CASE 3676: Application of GULF FOR A WATERFLOOD PROJECT, EDDY COUNTY, NEW MEXICO.

CASE NO. 3676

Application,
Transcripts,
Small Exhibits

ETC.

Gulf Oil Corporation

ROSWELL PRODUCTION DISTRICT

W. B. Hopkins
DISTRICT MANAGER
M. I. Taylor
DISTRICT PRODUCTION MANAGER
F. O. Mortlock
DISTRICT EXPLORATION MANAGER
H. A. Rankin
DISTRICT SERVICES MANAGER

September 20, 1967

P. O. Drawer 1938
Roswell, New Mexico 88201

Case 3676

Secretary Director
Oil Conservation Commission
State of New Mexico
Post Office Box 2088
Santa Fe, New Mexico 87501

'67 SEP 22 AM 8 38

Re: Application of Gulf Oil Corporation for the Approval of the North Hackberry Yates Unit Agreement Providing for Secondary Recovery Operations in a Portion of the North Hackberry Yates Pool, Eddy County, New Mexico

Dear Sir:

Gulf Oil Corporation, as proposed Unit Operator, seeks the Commission's approval of the North Hackberry Yates Unit Agreement on the basis that the proposed unit plan for waterflooding certain wells in the North Hackberry Yates Pool will promote the conservation of oil and gas and prevent waste. In support of this application, the following is offered:

(1) The Unit Area shall be:

Township 19 South, Range 35 East

Section 23: S/2 NE/4 and SE/4
Section 24: S/2 N/2 and S/2

Containing 720.00 acres, more or less,
more fully shown on the enclosed plats.

(2) The Unit Area includes only wells completed in the Yates formation and a dry hole. No producing North Hackberry Yates wells are contiguous to the Unit Area other than those in this proposed Unit.

(3) Average production from the 16 wells in the proposed Unit Area has declined to approximately ten (10) barrels of oil a day per well, and the unit wells have reached an advanced stage of depletion as described in Rule 701(E)(1).

(4) Applicant proposes to convert eight (8) wells to water injection wells, detailed descriptions of which are outlined and summarized in the enclosed diagrammatic sketches. Copies of logs on all injection wells are also enclosed.

Gulf Oil Corporation

ROSWELL PRODUCTION DISTRICT

W. B. Hopkins
DISTRICT MANAGER
M. I. Taylor
DISTRICT PRODUCTION MANAGER
F. O. Mortlock
DISTRICT EXPLORATION MANAGER
H. A. Rankin
DISTRICT SERVICES MANAGER

September 20, 1967

P. O. Drawer 1938
Roswell, New Mexico 88201

Case 3676

Secretary Director
Oil Conservation Commission
State of New Mexico
Post Office Box 2088
Santa Fe, New Mexico 87501

'67 SEP 22 AM 8 39

Re: Application of Gulf Oil Corporation for the Approval of the North Hackberry Yates Unit Agreement Providing for Secondary Recovery Operations in a Portion of the North Hackberry Yates Pool, Eddy County, New Mexico

Dear Sir:

Gulf Oil Corporation, as proposed Unit Operator, seeks the Commission's approval of the North Hackberry Yates Unit Agreement on the basis that the proposed unit plan for waterflooding certain wells in the North Hackberry Yates Pool will promote the conservation of oil and gas and prevent waste. In support of this application, the following is offered:

(1) The Unit Area shall be:

Township 19 South, Range 35 East

Section 23: S/2 NE/4 and SE/4
Section 24: S/2 N/2 and S/2

Containing 480.00 acres, more or less,
more fully shown on the enclosed plats.

(2) The Unit Area includes only wells completed in the Yates formation and a dry hole. No producing North Hackberry Yates wells are contiguous to the Unit Area other than those in this proposed Unit.

(3) Average production from the 16 wells in the proposed Unit Area has declined to approximately ten (10) barrels of oil a day per well, and the unit wells have reached an advanced stage of depletion as described in Rule 701(E)(1).

(4) Applicant proposes to convert eight (8) wells to water injection wells, detailed descriptions of which are outlined and summarized in the enclosed diagrammatic sketches. Copies of logs on all injection wells are also enclosed.

(5) Applicant plans to inject up to 500 barrels a day of salt water into each injection well. Injection will be into the Yates formation (see typical well log) at depths ranging from 1750 to 2050 feet below the surface and will be on an 80-acre 5-spot pattern as shown on the enclosed plats.

(6) Source of the injection water will be shallow wells to be drilled in Section 24, T19S, R30E. Saline water will be produced from the Rustler formation at depths ranging from 300 to 500 feet below the surface. Gulf's Applications to Appropriate Groundwater, CP-357, CP-357-X and CP-357-X-2, have previously been approved for this purpose by the State Engineer.

(7) The order of the Commission should become effective upon the final approval of the Unit Agreement by both Working Interest Owners and the United States Geological Survey and terminate ipso facto upon termination of the Unit Agreement.

Gulf Oil Corporation has obtained preliminary approval of the Unit Agreement from the U. S. Geological Survey, and a copy of this application, complete with all attachments, has been sent to the State Engineer Office, Santa Fe, New Mexico.

It is requested that this matter be set for hearing before an examiner.

Respectfully submitted,

GULF OIL CORPORATION

M. I. Taylor

Attachments
DCB:ers

cc: U. S. Geological Survey
Post Office Box 1857
Roswell, New Mexico 88201

State Engineer Office
Post Office Box 1079
Santa Fe, New Mexico 87501

New Mexico Oil Conservation Commission
Post Office Box 1980
Hobbs, New Mexico 88240

GOVERNOR
DAVID F. CARGO
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

P. O. BOX 2088
SANTA FE

November 13, 1967

Mr. Bill Kastler
Gulf Oil Corporation
Post Office Box 1938
Roswell, New Mexico 88201

Re: Case No. 3676
Order No. R-3340
Applicant:

Gulf Oil Corporation

Dear Sir:

Enclosed herewith is a copy of the above-referenced Commission order recently entered in the subject case. Letter pertaining to conditions of approval and maximum allowable to follow.

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ALP/ir

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC x
Aztec OCC
State Engineer x

Other

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

November 13, 1967

C Mr. Bill Kastler
Gulf Oil Corporation
Post Office Box 1938
Roswell, New Mexico 88201

O Dear Sir:

Reference is made to Commission Order No. R-3340, recently entered in Case No. 3676, approving the Gulf North Hackberry Waterflood Project.

P Injection is to be through the eight authorized water injection wells, each of which shall be equipped with plastic-coated tubing set in a packer, said packer being set within 100 feet of the top of the perforations in the Yates formation. The casing-tubing

Y annulus shall be filled with an inert fluid and left open or equipped with a pressure gauge to facilitate detection of tubing or packer leakage.

As to allowable, our calculations indicate that when all of the authorized injection wells have been placed on active injection, the maximum allowable which this project will be eligible to receive under the provisions of Rule 701-E-3 is 672 barrels per day when the Southeast New Mexico normal unit allowable is 42 barrels per day or less.

Please report any error in this calculated maximum allowable immediately, both to the Santa Fe office of the Commission and the appropriate district proration office.

In order that the allowable assigned to the project may be kept current, and in order that the operator may fully benefit from the allowable provisions of Rule 701, it behooves him to promptly notify

OIL CONSERVATION COMMISSION
P. O. BOX 2088
SANTA FE, NEW MEXICO

Mr. Bill Kastler
Gulf Oil Corporation
Post Office Box 1938
Roswell, New Mexico 88201

C both of the aforementioned Commission offices by letter of any change in the status of wells in the project area, i.e., when active injection commences, when additional injection or producing wells are drilled, when additional wells are acquired through purchase or unitization, when wells have received a response to water injection, etc.

O Your cooperation in keeping the Commission so informed as to the status of the project and the wells therein will be appreciated.

P Very truly yours,

Y A. L. PORTER, Jr.
Secretary-Director

ALP/DSM/ir

cc: Oil Conservation Commission Offices in Hobbs and Artesia

Mr. Frank Irby, State Engineer Office, Santa Fe, New Mexico

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 3676
Order No. R-3340

APPLICATION OF GULF OIL CORPORATION
FOR A WATERFLOOD PROJECT, EDDY COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on October 25, 1967, at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this 9th day of November, 1967, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Gulf Oil Corporation, seeks permission to institute a waterflood project in the North Hackberry Yates Unit Area, North Hackberry-Yates Pool, by the injection of water into the Yates formation through eight injection wells in Sections 23 and 24, Township 19 South, Range 30 East, NMPM, Eddy County, New Mexico.

(3) That the wells in the project area are in an advanced state of depletion and should properly be classified as "stripper" wells.

(4) That the proposed waterflood project should result in the recovery of otherwise unrecoverable oil, thereby preventing waste.

(5) That the subject application should be approved and the project should be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:

(1) That the applicant, Gulf Oil Corporation, is hereby authorized to institute a waterflood project in the North Hackberry Yates Unit Area, North Hackberry-Yates Pool, by the injection of water into the Yates formation through the following-described wells in Township 19 South, Range 30 East, NMPM, Eddy County, New Mexico:

OPERATOR	LEASE	WELL NO.	UNIT	SECTION
Gulf Oil Corp.	Union Federal	1	P	23
Gulf Oil Corp.	Union Federal	2	J	23
Gulf Oil Corp.	Union Federal	3	H	23
Gulf Oil Corp.	Federal-Holder "CR"	1	L	24
Gulf Oil Corp.	Federal-Holder "CR"	5	J	24
Gulf Oil Corp.	Federal-Holder "CR"	6	N	24
Gulf Oil Corp.	Federal-Holder "CR"	8	F	24
Gulf Oil Corp.	Federal-Holder "CR"	10	H	24

(2) That the subject waterflood project is hereby designated the Gulf North Hackberry Waterflood Project and shall be governed by the provisions of Rules 701, 702, and 703 of the Commission Rules and Regulations.

(3) That monthly progress reports of the waterflood project herein authorized shall be submitted to the Commission in accordance with Rules 704 and 1120 of the Commission Rules and Regulations.

(4) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

DAVID F. CARGO, Chairman

GUYTON B. HAYS, Member

A. L. PORTER, Jr., Member & Secretary

esr/

Case 3676
Heard 10-26-67
Rec. 10-31-67

Appears Gulf's 8 injection wells in their N. Hackberry-Yates unit.
Testimony shows ~~that~~ produced water will be reinjected.
The 8 wells (injection) are listed on exhibit 1-S in back of brochure.

Thos. H. [illegible]

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
October 25, 1967

IN THE MATTER OF:

Application of Gulf Oil Corporation for a Unit Agreement, Eddy County, New Mexico — Case No. 3675

Application of Gulf Oil Corporation for a waterflood project, Eddy County, New Mexico. — Case No. 3676

BEFORE: Elvis A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 3675.

MR. HATCH: Case 3675, Application of Gulf Oil Corporation for a unit agreement, Eddy County, New Mexico.

MR. KASTLER: If the Examiner please, I am Bill Kastler, from Roswell, representing Gulf. I would like to have Case 3675 and Case 3676 consolidated for the purpose of the hearing.

MR. UTZ: Case 3675 is for the north Hackberry Yates Unit area and 3676 is for a water injection approval from that same area, is that true?

