NEW MEXICO ENERGY, MINERALS
& NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION
2040 South Pacheco Street
Santa Fe, New Mexico 87505
(505) 827-7131

ADMINISTRATIVE ORDER SWD-680

APPLICATION OF WILLOW PIPELINE CORPORATION FOR SALT WATER DISPOSAL, CHAVES COUNTY, NEW MEXICO.

ADMINISTRATIVE ORDER
OF THE OIL CONSERVATION DIVISION

Under the provisions of Rule 701(B), Willow Pipeline Corporation made application to the New Mexico Oil Conservation Division on September 8, 1997, for permission to complete for salt water disposal its O'brien Fee '19' Well No.8 located 330 feet from the South line and 990 feet from the East line (Unit P) of Section 19, Township 8 South, Range 29 East, NMPM, Chaves County, New Mexico.

THE DIVISION DIRECTOR FINDS THAT:

(1) The application has been duly filed under the provisions of Rule 701(B) of the Division Rules and Regulations;

(2) Satisfactory information has been provided that all offset operators and surface owners have been duly notified;

(3) The applicant has presented satisfactory evidence that all requirements prescribed in Rule 701 will be met; and

(4) No objections have been received within the waiting period prescribed by said rule.

(5) The application should be approved.

IT IS THEREFORE ORDERED THAT:

The applicant herein, is hereby authorized to complete its O'brien Fee '19' Well No.8 located 330 feet from the South line and 990 feet from the East line (Unit P) of Section 19, Township 8 South, Range 29 East, NMPM, Chaves County, New Mexico, in such manner as to permit the injection of salt water for disposal purposes into the San Andres formation at approximately 2,680 feet to 2,798 feet through 2 3/8-inch plastic-lined tubing set in a packer located at approximately 2,580 feet.

IT IS FURTHER ORDERED THAT:

The operator shall take all steps necessary to ensure that the injected water enters only the proposed injection interval and is not permitted to escape to other formations or onto the surface.

Prior to commencing injection operations into the well, the casing shall be pressure tested from the surface to the packer setting depth to assure the integrity of said casing.

The casing-tubing annulus shall be loaded with an inert fluid and equipped with a pressure gauge at the surface or left open to the atmosphere to facilitate detection of leakage in the casing, tubing, or packer.

The injection well or system shall be equipped with a pressure limiting device which will limit the wellhead pressure on the injection well to no more than 536 psi.

The Director of the Division may authorize an increase in injection pressure upon a proper showing by the operator of said well that such higher pressure will not result in migration of the injected fluid from the San Andres formation. Such proper showing shall consist of a valid step-rate test run in accordance with and acceptable to this office.

The operator shall notify the supervisor of the Artesia district office of the Division of the date and time of the installation of disposal equipment and of the mechanical integrity test so that the same may be inspected and witnessed.

The operator shall immediately notify the supervisor of the Artesia district office of the Division of the failure of the tubing, casing, or packer in said well and shall take such steps as may be timely and necessary to correct such failure or leakage.

PROVIDED FURTHER THAT, jurisdiction of this cause is hereby retained by the Division for the entry of such further order or orders as may be deemed necessary or convenient for the prevention of waste and/or protection of correlative rights; upon failure of the operator to conduct operations in a manner which will ensure the protection of fresh water or in a manner inconsistent with the requirements set forth in this order, the Division may, after notice and hearing, terminate the injection authority granted herein.

The operator shall submit monthly reports of the disposal operations in accordance with Rule Nos. 706 and 1120 of the Division Rules and Regulations.

The injection authority granted herein shall terminate one year after the effective date of this order if the operator has not commenced injection operations into the subject well, provided however, the Division, upon written request by the operator, may grant an extension thereof for good cause shown.

Approved at Santa Fe, New Mexico, on this 20th day of October, 1997.

WILLIAM J. LEMAY, Director

S E A L

WJL/BES

xc: Oil Conservation Division - Artesia

PERMITS WEST, INC.
PROVIDING PERMITS for LAND USERS
37 Verano Loop, Santa Fe, New Mexico 87505 (505) 466-8120

SWD 680

September 7, 1997

William LeMay, Director
NM Oil Conservation Div.
2040 South Pacheco
Santa Fe, NM 87505

Dear Mr. LeMay:

Enclosed are one original and one copy of Willow Pipeline Company's application to convert the O'Brien Fee 19-8 oil well to a water disposal well.

Please call me if you have any questions.

Sincerely,

Brian Wood

Brian Wood

cc (w/ encl.): Artesia OCD

9/8/97	9/23/97	BS	KN	SWD

ABOVE THIS LINE FOR DIVISION USE ONLY

NEW MEXICO OIL CONSERVATION DIVISION

- Engineering Bureau -

ADMINISTRATIVE APPLICATION COVERSHEET

THIS COVERSHEET IS MANDATORY FOR ALL ADMINISTRATIVE APPLICATIONS FOR EXCEPTIONS TO DIVISION RULES AND REGULATIONS

Application Acronyms:

[NSP-Non-Standard Proration Unit] [NSL-Non-Standard Location]
[DD-Directional Drilling] [SD-Simultaneous Dedication]
[DHC-Downhole Commingling] [CTB-Lease Commingling] [PLC-Pool/Lease Commingling]
[PC-Pool Commingling] [OLS - Off-Lease Storage] [OLM-Off-Lease Measurement]
[WFX-Waterflood Expansion] [PMX-Pressure Maintenance Expansion]
[SWD-Salt Water Disposal] [IPI-Injection Pressure Increase]
[EOR-Qualified Enhanced Oil Recovery Certification] [PPR-Positive Production Response]

[1] **TYPE OF APPLICATION** - Check Those Which Apply for [A]

[A] Location - Spacing Unit - Directional Drilling

❑ NSL ❑ NSP ❑ DD ❑ SD

Check One Only for [B] or [C]

[B] Commingling - Storage - Measurement

❑ DHC ❑ CTB ❑ PLC ❑ PC ❑ OLS ❑ OLM

[C] Injection - Disposal - Pressure Increase - Enhanced Oil Recovery

❑ WFX ❑ PMX ☒ SWD ❑ IPI ❑ EOR ❑ PPR

[2] **NOTIFICATION REQUIRED TO:** - Check Those Which Apply, or ❑ Does Not Apply

[A] ❑ Working, Royalty or Overriding Royalty Interest Owners

[B] ☒ Offset Operators, Leaseholders or Surface Owner

[C] ☒ Application is One Which Requires Published Legal Notice

[D] ❑ Notification and/or Concurrent Approval by BLM or SLO
U.S. Bureau of Land Management - Commissioner of Public Lands, State Land Office

[E] ☒ For all of the above, Proof of Notification or Publication is Attached, and/or,

[F] ❑ Waivers are Attached

[3] **INFORMATION / DATA SUBMITTED IS COMPLETE** - Statement of Understanding

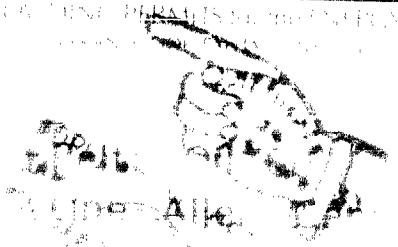
I hereby certify that I, or personnel under my supervision, have read and complied with all applicable Rules and Regulations of the Oil Conservation Division. Further, I assert that the attached application for administrative approval is accurate and complete to the best of my knowledge and where applicable, verify that all interest (WI, RI, ORRI) is common. I further verify that all applicable API Numbers are included. I understand that any omission of data, information or notification is cause to have the application package returned with no action taken.

Note: Statement must be completed by an individual with supervisory capacity.

Print or Type Name	Signature	Title	Date
BRIAN WOOD	Brian Wood	Consultant	9-7-97

MAIL

PERMITS WEST



SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
N. Dale Nichols
P.O. Box 1972
Midland, TX 79702

4a. Article Number: Z 290 069 899

4b. Service Type: ☐ Registered ☐ Certified ☐ Express Mail ☐ Insured ☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery: AUG 28 1997

5. Received By: *(Print Name)*

8. Addressee's Address *(Only if requested and fee is paid)*

6. Signature: *(Addressee or Agent)* X Blinda Nichols

PS Form **3811**, December 1994 102595-97-B-0179 Domestic Return Receipt

Thank you for using Return Receipt Service.

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Joseph Ortschied
2881 County Road Z
Adams, Wis. 53910

4a. Article Number: Z 290 069 909

4b. Service Type: ☐ Registered ☒ Certified ☐ Express Mail ☐ Insured ☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery: 8-28-97

5. Received By: *(Print Name)*

8. Addressee's Address *(Only if requested and fee is paid)*

6. Signature: *(Addressee or Agent)* X [illegible signature]

PS Form **3811**, December 1994 102595-97-B-0179 Domestic Return Receipt

Thank you for using Return Receipt Service.

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
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- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Stevens Operating
PO Bx 2203
Roswell, NM 88201

4a. Article Number: Z 290 069 [illegible]

4b. Service Type: ☐ Registered ☒ Certified ☐ Express Mail ☐ Insured ☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery: 9-3-97

5. Received By: *(Print Name)*

8. Addressee's Address *(Only if requested and fee is paid)*

6. Signature: *(Addressee or Agent)* X [illegible signature]

PS Form **3811**, December 1994 102595-97-B-0179 Domestic Return Receipt

Is your **RETURN ADDRESS** completed on the reverse side?

