was our concept that a pilot water flooding scheme on a quarter section five spot could provide an alternative should severe equity problems arise. The objections raised in points (a) and (b) of the California Standard letter can not be considered reasonable objections as we can not visualize any reason other than economics why a number of such projects could not be instituted. We must add that such schemes are not uncommon in various parts of the United

States. It is evident, however, that in view of the experimental nature of the project, addition of such costs becomes unrealistic particularly from an over-all field consideration. It is possible, however, that the costs of such a project or series of projects might be favourably considered when weighed against equity problems. In any event we would not recommend any such procedure as being a realistic solution for over-all pressure maintenance in the North Virden Scallion field.

In view of the fact that the California Standard letter in question deals only with the engineering aspects of the proposed pilot water flooding scheme we have not considered any of the equity aspects in this letter.

Sincerely yours,

McDANIEL CONSULTANTS LTD.

Copy (Original Signed) *R. R. McDaniel*

per R. R. McDaniel, P. Eng.

COPY

MINES
RESOURCES
1968
MINES

PROVINCE OF MANITOBA

DEPARTMENT OF MINES AND NATURAL RESOURCES, WINNIPEG, CANADA

COPY

September 25, 1958.

Mr. R. R. McDaniel,
President,
McDaniel Consultants Ltd.,
231 - 8th Avenue, West,
Calgary, Alberta.

Dear Mr. McDaniel:

I have read with interest your letter of September 19th, commenting on the letter received from The California Standard Company, and confirming the opinions expressed by its representatives at our meeting of September 12th, in respect to possible alternative methods of initiating the North Virden Scallion Pilot Water Flood.

We note the remark that your comments were limited to the engineering aspects of the proposed pilot flood because the California Standard letter did not deal with the equity phase of the problem. However, the Board is very interested in your opinion in respect to the equity problems and, in particular, to know if you feel that unitization should be carried out in order to maintain equity.

Yours very truly,

J. G. Cowan,
Chairman,
The Oil and Natural Gas
Conservation Board.

JSR:lsm

MNR-C-24

C O P Y

THE CALIFORNIA STANDARD COMPANY

L. A. Swanson
Vice-President
Producing

Calgary, Alberta

September 19, 1958.

Mr. J. S. Richards,
Director of Mines, Mines Branch,
Department of Mines and Natural Resources,
Box 42, Legislative Building,
WINNIPEG 1, Manitoba.

Dear Sir:

In accordance with our discussions with you on September 12, 1958, we wish to report the present status of consents that we have acquired with respect to the interest held under the various lands covered by our application for a Pilot Water Flood in the North Virden Scallion Field.

In the NE¼ 15-11-26 WPM we have acquired consent from 100% of the mineral ownership.

In the NW¼ 15-11-26 WPM we have acquired consent from 96% of the mineral ownership.

In the SW¼ 15-11-26 WPM we have acquired consent from 75% of the mineral ownership.

In the SE¼ 15-11-26 WPM we have acquired consent from 75% of the mineral ownership.

In the SW¼ 22-11-26 WPM we have acquired consent from 20% of the mineral ownership.

We are in the process of contacting all of the balance of the mineral ownership, and as soon as we have a significant change to report we will do so.

Yours very truly,

"L. A. Swanson"

L. S. SWANSON

LAS:DY

September 16, 1958.

Mr. J. S. Richards,
Director of Mines,
Department of Mines and Natural Resources,
Mines Branch,
Box 42 Legislative Building,
Winnipeg 1, Manitoba.

Dear Sir:

In order to confirm our discussions of the September 12th meeting in Winnipeg, we herewith reply to your letter dated August 21, 1958.

The points shall be dealt with in the same order listed in your letter:

1. Perimeter Flooding: During the initial study of the North Virden field consideration was given to the possibility of peripheral flooding. This would involve converting most of the edge wells around the field to water injection and using the remaining central wells for oil production. This method of water flood was not considered feasible for the North Virden Scallion field for the following reasons:

(a) The edge of the productive limits of the three zones are not coincident. (Please refer to figures 6, 8 and 10 "Reservoir Study, North Virden Scallion Field" - note that all subsequent figures refer to our context of this report). This would mean that an edge well for one zone could be of limited or no use to another zone. By tracing the periphery of each zone it is observed that the Charty Zone would require about 73 edge injection wells; the Oolitic Zone about 84 edge injection wells and the Crinoidal Zone about 38 edge injection wells. The total number of injection wells to efficiently flood all three zones would not, however, be the summation of these numbers since some of the wells would serve more than one zone.

(b) The injectivity of edge wells is too low to replace future voidage of reservoir fluids. The eastern edge of the field consists of a porosity type pinchout, hence the pay section is thin and the permeability is low. On the west side of the field the pay

section is also thin since the formation dips in a southwesterly direction and intersects the oil/water interface. The injectivity of the peripheral wells mentioned above, was calculated as follows:

ZONE	PERIPHERAL INJECTION WELLS	CALCULATED INJECTIVITY
Cherty	73	1650 b/d
Oolitic	84	1750 b/d
Crinoidal	38	150 b/d
TOTAL		3550 b/d

The ultimate voidage rate is estimated by multiplying the 250 wells x the 70 b/d allowable x a formation volume factor of 1.02 = 17,900 b/d.

It may be seen that the injectivity is less than 25 percent of ultimate requirements. It is also noted that the injectivity calculations deal with injection into the oil zone exclusive of injection into the aquifer.

Consideration has also been given to injection into the entire Cherty zone, (i.e. both oil zone and aquifer) to supplement the natural water expansion. This type of pressure maintenance would involve the peripheral wells on the west down dip flank of the North Virden Scallion Field. It is our opinion that pressure maintenance by this method would not be adequate for the same reason that the natural water expansion is limited, by low permeability. As a result the only wells favorably influenced by water expansion are either edge wells or first or second line wells. The exception to this is the fractured area which is shown in figure 14. This area, however, does not require pressure maintenance.

2. Injection below the oil/water interface: The North Virden Scallion Field is not considered suitable for bottom water injection for the following reasons:

(a) The field is not one reservoir but three, namely the Cherty Zone, the Oolitic Zone and the Crinoidal Zone. These zones are separated by continuous correlatible dense shale bands of three feet to eight feet in thickness. Thus a bottom water flood in the Cherty Zone would not effectively flood the Oolitic and Crinoidal Zones. It is noted that artificially induced fractures may cause some limited communication in areas where the Crinoidal Zone has been sand fractured. This is not considered to be of significant magnitude to make bottom water flooding feasible for the Oolitic and Crinoidal Zones, but might indeed result in coming through these fractures, thus permitting by-passing and loss of ultimate oil recovery.

(b) There is a variable oil/water interface in the Cherty Zone which is transitional in nature. (Refer to figures 3 and 5).

The reservoir rock characteristics which cause this variable oil/water interface would also adversely affect a bottom water flood. The reservoir rock characteristics are a result of irregular lithological changes indicated by the fractured area, leached area, pinchout or anhydritized area which yield variations in permeability and porosity.

(c) Permeability profiles in the Cherty Zone indicate dense zones of variable thickness. Dense streaks and low permeabilities in the aquifer are illustrated by figure 4. Core analysis from many wells show dense streaks throughout the oil zone. (eg. Calstan Scallion 12-22, Calstan Scallion 4-22 and Imperial Scallion 10-33). The lateral extent of these dense streaks are considered a definite risk factor in bottom water flooding.

(d) The permeability is of a low order of magnitude. Referring to figure 22 it may be observed that 50% of the permeability is less than 10 md. and 90% of the permeability is less than 64 md. By way of comparison we would like to refer to the Acheson field in Alberta. The pressure in this pool is being maintained by bottom water injection. Two significant features of this pool are: (a) a uniform original oil/water interface at -2775 feet subsea and (b) a weighted average area permeability of 3000 md.

3. A one-quarter section five spot with a single injection well in the centre of the quarter section: It is our opinion that this type of pilot flood has three distinct disadvantages as follows:

(a) It would provide only a one well injectivity test.

(b) It would provide very limited and probably nonconclusive performance data.

(c) It does not lend itself to future full scale expansion, thus the cost of drilling the injection well in the centre of the quarter section would be lost.

We hope that this summary satisfactorily covers all the points raised in your letter.

In regard to the matter of Mineral Owner consents, a report will be forwarded to you later this week.

Yours very truly,

L. A. Swanson/RRD

L. A. SWANSON

c.c. R.R. McDaniel
J.G. Trewell

RRD/mig

PS-1-58

COPY

August 21, 1958.

The California Standard Company,
Medical Arts Building,
Calgary,
Alberta.

Gentlemen: Attention Mr. J. Zeddie.

This is to advise the Board has reviewed your application for a Pilot Flood in the North Virden Scallion Field and submission made to Public Hearing, held July 3, 1958, and feels that further consideration should be given to the following:

1. Perimeter flooding;
2. Injection below the oil - water interface;
3. A one-quarter section five spot with a single injection well in the centre of the quarter section.

The Board requests that serious study be given to these alternatives.

The Board is of the opinion that equity can only be established by unitisation of a proposed flood area.

The Board also requests that written consents be obtained from the operators and lessors of all adjoining leases, and that the same be filed with the Board.

Yours very truly,

J. S. Richards,
Deputy Chairman,
The Oil and Natural Gas
Conservation Board.

JSR:db

c. c. to: Mr. J. G. Cowan, Q.C.,
Chairman;
and
Mr. M. J. Gobert,
Member.

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1 Dutka – [illegible] Finding [illegible]
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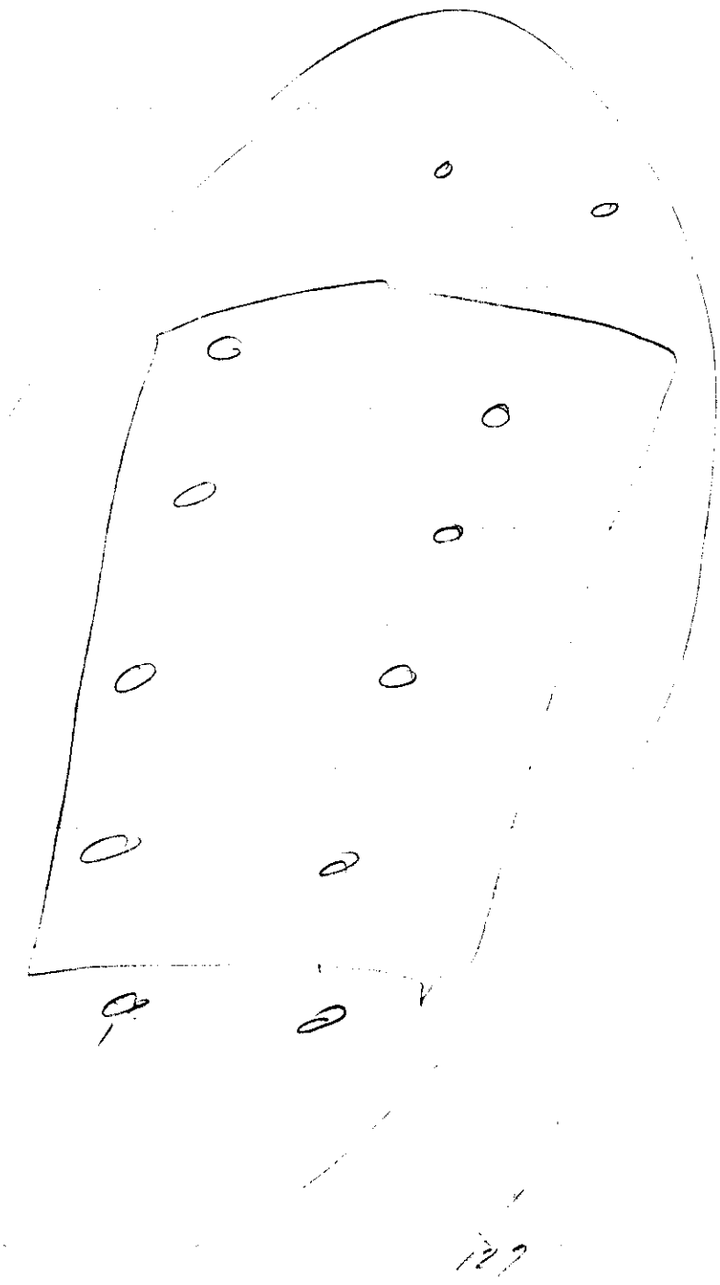
Sept. 12, 1958. 1:45 from C.R.T.

R. Dutka – Permitted Flooding. Figs. 6-8-10.
Large number of wells
0-5-10 pay zone. Low rates. tighter –
Zones not directly supervised
73 wells – Cherty zone –
84 Oolitic
38 Cremaidal not all the same.
Injectivity – Cherty – pay zone 1650 bbl per total –
Cremaidal 3 " "
discrepancy in injection rates due to thickness of pay zone
∴ 3 reservoirs
2 Bottom water flood – transitional oil-water interface
3. Plot of Core Analysis for well-permeability
Vertical assumed where horizontal
Dense nucleus K or Vert.
4. Qualitative – altho best in Mon still a long way from a high permeable field
Fractured zone & leached zone fig 14
SW low edgewater expansion may not require flood. Vide Conrad Field.

Daily 2-12 broken thru to 3-12.

No Consents required of offsetts
or diagonal lease not required
for seed wells in allocation Task
Force



September 2, 1958.

Mr. R.R. McDaniel,
Queen Elizabeth Hotel,
Montreal, Quebec.

Dear Sir:

I believe that The California Standard Company have asked for a meeting with the Board to discuss the North Virden Scallion Field Pilot Flood. Messrs. Cowan and Richards are in Fredricton and such a meeting could not take place before the week of September 8th. I have suggested to them that you should be present and that the meeting be held on September 12th.