MR. KASTLER: That's correct.

MR. UTZ: Cases 3675 and 3676 will be consolidated.

MR. KASTLER: We have three copies of a brochure and it has been appropriately marked and it contains all of our exhibits. Would you like copies of the Unit and Unit Operating Agreement to be submitted as Exhibits 2 and 3

MR. UTZ: We'll let the attorney make that decision.

MR. HATCH: Let's have them, please.

(Whereupon, Applicant's Exhibits 1 through 1-A and 1-G and Exhibits 2 and 3 were marked for identification.)

MR. KASTLER: Our only witness this morning will be Mr. Don G. Bilbrey.

(Witness sworn.)

D O N G. B I L B R E Y, called as a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KASTLER:

Q Mr. Bilbrey, will you please state your name and your address and for whom you work?

A My name is Don G. Bilbrey. I reside at 1201 West McGaffey in Roswell, New Mexico, and I work for Gulf Oil Corporation in Roswell.

MR. UTZ: Would you spell your name?

THE WITNESS: Don G. B-i-l-b-r-e-y.

Q (By Mr. Kastler) Have you previously testified before the Oil Conservation Commission?

A Yes, I have, on several occasions.

Q Will you briefly outline the purpose of this hearing?

A Yes. Gulf, in cooperation with Union Oil Company of California, proposes to unitize and waterflood a portion of the North Hackberry-Yates Pool in Eddy County, New Mexico. We would like to do this in order to inject water into the Yates formation to recover additional oil reserves which might be otherwise left in the ground.

Q Would you describe the location of the proposed

unit in the project and give the number of wells and the total number of acres involved?

A Yes. I would like to refer to Exhibit No. 1 now, No. 1-A more specifically, which is an area plat. The Unit area covers portions of Section 23 and 24 of Township 19 South, Range 30 East, in Eddy County, New Mexico, and the area lies approximately 24 miles from, northeast of Carlsbad, New Mexico. The area includes 720 acres and 16 producing wells. There's one dry hole within theproposed boundary and this is in the southwest quarter of the northeast quarter of Section 23, and there's one vacant location. This is in the southeast of the southeast of Section 24, on Gulf's Federal-Holder Tract.

Q Are there currently any waterflood projects in this pool?

A No, there are not; to my knowledge, the nearest waterflood is Hondo Oil and Gas Culwin Queen Unit flood about three miles north of the Shugart Yates Pool.

Q You previously stated that the purpose of the North Hackberry-Yates Unit Waterflood would be to inject water into the Yates Formation. Would you tell us more about the Yates in this area?

A Yes; I would like to refer now to Exhibit No. 1-B

which is a typical well log in the area showing a portion of the Yates formation. You will see from this exhibit the productive zones are in a 50 to 100 foot gross interval in the upper part of the formation. The depth of these producing horizons ranges from 1750 to 2050 feet below the surface in this area. The net pay in the two zones ranges from 3 to 24 feet in the upper zone and from 0 to 8 feet in the lower zone in the 16 producing wells involved. As shown on Exhibit 1-D and 1-E, which is the net pay isopachs for the upper zone, you will see that the upper zone covers essentially the entire unit area. This is the main producing zone or horizon in this part of the North Hackberry-Yates pool and we figure it has contributed probably 90% of the oil production to date. The figure or Exhibit No. 1-E - the lower zone - is a net pay isopach of the lower zone and from it you can see that it covers approximately half of the unit area. It is much thinner than the upper zone and it has probably contributed no more than 10% of the oil production that has come from this interval to date.

The reservoir rock is similar in both the pay zones. It's a tan to brown, fine medium grain sandstone which is slightly dolomitic and argillaceous. The rock is extremely friable in some parts of the reservoir as evidenced by loss of core in several wells.

As far as structure is concerned, I would like now to refer to Exhibit 1-C and from this you can see that the reservoir is located on the northeastern flank of an anticlinal nose which plunges to the east at approximately 100 feet per mile. On this same exhibit we have shown an oil-water contact at approximately 1395 feet above sea level. This oil-water contact probably limits production on the northeast flank of this structure. Production on other directions is probably limited by loss of porosity and permeability.

Q What about porosity and permeability of the reservoir rock?

A Thirteen of the sixteen wells in the unit area producing wells were cored and analyzed, and based on these analyses, the average porosity in the upper zone is 21.05 percent and 18 1/2 percent in the lower zone. The average permeability is approximately the same for both zones, being 14.3 millidarcies in the upper and 13.3 millidarces in the lower. The permeability in these pays ranges from 5 millidarcies cutoff which was used to determine net pay, to a maximum of 467 millidarcies.

Q Is that the same number of millidarcies, same average, or largest permeability range, is that true as to both

upper and lower zones?

A No, the upper zone, this porosity is better, its permeability is slightly better, too. The maximum permeability of 467 is in the upper zone. The lower zone maximum is 364, from the 13 cores that we have.

Q What can you tell the Commission concerning primary operations in this area?

A The initial production from the Unit area was in December, 1960. I would like now to refer to Exhibit 1-F which is the production history for the unit area. The upper curve, you can see the twelve wells were completed the first year or so, by January of 1962, when drilling came to a temporary halt there for two, two and a half years. In the latter part of 1964, and in the first part of '65, Gulf Oil drilled four additional wells in the Northeast portion of the pool on their Federal-Holder lease. These four wells were, you can go back to Exhibit 1-C, were completed much closer to the oil-water contact than the previous wells. On the production history curve, then, you will see that at the completion of these wells and by the very close proximity of the wells to the water-oil contact, that the water production increased markedly due to these wells, especially Well No. 10.

The cumulative production from the 16 wells was

710,585 barrels through July, 1967, which is an average of 44,400 barrels per well. The oil is being produced by solution-gas-drive and the reservoir is approximately 75% depleted of its primary oil at this time. Average daily production from the wells is approximately 10 barrels per well now. A total of probably 939,000 barrels of oil will be produced through primary operations. This represents 1.44% of the esimated original oil-in-place.

Q In order to recover additional oil, you say you plan to install a waterflood. Will you tell the Commission what your plans involve?

A Yes, we propose to install a 16-well project using an 80-acre, 5-spot pattern as shown on Exhibits 1A, D and E. There will be 8 input wells into which we plan to put up to 500 barrels of water per day per well. Our plans call for the initial injection pressure at the wellhead not to exceed 1000 psi. However, the plant will be designed for 2000 psi so that higher injection pressures can be utilized if necessary, later on in the project.

Q How, specifically, do you plan to inject water into the 8 input wells?

A I would like to refer now to Exhibit 1-G which is a schematic diagram showing the schematic diagram for all

eight of the proposed injection wells.

Q Is 1-G continued on two pages?

A Yes, there are two pages to 1-G, in each of them water will be injected down 2-3/8ths inch O. D. plastic-coated tubing, below a packer into the Yates formation through casing perforations. The casing tubing annulus will be filled with corrosion-resistant inhibited water.

Q Now, this diagram, the schematic diagram, Exhibit 1-G, shows all of these injection wells and identifies each one of them?

A It does, yes.

Q And in each one are your injections going to be into both the upper and the lower pay zones?

A Where they're found in the particular injection well involved, yes. There are several injection wells which only the one zone, the main upper zone is found.

Q How have you delineated that on your schematic diagram?

A I have not. I've given the gross interval in which we plan to inject. Realizing that the zones will be selectively perforated where they're found. In fact, I think all of these are perforated exactly where they're indicated right now.

Q They are presently perforated?

A As shown, right.

MR. UTZ: In other words, you are currently perforated in each of the zones from which they have been producing?

THE WITNESS: That's correct.

MR. UTZ: You are going to inject into the same zone?

THE WITNESS: Into the same zone. I think all zones have been perforated where they're found in the wellbore.

Q (By Mr. Kastler) What will be the source of your injection water?

A Most of it initially will come from the shallow wells to be drilled to the Rustler formation, about 300 to 500 feet below the surface in the Unit area. Produced water will be used also, but this will not be a significant part of the total until the latter stage of the project.

Q That's your produced water?

A That's produced water, yes.

Q Do you have any produced water now that you are disposing of?

A Yes, we have two to three thousand barrels per month, currently, that will be injected initially.

Q Has Gulf made an application and received the approval of the State Engineer to use Rustler water for this project?

A Yes, our application to appropriate ground water

were approved by the State Engineer August 22, 1966, entitling us to use 200 acre feet of Rustler water annually for water-flooding purposes.

Q Has Gulf also sent a copy of this application to the State Engineer's Office?

A Yes, it has.

Q What is the quality of the Rustler water in this area?

A It is saline. Water samples from the Rustler underlying Gulf's Federal-Holder lease show the water contains approximately 60,000 ppm chloride.

Q Do you plan to treat this water prior to injection?

A No, not initially since all of our injection equipment will be coated for protection against corrosion. However, if tests and flood performance later indicate treatment of the water to be necessary, then appropriate action will be taken.

MR. UTZ: This is produced water you are talking about now?

THE WITNESS: This is produced and/or the initial water from our Rustler wells.

MR. UTZ: The Rustler water also?

THE WITNESS: Both; initially, nothing is planned

in the way of treatment.

Q (By Mr. Kastler) And the Rustler water is quite saline, 60,000 parts per million?

A Right.

Q How much additional oil do you think will be recovered from the project area due to the waterflood?

A Our estimate is that we will get at least 939,000 barrels of additional oil will be recovered, or 100% of primary. Recovery of this additional oil will increase the productive life of the unit area 4 to 5 years, over their primary lives.

Q Is it your opinion that unitization and waterflooding of these properties is in the best interest of conservation and in the prevention of waste?

A Yes, I do, under the primary operations alone, less than 15% of the original oil-in-place will be recovered. We feel we can double this through secondary recovery operations, with the waterflood project, and at the same time increase the effective producing life of this area.

Q Now, my next questions will concern the instruments in the unit and unit operating agreement. Are you familiar with the Unit Agreement and the exhibits to that?

A Yes, sir, I am.

Q Does Gulf have 100% working interest owners

commitment?

A Yes, verbally, at least; there are, of course, in this unit, only two working interest owners, Gulf and Union Oil of California. Union has not exactly signed the ratification, but they have assured us they will do so. Gulf, of course, has signed.

Q Do you know what the respective percentages of Gulf and Union are in acreage holding, in percentage of participation?

A Under both phases?

Q Yes.

A Under the primary phase, Gulf Oil will have 88.369%. Under the secondary phase 81.3789% in the unit. Union Oil of California, under the primary phase will have 11.6302% and that will increase to 18.6211% under the secondary phase of operations.

Q And these two operators are the only two involved?

A The only two working interest owners involved in the unit.

Q Are all of the lands within this Unit Federal-owned lands?

A Yes, they are. The Federal Government is the sole basic royalty owner here.

Q Has the Federal Government, through the U. S.

Geological Survey, examined this, and approved the unit designated as a Unit Area?

A Yes, they have given us preliminary approval in the Roswell Office, and Washington, D. C. Office.

Q Have they approved the form of Unit Agreement which we propose to use?

A Yes, they have.

Q Does the Unit Agreement provide for the expansion of the Unit Area under certain circumstances?

A Yes, Section 4, Page 5 of the agreement outlines the procedure for expansion of the Unit.