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
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- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Addr
2. ☐ Restricted Delive

Consult postmaster for fe

3. Article Addressed to:
QSTS Ranch
4040 Broadway
San Antonio, Tx 78209

4a. Article Number: Z 290 069 90[illegible]

4b. Service Type: ☐ Registered ☒ Ce ☐ Express Mail ☐ Ins ☐ Return Receipt for Merchandise ☐ CC

7. Date of Delivery: 8-28-97

5. Received By: *(Print Name)*

8. Addressee's Address *(Only if reque and fee is paid)*

6. Signature: *(Addressee or Agent)* X [illegible signature]

PS Form **3811**, December 1994 102595-97-B-0179 Domestic Return Re

Is your **RETURN ADDRESS** completed on the reverse side?

AFFIDAVIT OF PUBLICATION

County of Chaves
State of New Mexico

I, Fran Saunders,
Legal Clerk

Of the Roswell Daily Record, a daily newspaper published at Roswell, New Mexico, do solemnly swear that the clipping hereto attached was published once a week in the regular and entire issue of said paper and not in a supplement thereof for a period
of: one time weeks

beginning with issue dated
August 27th 1997

and ending with the issue dated
August 27th 1997

Fran Saunders
Clerk

Sworn and subscribed to before me

this 27th day of

August ,1997

Marylon L Skipper
Notary Public

My Commission expires

July 25, 1998

(SEAL)

Publish August 27, 1997

Willow Pipeline Company is applying to convert the O'Brien Fee 19 #8 oil well to a water disposal well. Contact is Brian Wood, Permits West, Inc., 37 Verano Loop, Santa Fe, NM 87505. Phone number is (505) 466-8120. The O'Brien Fee 19 #8 is located at 330' FSL & 990" FEL, Sec. 19, T. 8 S., R. 29 E., Chaves County, NM. The well will dispose of water produced from surrounding oil wells into the San Andres formation at a depth of 2,680' to 2,798' at a maximum rate of 250 barrels of water per day and at a maximum pressure of 1,000 psi. Interested parties must file objections or requests for hearing with the NM Oil Conservation Division, P.O. Box 2088, Santa Fe, NM 87504-2088 within 15 days.

STATE OF NEW MEXICO
ENERGY, MINERALS and NATURAL
RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION
PO BOX 2088
SANTA FE, NM 87504-2088

FORM C-108
Revised 7-1-81

APPLICATION FOR AUTHORIZATION TO INJECT

I. PURPOSE: ____ Secondary Recovery ____ Pressure Maintenance XXX Disposal ____ Storage
Application qualifies for administrative approval? XX Yes __ No

II. OPERATOR: WILLOW PIPELINE COMPANY

ADDRESS: P.O. BOX 131, WEATHERFORD, OK. 73096

CONTACT PARTY: BRIAN WOOD c/o PERMITS WEST, INC. PHONE: 505 466-8120

III. WELL DATA: Complete the data required on the reverse side of this form for each well processed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project: ___ Yes XXX No
If yes, give the Division order number authorizing the project _____

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).

*VIII. Attach appropriate geological data on the injection zone including appropriate lithologic detail, geological name, thickness and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/1 or less) overlying the proposed injection zone as well as any such sources known to be immediately underlying the injection interval.

IX. Describe the proposed stimulation program, if any.

* X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted.)

* XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground source of drinking water.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

XIV. Certification: I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: BRIAN WOOD TITLE: CONSULTANT

SIGNATURE: Brian Wood DATE: 8-24-97

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be resubmitted. Please show the date and circumstance of the earlier submittal. IN OCD FILES

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate District Office

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township, and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District Offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the section, township, and range location of multiple wells;

(3) The formation name and depth with expected maximum injection rates and pressures; and

(4) A notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, PO Box 2088, Santa Fe, NM 87504-2088 within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

II. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township, and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

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B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and name of the next higher and next lower oil or gas zone in the area of the well, if any.

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(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the section, township, and range location of multiple wells;

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INJECTION WELL DATA SHEET

Side

OPERATOR: Willow Pipeline Company

LEASE: O'Brien Fee 19

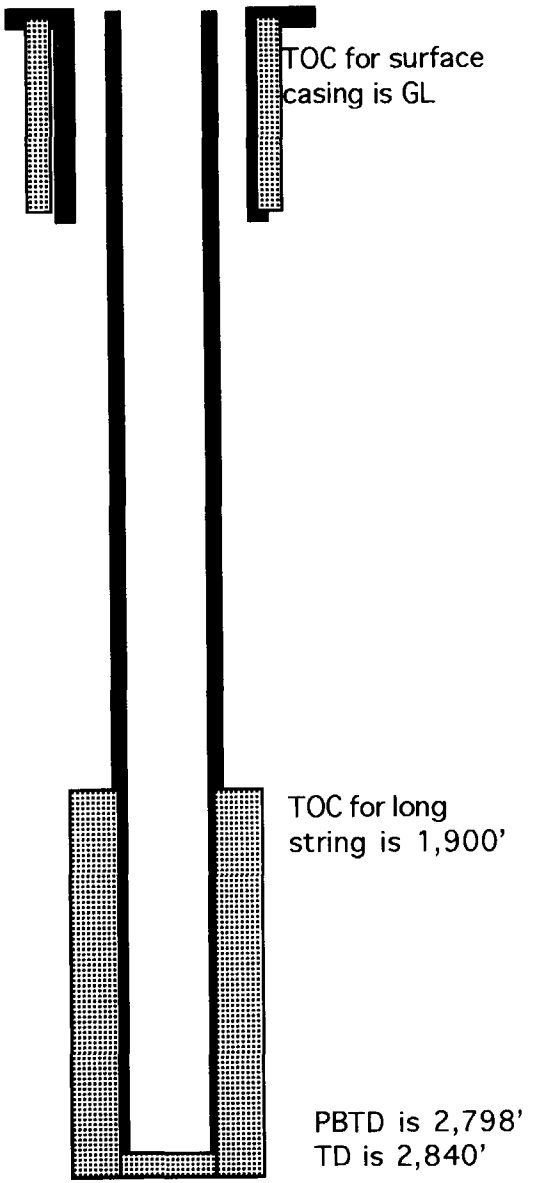
WELL NO.: O'Brien Fee 19-8

FOOTAGE LOCATION: 330' FSL & 990' FEL

SECTION: 19

TOWNSHIP: 8s

RANGE: 29e



Well Construction Data

Surface Casing

Size 8-5/8" " Cemented with 4 cu yd (Redimix) sx.

TOC Surface feet determined by Visual & log

Hole Size 11" (0' - 120')

Intermediate Casing

Size . " Cemented with . . sx.

TOC . feet determined by

Hole Size . .

Long String

Size 5-1/2" " Cemented with 125 (50/50 Poz) sx.

TOC 1,900' feet determined by Bond Log

Hole Size 7-7/8" (0' - 2,840')

Total Depth 2,840' (PBTD 2,798')

Injection Interval

2,680' feet to 2,798' feet

(perforated or open-hole; indicate which)

INJECTION WELL DATA SHEET

Tubing Size 2-3/8" 6.5# lined with steel (plastic lined) set in a
(type of internal coating)

Baker Hi-Par packer at 2,580' feet

Other type of tubing / casing seal if applicable N/A

Other Data

1. Is this a new well drilled for injection? ____ Yes __X__ No

   If no, for what purpose was the well originally drilled? Drilled & produced as San Andres oil well. SI since at least 3-96 due to poor economics.

2. Name of the injection formation San Andres dolomite

3. Name of Field or Pool (if applicable) Twin Lakes San Andres Associated

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e., sacks of cement or plug(s) used. San Andres perforated between 2,722' & 2,724 and 2,680' & 2,686' with 4 shots per foot.

5. Give the names and depths of any over or underlying oil of gas zones (pools) in this area.
   Top of Fussleman is 6,852'. Nichols Lynx #1 well, which is 3,287' north, produces from that zone. Only other oil or gas pool within 2 mile radius.

Willow Pipeline Company
O'Brien Fee 19 #8
330' FSL & 990' FEL
Sec. 19, T. 8 S., R. 29 E.
Chaves County, New Mexico

I. Purpose is water disposal.

II. Operator is: Willow Pipeline Company
Phone is: (405) 772-1111
Address is: P.O. Box 131, Weatherford, Ok. 73096
Contact is: Brian Wood (Permits West, Inc.). Phone is (505) 466-8120.

III. A. (1) Lease is 320 acre fee oil and gas lease which comprises all of the S2 of Section 19, T. 8 S., R. 29 E. Well name and number is O'Brien Fee 19 #8. Well is at 330' FSL and 990' FEL Sec. 19, T. 8 S., R. 29 E.
A. (2) Surface casing (8-5/8", 20#) was set at 120' in an 11" hole and cemented to the surface (visually observed and bond log run) with 4 cubic yards Redi-mix. Production casing (5-1/2", 14#) was set at 2840' in a 7-7/8" hole and cemented to ≈1,900' (bond log run) with 125 sx 50/50 Poz mix.
A. (3) Tubing will be 2-3/8" 6.5# plastic lined injection string. It will be set at ≈2,716' (disposal interval will be from 2,680' to 2,798').
A. (4) Baker Hi-Par packer will be set at 2,580'.