If agreeable to you, would you advise me as to where I could contact you September 9th or 10th once the meeting has been finalized and your time of arrival in Winnipeg on September 12th.

Yours truly,

M.J. Gobert,
Senior Petroleum Engineer.

MJG)lk

NORTH VIRDEN - SCALLION FIELD

WATER FLOOD PROPOSAL

THE CALIFORNIA STANDARD COMPANY

NORTH VIRDEN SCALLION FIELD

WATER FLOOD PROPOSAL

In December, 1953, the North Virden Scallion field was discovered by the drilling of California Standard Scallion Prov. 3-11 in LSD 3, Section 11-11-26 W.P.M. Commercial production was encountered in the Lodgepole Formation and the well put on pump December 31, 1953, with an initial production of 75 barrels per day. By November, 1957, the production from this well had decreased to 13 barrels per day.

The field was extended by rapid drilling through the two years following discovery, and by January, 1958, there were 227 producing wells in the field. Well depths average about 2,100 feet and the holes require about 10 days to drill and complete. The peak production of the field was reached in July, 1957, at 6,846 barrels per day. The field has been practically drilled out.

By the end of 1957, 5,570,000 barrels had been produced and under the present method of production it is estimated that 20,000,000 barrels can be produced from the field.

How can more of this oil be recovered? --

After exhaustive laboratory and reservoir studies during the past three years, we conclude that the answer is water flooding.

What is water flooding and how does it work? --

Water flooding is the process in which water is forced into the pores of the rock containing the oil, in order to wash or flush it out.

How much more oil will be produced under water flood? --

It is estimated that 16,000,000 barrels more oil will be recovered. This total of 36,000,000 barrels is almost double that without flooding.

20,000,000 BBL.

RECOVERY UNDER PRESENT METHOD

36,000,000 BBL.

TOTAL RECOVERY WITH WATER FLOODING

Who pays the cost of water flooding? --

The Operators, or oil companies bear the entire cost of water flood operations. The mineral owner pays nothing!

Is water flooding a completely new idea? --

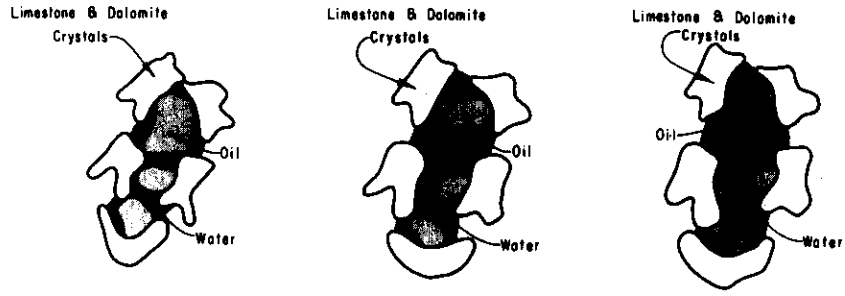
No, definitely not! It has been used successfully by oil companies throughout Canada and the United States for some time. The California Standard Company has had a small water flood in the Daly Field west of Virden since 1953.

Why do we need to water flood to get more oil? --

In oil reservoirs there is some natural energy available to move the oil into the producing wells. Oil is stored in the rock under conditions of high temperature and pressure. When a well is drilled into the reservoir rock a chance to release this energy is available. The expansion of the oil drives it toward the well bore. A small amount of gas is in solution with the oil, and as pressure is released the gas escapes; providing energy. These two processes allow the pressure in the reservoir to drop. The other source of energy in producing the oil is invading water from the sides of the field and from the water-bearing rock below the oil zone. This will help to maintain the pressure. However, in the North Virden Scallion Field the pressure in the reservoir has been dropping quite rapidly. Therefore the natural water drive is not completely effective. That is why artificial water injection is necessary to maintain the pressure and to recover more of the oil. The production decline of a typical North Virden Scallion well is shown in Figure 1.

How does water flooding get this extra oil out of the rock? --

Water under high pressure is pumped into an injection well. This stops the pressure drop in the reservoir and flushes oil from the pores in the rock.



INITIAL OIL IN PLACE | OIL LEFT AFTER NATURAL DEPLETION | OIL LEFT AFTER WATER FLOOD

Laboratory tests have shown that the reservoir rock in most of the North Virden Scallion Field is floodable. Reservoir engineering calculations show that an estimated 16,000,000 more barrels can be recovered from the field under water flooding. This is 80% more oil than would be recovered by the present method of production.

Figure 1 shows the production curve of a typical well when water flooding is introduced.

What is being done to institute water flooding in North Virden Scallion? --

The California Standard Company, with permission of the mineral owners and upon approval of the scheme by the Oil and natural Gas Conservation Board of the Province of Manitoba, plan to introduce a Pilot Water Flood as shown in Figure 2. Six oil wells will be converted to water injection as shown.

With co-operation of the mineral owners involved this program can be accomplished during 1958. Extension to a larger portion of the field will depend upon the co-operation of the many mineral owners and Companies having interests in this field.

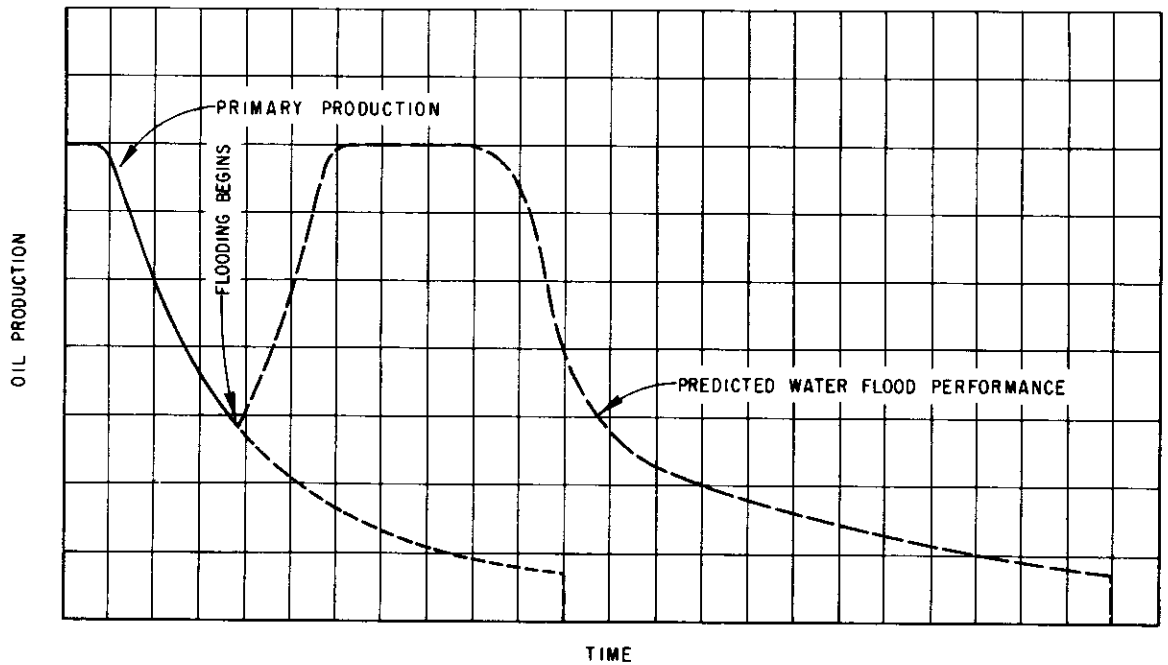


FIGURE 1
TYPICAL NORTH VIRDEN SCALLION WELL
UNDER NATURAL DEPLETION
AND
UNDER WATER FLOOD (SURROUNDED BY FOUR INJECTION WELLS)

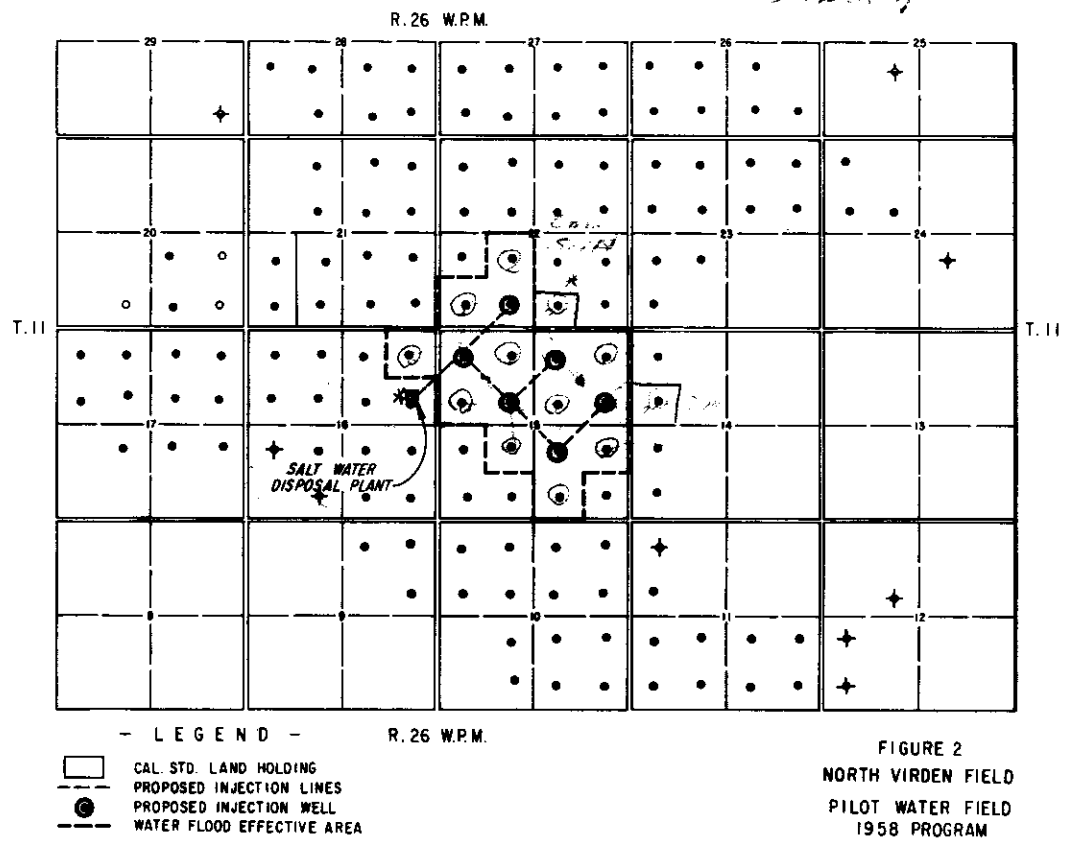
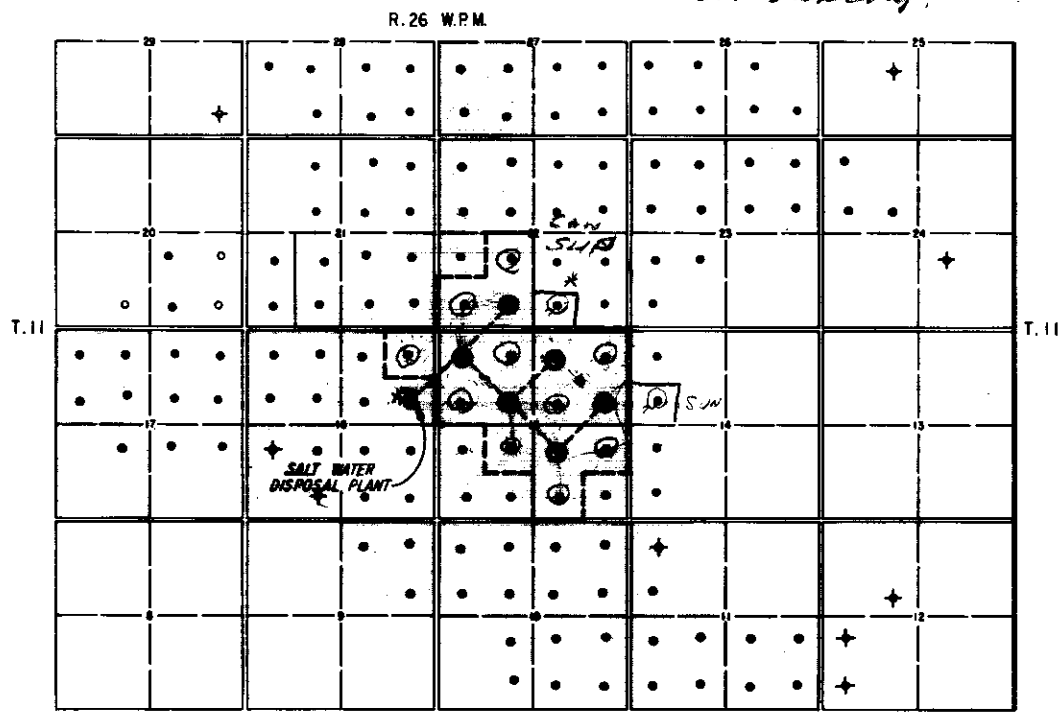


FIGURE 2
NORTH VIRDEN FIELD
PILOT WATER FIELD
1958 PROGRAM

C.S. Devonian SWD.

* Plugged back and dropping on Debing.