Q These are the normal provisions for expansion of the Unit?

A Yes.

Q Does this Unit Agreement provide for selection of a successor unit operator in the event of resignation or removal so as to insure continuous responsible operations?

A Yes, this is covered under Section 8, Page 7 of the Unit Agreement.

Q Under the Unit Agreement, what is the basis for allocation of the remaining primary and secondary oil reserves?

A The Unit Agreement, Section 13, Page 10 provides for a split participation formula which resulted from negotiations

between Union of California and Gulf.

The remaining primary oil for the unit will be allocated based on 50% oil rate for the six month period, December, 1966 through May, 1967, and 50% remaining primary reserves from June 1st, 1967. The secondary reserves will be allocated 50% on ultimate primary recovery and 50% on total net acre feet.

Q What were the primary or the estimated remaining primary reserves as of June 1, 1967?

A 314,692 barrels. That plus the cumulative will give the primary ultimate recovery of 939,000, or approximately 939,000 barrels of oil.

Q Has the U. S. Geological Survey representing the only royalty owner, approved this formula?

A Yes, they have.

Q As being equitable?

A Yes, they have.

MR. KASTLER: Those are all the questions I have on direct.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Bilbrey, in regard to your produced water, how saline is your produced water now?

A I don't think I have access to an analysis of a water sample of the produced water.

Q Do you know whether it's more or less saline than the Rustler water?

A I think it's less saline than the Rustler water, how much, I don't know. The Rustler in this area, sits right on top of your salt section and the water is artesian, it's circulating and it's probably picking up a great deal of salt. The produced water, I don't believe is quite as saline.

Q You don't anticipate any problem using the salt water?

A We don't anticipate any. We'll keep a close eye on it, and if anything happens as far as affecting the flood or our equipment, we'll make a judgment then, as to what to do.

Q If necessary, you will treat it?

A Right, of course.

Q This is in view of the fact that your produced water in the formation that you are going to flood has less salt in it than your proposed injection water?

A And I can't say definitely what the difference is; it's just in my opinion that it's probably a little less saline. The formation water is a little less saline.

Q In regard to Exhibit 1-G, do I interpret this as

well, no, I am sure I have interpreted it wreng. You have surface casing on each of the injection wells?

A Yes.

Q Is that all circulated to the surface?

A Yes, that is correct.

Q Is all the fresh water in this area beside the surface casing?

A Yes, what fresh water is, I think, is protected by the surface casing. You only have to go through to 500 feet to get this highly saline Rustler water and most of this surface casing just looking at Exhibit 1-G, is around four to five hundred feet deep. It looks like it's all set through the Rustler. The fresh water would be shallower than that in this area.

Q On your producing strings which is four and a h and five and a half in all cases --

A I believe that's correct. In fact, only two of the eight have five and a half, the rest of them have four and a half.

Q Is it your testimony that you have sufficient cement behind the producing strings to retain the injection pressure you propose?

A Yes, I believe so.

Q And where the cement does not come back up into the surface casing which I don't think it does in any of these, there's no danger of contaminating any oil or fresh water formation?

A No, in this area immediately above the Yates, well just within a few feet of the top of the Yates, you have your salt anydrite section which goes up to your Rustler.

Q Did you list all of your injection wells in your application?

A Yes.

Q Are all of those locations correct?

A To the best of my knowledge. I prepared it and checked it and I think they're correct.

MR. UTZ: Are there any other questions of the witness? The witness may be excused.

(Witness excused)

MR. UTZ: Do we have any statements in this case.

MR. KASTLER: Did I move, or will the record show that we move for admission of Exhibits 1-A through 1-G and 2 and 3 to be included in the record.

MR. UTZ: Exhibit 1, 2 and 3, that would be in Case 3675, correct?

MR. KASTLER: Yes

MR. UTZ: And Exhibits 1, parts A through G will be entered into the record in this case.

(Whereupon, Applicant's Exhibits 1-A through 1-G and 2 and 3 were admitted into evidence.)

MR. UTZ: The case will be taken under advisement.

I N D E X

EXHIBITS	MARKED	OFFERED AND ADMITTED
Applicant's 1-A through 1-G and 2 and 3	2	19

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my hand this 28th day of November, 1867.

Ada Dearnley
Court Reporter

I do hereby [illegible]
a complete [illegible]
the Examiner hearing of Case No. [illegible], 19[illegible];
heard by me on [illegible]

[illegible]
New Mexico Oil Conservation Commission

EXHIBIT NO. 1

DATA FOR

PROPOSED NORTH HACKBERRY YATES UNIT

WATERFLOOD PROJECT

OIL CONSERVATION COMMISSION HEARING

CASE NUMBER 3676

OCTOBER 25, 1967

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
EXHIBIT NO. 1
CASE NO. Case 3675 and 3676

Parts A-G

Gulf Oil Corporation

Roswell District

Case Number 3676
Date October 25, 1967

G E N E R A L

	Pertinent Exhibit(s)
OPERATOR Gulf Oil Corporation	
PROJECT North Hackberry Yates Unit Waterflood	
POOL North Hackberry Yates	
LOCATION OF PROJECT Sections 23 and 24, Township 19 South, Range 30 East, Eddy County, New Mexico, approximately 24 miles northeast of Carlsbad.	1-A
NUMBER OF WELLS IN PROJECT 16 producing wells and one dry hole	1-A
UNIT AND PROJECT AREA 720 acres	1-A
OTHER WATERFLOOD PROJECTS IN POOL None. The nearest flood project is Hondo Oil and Gas Company's Culwin Queen Unit flood about 3 miles north in the Shugart Yates Pool.	

G E O L O G I C A L A N D R E S E R V O I R D A T A

RESERVOIR Yates formation ✓	1-B
DEPTH 1750 to 2050 feet below the surface	1-B
PRODUCTIVE ZONES Two sandstone stringers in the upper part of the Yates formation. The upper zone is the main productive zone and covers the entire project area. The lower zone covers less than half the project area and contains only about 10% of the total reservoir volume.	1-B,D,E
NET PAY Ranges from 3 to 24 feet in the upper zone and from 0 to 8 feet in the lower zone in the 16 producing wells.	1-B,D,E

Case Number 3676
Date October 25, 1967

Pertinent Exhibit(s)

DESCRIPTION OF RESERVOIR ROCK A tan to brown, fine to medium grained sandstone which is slightly dolomitic and argillaceous. In some parts of the reservoir this rock is very friable.

STRUCTURE Anticlinal nose plunging to the east at approximately 100 feet per mile. 1-C

RESERVOIR LIMITS An oil-water contact at approximately - 1395 feet defines the down-dip productive limit to the northeast. Deterioration of porosity and permeability generally limits production in other directions. 1-C,D,E

AVERAGE POROSITY OF NET PAY 21.05% in upper zone and 18.45% in lower zone.

AVERAGE PERMEABILITY OF NET PAY 14.3 millidarcies in the upper zone and 13.3 millidarcies in the lower zone. Permeability ranges from the 5 millidarcy cutoff to as high as 467 millidarcies in the upper zone and 364 millidarcies in the lower.

PRIMARY OPERATIONS

DATE OF FIRST PRODUCTION December, 1960 1-F

TOTAL NUMBER OF WELLS DRILLED 17, including a dry hole in SW/4 NE/4 Section 23, Township 19 South, Range 30 East 1-A,F

CUMULATIVE PRODUCTION, 8-1-67 710,585 barrels

AVERAGE DAILY OIL PRODUCTION PER WELL, JULY 1967 10 barrels 1-F

Case Number 3676
Date October 25, 1967

Pertinent Exhibit(s)

DRIVE MECHANISM Solution-gas-drive

STAGE OF DEPLETION Moderately late. The reservoir in the project area is approximately 75% depleted of primary oil reserves. — 1-F

ESTIMATED OIL RECOVERY THROUGH PRIMARY OPERATIONS 939,000 barrels, or 14.4% of the estimated original oil-in-place.

W A T E R F L O O D O P E R A T I O N S

PROPOSED PATTERN 80-acre 5-spot — 1-A,D,E

NUMBER OF INPUT WELLS Eight — 1-A,D,E,G

INITIAL INJECTION RATES Up to 500 barrels of water per day per input well

ESTIMATED INJECTION PRESSURES Maximum of 1000 psi at the well head. Injection plant will be designed for 2000 psi maximum pressure.

PLAN OF INJECTION Batch inject into both pay zones simultaneously through plastic coated tubing and below a packer. — 1-G

SOURCE OF INJECTION WATER Shallow wells in the project area to the Rustler formation 300-500 feet below the surface. (Applications to Appropriate Groundwater, CP-357, CP-357-X and CP-357-X-2, have been approved by the State Engineer.)

TYPE OF WATER Saline. Tests indicate the Rustler water contains approximately 60,000 ppm chloride in this area.

Case Number 3676
Date October 25, 1967

Pertinent
Exhibit(s)

TREATMENT OF WATER None is anticipated; however, if later in the life of the project treatment is deemed necessary, appropriate action will be taken.

ADDITIONAL OIL RECOVERY ANTICIPATED 939,000 barrels, an amount equal to the estimated primary oil recovery.