B. (1) Disposal zone will be San Andres dolomite.
B. (2) Disposal interval will be 2,680' to 2,798'. It was originally perforated (0.44") with four shots per foot from 2,680' to 2,686' and from 2,722' to 2,724' in 1981. Additional similar perforations will be shot in same formation and same overall interval (2,680' to 2,798').
B. (3) Well was spudded in July, 1981 and completed in October, 1981 as an oil well in the Twin Lakes San Andres Associated field and pool.
B. (4) San Andres dolomite was perforated (0.44") with four shots per foot from 2,680' to 2,686' and from 2,722' to 2,724' for a total of 40 perforations.
B. (5) Top of San Andres dolomite is at 2,050'. Oil and gas are produced in same and adjoining fields from this formation. Closest well

producing from San Andres is Willow's own O'Brien Fee 19-2 and 19-7 wells which are 1,320' west and 1,980' north respectively. Both are currently shut-in, but will return to producing oil well status upon OCD C-104 approval (as will all other Willow wells). Top of Queen is at 1,565'. Queen has been found productive elsewhere in the basin. There will be minimum 630' intereval between highest injection perforation and bottom of Queen. Nichol's Lynx #1 (SWNE 19-8s-29e) produces from the Fusselman. Top of that producing interval is 6,852'. That well is 3,287' north. It is the only oil well within a 2 mile radius which produces from any zone other than the San Andres.

IV. This is not an expansion of an existing injection project.

V. A map is attached showing all wells within a half mile (just 4 oil wells - and all are operated by Willow), closest wells are Willow's O'Brien Fee 19-2 and 19-7 wells which are 1,980' west and north respectively) and within two miles (23 water injection + 47 oil + 13 P&A). A star marks the O'Brien Fee 19-8 well. Based on a USGS Water Resources Div. data base search on July 16, 1997 and a July 24, 1997 field inspection, there are no water wells within two miles. Details on the 83 wells are below.

OPERATOR	WELL	LOCATION	TYPE
Stevens	Huber State 1	SESW 16-8s-29e	P&A
Rhymes	O'Brien 19-1	SWNW 19-8s-28e	P&A
Rhymes	O'Brien 19-2	NENW 19-8s-28e	P&A
Rhymes	O'Brien 19-3	SWNE 19-8s-28e	P&A
Stevens	Red Lake Ridge #1	NENW 21-8s-29e	P&A
American	O'Brien 24-1	NWSE 24-8s-28e	P&A
Larue & Muncy	Sidney 1	SESW 24-8s-28e	P&A
Larue & Muncy	Sidney 2	SENW 24-8s-28e	P&A
Stevens	O'Brien R-3	NWNE 28-8s-29e	P&A
Marbob	TLSAU 33	SENE 31-8s-29e	P&A

Pelto	TLSAU 31	SENW 31-8s-29e	P&A
Pelto	O'Brien N-3	SWNW 32-8s-29e	P&A
Sweeney	O'Brien 2	NWSE 32-8s-29e	P&A

OPERATOR	WELL	LOCATION	TYPE
Marbob	TLSAU 4	NESE 25-8s-28e	WIW
Marbob	TLSAU 9	SWSW 25-8s-28e	WIW
Marbob	TLSAU 11	SWSE 25-8s-28e	WIW
Marbob	TLSAU 17	NENW 36-8s-28e	WIW
Marbob	TLSAU 19	NENE 36-8s-28e	WIW
Marbob	TLSAU 27	SWNE 36-8s-28e	WIW
Marbob	TLSAU 38	NESE 36-8s-28e	WIW
Avra	O'Brien LLL-1	SWSE 21-8s-29e	WIW
Avra	O'Brien P-1	NENW 28-8s-29e	WIW
Marbob	TLSAU 2	SWNW 30-8s-29e	WIW
Marbob	TLSAU 2	SWNW 30-8s-29e	WIW
Marbob	TLSAU 6	NESW 30-8s-29e	WIW
Marbob	TLSAU 13	SWSW 30-8s-29e	WIW
Marbob	TLSAU 15	SWSE 30-8s-29e	WIW
Marbob	TLSAU 21	NENW 31-8s-29e	WIW
Marbob	TLSAU 23	NENE 31-8s-29e	WIW
Marbob	TLSAU 30	SWNW 31-8s-29e	WIW
Marbob	TLSAU 32	SWNE 31-8s-29e	WIW
Marbob	TLSAU 40	NESW 31-8s-29e	WIW
Marbob	TLSAU 42	NESE 31-8s-29e	WIW
Marbob	TLSAU 50	SWSE 31-8s-29e	WIW
Marbob	TLSAU 43	NWSW 32-8s-29e	WIW
Marbob	TLSAU 52	SWSW 32-8s-29e	WIW

OPERATOR	WELL	LOCATION	TYPE
Willow	O'Brien 13-1	SESE 13-8s-28e	Oil
Willow	O'Brien 24-2	NESE 24-8s-28e	Oil
Willow	O'Brien 24-2	NENE 24-8s-28e	Oil
Marbob	O'Brien 25-2	SESE 25-8s-28e	Oil
Marbob	O'Brien 25-4	NWSE 25-8s-28e	Oil
Marbob	O'Brien F-1	SWSW 25-8s-28e	Oil
Marbob	O'Brien F-2	SESW 25-8s-28e	Oil
Marbob	O'Brien F-4	NESW 25-8s-28e	Oil
Marbob	O'Brien F-9	SENW 25-8s-28e	Oil
Sandco	Sandco 2	SWNE 25-8s-28e	Oil
Sandco	Sandco 3	NENE 25-8s-28e	Oil

Willow	O'Brien 25-5	SENE 25-8s-28e	Oil
Marbob	TLSAU 122	SENE 36-8s-28e	Oil
Marbob	Citgo A State 6	NWNE 36-8s-28e	Oil
Marbob	Citgo A State 7	SWNE 36-8s-28e	Oil
Marbob	Citgo A State 8	SENE 36-8s-28e	Oil
Willow	O'Brien Deming 1	NENW 17-8-29e	Oil
Willow	O'Brien 18-1	SWSW 18-8s-29e	Oil
Willow	O'Brien 18-2	SWSE 18-8s-29e	Oil
Willow	O'Brien 18-3	SESW 18-8s-29e	Oil
Willow	O'Brien 18-4	NWSW 18-8s-29e	Oil
Willow	O'Brien 18-5	NESW 18-8s-29e	Oil
Willow	O'Brien 18-6	NWSE 18-8s-29e	Oil
Nichols	Lynx 1	SWNE 19-8s-29e	Oil
Willow	O'Brien 19-1	SESW 19-8s-29e	Oil
Willow	O'Brien 19-2	SWSE 19-8s-29e	Oil
Willow	O'Brien 19-3	SWSW 19-8s-29e	Oil
Willow	O'Brien 19-4	NWSW 19-8s-29e	Oil
Willow	O'Brien 19-5	NESW 19-8s-29e	Oil
Willow	O'Brien 19-6	NWSE 19-8s-29e	Oil
Willow	O'Brien 19-7	NESE 19-8s-29e	Oil
Avra	O'Brien LLL 1	SESW 21-8s-29e	Oil
Avra	O'Brien R 1	SWSE 21-8s-29e	Oil
Avra	O'Brien P 2	NWNW 28-8s-29e	Oil
Avra	O'Brien P 3	SWNW 28-8s-29e	Oil
Marbob	O'Brien K 2	NWSW 30-8s-29e	Oil
Marbob	TSLSAU 14	SESW 30-8s-29e	Oil
Willow	Kucheman 1	NWNW 30-8s-29e	Oil
Willow	Kucheman 3	NeNW 30-8s-29e	Oil
Willow	Kucheman 4	SENW 30-8s-29e	Oil
Willow	Kucheman 5	SWNE 30-8s-29e	Oil
Marbob	O'Brien I 1	NWNW 31-8s-29e	Oil
Marbob	O'Brien I 3	NESW 31-8s-29e	Oil
Marbob	O'Brien J 2	NWSE 31-8s-29e	Oil
Marbob	O'Brien J 6	SESE 31-8s-29e	Oil
Marbob	O'Brien J 8	NWNE 31-8s-29e	Oil
Marbob	TLSAU 123	SENW 31-8s-29e	Oil

A map also shows all leases within a half mile (all fee) and within two miles (all fee or state). The only state leases are in 36-8s-28e and 16-8s-29e. A star marks the O'Brien Fee 19-8 well. Details on those leases

within a half mile are:

AREA	LESSEE
N2 19-8s-29e	N. Dale Nichols
S2 19-8s-29e	Willow Pipeline Company
SW4 20-8s-29e	Stevens Operating
NW4 20-8s-29e	Joseph Ortschid (Open-Lessor)
W2 29-8s-29e	Pelto Oil
NE4, N2NW4, & SWNW 30-8s-29e	Willow Pipeline Company

VI. There are four wells within a half mile. All are operated by Willow, all are in the south half of Section 19, and all are currently shut-in oil wells. Copies of the four completion reports are attached.