- LEGEND -

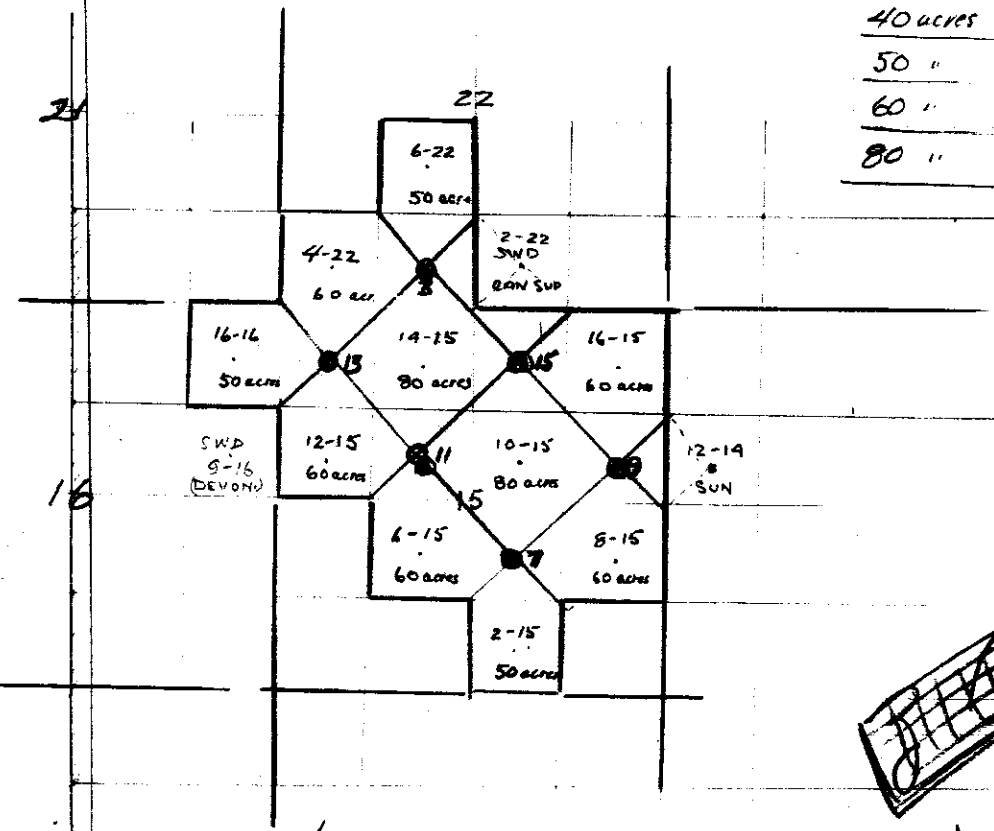
- CAL. STD. LAND HOLDING
- PROPOSED INJECTION LINES
- PROPOSED INJECTION WELL
- WATER FLOOD EFFECTIVE AREA

FIGURE 2
NORTH VIRDEN FIELD
PILOT WATER FIELD
1958 PROGRAM

[illegible] = 1121 [illegible]
ACREAGE = 610 acres
per acre = 1.57 bbls

	MPR	
40 acres	75	56
50 acres	94	66
60 acres	113	
80 acres	150	

40 acres	MPR = 70	
50 "	" = 88	
60 "	" = 105	
80 "	" = 140	



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PROVINCE OF MANITOBA

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J. S. RICHARDS
DIRECTOR OF MINES

DEPARTMENT OF MINES AND NATURAL RESOURCES
MINES BRANCH
DIRECTOR'S OFFICE
ROOM 21 - 469 BROADWAY AVENUE - WINNIPEG 1
(BOX 42 LEGISLATIVE BUILDING)

July 23, 1958.

Mr. R. R. McDaniel,
President,
McDaniel Consultants Ltd.,
231 - 8th Avenue, West,
Calgary, Alberta.

Dear Mr. McDaniel:

In accordance with our verbal understanding, I am forwarding, under separate cover, copies of the following:

Proceedings of Public Hearing of The Oil and Natural Gas Conservation Board, July 3, 1958;

Application to Convert Canadian Superior Hauk 2-35 to Mississippian Salt Water Disposal Well. (Canadian Superior Oil of California, Ltd.)

Application to Convert Canadian Superior Thomson 9-32 to Mississippian Salt Water Disposal Well. (Canadian Superior Oil of California, Ltd.)

Application to Convert Imperial Virden 7-28-10-26 for use as a salt water disposal well in the Lodgepole of the Mississippian formation. (Imperial Oil Limited).

Halliburton-Vandershaeghe #5-15-9-25 WPM -- Well History -- Proposed Conversion to Salt Water Disposal Well. (Hegion & Atkinson Limited).

Letter, dated June 26, 1958, from The California Standard Company requesting permission to convert the well Calstan Routledge 16-28-9-25 in L.S. 16, Sec. 28, Twp. 9, Rge. 25, W.P.M. into a salt water disposal well in the Mississippian Lodgepole formation.

Letter, dated May 30, 1958, from The California Standard Company, with application for approval of a pilot water flood scheme in the North Virden Scallion Field.

Reservoir Study, North Virden Scallion Field, Manitoba. (The California Standard Company).

As previously stated, I will be absent from the office for the next three weeks so that, if you have any questions in connection with any of these applications, or feel we can supply you with any supplementary information which you require, would you please contact Mr. M. J. Gobert, Senior Petroleum Engineer, Mines Branch, Box 42, Legislative Building, Winnipeg 1.

Yours very truly,

J. S. Richards,
Director of Mines.

JSR:lsm

PROVINCE OF MANITOBA

DEPARTMENT OF MINES AND NATURAL RESOURCES, WINNIPEG, CANADA

COPY

July 2, 1958.

Mr. J. T. Cauley, P. Eng.,
Deputy Minister,
Department of Mineral Resources,
Government Administration Building,
Regina, Saskatchewan.

Dear Jim:

Many thanks for your letter of June 23rd, setting out your comments relative to the proposed plan of Pilot Water Flood in the North Virden Scallion Field. The points made will be very useful to our Board. Would you also express to Mr. Coons our sincere appreciation for the time and effort which he devoted to this problem.

I expect that the matter of the engagement of a consultant to our Board will be receiving consideration in the very near future. Provided that you have no objections, we would appreciate receiving a copy of any resume of Mr. Kaveler's qualifications and experience which you may have on file.

Yours very truly,

J. S. Richards,
Director of Mines.

JSR:lsm

c.c. Mr. J. G. Cowan, Q.C., Deputy Minister.
Mr. M. J. Gobert, Senior Petroleum Engineer.

MNR-C-21

Province of Saskatchewan

DEPUTY MINISTER
OF
MINERAL RESOURCES

REGINA, Saskatchewan,
June 23, 1958.

Mr. J. Richards,
Director of Mines,
Department of Mines & Natural Resources,
WINNIPEG, Manitoba.

Dear Jimmie:

Re: Pilot Water Flooding

I had Mr. Coons, our Technical Co-ordinator, go over the proposed Plan of Pilot Water Flood in the North Virden Scallion Field and following are our collective comments:

1. This Department would endeavour to take in a greater area than that indicated in this particular plan. However, we realize that you have a problem in that your Act does not provide for plans other than co-operative schemes. We do think that the possibility of getting the other interested parties to go along with the scheme should be investigated.

2. Since the proposed injection rate is approximately the same as proposed withdrawals, the pilot water flood will not likely have any great affect on the land lying outside the test area other than to reduce the pressure decline rate and possibly maintain pressure in the subject area. This may or may not effect an advantage to those lying outside the flood area and in effect, outside the unit area. This should be developed at your hearing and an official position of the Department indicated so that all parties will have clear notice as to how your Department proposes to protect equity interest in the event it is established that equity may be affected. It would be my suggestion that your Department assess just what the effect would be, and how you propose to control it. Within the powers of your Act at the present time, your Department could probably maintain through M.P.R. control, equity across the boundaries of the unit. That is to say, the unit could be treated as a lease, givenan appro-

priate M.P.R., and those outside the unit could be given an appropriate M.P.R. to maintain a balance in order to protect equity as between all parties in the Field.

3. The ideal pilot water flood should be in the centre of a lease in order that a row of buffer wells (probably with normal M.P.R.'s) may surround the injection and producing wells. The following list of M.P.R.'s is suggested to effect in part, a buffer zone of normal M.P.R.'s on the wells offsetting land owned by others than Californis Standard; this, of course, is only feasible if the subject area is Crown land or is to be unitized:

Well	Suggested M.P.R.	cyp/d	Daily
2-15	140	1054	35
6-15	140	2132	70
8-15	70	1275	42
10-15	140	628	21
12-15	70	2185	70
14-15	140	220	7
16-15	70	57	2
4-22	140	734	24
6-22	70	837	28
16-16	140	1832	60

4. The engineering submission is well prepared. The results of fluid analysis mentioned on page 7 should be submitted to the Mines Branch, if not already submitted, and some explanation should be given to the marked variation in the one sample. Perhaps further samples should be analyzed during the period of pilot water flood to assist in field wide secondary recovery studies.

5. The lack of formation pressure information (page 8) could be critical in the future and provision should be made in the approval, if granted, whereby one or two wells in the subject area are available for pressure study and their allowable during shut-in periods transferred to other wells.

6. Page 12 - Unit and Cross-Line Flooding agreements..... "The pilot water flood would not prejudice future unitzation or co-operative flooding". I cannot agree with this statement and would urge the Manitoba Board to encourage the early unitization of the complete reservoir.

7. (Page 13). What happens to this scheme if the other operators decide to use their salt water for their own purposes? It would seem that provision should be made for an independent source of water, having regard to a difficult situation in the event that operators outside the unit decide not to deliver their water to the unit.

At the same time, if the company is going to develop a comprehensive pilot water flood it may be necessary to inject more water than is available at the present time in order to get adequate answers.

Other than the above, the plan appears reasonably adequate.

I trust that these comments may be of some use to you.

In accordance with your request, I am returning the following to you herewith:

1. Reservoir Study North Virden Scallion Field, Manitoba;
2. North Virden-Scallion Field Water Flood Proposal;
3. Letter of transmittal from the California Standard Co. under date of May 30 re pilot water flood scheme;
4. Letter from California Standard Co. dated May 28 requesting approval of pilot water flood scheme.

Yours sincerely,

James T. Cawley, P.Eng.,
Deputy Minister

JTC:MH

DEPARTMENT OF MINES
& NATURAL
JUN 26 1958
DIRECTOR

PROVINCE OF MANITOBA

DEPARTMENT OF MINES AND NATURAL RESOURCES, WINNIPEG, CANADA

COPY

PROVINCE OF SASKATCHEWAN

REGINA, Saskatchewan
June 23, 1958.

Mr. J. Richards,
Director of Mines,
Department of Mines & Natural Resources,
Winnipeg, Manitoba.

Dear Jimmie:

Re: Pilot Water Flooding

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Well	Suggested M.P.R.
2-15	140
6-15	140
8-15	70
10-15	140
12-15	70
14-15	140
16-15	70
4-22	140
6-22	70
16-16	140

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"James T. Cawley", P.Eng.
Deputy Minister.

PROVINCE OF MANITOBA

DEPARTMENT OF MINES AND NATURAL RESOURCES, WINNIPEG, CANADA

COPY

PROVINCE OF SASKATCHEWAN

REGINA, Saskatchewan
June 23, 1958.

MR. J. Richards,
Director of Mines,
Department of Mines & Natural Resources,
WINNIPEG, Manitoba.

Dear Jimmie:

Re: Pilot Water Flooding

I had Mr. Coons, our Technical Co-ordinator, go over the proposed Plan of Pilot Water Flood in the North Virden Scallion Field and following are our collective comments:

1. This Department would endeavour to take in a greater area than that indicated in this particular plan. However, we realize that you have a problem in that your Act does not provide for plans other than co-operative schemes. We do think that the possibility of getting the other interested parties to go along with the scheme should be investigated.

2. Sincethe proposed injection rate is approximately the same as proposed withdrawals, the pilot water flood will not likely have any great affect on the land lying outside the test area other than to reduce the pressure decline rate and possibly maintain pressure in the subject area. This may or may not effect an advantage to those lying outside the flood area and in effect, outside the unit area. This should be developed at your hearing and an official position of the Department indicated so that all parties will have clear notice as to how your Department proposes to protect equity interest in the event it is established that equity may be affected. It would be my suggestion that your Department assess just what the effect would be, and how you propose to control it. Within the pwoers of your Act at the present time, your Department could probably maintain through M.P.R. control, equity across the boundaries of the unit. That is to say, the unit could be treated as a lease, given an appropriate M.P.R., and those outside the unit could be given an appropriate M.P.R. to maintain a balance in order to protect equity as between all parties in the Field.

3. The ideal pilot water flood should be in the centre of a lease in order that a reow of buffer wells (probably with normal M.P.R.'s) may surround the injection and producing wells. The following list of M.P.R.'s is suggested to effect in part, a buffer zone of normal M.P.R.'s on the wells offsetting land owned by others than California Standard; this, of course, is only feasibly if the subject area is Crown land or is to be unitized:

Well	Suggested M.P.R.
2-15	140
6-15	140
8-15	70
10-15	140
12-15	70
14-15	140
16-15	70
4-22	140
6-22	70
16-16	140

4. The engineering submission is well prepated. The results of fluid analysis mentioned on page 7 should be submitted to the Mines Branch, if not already submitted, and some explanation should be given to the marked variation in theone sample. Perhaps further samples should be analyzed during the period of pilot water flood to assist in field wide secondary recovery studies.

5 The lack of formation pressure information (page 8) could be critical in the future and provisions should be made in the approval, if granted, whereby one or two wells in the subject area are available for pressure study and their allowable during shut-in periods transferred to other wells.

6. Page 12 - Unit and Cross-Line Flooding agreements . . . . . "The pilot water flood would not prejudice future unitization or co-operative flooding". I cannot agree with this statement and would urge the Manitoba Board to encourage the early unitization of the complete reservoir.