INCREASE IN LIFE OF UNIT WELLS 4-1/2 years beyond estimated primary life

Case Number 3676
Date October 25, 1967

CONCLUSIONS AND RECOMMENDATIONS

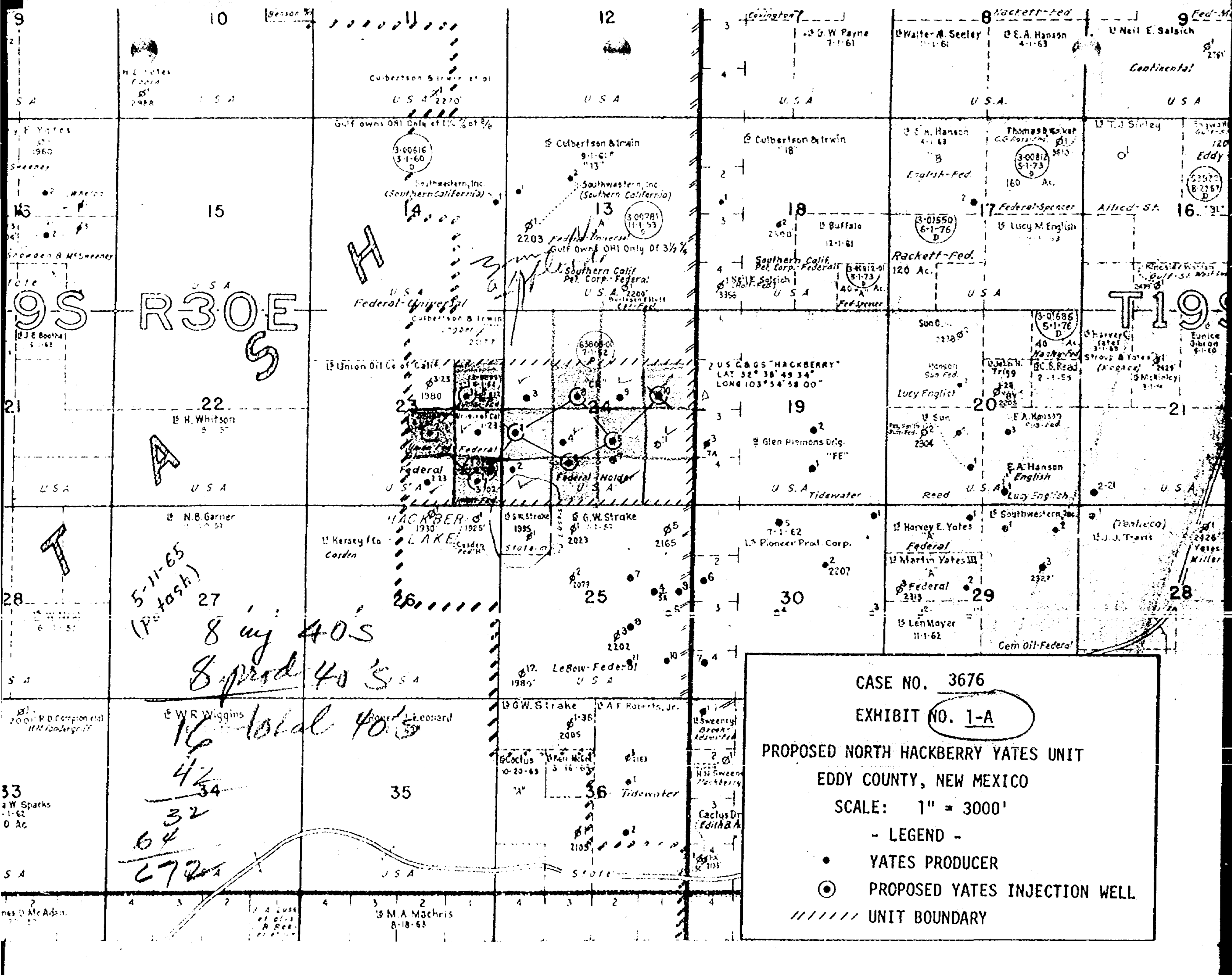
The North Hackberry Yates Pool produces by solution-gas-drive and as a result less than 15% of the original oil-in-place beneath the proposed unit and project area will be recovered through primary operations.

This portion of the Pool is 75% depleted of primary oil and daily oil production averages only 10 barrels per well.

Engineering and geological studies indicate the Yates reservoir under the unit and project area can be successfully waterflooded, thereby increasing the life and ultimate oil recovery of wells in the North Hackberry Yates Unit.

Gulf Oil Corporation, in association with Union Oil Company of California, concludes that unitization of the 16 producing wells and 720 acres outlined in Exhibit No. 1-A for the purpose of waterflooding the Yates formation is in the best interest of conservation and prevention of waste.

Gulf, as Operator of the North Hackberry Yates Unit, respectfully requests that the Oil Conservation Commission approve the proposed waterflood project and grant a unit oil allowable for the 16 producing wells in the waterflood area as provided under Rule 701 of the Commission Rules and Regulations.



T19S R30E
HACKBERRY LAKE
U S C & G S "HACKBERRY"
LAT 32° 38' 49 34"
LONG 103° 54' 58 00"
Culbertson & Irwin
Southwestern, Inc (Southern California)
Gulf owns ORI Only of 3½%
Federal-Universal
Southern Calif Pet. Corp.-Federal
Union Oil Co of Calif
H. Whitson
N.B. Garner
G.W. Strake
Kersey & Co
Cosden
LeBow-Federal
W.R. Wiggins
M.A. Machris
Glen Pinmons Drlg. "FE"
Pioneer Prod. Corp.
Tidewater
Rackett-Fed.
Lucy English
E.A. Hanson
Harvey E. Yates
Martin Yates III
Len Mayer
Cem Oil-Federal
Southwestern Inc.
J.J. Travis
Continental
Neil E. Salsich
Walter A. Seeley
G.W. Payne
5-11-65 (Potash)
8 inj 40's
8 prod 40's
16 total 40's

CASE NO. 3676

EXHIBIT NO. 1-A

PROPOSED NORTH HACKBERRY YATES UNIT

EDDY COUNTY, NEW MEXICO

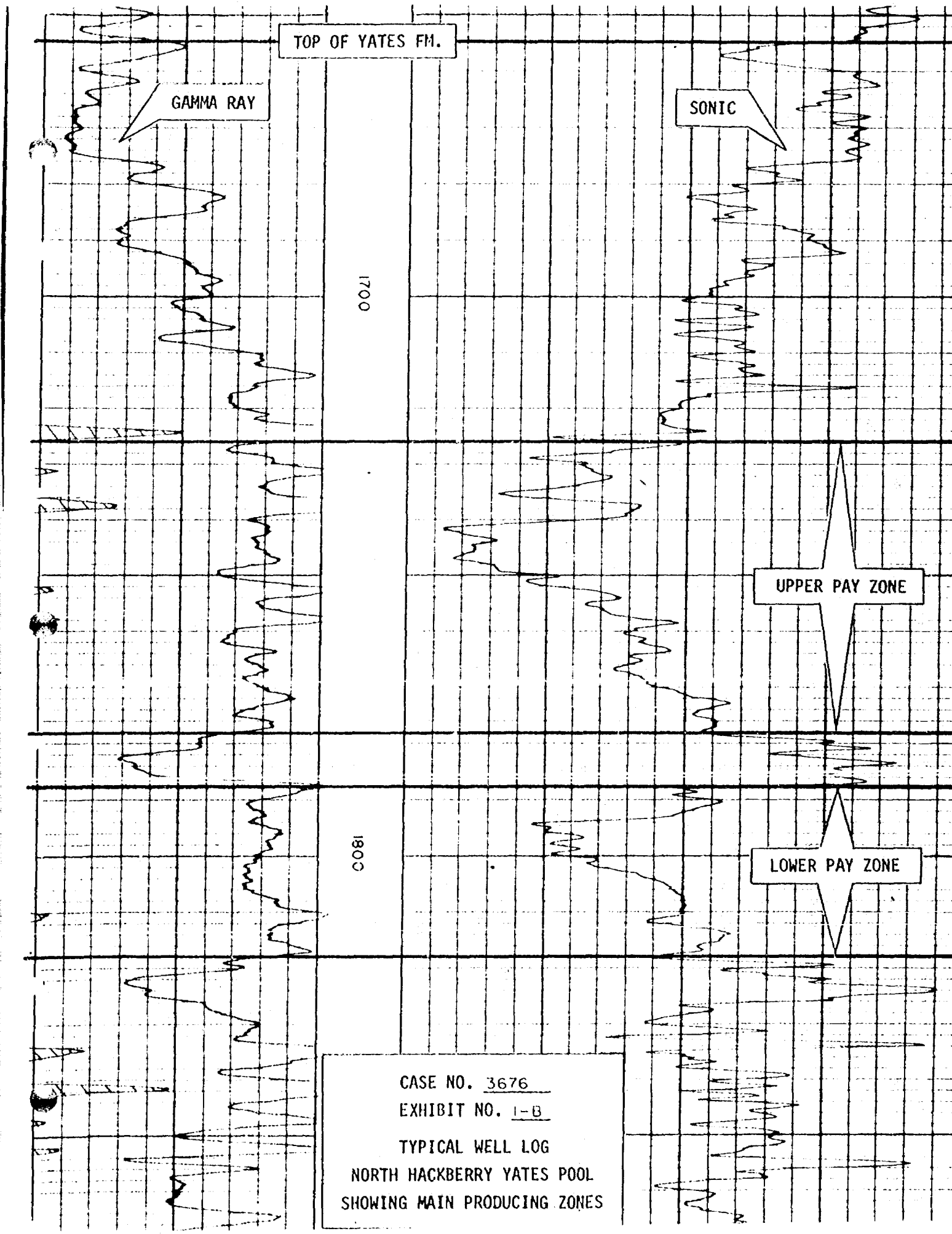
SCALE: 1" = 3000'