Well	Surf. Casing	Prod. Casing	Date	Where	TD	Completion
19-1	20#, 308' 150 sx cmt	14#, 2796' 100 sx cmt	1978	SESW	2,800'	Perf: 2,629'-2,674'
19-2	20#, 122' 75 sx cmt	14#, 2794' 175 sx cemt	1979	SWSE	2,800'	Perf: 2,632'-2,680'
19-6	20#, 125' 4 cu yd cmt	14#, 2787' 125 sx cmt	1981	NWSE	2,800'	Perf: 2,641'-2,672'
19-7	20#, 126' 4 cu yd cmt	14#, 1868' 100 sx cmt 11#, 1,051' 265 sx cmt 9#, 1759'	1981	NESE	2,845'	Perf: 2,660'-2,687'

VII. 1. Average injection rate = 175 bwpd. Maximum rate = 250 bwpd.
2. System will initially be open (trucked to well). Depending on volume, pipeline may be laid later.
3. Average injection pressure=200 psi. Maximum pressure=1,000 psi.
4. Water source will be Willow's 27 other wells producing from San Andres. Eleven water analyses are attached. Water produced from the San Andres dolomite will be disposed of into the San Andres dolomite. A summary follows (K = Kucheman, all others = OBrien):

Parameter	K-1	K-3	K-4	K-5	13-1	18-3	18-5	18-6	19-1	19-4	25-5
pH	5.9	5.9	5.9	6.3	6.1	5.9	6.8	6.5	5.9	5.9	6.2
H2S	0	0	0	0	0	0	0	0	0	0	0
TDS*	2.12	2.11	2.30	2.31	2.29	1.99	1.87	2.22	2.25	2.41	2.24
Calcium	12,224	14,028	7,615	6,513	8,016	3,307	3,307	2,104	16,032	16,733	1,503
Magnesium	2,917	3,161	2,188	1,884	3,829	1,033	1,520	912	5,349	5,713	790
Sodium*	0.65	0.63	0.79	0.81	0.75	0.73	0.67	0.83	0.63	0.68	0.84
Bicarbonate	366	454	308	1,800	669	483	722	620	527	473	781
Sulfate	950	750	1,450	1,800	1,500	3,500	4,100	5,100	700	600	5,100
Chloride*	1.30	1.30	1.40	1.40	1.40	1.18	1.10	1.30	1.40	1.50	1.31
Iron	15	49	468	2,900	7	23	1,600	13	1,300	23	65
Hardness*	0.43	0.48	0.28	0.24	0.36	0.13	0.15	0.09	0.62	0.65	0.07

* x 100,000

5. The San Andres dolomite is productive. The 19-8 well initially produced 10 bopd and 5 Mcfd from the San Andres dolomite when completed in 1981. There are four existing oil wells within a half mile which produce from the San Andres dolomite. There are 46 oil wells within two miles which produce from the San Andres dolomite.

VIII. The San Andres Formation is mainly dolomite with some anhydrite and limestone. It is at least 157' thick in the 19-8 wellbore. (Nichol's Lynx well which is 2/3 of a mile northwest recorded a 1,244' thick anhydrite, limestone, dolomite sequence.) Top is 2,680' and bottom is ≈2,837'. There is a 630' thick layer of anhydrite with some shale and dolomite above the San Andres in the 19-8 well. Strata beneath the San Andres, as recorded in the Lynx well, are (from shallow to deep):

Rock Type	Top	Bottom	Thickness
Sandstone, dolomite, anhydrite	3,296'	4,708'	1,412'
Sandstone, ahydrite	4,708'	5,413'	705'
Red shale	5,413'	6,174'	761'
Limestone	6,174'	6,604'	430'
Limestone	6,604'	6,770'	166'
Limestone	6,770'	6,849'	79'
Dolomite	6,849	7,491'	642'

No drinking water bearing zones are known be above or below the San Andres within a two mile radius.

IX. Stimulation will include an acid job.

X. DL & ML, G-R SN, and cement bond logs were run and are on file.

XI. Based on a USGS Water Resources Div. data base search on July 16, 1997 and a July 24, 1997 field inspection, there are no water wells within two miles.

XII. Well files have been examined and a field inspection made. No evidence of open faults or other hydrologic connection between the San Adnres and any underground source of water has been found.

XIII. Notice (this application) has been sent to the surface owner (QSTS Ranch Partnership) and N. Dale Nichols, Joseph Ortschid, Pelto Oil, and Stevens Operating. N. Dale Nichols, Joseph Ortschid, Pelto Oil, Stevens Operating, and Willow Pipeline Company are the operators of all leases within a half mile.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

SANTA FE		
FILE		
U.S.G.S.		
LAND OFFICE		
OPERATOR		

NEW MEXICO OIL CONSERVATION COMMISSION

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

Date

State Oil & Gas Lease No.

Date

CASING

DEPTH

308'

2796'

RECORD

INDICATE FORMATION TOPS IN CONFORMANCE WITH GEOGRAPHICAL SECTION OF STATE

Southeastern New Mexico		Northwestern New Mexico	
T. Anhy	T. Canyon	T. Ojo Alamo	T. Penn. "B"
T. Salt	T. Strawn	T. Kirtland-Fruitland	T. Penn. "C"
B. Salt	T. Atoka	T. Pictured Cliffs	T. Penn. "D"
T. Yates 884'	T. Miss	T. Cliff House	T. Leadville
T. 7 Rivers	T. Devonian	T. Menefee	T. Madison
T. Queen 1517'	T. Silurian	T. Point Lookout	T. Elbert
T. Grayburg	T. Montoya	T. Mancos	T. McCracken
T. San Andres 2004'	T. Simpson	T. Gallup	T. Ignacio Qtzte
T. Glorieta	T. McKee	Base Greenhorn	T. Granite
T. Paddock	T. Ellenburger	T. Dakota	T.
T. Blinebry	T. Gr. Wash	T. Morrison	T.
T. Tubb	T. Granite	T. Todilto	T.
T. Drinkard	T. Delaware Sand	T. Entrada	T.
T. Abo	T. Bone Springs	T. Wingate	T.
T. Wolfcamp	T.	T. Chinle	T.
T. Penn.	T.	T. Permian	T.
T Cisco (Bough C)	T.	T. Penn. "A"	T.

OIL OR GAS SANDS OR ZONES

No. 1, from 2624' to 2686' No. 4, from ____ to ____

No. 2, from ____ to ____ No. 5, from ____ to ____

No. 3, from ____ to ____ No. 6, from ____ to ____

IMPORTANT WATER SANDS

Include data on rate of water inflow and elevation to which water rose in hole.

No. 1, from ____ to ____ feet. ____

No. 2, from ____ to ____ feet. ____

No. 3, from ____ to ____ feet. ____

No. 4, from ____ to ____ feet. ____

FORMATION RECORD (Attach additional sheets if necessary)

From	To	Thickness in Feet	Formation	From	To	Thickness in Feet	Formation
0'	755'	755'	Permian Red Bed w/minor silt, sand, gyp & salt				
755'	1600'	845'	Salt, anhyd, red & green shales w/minor silt & sand				
1600'	2004'	404'	Red Bed				
2004'	2625'	621'	Anhyd & salt w/minor shale & Dolo.				
2625'	2770'	145'	Dolo. w/minor anhyd & shale				
2770'	2797'	27'	Limestone				

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPT.

OIL CONSERVATION DIVISION

P O BOX 2088

Form C-105
Revised 10-1-78

INSTRUCTIONS

... Rule 1106.

... TOPS IN CONFORMANCE ...

OIL OR GAS SAND ...

IMPORTANT ...

...tion to which water rose in hole.

...ATION RECORD (Attach add...

Red B...ds w/minor ...
...d, g... & salt

... red ...
...ales (minor s...

...e w/minor dolo

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

Form C-101
Revised 10-1-78

OIL CONSERVATION DIVISION

T. Anhy		T. Canyon	T. Ojo Alamo	T. Penn. "B"	
T. Salt		T. Strawn	T. Kirtland-Fruitland	T. Penn. "C"	
B. Salt		T. Atoka	T. Pictured Cliffs	T. Penn. "D"	
T. Yates	910	T. Miss	T. Cliff House	T. Leadville	
T. 7 Rivers		T. Devonian	T. Menefee	T. Madison	
T. Queen	1530	T. Silurian	T. Point Lookout	T. Elbert	
T. Grayburg		T. Montoya	T. Mancos	T. McCracken	
T. San Andres	2008	T. Simpson	T. Gallup	T. Ignacio Qtzte	
T. Glorieta		T. McKee	Base Greenhorn	T. Granite	
T. Paddock		T. Ellenburger	T. Dakota	T.	
T. Blinebry		T. Gr. Wash	T. Morrison	T.	
T. Tubb		T. Granite	T. Todilto	T.	
T. Drinkard		T. Delaware Sand	T. Entrada	T.	
T. Abo		T. Bone Springs	T. Wingate	T.	
T. Wolfcamp		T.	T. Chinle	T.	
T. Penn.		T.	T. Permian	T.	
T. Cisco (Bough C)		T.	T. Penn. "A"	T.	

OIL OR GAS SANDS OR ZONES

No. 1, from 2622 to 2704 No. 4, from ____ to ____

No. 2, from 2704 to 2747 No. 5, from ____ to ____

No. 3, from ____ to ____ No. 6, from ____ to ____

IMPORTANT WATER SANDS

Include data on rate of water inflow and elevation to which water rose in hole.

No. 1, from ____ to ____ feet. ____

No. 2, from ____ to ____ feet. ____

No. 3, from ____ to ____ feet. ____

No. 4, from ____ to ____ feet. ____

FORMATION RECORD (Attach additional sheets if necessary)

From	To	Thickness in Feet	Formation	From	To	Thickness in Feet	Formation
0	910	910	Permian Red Beds w/minor silt, sand, gyp & salt.				
910	1530	620	Salt, Anhydrite, Red & Green Shales with minor Silt & Sand.				
1530	2008	478	Red Beds				
2008	2622	614	Anhydrite with minor Dolomite & Shale.				