7. (Page 13). What happens to this scheme if the other operators decide to use their salt water for their own purposes? It would seem that provision should be made for an independent source of water, having regard to a difficult situation in the event that operators outside the unit decide not to deliver their water to the unit.

At the same time, if the company is going to develop a comprehensive pilot water flood it may be necessary to inject more water than is available at the present time in order to get adequate answers.

Other than the above, the plan appears reasonably adequate.

I trust that these comments may be of some use to you.

In accordance with your request, I am returning the following to you herewith:

1. Reservoir Study North Virden Scallion Field, Manitoba;
2. North Virden-Scallion Field Water Flood Proposal;
3. Letter of transmittal from the California Standard Co. under date of May 30 re pilot water flood scheme;
4. Letter from California Standard Co. dated May 28 requesting approval of pilot water flood scheme.

Yours sincerely,

"James T. Cawley", P. Eng.
Deputy Minister

THE CALIFORNIA STANDARD COMPANY

DEPARTMENT OF MINES & NATURAL RESOURCES

PETROLEUM ENGINEERING DIVISION

CALGARY, ALBERTA

May 30, 1958.

The Oil and Natural Gas Conservation Board,
Mines Branch, Province of Manitoba,
Box 42, Legislative Building,
Winnipeg, Manitoba.

Dear Sirs:

We are enclosing three copies of an application for approval of a pilot water flood scheme in the North Virden Scallion field, together with three copies of a supporting report entitled "Reservoir Study, North Virden Scallion Field, Manitoba". We are also enclosing three copies of a brochure relative to this project which has been prepared for distribution to the mineral owners in the area involved.

Copies of the application and supporting report have also been forwarded to all operators in the North Virden Scallion Field for their information and review.

Yours very truly,

J. F. Ross

J. F. Ross

Encl.

THE CALIFORNIA STANDARD COMPANY

CALGARY, ALBERTA

May 28, 1958.

The Oil and Natural Gas Conservation Board,
Mines Branch,
Box 42, Legislative Building,
Winnipeg, Manitoba.

Gentlemen:

The California Standard Company hereby submits to the Oil and Natural Gas Conservation Board for its approval, a pilot water flood scheme for that portion of the North Virden Scallion field outlined in Figure 1, attached, and described as follows:

LSD's 2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16 in Section 15, Township 11, Range 26, W.P.M.

LSD 16, Section 16, Township 11, Range 26, W.P.M.

LSD's 3, 4, and 6, Section 22, Township 11, Range 26, W.P.M.

The scheme will involve the conversion of six wells into water injection wells, namely:

Calstan Scallion 7-15-11-26
Calstan Scallion 9-15-11-26
Calstan Scallion 11-15-11-26
Calstan Scallion 13-15-11-26
Calstan Scallion 15-15-11-26
Calstan Scallion 3-22-11-26

all of which are located in Township 11, Range 26, W.P.M. The proposed conversion program is attached.

A salt water disposal system is currently in operation with the disposal well located in LSD 9, Section 16, Township 11, Range 26, W.P.M. Approximately 1,600 barrels/day of salt water are being disposed of at the well into the Devonian formation and it is the applicant's intent to utilize this system as a water source for the pilot water flood scheme. The present plant facilities with the addition of filter equipment, will meet the water

flood scheme requirements. An inhibitor will be added to the salt water at the disposal plant to minimize corrosion as much as possible.

The applicant requests that as long as the maximum permissible rate of production is calculated on a natural depletion basis in the pilot water flood area, the M.P.R.'s be transferred from the injection wells to other wells within a common lease. ~~providing, however, that during this period, no producing well will have an aggregate M.P.R. greater than twice the normal well M.P.R.~~ The above transfers would result in the following M.P.R.'s:

Well	M.P.R.
Calstan Scallion 2-15-11-26	105
Calstan Scallion 6-15-11-26	70
Calstan Scallion 8-15-11-26	105
Calstan Scallion 10-15-11-26	140 175
Calstan Scallion 12-15-11-26	140 105
Calstan Scallion 14-15-11-26	140 175
Calstan Scallion 16-15-11-26	140 105
Calstan Scallion 4-22-11-26	105
Calstan Scallion 6-22-11-26	105
Calstan Scallion 16-16-11-26	70
	1,120 B/D
	1120

Current M.P.R. = 16 wells x 70 B/D/W = 1,120 B/D

The estimated increase in reserves due to the pilot water flood is 1,340,000 barrels over a period of 21 years. This represents a recovery of 21% of oil in place by water flood as compared to 9.5% recovery by primary depletion. It is believed that the proposed pilot water flood area represents average field conditions and that it will thoroughly test the Cherty Zone, the main object of flooding consideration. Performance data from this pilot flood will be invaluable to various operators in future considerations for field wide flooding.

In support of this application is a report entitled "Reservoir Study, North Virden Scallion Field, Manitoba" which is attached. This report has been compiled by the Engineering Division of The California Standard Company concluding a detailed study of primary and secondary recovery in the North Virden Scallion field.

Respectfully submitted,

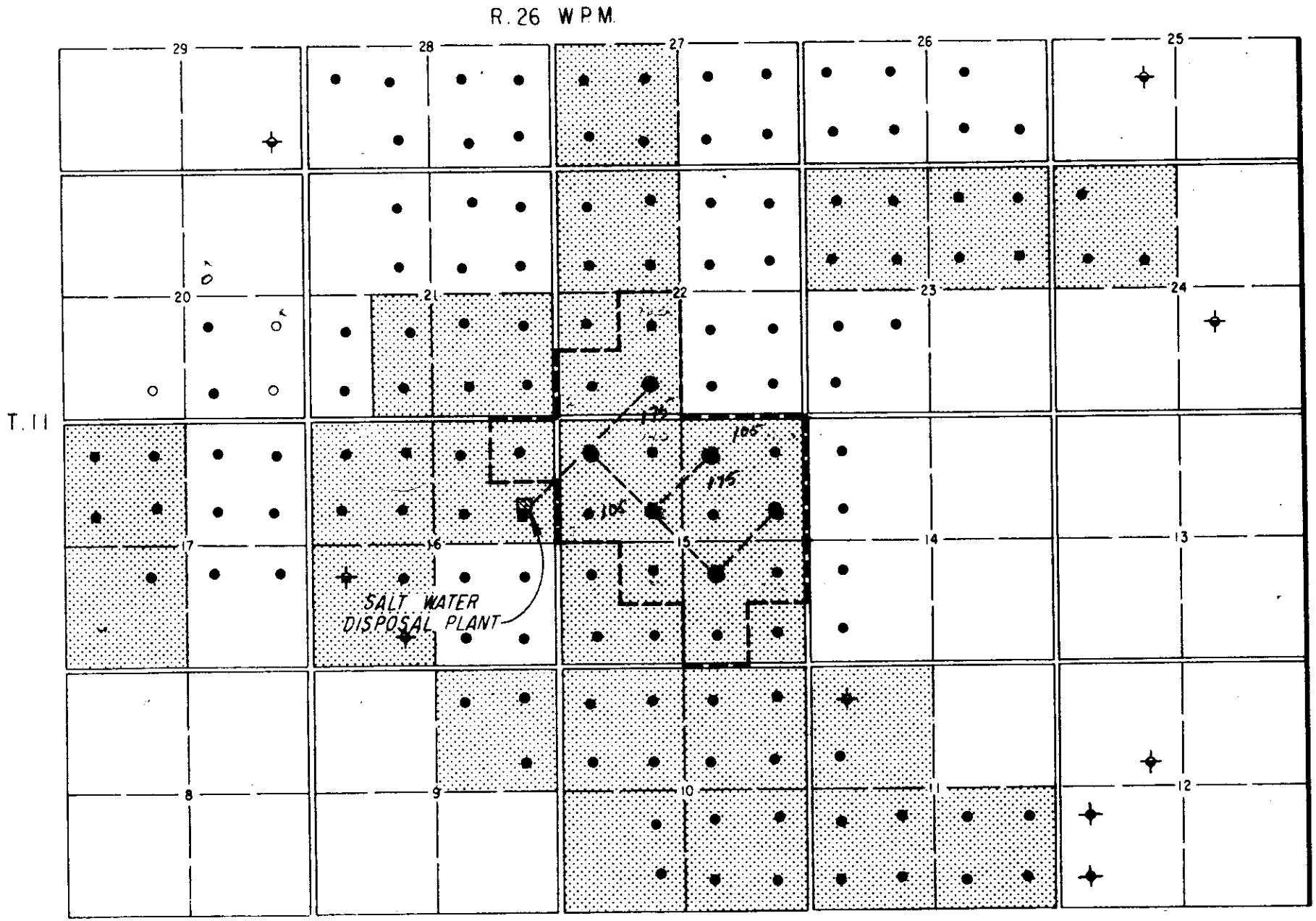
J Zedde

The California Standard Company

Encl's.

CONVERSION PROGRAM FOR INJECTION WELLS

1. Move on Contractor's rig and equipment.
2. Pull rods and tubing.
3. Run injectivity tests including spinner surveys.
4. Place wells on water injection.



R. 26 WPM

- LEGEND -

- CAL STD LAND HOLDING
- PROPOSED INJECTION LINES
- PROPOSED INJECTION WELL
- WATER FLOOD EFFECTIVE AREA

FIGURE I

NORTH VIRDEN-SCALLION FIELD

PILOT WATER FIELD
1958 PROGRAM

THE CALIFORNIA STANDARD COMPANY

CALGARY, ALBERTA

May 28, 1958.

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Mines Branch,
Box 42, Legislative Building,
Winnipeg, Manitoba.

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Calstan Scallion 6-15-11-26	70
Calstan Scallion 8-15-11-26	105
Calstan Scallion 10-15-11-26	140
Calstan Scallion 12-15-11-26	140
Calstan Scallion 14-15-11-26	140
Calstan Scallion 16-15-11-26	140
Calstan Scallion 4-22-11-26	105
Calstan Scallion 6-22-11-26	105
Calstan Scallion 16-16-11-26	70
	1,120 B/D

Current M.P.R. = 16 wells x 70 B/D/W = 1,120 B/D

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Respectfully submitted,

The California Standard Company

Encl's.

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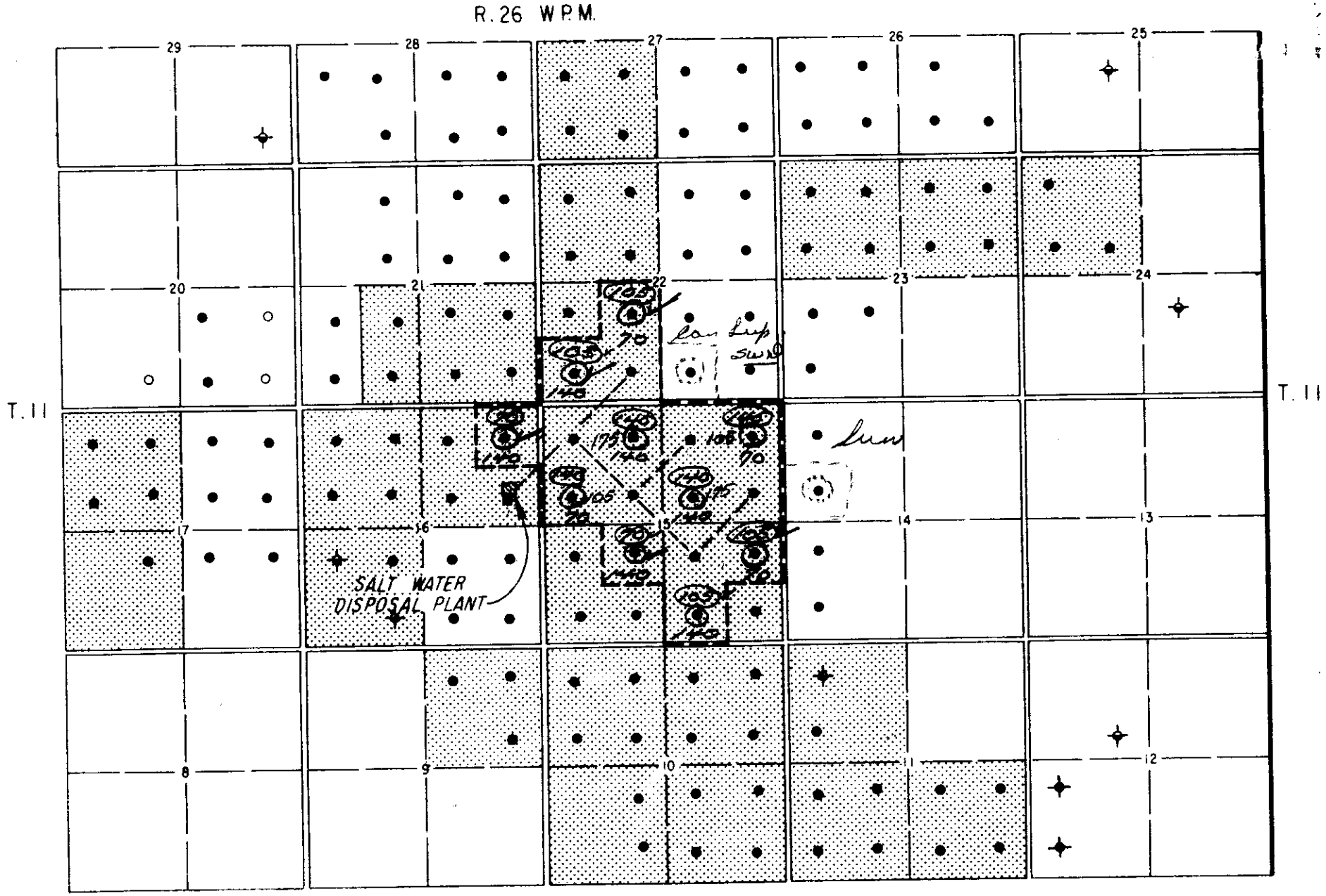


FIGURE 1

NORTH VIRDEN-SCALLION FIELD

PILOT WATER FIELD

1958 PROGRAM

Rec'd

April 9, 1957.