- LEGEND -

• YATES PRODUCER

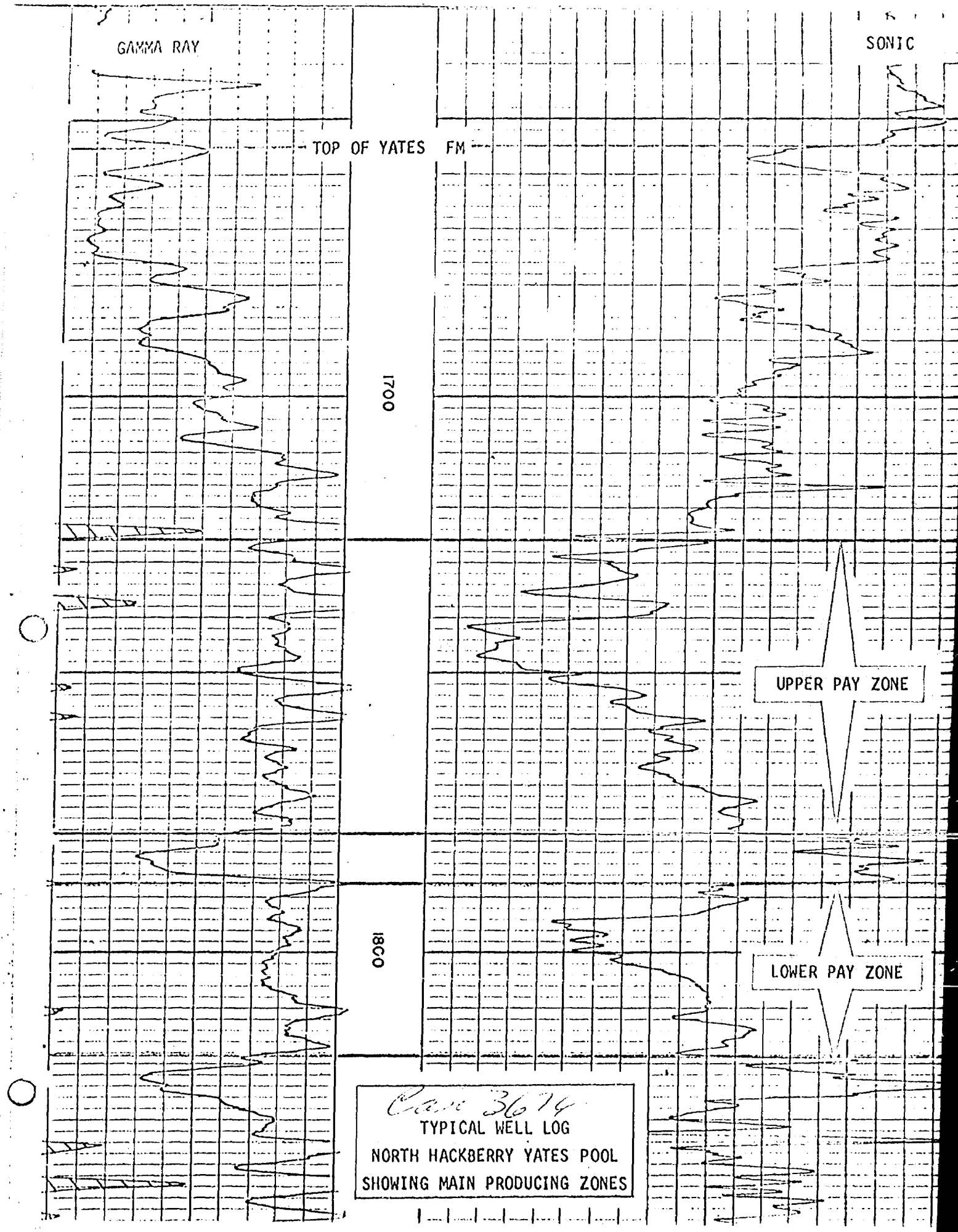
⊙ PROPOSED YATES INJECTION WELL

/////// UNIT BOUNDARY



CASE NO. 3676
EXHIBIT NO. 1-B

TYPICAL WELL LOG
NORTH HACKBERRY YATES POOL
SHOWING MAIN PRODUCING ZONES



Case 3614

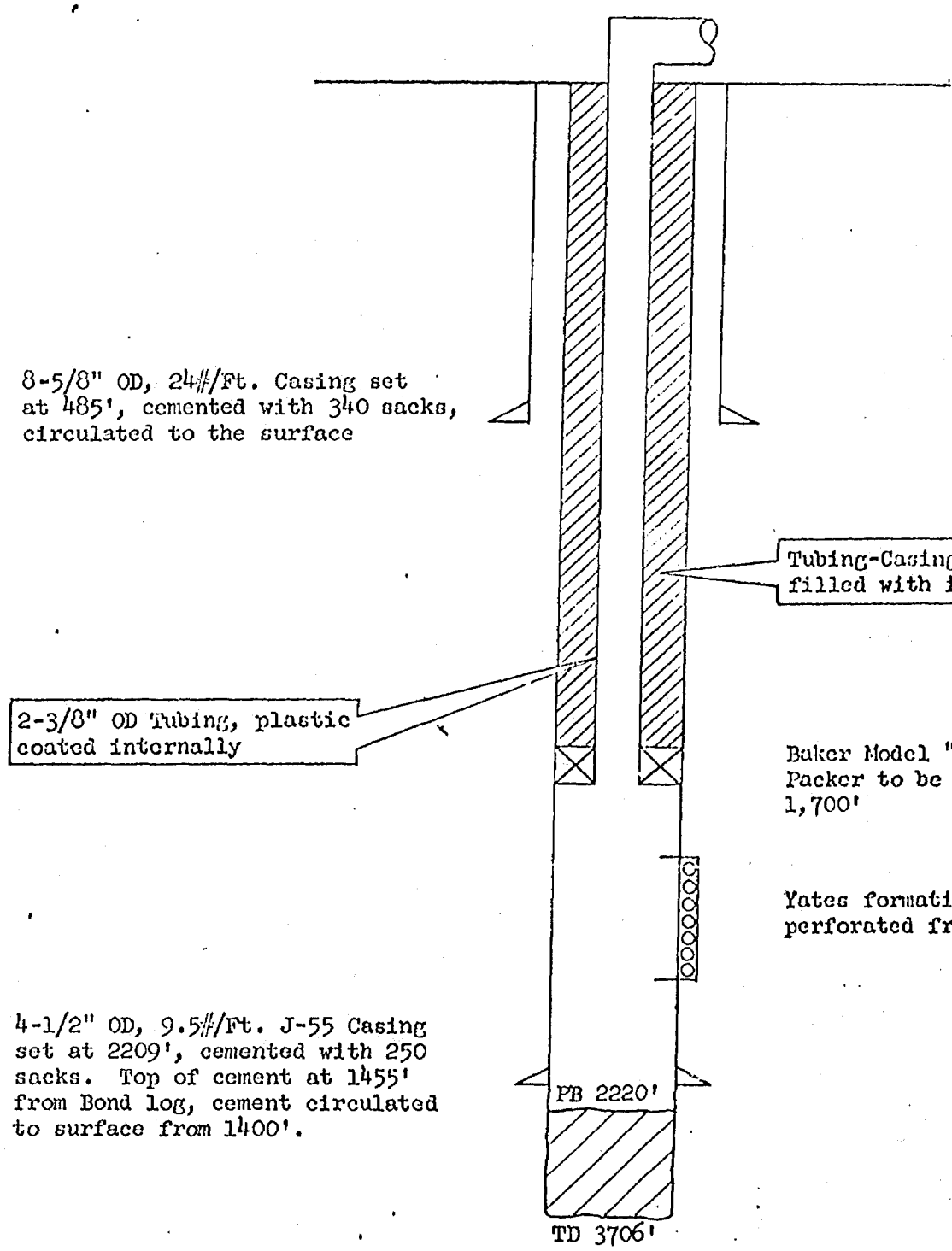
TYPICAL WELL LOG
NORTH HACKBERRY YATES POOL
SHOWING MAIN PRODUCING ZONES

NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
UNION-FEDERAL WELL NO. 1

Located 660' FSL, 660' FEL, Section 23-19S-30E
Eddy County, New Mexico

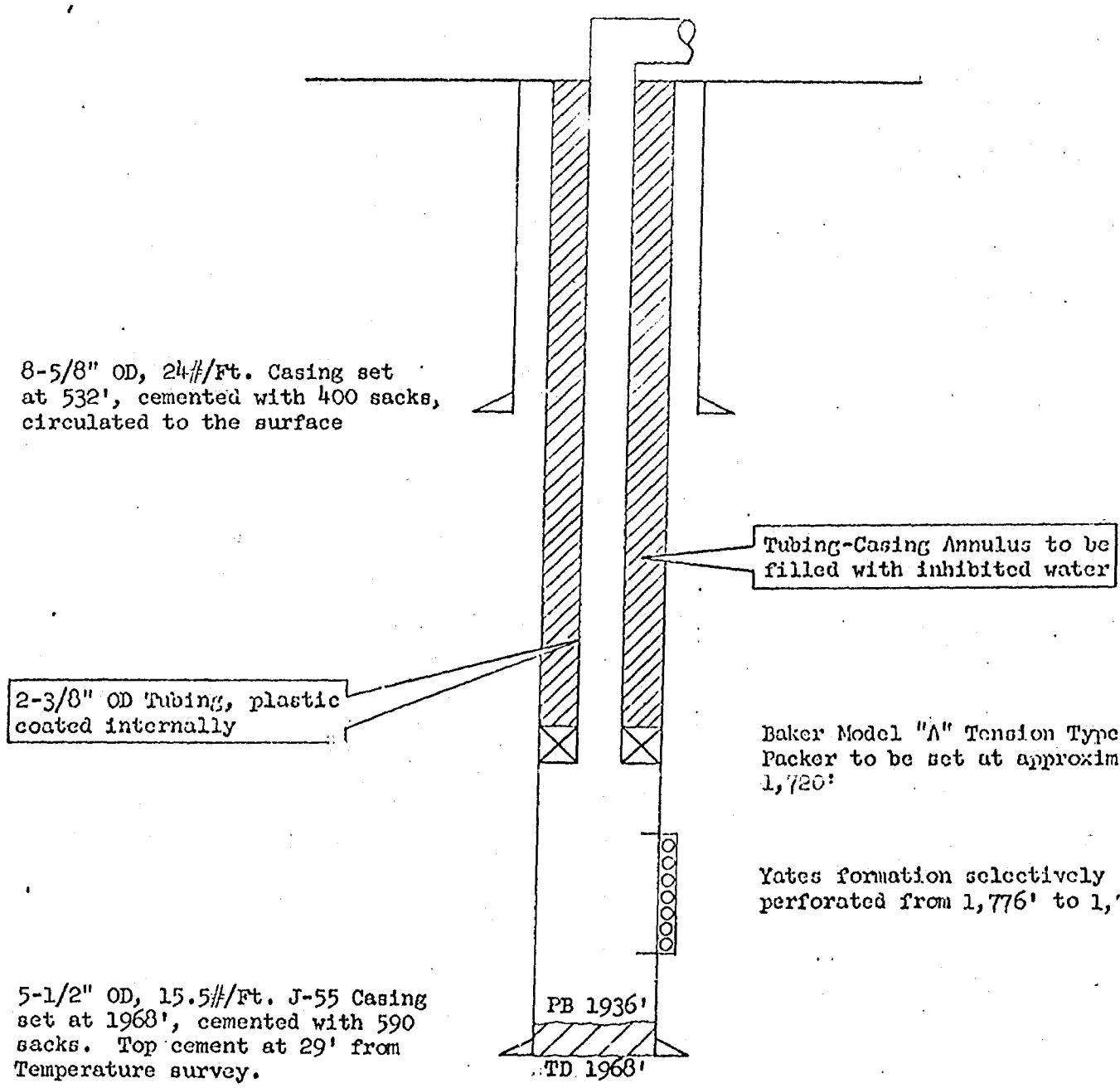


NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
UNION-FEDERAL WELL NO. 2

Located 1980' FSL, 1980' FEL, Section 23-19S-30E
Eddy County, New Mexico