Form C-105
Revised 10-1-78

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

P. O. BOX 2088

NUMBER OF COPIES RECEIVED		
DISTRIBUTION		
SANTA FE		
FILE		
U.S.G.S.		
LAND OFFICE		
OPERATOR		

5a. Indicate Type of Lease: State ☐ Fee ☒

RECEIVED
NOV 30 1981
O. C. D.
ARTESIA, OFFICE

1a. TYPE OF WELL: OIL WELL ☒ GAS WELL ☐ DRY ☐ OTHER

b. TYPE OF COMPLETION: NEW WELL ☒ WORK OVER ☐ DEEPEN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ OTHER

2. Name of Operator: THE HARLOW CORPORATION

3. Address of Operator: 600 Petroleum Bldg, Amarillo, TX 79101

4. Location of Well: Unit Letter I, Located 2310 Feet From The South Line and 990 Feet From The East Line of Sec. 19, Twp. 8S, Rge. 29E, NMPM

7. Unit Agreement Name:

8. Farm or Lease Name: O'Brien Fee "19"

9. Well No.: 7

10. Field and Pool, or Wildcat: Twin Lakes-San Andres Associated

12. County: Chaves

15. Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Casinghead
3'19'81	4'7'81	10'30'81	3933 GL	3932

20. Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By	Rotary Tools	Cable Tools
2845	2729		→	126-2845	0-126'

24. Producing Interval(s), of this completion — Top, Bottom, Name: San Andres 2660-87

25. Was Directional Survey Made: No

26. Type Electric and Other Logs Run: LL, MLL, S-N, G-R, Bond

27. Was Well Cored: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
8 5/8"	20#	126'	11"	4 yds	None
5 1/2"	14#	1868'	7 7/8"	100 sx	None
4" O D	11#	1051'	4 3/4"	265	None
Comb.-String	9#	1759'			None

29. LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2 3/8 EU	2596	None

31. Perforation Record (Interval, size and number)

~~1769-68 4JJJ 4 shots/ft~~
2682-87 " "
2674-76 " "
2660-62 " "

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
~~1769-68~~	~~500g MCA~~
2660-87	500g MCA
2660-87	2000g Ne Fe, 35 balls
2660-87	6000g Ne Fe, N_2 & balls

33. PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
10'30'81	Pumping	Prod

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas — Oil Ratio
11'16'81	24	None		2	4	32	2000

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
22#	22#		2	4	32	24

34. Disposition of Gas (Sold, used for fuel, vented, etc.): Sold to Mapco Production Co

Test Witnessed By: Rick Likens

35. List of Attachments: Logs listed above, 104, 116 FERC 121 Deviation Report

36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED B R LaFon TITLE Production Engineer DATE 11'25'81

No. 4

No. 5

No. 6

in hole.

From	To	Formation
[illegible]	[illegible]	[illegible]

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

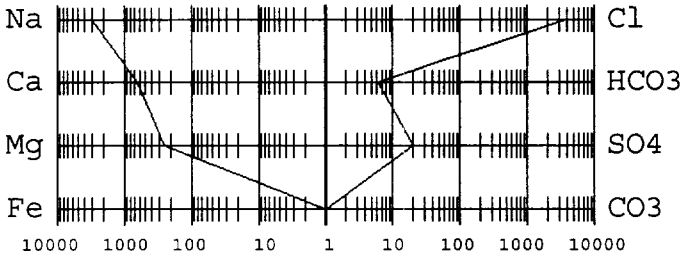
Oil Co. : **Willow Pipeline**
Lease : **Kuchaman**
Well No.: **# 1**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

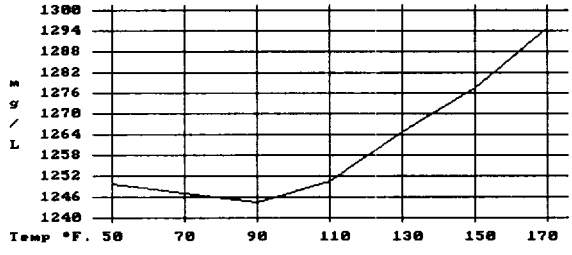
ANALYSIS

1.	pH		5.900		
2.	Specific Gravity 60/60 F.		1.159		
3.	$CaCO_3$ Saturation Index @ 80 F.		+0.692		
	@ 140 F.		+2.112		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		Not Present		
5.	Carbon Dioxide		Not Determined		
6.	Dissolved Oxygen		Not Determined		
	Cations				
7.	Calcium	(Ca^{++})	12,224	/ 20.1 =	608.16
8.	Magnesium	(Mg^{++})	2,917	/ 12.2 =	239.10
9.	Sodium	(Na^{+}) (Calculated)	65,333	/ 23.0 =	2,840.57
10.	Barium	(Ba^{++})	Not Determined		
	Anions				
11.	Hydroxyl	(OH^{-})	0	/ 17.0 =	0.00
12.	Carbonate	($CO_3^{=}$)	0	/ 30.0 =	0.00
13.	Bicarbonate	(HCO_3^{-})	366	/ 61.1 =	5.99
14.	Sulfate	($SO_4^{=}$)	950	/ 48.8 =	19.47
15.	Chloride	(Cl^{-})	129,971	/ 35.5 =	3,661.15
16.	Total Dissolved Solids		211,761		
17.	Total Iron (Fe)		15	/ 18.2 =	0.82
18.	Total Hardness As $CaCO_3$		42,538		
19.	Resistivity @ 75 F. (Calculated)		0.001 /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	5.99	485
$CaSO_4$	68.07	19.47	1,325
$CaCl_2$	55.50	582.70	32,340
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	239.10	11,386
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	2,839.35	165,989

***Milli Equivalents per Liter**

This water is somewhat corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

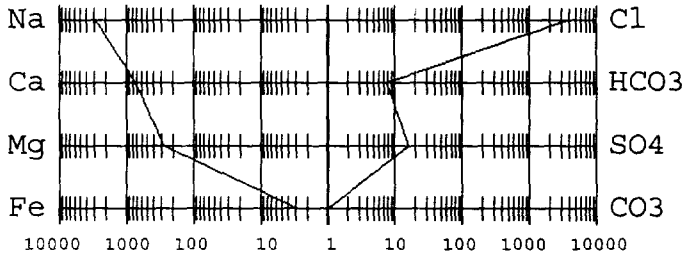
Oil Co. : **Willow Pipeline**
Lease : **Kuchaman**
Well No.: **# 3-C**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

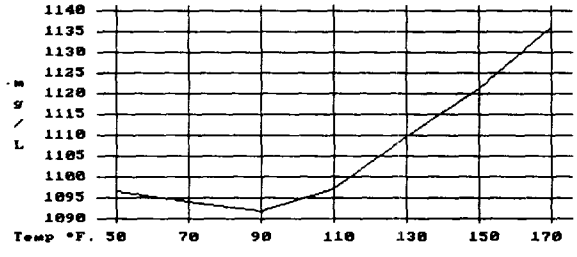
ANALYSIS

1.	pH		5.890		
2.	Specific Gravity 60/60 F.		1.155		
3.	$CaCO_3$ Saturation Index @ 80 F.		+0.835		
	@ 140 F.		+2.255		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		Not Present		
5.	Carbon Dioxide		Not Determined		
6.	Dissolved Oxygen		Not Determined		
	Cations				
7.	Calcium	(Ca^{++})	14,028	/ 20.1 =	697.91
8.	Magnesium	(Mg^{++})	3,161	/ 12.2 =	259.10
9.	Sodium	(Na^{+}) (Calculated)	62,740	/ 23.0 =	2,727.83
10.	Barium	(Ba^{++})	Not Determined		
	Anions				
11.	Hydroxyl	(OH^{-})	0	/ 17.0 =	0.00
12.	Carbonate	($CO_3^{=}$)	0	/ 30.0 =	0.00
13.	Bicarbonate	(HCO_3^{-})	454	/ 61.1 =	7.43
14.	Sulfate	($SO_4^{=}$)	750	/ 48.8 =	15.37
15.	Chloride	(Cl^{-})	129,971	/ 35.5 =	3,661.15
16.	Total Dissolved Solids		211,104		
17.	Total Iron (Fe)		49	/ 18.2 =	2.69
18.	Total Hardness As $CaCO_3$		48,043		
19.	Resistivity @ 75 F. (Calculated)		0.001 /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L	= mg/L.
$Ca(HCO_3)_2$	81.04	7.43	602
$CaSO_4$	68.07	15.37	1,046
$CaCl_2$	55.50	675.11	37,469
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	259.10	12,338
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	2,726.95	159,417

***Milli Equivalents per Liter**

This water is somewhat corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

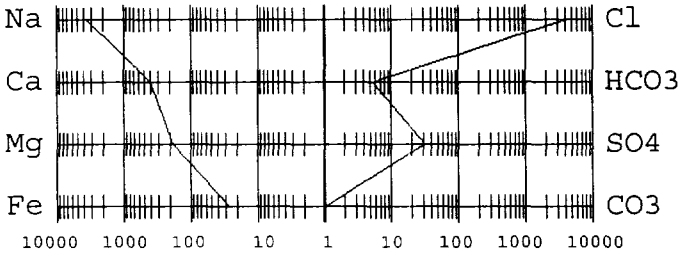
Oil Co. : **Willow Pipeline**
Lease : **Kicheman**
Well No. : **# 4**
Salesman:

Sample Loc. :
Formation :
Date Analyzed: **01-July-1996**

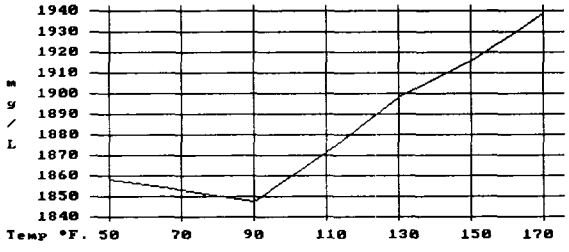
ANALYSIS

1.	pH		5.900		
2.	Specific Gravity 60/60 F.		1.148		
3.	$CaCO_3$ Saturation Index @ 80 F.		+0.472		
	@ 140 F.		+1.972		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		Not Present		
5.	Carbon Dioxide		Not Determined		
6.	Dissolved Oxygen		Not Determined		
	Cations				
7.	Calcium	(Ca^{++})	7,615	/ 20.1 =	378.86
8.	Magnesium	(Mg^{++})	2,188	/ 12.2 =	179.34
9.	Sodium	(Na^{+}) (Calculated)	78,700	/ 23.0 =	3,421.74
10.	Barium	(Ba^{++})	Not Determined		
	Anions				
11.	Hydroxyl	(OH^{-})	0	/ 17.0 =	0.00
12.	Carbonate	($CO_3^{=}$)	0	/ 30.0 =	0.00
13.	Bicarbonate	(HCO_3^{-})	308	/ 61.1 =	5.04
14.	Sulfate	($SO_4^{=}$)	1,450	/ 48.8 =	29.71
15.	Chloride	(Cl^{-})	139,968	/ 35.5 =	3,942.76
16.	Total Dissolved Solids		230,229		
17.	Total Iron (Fe)		468	/ 18.2 =	25.71
18.	Total Hardness As $CaCO_3$		28,025		
19.	Resistivity @ 75 F. (Calculated)		0.001 /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	5.04	409
$CaSO_4$	68.07	29.71	2,023
$CaCl_2$	55.50	344.10	19,098
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	179.34	8,540
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	3,419.31	199,893

***Milli Equivalents per Liter**

This water is somewhat corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

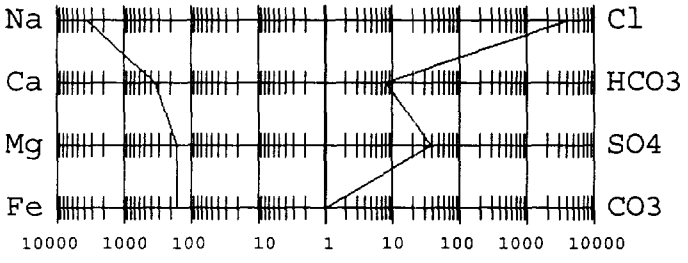
Oil Co. : **Willow Pipeline**
Lease : **Kuchaman**
Well No.: **# 5**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

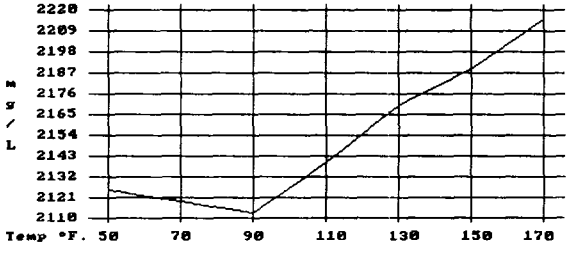
ANALYSIS

1.	pH		**6.260**		
2.	Specific Gravity 60/60 F.		**1.154**		
3.	$CaCO_3$ Saturation Index @ 80 F.		**+0.937**		
	@ 140 F.		**+2.437**		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		**Not Present**		
5.	Carbon Dioxide		**Not Determined**		
6.	Dissolved Oxygen		**Not Determined**		
	Cations				
7.	Calcium	(Ca^{++})	**6,513**	/ 20.1 =	**324.03**
8.	Magnesium	(Mg^{++})	**1,884**	/ 12.2 =	**154.43**
9.	Sodium	(Na^{+}) (Calculated)	**80,763**	/ 23.0 =	**3,511.43**
10.	Barium	(Ba^{++})	**Not Determined**		
	Anions				
11.	Hydroxyl	(OH^{-})	**0**	/ 17.0 =	**0.00**
12.	Carbonate	($CO_3^{=}$)	**0**	/ 30.0 =	**0.00**
13.	Bicarbonate	(HCO_3^{-})	**459**	/ 61.1 =	**7.51**
14.	Sulfate	($SO_4^{=}$)	**1,800**	/ 48.8 =	**36.89**
15.	Chloride	(Cl^{-})	**139,968**	/ 35.5 =	**3,942.76**
16.	Total Dissolved Solids		**231,387**		
17.	Total Iron (Fe)		**2,900**	/ 18.2 =	**159.34**
18.	Total Hardness As $CaCO_3$		**24,021**		
19.	Resistivity @ 75 F. (Calculated)		**0.001** /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	7.51	609
$CaSO_4$	68.07	36.89	2,511
$CaCl_2$	55.50	279.63	15,520
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	154.43	7,354
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	3,508.70	205,119

***Milli Equivalents per Liter**

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

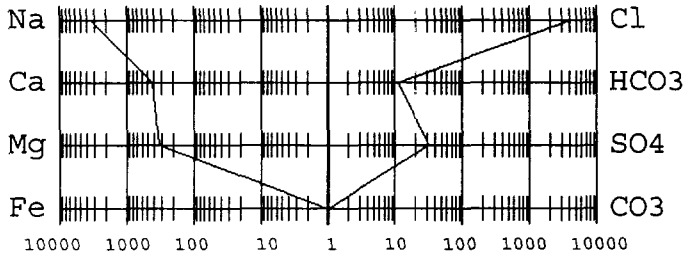
Oil Co. : **Willow Pipeline**
Lease : **O'Brien**
Well No.: **13-1**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

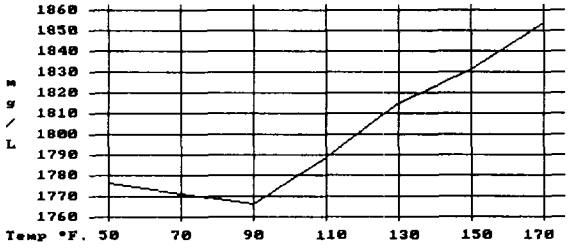
ANALYSIS

1.	pH		**6.090**		
2.	Specific Gravity 60/60 F.		**1.148**		
3.	$CaCO_3$ Saturation Index	@ 80 F.	**+1.070**		
		@ 140 F.	**+2.680**		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		**Not Present**		
5.	Carbon Dioxide		**Not Determined**		
6.	Dissolved Oxygen		**Not Determined**		
	Cations				
7.	Calcium (Ca^{++})		**8,016**	/ 20.1 =	**398.81**
8.	Magnesium (Mg^{++})		**3,829**	/ 12.2 =	**313.85**
9.	Sodium (Na^{+})	(Calculated)	**75,296**	/ 23.0 =	**3,273.74**
10.	Barium (Ba^{++})		**Not Determined**		
	Anions				
11.	Hydroxyl (OH^{-})		**0**	/ 17.0 =	**0.00**
12.	Carbonate ($CO_3^{=}$)		**0**	/ 30.0 =	**0.00**
13.	Bicarbonate (HCO_3^{-})		**669**	/ 61.1 =	**10.95**
14.	Sulfate ($SO_4^{=}$)		**1,500**	/ 48.8 =	**30.74**
15.	Chloride (Cl^{-})		**139,968**	/ 35.5 =	**3,942.76**
16.	Total Dissolved Solids		**229,278**		
17.	Total Iron (Fe)		**7**	/ 18.2 =	**0.38**
18.	Total Hardness As $CaCO_3$		**35,782**		
19.	Resistivity @ 75 F. (Calculated)		**0.001** /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L	= mg/L.
$Ca(HCO_3)_2$	81.04	10.95	887
$CaSO_4$	68.07	30.74	2,092
$CaCl_2$	55.50	357.12	19,820
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	313.85	14,946
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	3,271.79	191,269

***Milli Equivalents per Liter**

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

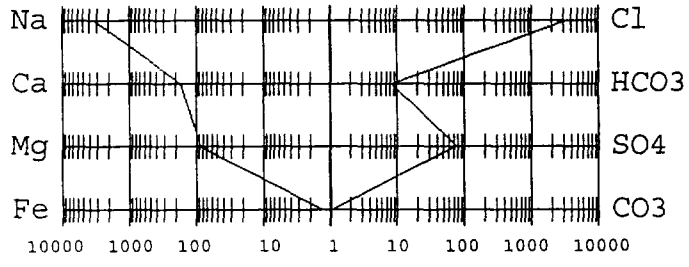
Oil Co. : **Willow Pipeline**
Lease : **O'Brien 18**
Well No.: **# 3**
Salesman:

Sample Loc. :
Formation :
Date Analyzed: **01-July-1996**

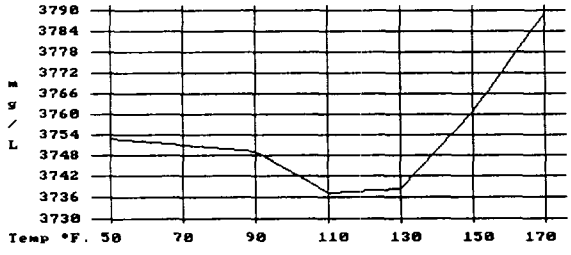
ANALYSIS

1.	pH		5.930		
2.	Specific Gravity 60/60 F.		1.135		
3.	$CaCO_3$ Saturation Index	@ 80 F.	-0.026		
		@ 140 F.	+1.074		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		Not Present		
5.	Carbon Dioxide		Not Determined		
6.	Dissolved Oxygen		Not Determined		
	Cations				
7.	Calcium (Ca^{++})		3,307	/ 20.1 =	164.53
8.	Magnesium (Mg^{++})		1,033	/ 12.2 =	84.67
9.	Sodium (Na^{+})	(Calculated)	72,610	/ 23.0 =	3,156.96
10.	Barium (Ba^{++})		Not Determined		
	Anions				
11.	Hydroxyl (OH^{-})		0	/ 17.0 =	0.00
12.	Carbonate ($CO_3^{=}$)		0	/ 30.0 =	0.00
13.	Bicarbonate (HCO_3^{-})		483	/ 61.1 =	7.91
14.	Sulfate ($SO_4^{=}$)		3,500	/ 48.8 =	71.72
15.	Chloride (Cl^{-})		117,973	/ 35.5 =	3,323.18
16.	Total Dissolved Solids		198,906		
17.	Total Iron (Fe)		23	/ 18.2 =	1.26
18.	Total Hardness As $CaCO_3$		12,511		
19.	Resistivity @ 75 F. (Calculated)		0.001 /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	7.91	641
$CaSO_4$	68.07	71.72	4,882
$CaCl_2$	55.50	84.90	4,712
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	84.67	4,032
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	3,153.61	184,360

***Milli Equivalents per Liter**

This water is somewhat corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

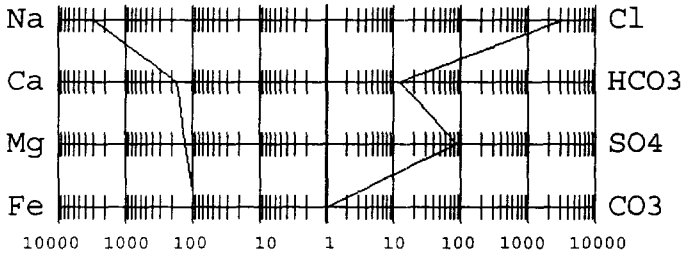
Oil Co. : **Willow Pipeline**
Lease : **O'Brien**
Well No.: **18-5**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

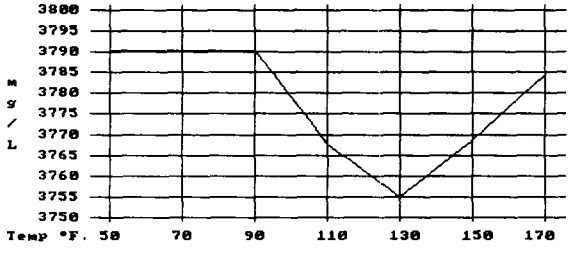
ANALYSIS

1.	pH		**6.750**		
2.	Specific Gravity 60/60 F.		**1.128**		
3.	$CaCO_3$ Saturation Index	@ 80 F.	**+0.879**		
		@ 140 F.	**+1.869**		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		**Not Present**		
5.	Carbon Dioxide		**Not Determined**		
6.	Dissolved Oxygen		**Not Determined**		
	Cations				
7.	Calcium (Ca^{++})		**3,307**	/ 20.1 =	**164.53**
8.	Magnesium (Mg^{++})		**1,520**	/ 12.2 =	**124.59**
9.	Sodium (Na^{+})	(Calculated)	**66,880**	/ 23.0 =	**2,907.83**
10.	Barium (Ba^{++})		**Not Determined**		
	Anions				
11.	Hydroxyl (OH^{-})		**0**	/ 17.0 =	**0.00**
12.	Carbonate ($CO_3^{=}$)		**0**	/ 30.0 =	**0.00**
13.	Bicarbonate (HCO_3^{-})		**722**	/ 61.1 =	**11.82**
14.	Sulfate ($SO_4^{=}$)		**4,100**	/ 48.8 =	**84.02**
15.	Chloride (Cl^{-})		**109,975**	/ 35.5 =	**3,097.89**
16.	Total Dissolved Solids		**186,504**		
17.	Total Iron (Fe)		**1,600**	/ 18.2 =	**87.91**
18.	Total Hardness As $CaCO_3$		**14,513**		
19.	Resistivity @ 75 F. (Calculated)		**0.010** /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	11.82	958
$CaSO_4$	68.07	84.02	5,719
$CaCl_2$	55.50	68.69	3,813
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	124.59	5,933
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	2,904.60	169,803

***Milli Equivalents per Liter**

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

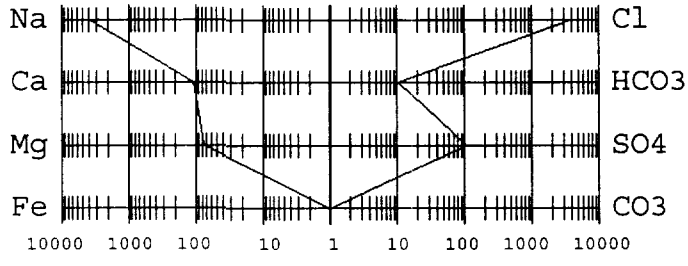
Oil Co. : **Willow Pipeline**
Lease : **O'Brien**
Well No.: **18-6**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

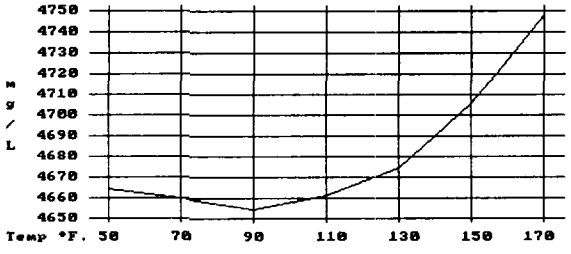
ANALYSIS

1.	pH		**6.470**		
2.	Specific Gravity 60/60 F.		**1.149**		
3.	$CaCO_3$ Saturation Index	@ 80 F.	**+0.606**		
		@ 140 F.	**+1.886**		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		**Not Present**		
5.	Carbon Dioxide		**Not Determined**		
6.	Dissolved Oxygen		**Not Determined**		
	Cations				
7.	Calcium (Ca^{++})		**2,104**	/ 20.1 =	**104.68**
8.	Magnesium (Mg^{++})		**912**	/ 12.2 =	**74.75**
9.	Sodium (Na^{+})	(Calculated)	**82,817**	/ 23.0 =	**3,600.74**
10.	Barium (Ba^{++})		**Not Determined**		
	Anions				
11.	Hydroxyl (OH^{-})		**0**	/ 17.0 =	**0.00**
12.	Carbonate ($CO_3^{=}$)		**0**	/ 30.0 =	**0.00**
13.	Bicarbonate (HCO_3^{-})		**620**	/ 61.1 =	**10.15**
14.	Sulfate ($SO_4^{=}$)		**5,100**	/ 48.8 =	**104.51**
15.	Chloride (Cl^{-})		**129,971**	/ 35.5 =	**3,661.15**
16.	Total Dissolved Solids		**221,524**		
17.	Total Iron (Fe)		**13**	/ 18.2 =	**0.71**
18.	Total Hardness As $CaCO_3$		**9,008**		
19.	Resistivity @ 75 F. (Calculated)		**0.001** /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	10.15	822
$CaSO_4$	68.07	94.53	6,435
$CaCl_2$	55.50	0.00	0
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	9.98	601
$MgCL_2$	47.62	64.78	3,085
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	3,596.38	210,244

***Milli Equivalents per Liter**

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

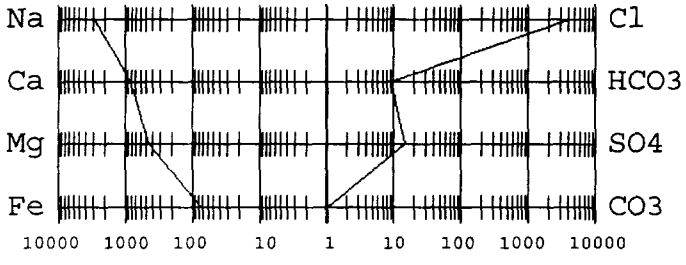
Oil Co. : **Willow Pipeline**
Lease : **O'Brien**
Well No.: **19-1**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

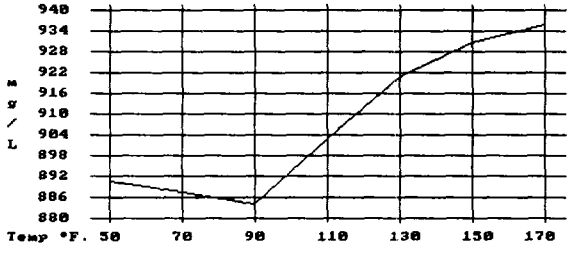
ANALYSIS

1.	pH		**5.850**		
2.	Specific Gravity 60/60 F.		**1.160**		
3.	$CaCO_3$ Saturation Index	@ 80 F.	**+1.238**		
		@ 140 F.	**+3.338**		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		**Not Present**		
5.	Carbon Dioxide		**Not Determined**		
6.	Dissolved Oxygen		**Not Determined**		
	Cations				
7.	Calcium (Ca^{++})		**16,032**	/ 20.1 =	**797.61**
8.	Magnesium (Mg^{++})		**5,349**	/ 12.2 =	**438.44**
9.	Sodium (Na^{+})	(Calculated)	**62,789**	/ 23.0 =	**2,729.96**
10.	Barium (Ba^{++})		**Not Determined**		
	Anions				
11.	Hydroxyl (OH^{-})		**0**	/ 17.0 =	**0.00**
12.	Carbonate ($CO_3^{=}$)		**0**	/ 30.0 =	**0.00**
13.	Bicarbonate (HCO_3^{-})		**527**	/ 61.1 =	**8.63**
14.	Sulfate ($SO_4^{=}$)		**700**	/ 48.8 =	**14.34**
15.	Chloride (Cl^{-})		**139,968**	/ 35.5 =	**3,942.76**
16.	Total Dissolved Solids		**225,365**		
17.	Total Iron (Fe)		**1,300**	/ 18.2 =	**71.43**
18.	Total Hardness As $CaCO_3$		**62,055**		
19.	Resistivity @ 75 F. (Calculated)		**0.001** /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	8.63	699
$CaSO_4$	68.07	14.34	976
$CaCl_2$	55.50	774.64	42,993
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	438.44	20,879
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	2,729.68	159,577