Mr. E. Hochhausen,
Manager
Rice Engineering & Operating Ltd.,
No. 5,
10509 - 81 Avenue,
EDMONTON, Alta.

Re: File A-700

Dear Sir:

With reference to your letter of April 5th, am enclosing herewith 2 copies of map showing contours. However, since these are at 25-foot intervals, doubt if they will be of much assistance so have enclosed a list of ground elevations in the North Virden Field as well.

Yours very truly,

M. J. Gobert,
Senior Petroleum Engineer.

MJG/h

Rice Engineering & Operating Ltd.

No. 5, 10509 - 81 Avenue Telephone 390008

EDMONTON, ALBERTA

April 5th, 1957

File: A-700

Mr. M.J. Gobert,
Department of Mines and Natural Resources,
Mines Branch,
WINNIPEG, Manitoba.

Dear Mr. Gobert,

We have been reviewing briefly some of the individual operator's problems with respect to water disposal in the North Virden pool. However, we would like to investigate the possibility of a collective system for this area, and in order to make this investigation we require either a fairly accurate contour map of the area with approximate 5-foot contours or the ground level elevations of all the wells in the area. Is it possible to obtain this information your your department? If so, we would appreciate receiving this information at your earliest convenience.

The Salt Water Disposal Working Committee is proceeding fairly well. I believe that another meeting of two or three of the permanent members of the committee to re-draft the materials obtained thus far should almost complete our study on surface disposal. I shall be meeting with Mr. Blackadar shortly to finalize this matter.

Yours very truly,

RICE ENGINEERING & OPERATING LTD.

E. Hochhausen

E. Hochhausen
Manager

EH/tw
Day File A-156

DEPA
& NAT
APR 8 1957
PETROL
DIV

ND TO BERT GOBERT

WINNIPEG.

		REMARKS
PROVE		I THOT YOU MIGHT LIKE
MMENT		TO ADD THIS PAPER
LE		TO YOUR PERSONAL
NDLE		LIBRARY. RUDY WAGG
TE		BE GLAD TO GO OVER
E ME		IT WITH YOU NEXT
ACE		TIME HE IS IN

FROM WINNIPEG. JACK ROSS

-24-CS

March 6, 1958.

Mr. J. F. Ross,
Chief Engineer,
The California Standard Company,
Medical Arts Bldg.,
Calgary, Alta.

Dear Jack:

Thanks very much for the copy of the paper "The Prediction of Oil Recovery By Water Flood" - Dykstra and Parsons.

Will be very pleased to see Rudy at any time.

Incidentally, could you have someone give me the name and type of copying machine used. These copies are much superior to anything that either one of our machines can produce.

Yours very truly,

M.J. Gobert,
Senior Petroleum Engineer.

MJG/h

DEPARTMENT OF MINES AND NATURAL RESOURCES

PROVINCE OF MANITOBA

MINES BRANCH

THE OIL AND NATURAL GAS CONSERVATION BOARD

Notice of Hearing

A Public Hearing will be held in Room 230 Legislative Buildings, in the City of Winnipeg, Manitoba, on Thursday, July 3, 1958, at 9.30 a.m., Central Daylight Time, for:

(a) The purpose of hearing representations with respect to an application by Canadian Superior Oil of California, Ltd., to convert the wells known as -

Hauk 2-35	lsd. 2-35-10-26 WPM
Thomson 9-32	lsd. 9-32-9-28 WPM

in the Virden-Roselea and Daly Fields respectively, to salt water disposal wells in the Mississippian Lodgepole Formation.

(b) The purpose of hearing representations with respect to an application by Imperial Oil Limited, to convert the well known as -

Imperial Virden 7-28-10-26

in the Virden-Roselea Field, to salt water disposal in the Mississippian Lodgepole Formation.

(c) The purpose of hearing representations with respect to an application by Halliburton Oil Producing Company, to convert the well known as -

HOPCO Vanderschaeghe 5-15-9-25

located South of the Routledge Field, to salt water disposal in the Mississippian Lodgepole Formation.

(d) The purpose of hearing representations with respect to an application by The California Standard Company for a Pilot Water Flood scheme and the conversion of the wells known as -

Calstan Scallion 7-15-11-26
Calstan Scallion 9-15-11-26
Calstan Scallion 11-15-11-26
Calstan Scallion 13-15-11-26
Calstan Scallion 15-15-11-26
Calstan Scallion 3-22-11-26

in the North Virden Scallion Field, into water injection wells.

Dated at Winnipeg, Manitoba, this Second Day of June, 1958.

J. G. Cowan

J. G. Cowan, Q.C.
Chairman.

		WATER			OIL		
		ACCUM. 31 DEC 1957	PRODUCT. MAR. 58	ACCUM. PROD 1958	ACCUM. 31 DEC 1957	PRODUCT MAR. 58	ACCUM. 1958
CALSTAN 6-22		615	3	3	48261	912	2736
" 4-22		561	2	2	45629	718	2224
" 3-22	INJ	1671	2	2	39968	554	1575
CAN. SUP 2-22	SWD						
CALSTAN 16-16		476	70	189	65482	1860	5565
" 13-15	INJ	5907	60	203	24641	484	1352
" 14-15		3601	-	-	16591	285	834
" 15-15	INJ	2738	-	-	11,281	199	670
" 16-15		1106	-	-	7,949	57	167
CALSTAN 12-15		1560	277	933	70181	2184	6579
" 11-15	INJ	7075	80	120	44597	1067	3124
" 10-15		2380	20	21	36105	604	1865
" 9-15	INJ	682	-	-	12657	149	492
SUN 12-14		3849	34	103	6327	230	687
CALSTAN 6-15		606	13	94	66310	2205	6403
" 7-15	INJ	965	-	1	59496	1543	4204
" 8-15		804	13	14	43486	1168	3323
" 2-15		1221	-	1	51110	1316	3729

		Chuty	free	[illegible]
13-15-11-26	—	2026'	SAA free - 2014-2059	2014.3'
15-15	-	2032'	" 2039-2052	2039
11-15		2022	" [illegible] 2008-2055	2008
9-15		2022'	" 2029-2034	2090
7-15		2022	[illegible] 2008-2055	2008
(3 22		2008	" " " 2014-2045	2013) Plugged 2032'

CALSTAN PILOT WATER FLOOD. WELL PRODUCTION TO DEC 31/57

		WATER	BBLS	OIL
CALSTAN 6-22		615		48 261
4-22		561		45 629
3-22	INJ.	1671		39 968
16-16		478		65 482
13-15	INJ.	5907		24 641
14-15		3601		16 591
15-15	INJ.	2738		11 281
12-15		1560		70 181
11-15		7075		44 597
10-15		2380		36 105
9-15	INJ.	682		12 857
6-15		606		66 310 ←
7-15	INJ.	965		59 496
8-15		804		43 486
2-15		1221		51 110
16-15		1106		7949
		31 970		643 944

TOTAL FLUID WITHDRAWN = 675, 914 BBLS.

①

North Verden Scallion Field Water Flood Proposal
page 2, 3 para – "That is why artificial water injection is necessary to maintain the pressure and recoverable oil"
page 2, 4 para – "stops the pressure drop"
page 3, laboratory test have shown – – –
page 3, para 4 – pilot flood 1958
by Union Oil Company Corporation

Letter – May 28, 1958 application & pilot flood.
page 2 para 2 – depletion & transfer of allowables within a common lease

Why not – 2-22-11-26 } share in allowable.
12-14-11-26 }

why 6-15-11-26 only 70 barrels allowable.
16-16-11-26 " 70
6-22-11-26 105.

page 2 para 3 – how will this be made available to other operators.

Reservoir Study.
Findings II D. by fluid expansion only account for 0.6 To.? not at bubble pt yet
page 2 ¶. see figure 19 for cutoff primary, secondary & result of pilot flood.
Conclusions 3 a) correct pressure decline ✓

Obtites & Connecticut

Page 4 para 5 transgression.
page 5 all wells are cored ✓ para 2.
page 5 – Porosity & permeability profiles "layered within the different pay zones".

p. 6 "Latter 2 zones"
p. 6 para "transitional in nature" – fig 5. blocksom diagram fig 5.?
Fig 3 "Lowered lines"

Fig 3 Lic. 19 & 20 why d/w entrance open when fig 6 closes?

Dennis figures 10 & 11.

P7. versus Dystra p 162 on initial & recovery.

Dennis Fig 26.

B.H.P. p. 8 - Section 4-11 BHP in 1954 not used? ✓

Compare l.o.s on p 8 with l.o.s on p.7. ✓

Dennis Figure 15 cumulative ✓

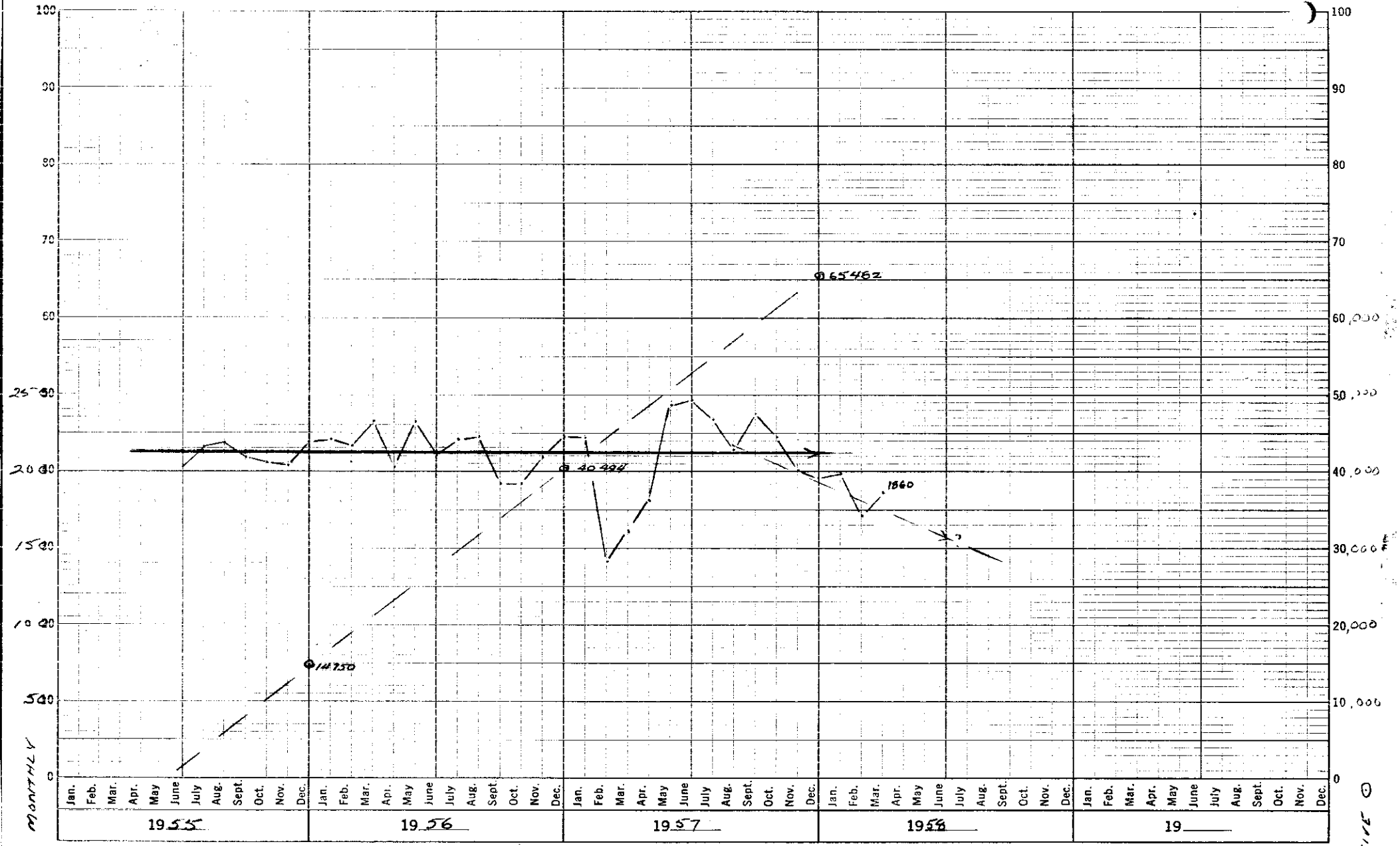
Para 2 p 9 dennis add infiltration.

Para 3 p. 9 " " "

Para 6 p. 9 with or without analysis.

K+E 5 YEARS BY MONTHS X 100 DIVISIONS KEUFFEL & ESSER CO. 358-192 MADE IN U.S.A.