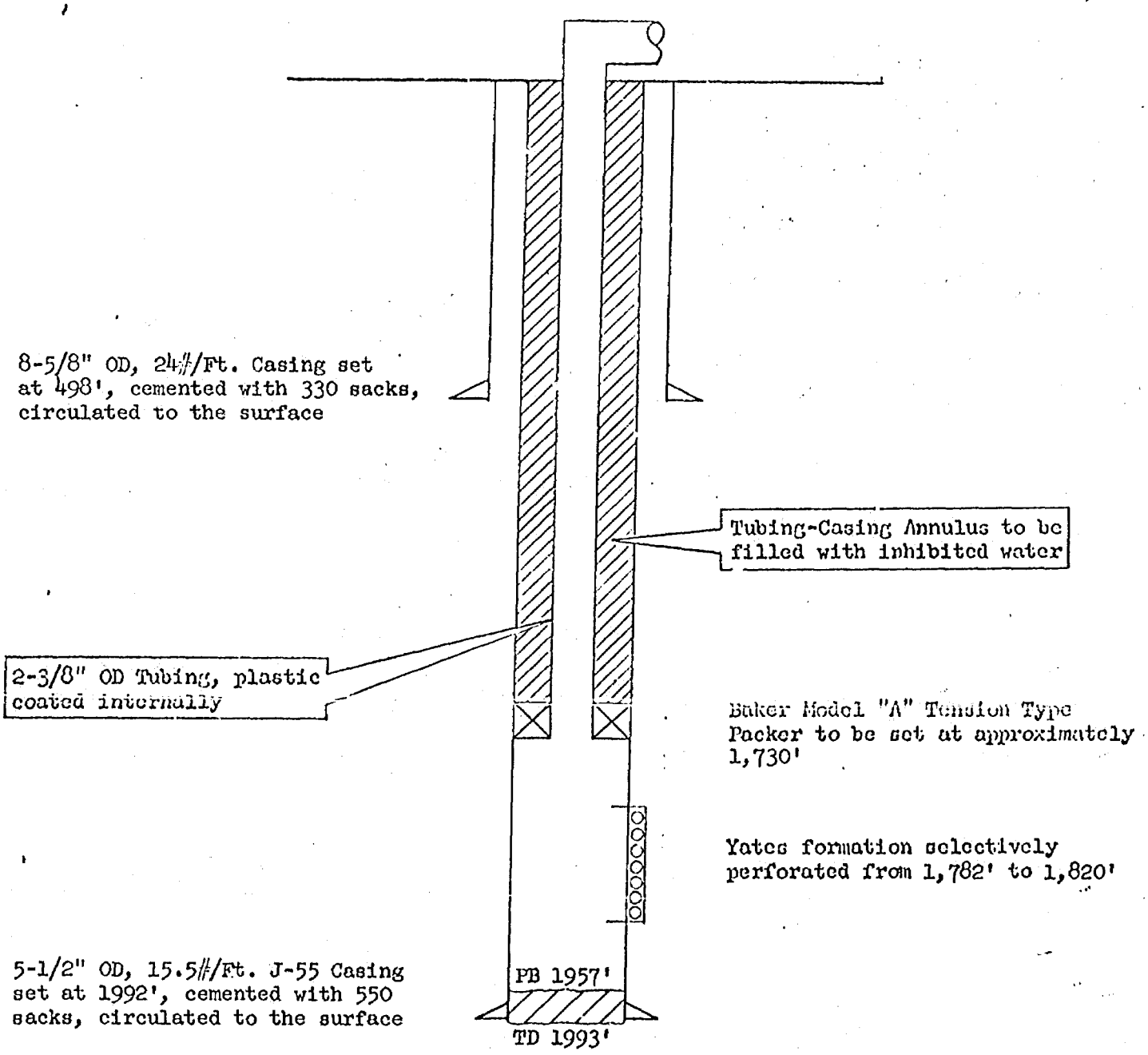


NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
UNION-FEDERAL WELL NO. 3

Located 2310' FNL, 990' FEL, Section 23-19S-30E
Eddy County, New Mexico

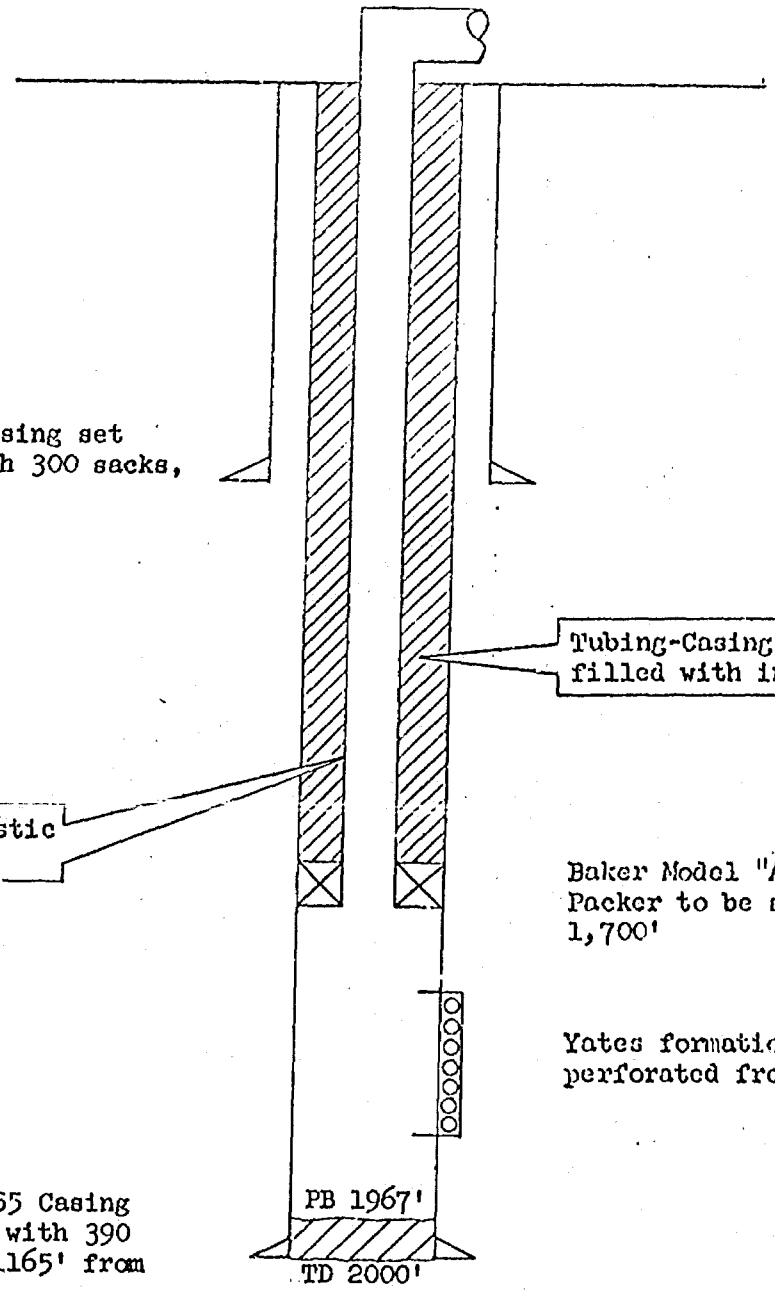


NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
FEDERAL-HOLDER "CR" WELL NO. 1

Located 1980' FSL, 330' FWL Section 24-19S-30E
Eddy County, New Mexico

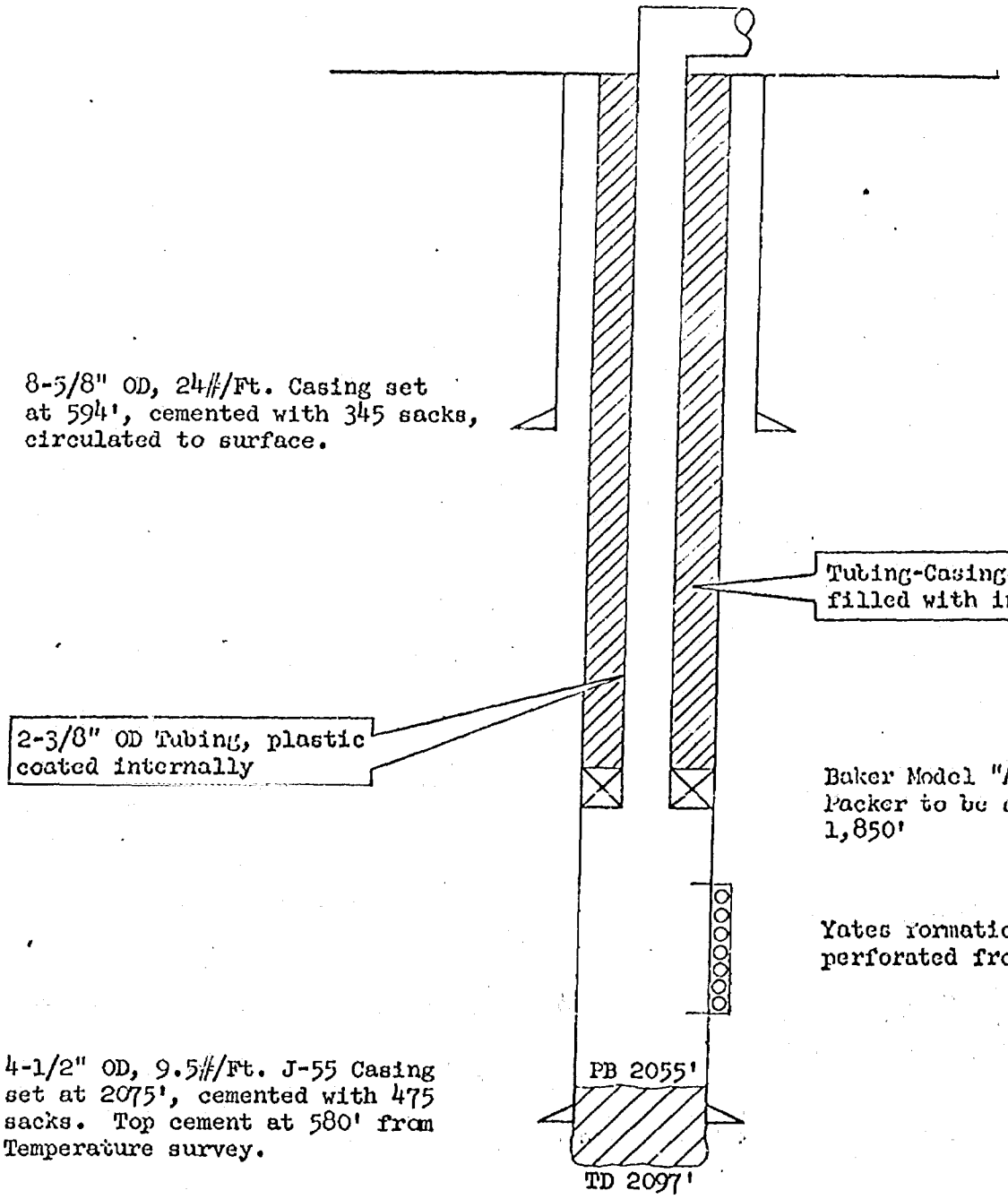


NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
FEDERAL-HOLDER "CR" WELL NO. 5

Located 1650' FSL, 2310' FEL Section 24-19S-30E
Eddy County, New Mexico



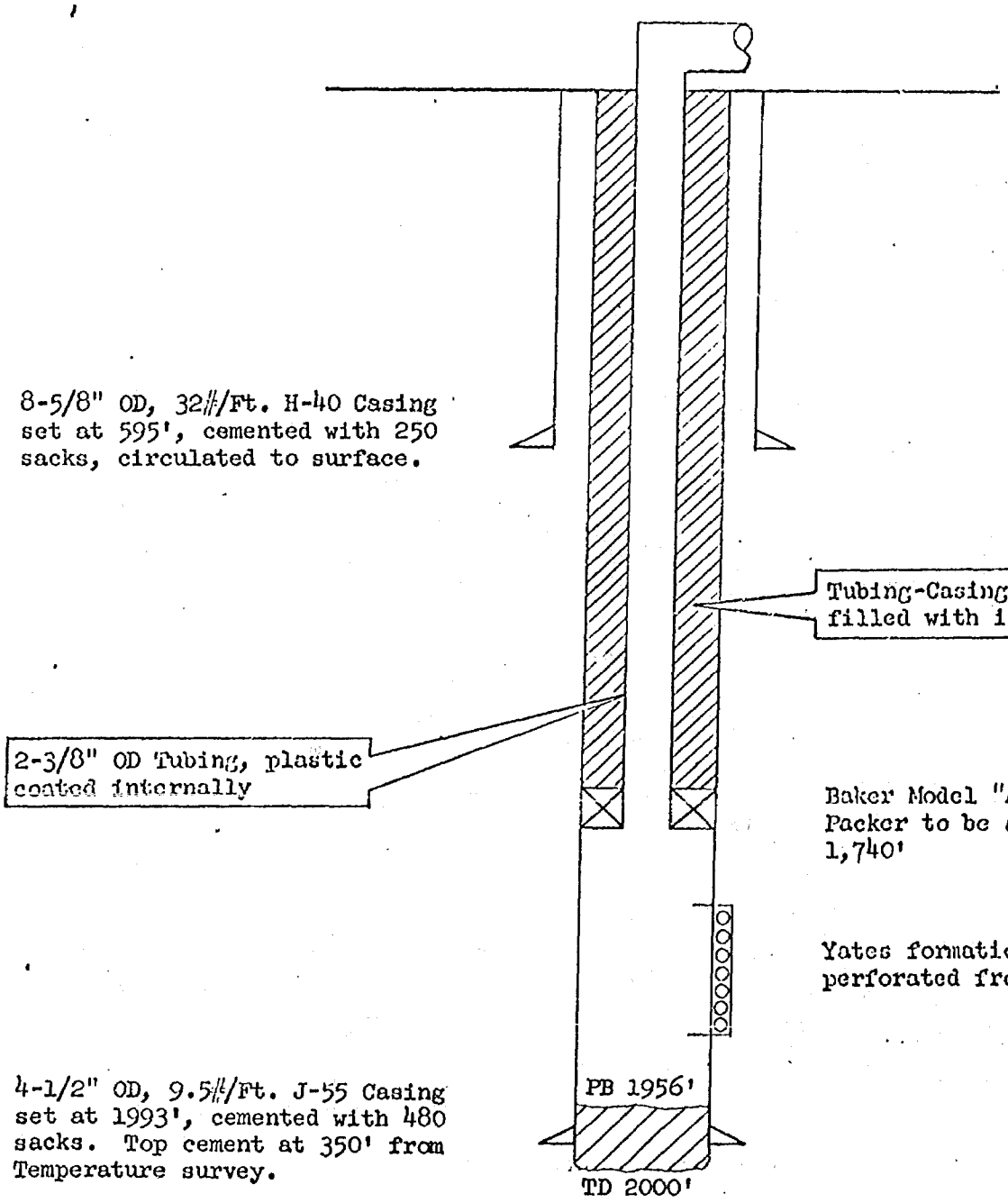
Case 3476

NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
FEDERAL-HOLDER "CR" WELL NO. 6