***Milli Equivalents per Liter**

This water is somewhat corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

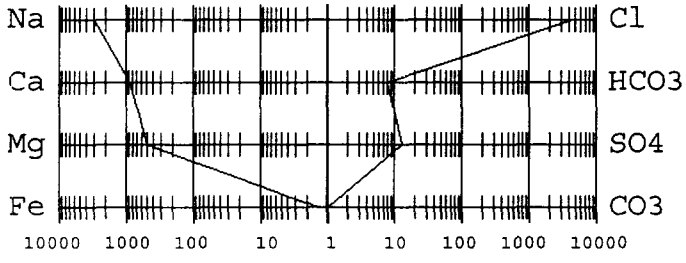
Oil Co. : **Willow Pipeline**
Lease : **O'Brien**
Well No.: **19-4**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

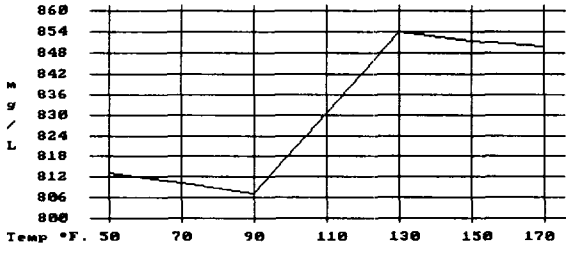
ANALYSIS

1.	pH		**5.920**		
2.	Specific Gravity 60/60 F.		**1.169**		
3.	$CaCO_3$ Saturation Index @ 80 F.		**+1.539**		
	@ 140 F.		**+3.479**		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		**Not Present**		
5.	Carbon Dioxide		**Not Determined**		
6.	Dissolved Oxygen		**Not Determined**		
	Cations				
7.	Calcium	(Ca^{++})	**16,733**	/ 20.1 =	**832.49**
8.	Magnesium	(Mg^{++})	**5,713**	/ 12.2 =	**468.28**
9.	Sodium	(Na^{+}) (Calculated)	**67,712**	/ 23.0 =	**2,944.00**
10.	Barium	(Ba^{++})	**Not Determined**		
	Anions				
11.	Hydroxyl	(OH^{-})	**0**	/ 17.0 =	**0.00**
12.	Carbonate	($CO_3^{=}$)	**0**	/ 30.0 =	**0.00**
13.	Bicarbonate	(HCO_3^{-})	**473**	/ 61.1 =	**7.74**
14.	Sulfate	($SO_4^{=}$)	**600**	/ 48.8 =	**12.30**
15.	Chloride	(Cl^{-})	**149,966**	/ 35.5 =	**4,224.39**
16.	Total Dissolved Solids		**241,197**		
17.	Total Iron (Fe)		**23**	/ 18.2 =	**1.26**
18.	Total Hardness As $CaCO_3$		**65,308**		
19.	Resistivity @ 75 F. (Calculated)		**0.001** /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L	= mg/L.
$Ca(HCO_3)_2$	81.04	7.74	627
$CaSO_4$	68.07	12.30	837
$CaCl_2$	55.50	812.45	45,091
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	0.00	0
$MgCL_2$	47.62	468.28	22,299
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	2,943.66	172,087

***Milli Equivalents per Liter**

This water is somewhat corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

Permian Treating Chemicals

WATER ANALYSIS REPORT

SAMPLE

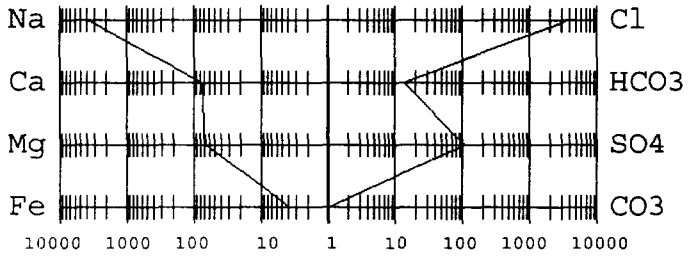
Oil Co. : **Willow Pipeline**
Lease : **O'Brien**
Well No.: **25-5**
Salesman:

Sample Loc. :
Date Reported: **21-May-1996**
Date Sampled :

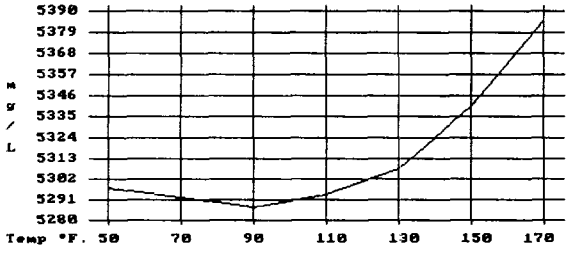
ANALYSIS

1.	pH		**6.210**		
2.	Specific Gravity 60/60 F.		**1.153**		
3.	$CaCO_3$ Saturation Index	@ 80 F.	**+0.300**		
		@ 140 F.	**+1.580**		
	Dissolved Gasses		**MG/L**	**EQ. WT.**	***MEQ/L**
4.	Hydrogen Sulfide		**Not Present**		
5.	Carbon Dioxide		**Not Determined**		
6.	Dissolved Oxygen		**Not Determined**		
	Cations				
7.	Calcium (Ca^{++})		1,503	/ 20.1 =	74.78
8.	Magnesium (Mg^{++})		790	/ 12.2 =	64.75
9.	Sodium (Na^{+})	(Calculated)	84,446	/ 23.0 =	3,671.57
10.	Barium (Ba^{++})		**Not Determined**		
	Anions				
11.	Hydroxyl (OH^{-})		0	/ 17.0 =	0.00
12.	Carbonate ($CO_3^{=}$)		0	/ 30.0 =	0.00
13.	Bicarbonate (HCO_3^{-})		781	/ 61.1 =	12.78
14.	Sulfate ($SO_4^{=}$)		5,100	/ 48.8 =	104.51
15.	Chloride (Cl^{-})		130,970	/ 35.5 =	3,689.30
16.	Total Dissolved Solids		223,590		
17.	Total Iron (Fe)		65	/ 18.2 =	3.57
18.	Total Hardness As $CaCO_3$		7,006		
19.	Resistivity @ 75 F. (Calculated)		0.001 /cm.		

LOGARITHMIC WATER PATTERN
***meq/L.**



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT.	X *meq/L =	mg/L.
$Ca(HCO_3)_2$	81.04	12.78	1,036
$CaSO_4$	68.07	61.99	4,220
$CaCl_2$	55.50	0.00	0
$Mg(HCO_3)_2$	73.17	0.00	0
$MgSO_4$	60.19	42.51	2,559
$MgCL_2$	47.62	22.24	1,059
$NaHCO_3$	84.00	0.00	0
$NaSO_4$	71.03	0.00	0
NaCl	58.46	3,667.06	214,376

***Milli Equivalents per Liter**

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

CHECKLIST for ADMINISTRATIVE INJECTION APPLICATIONS

Operator: Williams Pipeline Co. Well: O'Brien 19-8

Contact: Brian Woods Title: Permits West (Agent) Phone: 466-8120

DATE IN 9-8-97 RELEASE DATE 9-23-97 DATE OUT 10-20-97

Proposed Injection Application is for: ___ **WATERFLOOD** ___ Expansion ___ Initial

Original Order: R- _____ Y Secondary Recovery ___ Pressure Maintenance

SENSITIVE AREAS ___ **SALT WATER DISPOSAL** ___ Commercial Well

___ WIPP ___ Capitan Reef

Data is complete for proposed well(s)? Yes Additional Data Req'd _____

AREA of REVIEW WELLS

4 Total # of AOR 0 # of Plugged Wells

___ Tabulation Complete ___ Schematics of P & A's

___ Cement Tops Adequate ___ AOR Repair Required

INJECTION FORMATION

Injection Formation(s) San Andres Compatible Analysis Yes

Source of Water or Injectate Area Production

PROOF of NOTICE

___ Copy of Legal Notice ___ Information Printed Correctly

___ Correct Operators ___ Copies of Certified Mail Receipts

NO Objection Received ___ Set to Hearing _____ Date

NOTES: _____

APPLICATION QUALIFIES FOR ADMINISTRATIVE APPROVAL? Yes

COMMUNICATION WITH CONTACT PERSON:

1st Contact: ___ Telephoned ___ Letter _____ Date Nature of Discussion _____

2nd Contact: ___ Telephoned ___ Letter _____ Date Nature of Discussion _____

3rd Contact: ___ Telephoned ___ Letter _____ Date Nature of Discussion _____