Total Fluid 675,914



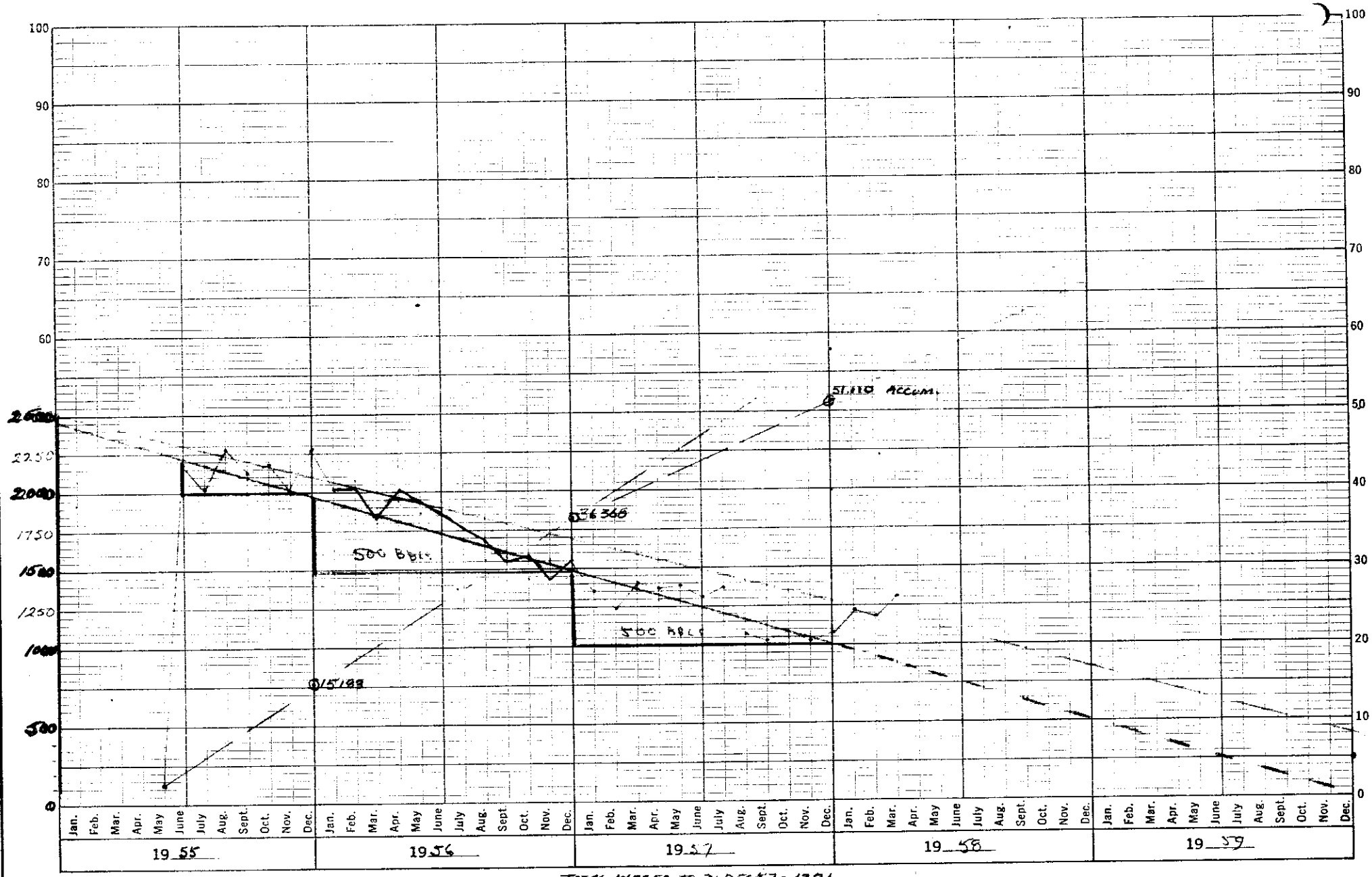
TOTAL WATER TO 31 DEC/57 - 476 BBLS.

CALSTAN SCALLION
16-16-11-26

OIL PRODUCTION.

RESULTS APR - 70

K+E 5 YEARS BY MONTHS X 100 DIVISIONS KEUFFEL & ESSER CO. 358-192 MADE IN U.S.A.



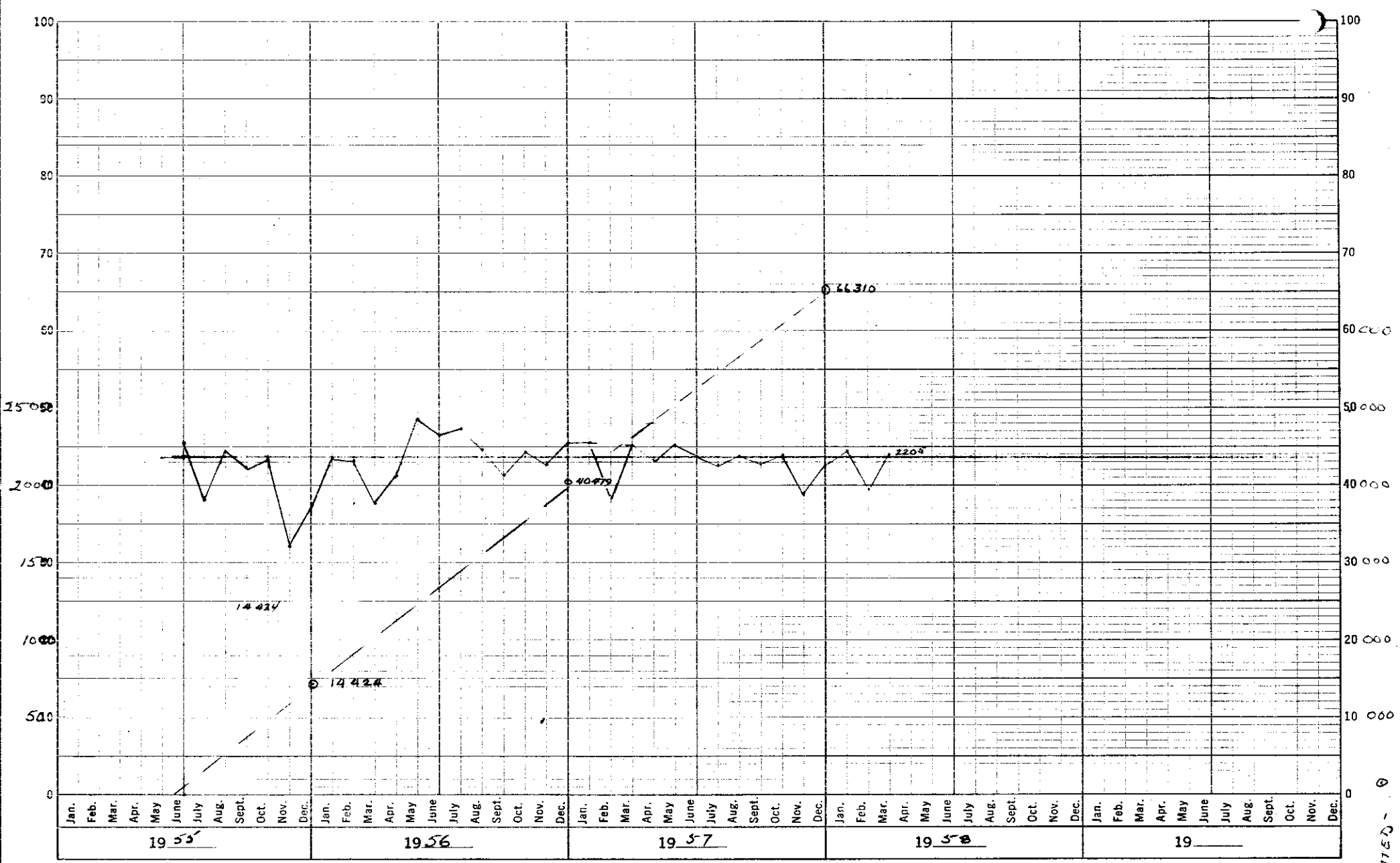
TOTAL WATER TO 31 DEC 57 - 1221

NORTH VIRDEN 2-15'
CALCIAN.

OIL [illegible]

REQUESTED MPR - 105

K+E 5 YEARS BY MONTHS X 100 DIVISIONS 358-192
KEUFFEL & ESSER CO. MADE IN U.S.A.



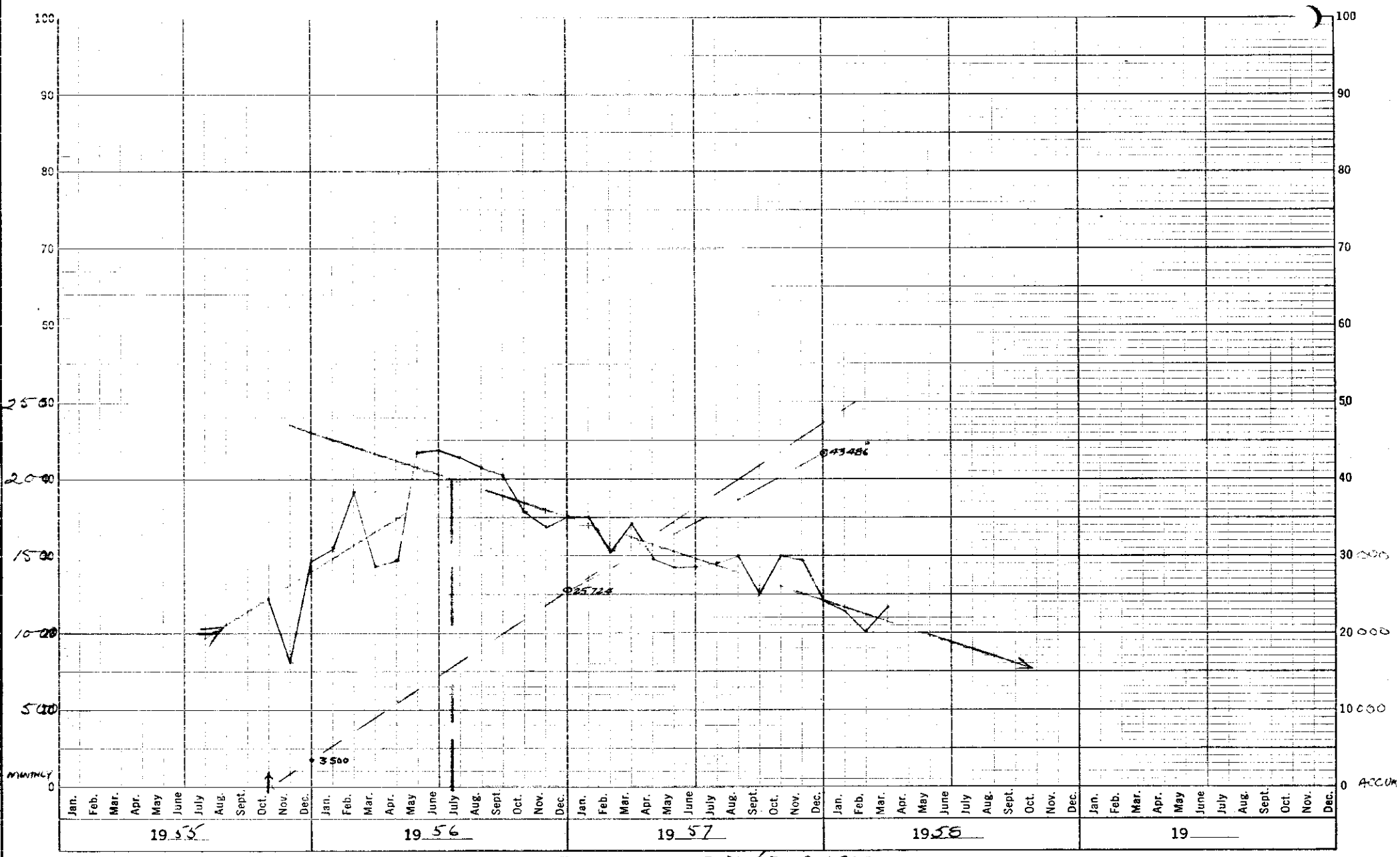
TOTAL WATER TO 31DEC/57 606 BBLS

CALSTAN SCALLION
6-15-11-26

MONTHLY OIL PROD.

REQUESTED MPR - 70

K+E 5 YEARS BY MONTHS X 100 DIVISIONS KEUFFEL & ESSER CO. 358-192 MADE IN U.S.A.