Located 940' FSL, 1725' FWL Section 24-19S-30E
Eddy County, New Mexico

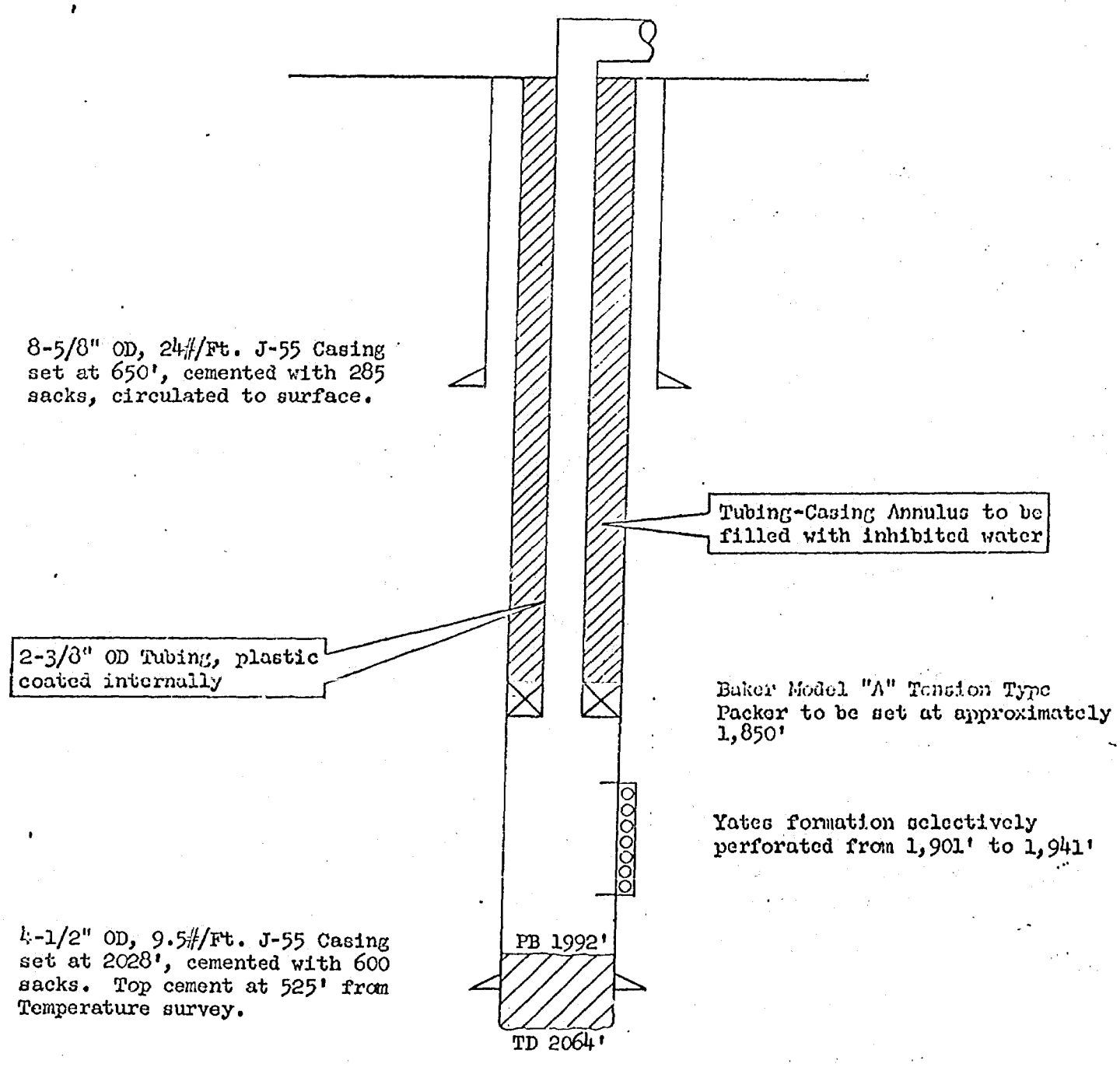


NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
FEDERAL-HOLDER "CR" WELL NO. 8

Located 2310' FNL, 1980' FWL Section 24-19S-30E
Eddy County, New Mexico

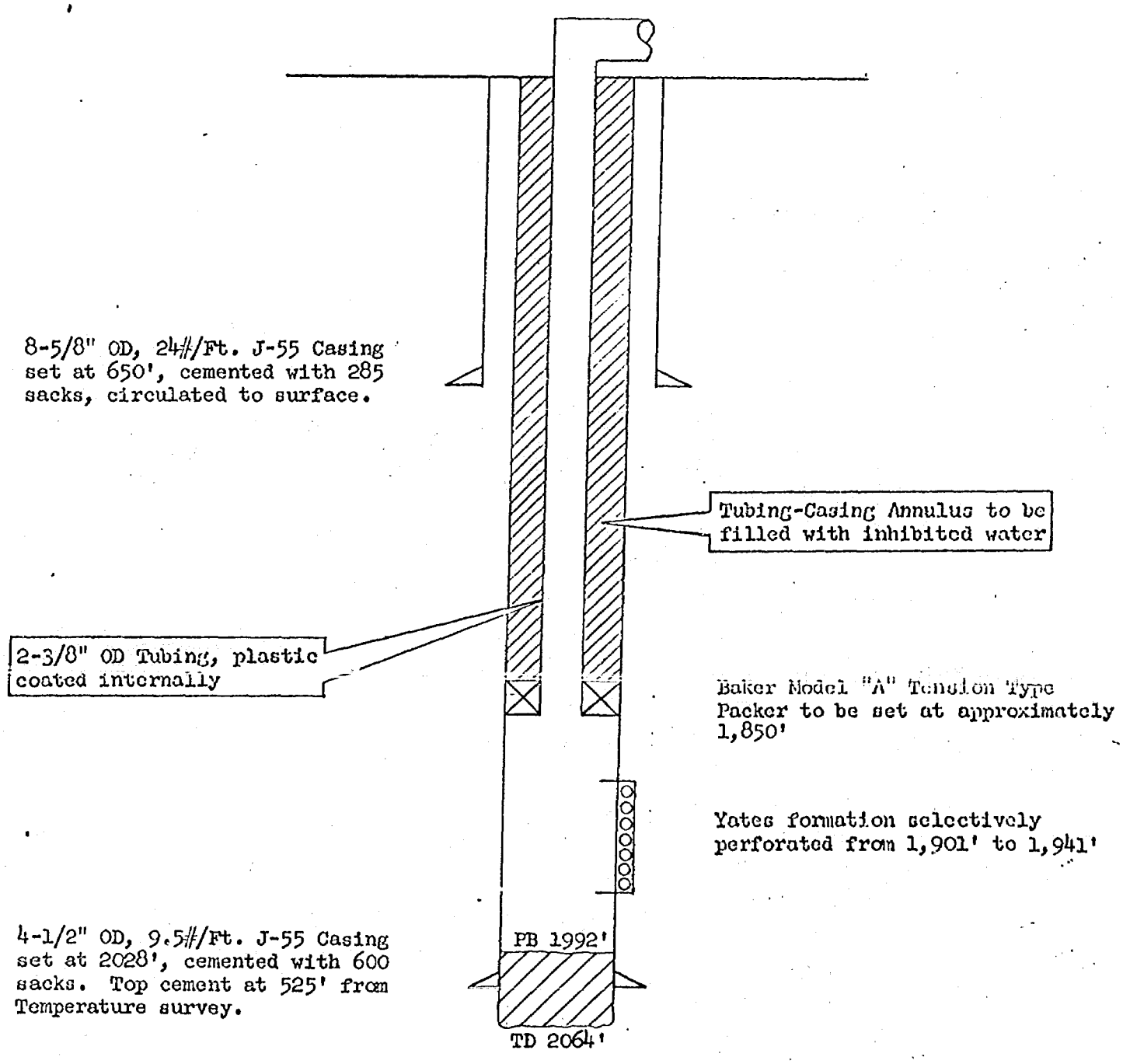


NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
FEDERAL-HOLDER "CR" WELL NO. 8