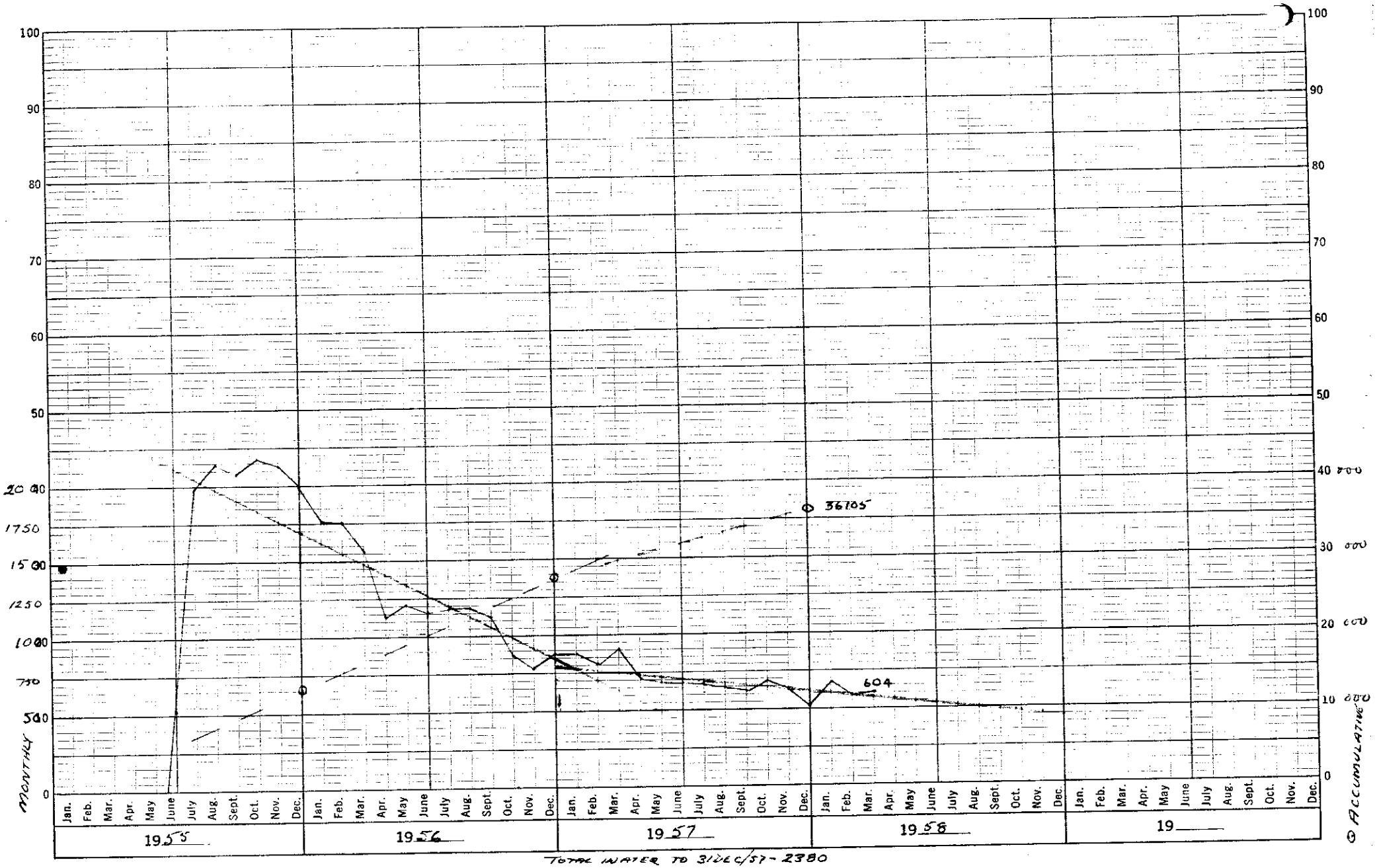


TOTAL WATER TO 31 DEC/57 304 BALS

CALSTAN SCALLION
8-15-11-26

REQUESTED MPR-105

K+E 5 YEARS BY MONTHS X 100 DIVISIONS KEUFFEL & ESSER CO. 358-192 MADE IN U.S.A.

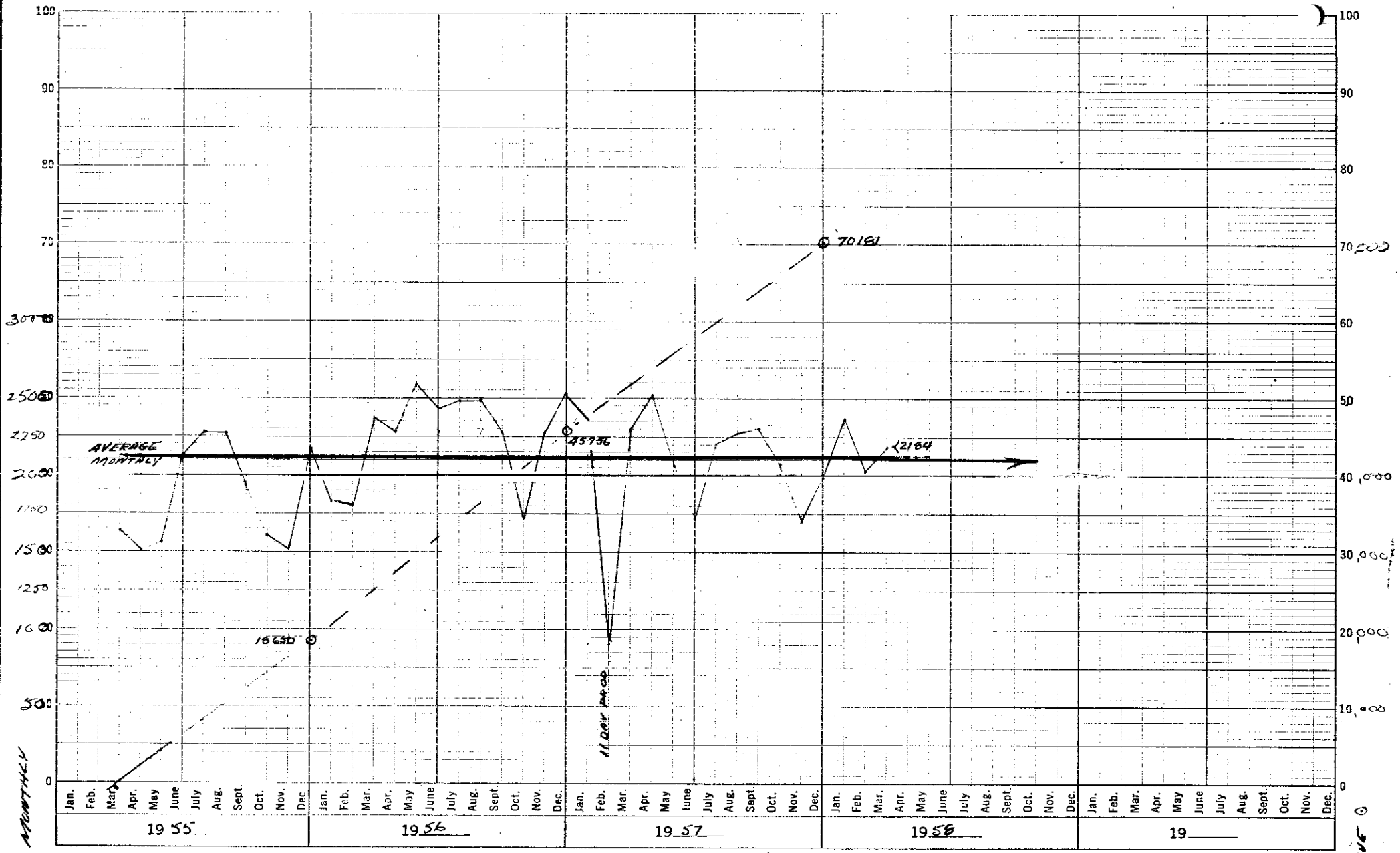


TOTAL WATER TO 31 DEC/57 - 2380

CALSTAN SCALE
10-15-11-26

REQUESTED MDR - 140.

K+E 5 YEARS BY MONTHS X 100 DIVISIONS KEUFFEL & ESSER CO. 358-192 MADE IN U.S.A.

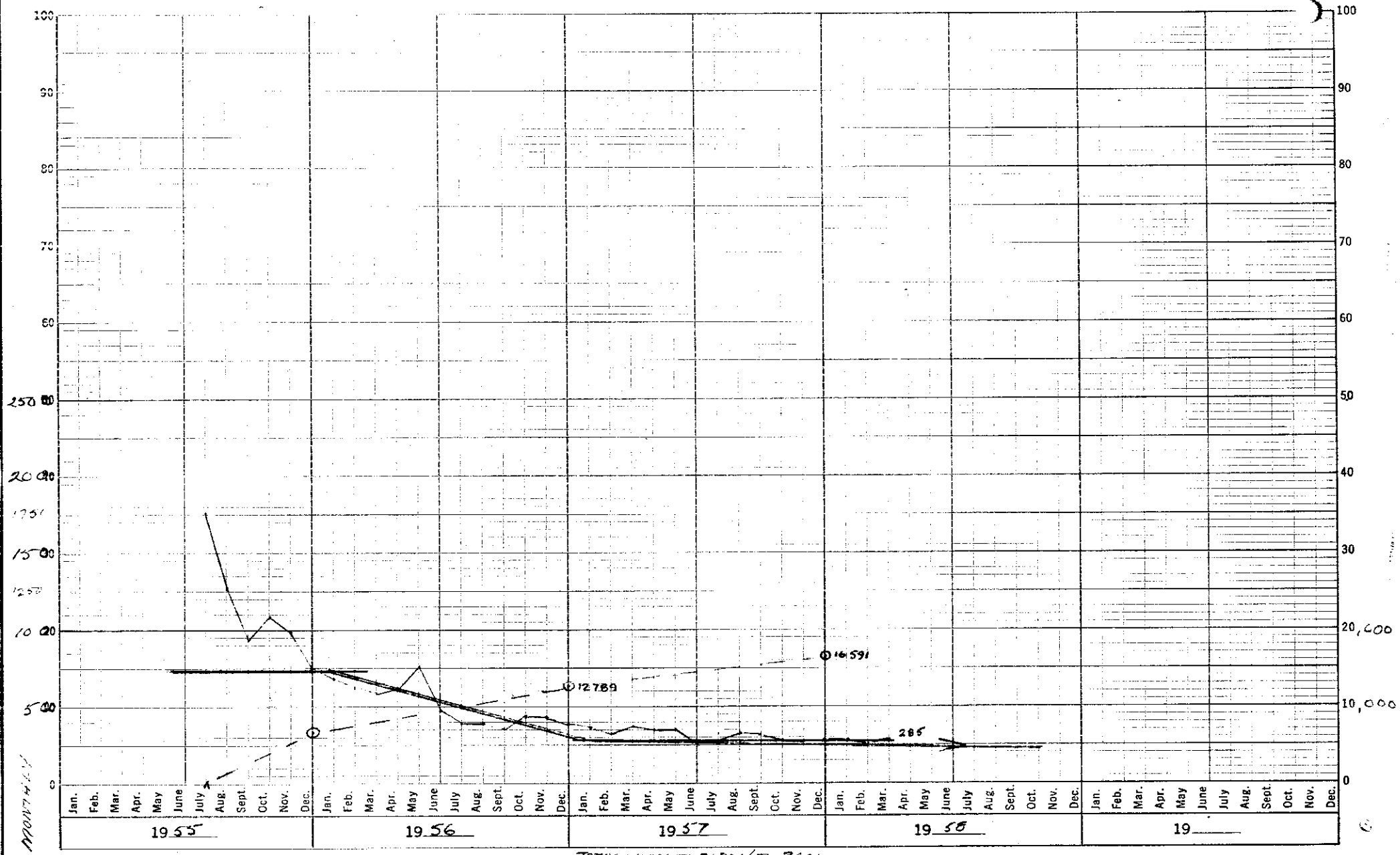


TOTAL WATER TO 31 DEC/57 - 1560 BALS

CALSTAN SCALLION
12-15-11-26

REQUESTED MPR - 140

K+E 5 YEARS BY MONTHS X 100 DIVISIONS 358-192
KEUFFEL & ESSER CO. MADE IN U.S.A.

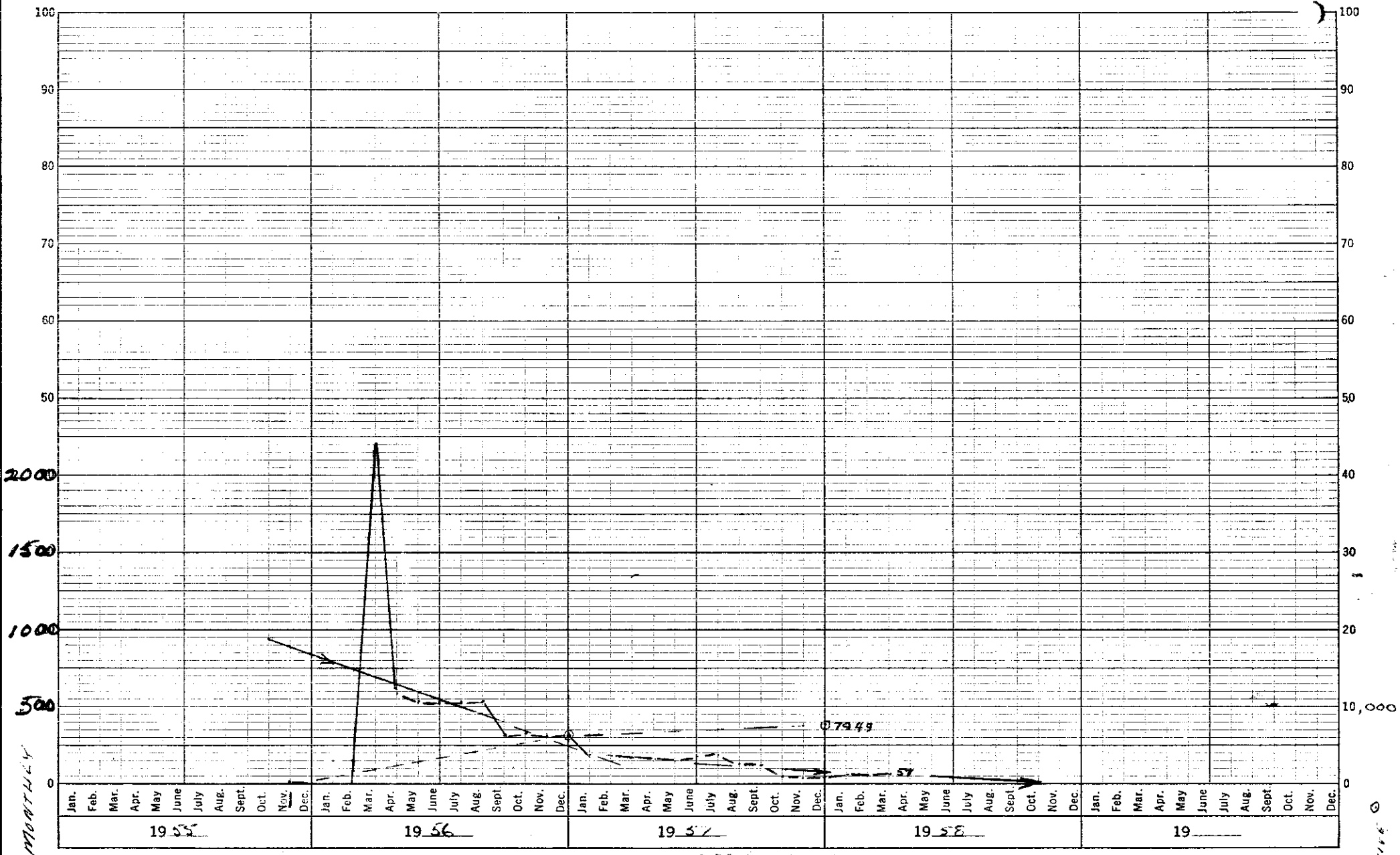


TOTAL WATER TO 31 DEC 57 - 3601.

CALSTAN SCALLION
14-15-11-26

REQUESTED MPR - 140

K+E 5 YEARS BY MONTHS 358-192
X 100 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.



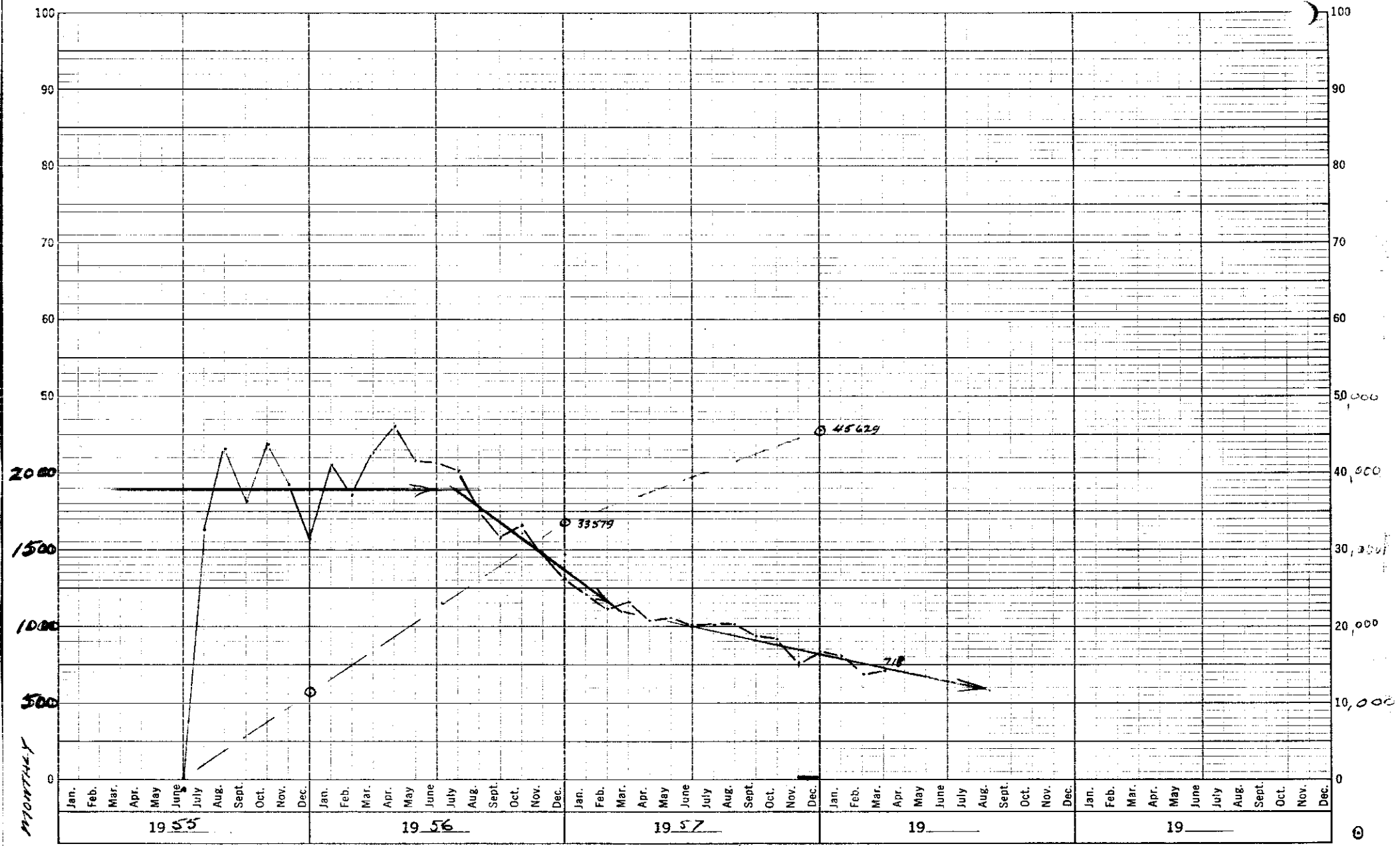
TOTAL ... 29 TO 31 DEC/57 - 1106 BBLS

CHASTAIN SCHELLION
16-15-11-23

OIL PRODUCTION.

REQUESTED MPR - 140

K+E 5 YEARS BY MONTHS X 100 DIVISIONS KEUFFEL & ESSER CO. 358-192 MADE IN U.S.A.

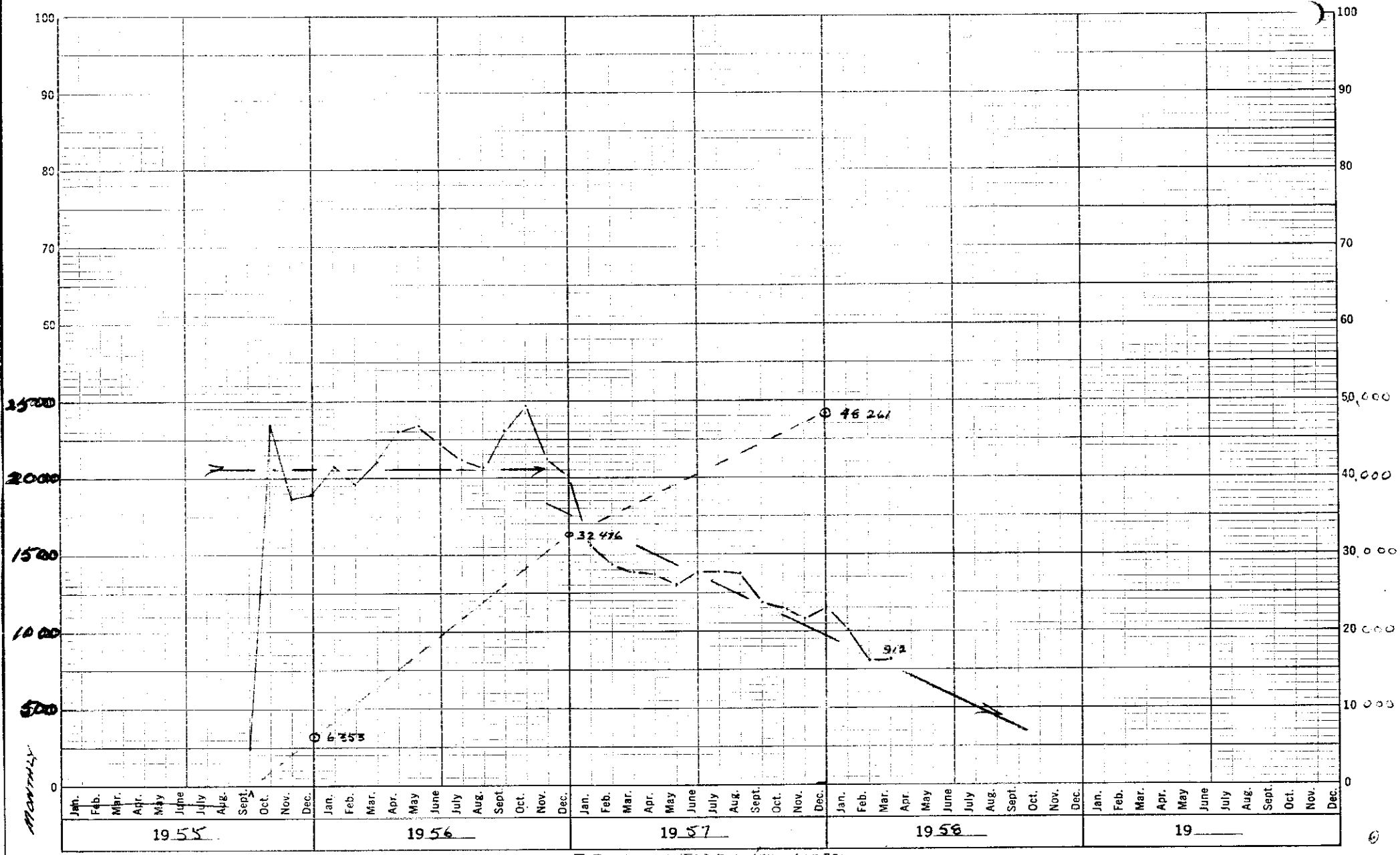


TOTAL WATER TO DEC. 31/57 - 561 BBLS

CALSTAN SCALLOP

4-22-11-26. OIL PRODUCTION. REQUESTED MPR - 105

K+E 5 YEARS BY MONTHS X 100 DIVISIONS KEUFFEL & ESSER CO. 358-192 MADE IN U.S.A.



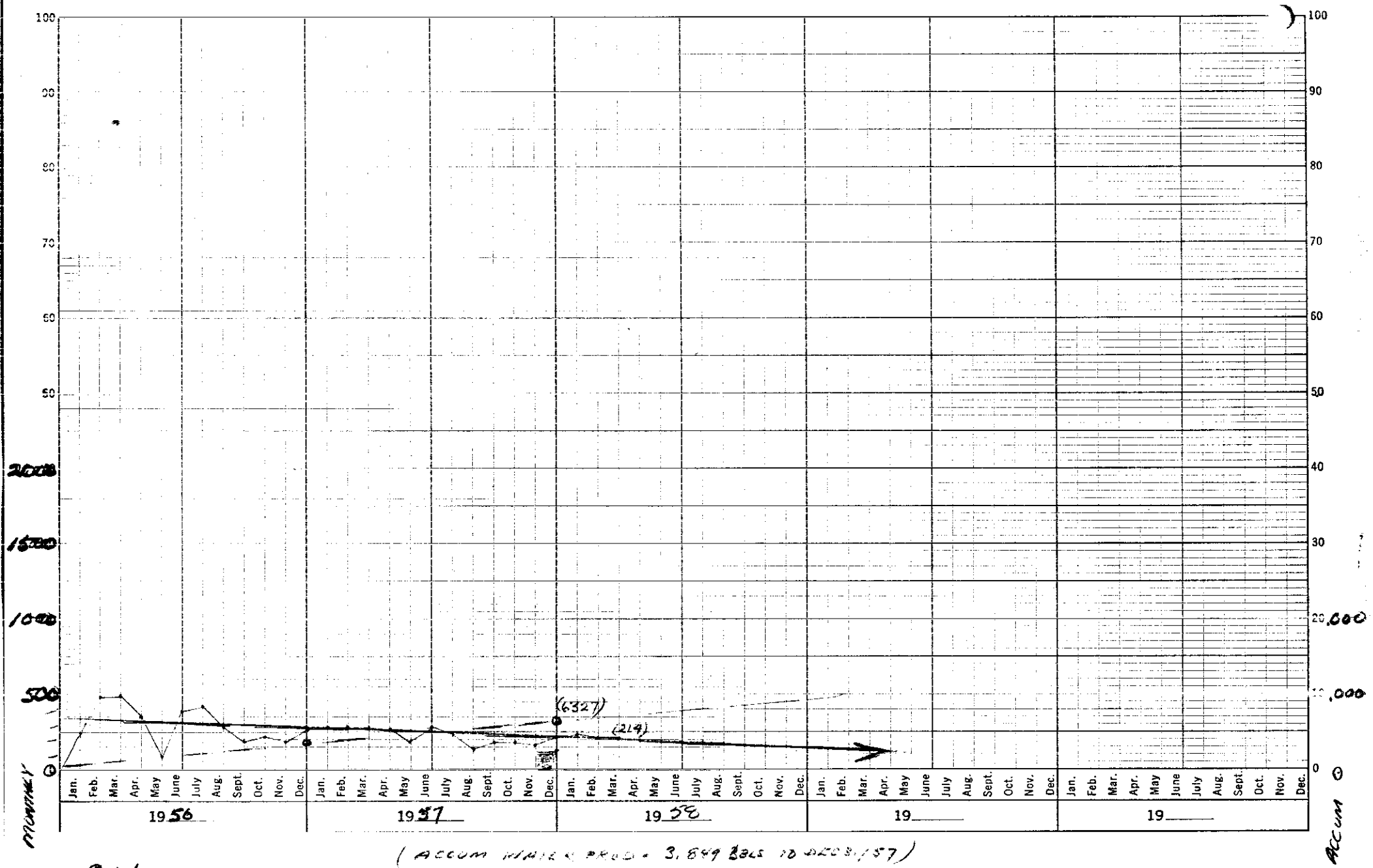
TOTAL WATER TO DEC. 31/57 - 615 BBLS

CALSTAN SCALLION
6-22-11-26

OIL PRODUCTION

REQUESTED MPR-105

K+E 5 YEARS BY MONTHS X 100 DIVISIONS 358-192
KEUFFEL & ESSER CO. MADE IN U.S.A.



(ACCUM WATER PROD = 3,849 BBLS TO DEC 31/57)

SUN
12-14-11-26

43560 cu ft/acre ft

7,758
5,161
12,919
465,48
38790
[illegible]