Located 2310' FNL, 1980' FWL Section 24-19S-30E
Eddy County, New Mexico

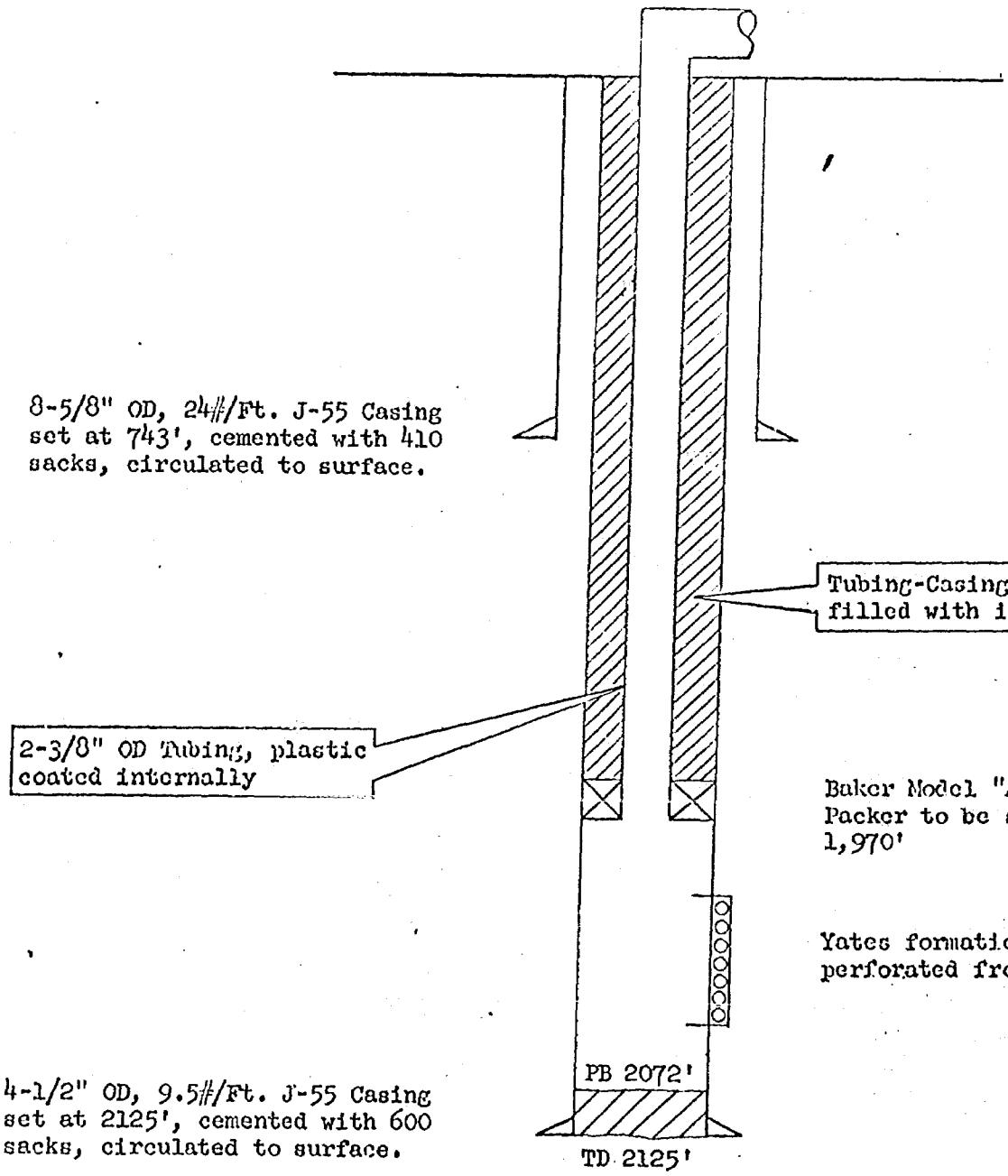


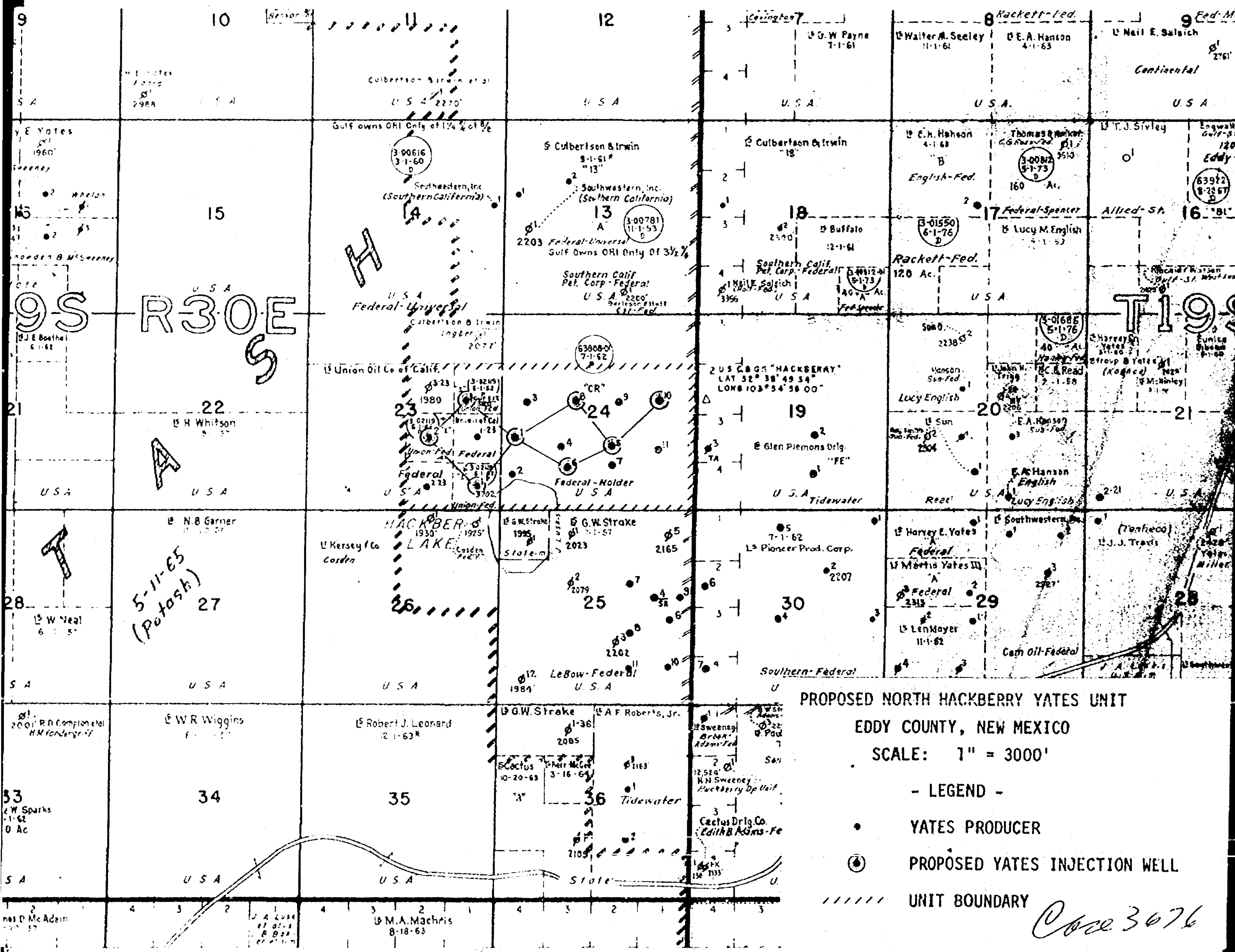
NORTH HACKBERRY YATES UNIT

Diagrammatic Sketch
Proposed Injection Well

GULF OIL CORPORATION
FEDERAL-HOLDER "CR" WELL NO. 10

Located 2310' FNL, 990' FEL Section 24-19S-30E
Eddy County, New Mexico





T19S-R30E
HACKBERRY LAKE
Federal-Universal
Federal-Holder
LeBow-Federal
Culbertson & Irwin
Southwestern, Inc. (Southern California)
Gulf Owns ORI Only Of 3½%
Union Oil Co of Calif.
Glen Plemons Drlg.
Pioneer Prod. Corp.
Rackett-Fed.
Lucy M. English
Tidewater
Southern-Federal
G.W. Strake
A F Roberts, Jr.
Robert J. Leonard
W R Wiggins
M.A. Machris
N.B Garner
H. Whitson
Continental
U.S.A.
5-11-65 (Potash)

PROPOSED NORTH HACKBERRY YATES UNIT

EDDY COUNTY, NEW MEXICO

SCALE: 1" = 3000'

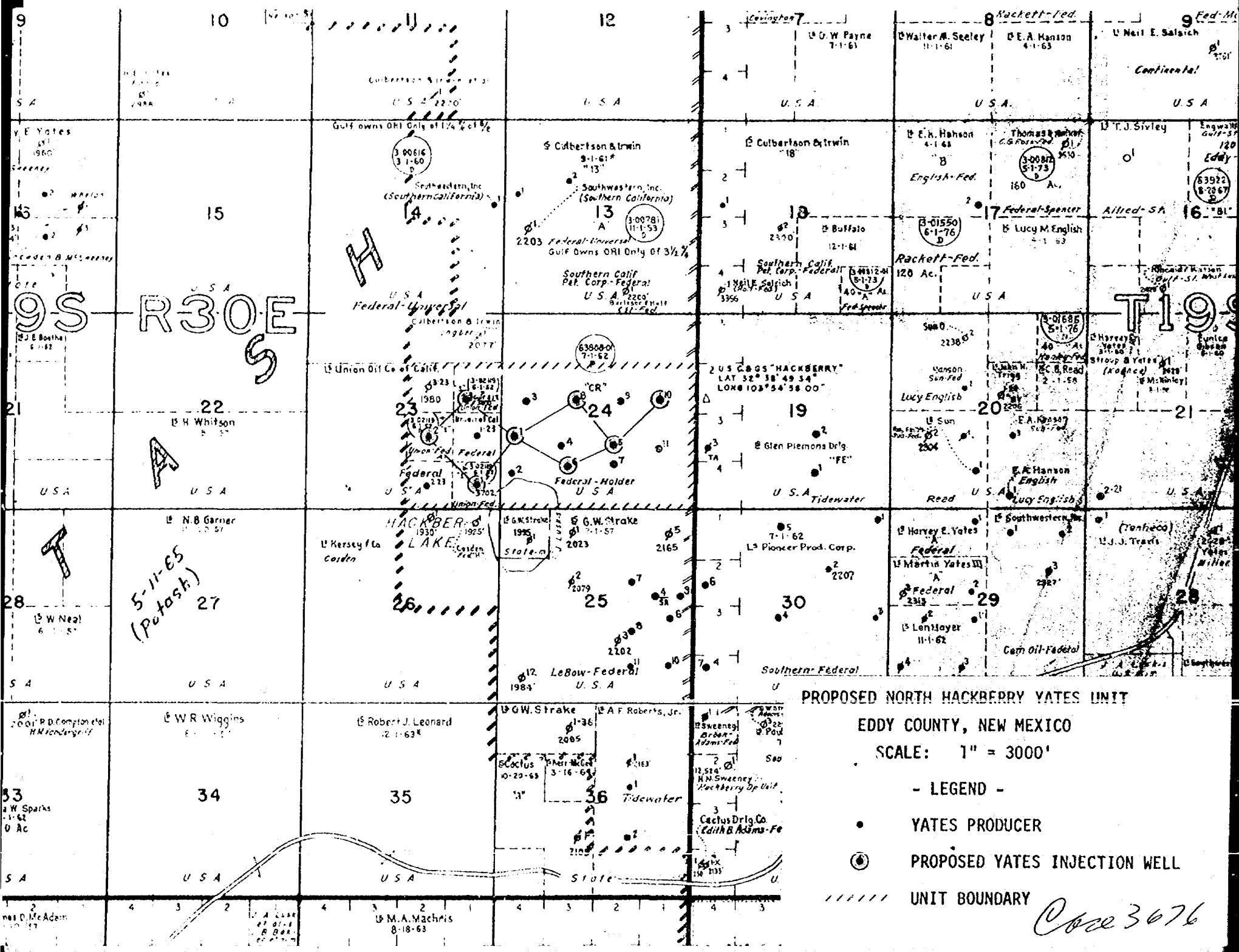
- LEGEND -

• YATES PRODUCER

⊙ PROPOSED YATES INJECTION WELL

////// UNIT BOUNDARY

Case 3676



PROPOSED NORTH HACKBERRY YATES UNIT

EDDY COUNTY, NEW MEXICO

SCALE: 1" = 3000'

- LEGEND -

- • YATES PRODUCER
- ◉ PROPOSED YATES INJECTION WELL
- ////// UNIT BOUNDARY

Case 3676