CASE 6446: [redacted] OIL COMPANY FOR SALT WATER DISPOSAL, LEA COUNTY, NEW MEXICO

CASE NO.

6446

APPLICATION,

TRANSCRIPTS,

SMALL EXHIBITS,

ETC.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

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March 6, 1979

Mr. Jason Kellahin
Kellahin & Kellahin
Attorneys at Law
Post Office Box 1769
Santa Fe, New Mexico

Re: CASE NO. 6446
ORDER NO. R-5932

Applicant:

Flag-Redfern Oil Company

Dear Sir:

Enclosed herewith are two copies of the above-referenced Division order recently entered in the subject case.

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCC x
Artesia OCC x
Aztec OCC

Other

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6146
Order No. R-5932

APPLICATION OF FLAG-REDFERN OIL
COMPANY FOR SALT WATER DISPOSAL,
LEA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on February 14, 1979, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 28th day of February, 1979, the Division Director, 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 Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Flag-Redfern Oil Company, is the owner and operator of the Santa Fe Well No. 2, located in Unit D of Section 35, Township 10 South, Range 36 East, NMPM, Dickinson-San Andres Pool, Lea County, New Mexico.

(3) That the applicant proposes to utilize said well to dispose of produced salt water into the San Andres formation, with injection into the perforated interval from approximately 4,969 feet to 4,984 feet.

(4) That the injection should be accomplished through 2 3/8-inch plastic lined tubing installed in a packer set at approximately 4900 feet; that the casing-tubing annulus should be filled with an inert fluid; and that a pressure gauge or approved leak detection device should be attached to the annulus in order to determine leakage in the casing, tubing, or packer.

(5) That the injection well or system should be equipped with a pressure limiting switch or other acceptable device which will limit the wellhead pressure on the injection well to no more than 1308 psi.

(6) That the operator should notify the supervisor of the Hobbs district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(7) That the operator should 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.

(8) That approval of the subject application will prevent the drilling of unnecessary wells and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Flag-Redfern Oil Company, is hereby authorized to utilize its Santa Fe Well No. 2, located in Unit D of Section 35, Township 10 South, Range 36 East, NMPM, Dickinson-San Andres Pool, Lea County, New Mexico, to dispose of produced salt water into the San Andres formation, injection to be accomplished through 2 3/8-inch tubing installed in a packer set at approximately 4900 feet, with injection into the perforated interval from approximately 4,969 feet to 4,984 feet;

PROVIDED HOWEVER, that the tubing shall be plastic-lined; that the casing-tubing annulus shall be filled with an inert fluid; and that a pressure gauge shall be attached to the annulus or the annulus shall be equipped with an approved leak detection device in order to determine leakage in the casing, tubing, or packer.

(2) That the injection well or system shall be equipped with a pressure limiting switch or other acceptable device which will limit the wellhead pressure on the injection well to no more than 1308 psi.

(3) That the operator shall notify the supervisor of the Hobbs district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(4) That the operator shall immediately notify the supervisor of the Division's Hobbs district office of the failure of the tubing, casing, or packer, in said well or the leakage of water from or around said well and shall take such steps as may be timely and necessary to correct such failure or leakage.

(5) That the applicant shall submit monthly reports of its disposal operations in accordance with Rules 704 and 1120 of the Division Rules and Regulations.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

ca/

Dockets Nos. 7-79 and 8-79 are tentatively set for hearing on February 28 and March 14, 1979. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - FEBRUARY 14, 1979

9 A.M. - OIL CONSERVATION DIVISION CONFERENCE ROOM,
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

The following cases will be heard before Daniel S. Nutter, Examiner, or Richard L. Stamets, Alternate Examiner:

ALLOWABLE: (1) Consideration of the allowable production of gas for March, 1979, from fifteen prorated pools in Lea, Eddy, and Chaves Counties, New Mexico.

(2) Consideration of the allowable production of gas for March, 1979, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

(3) Consideration of purchaser's nominations for the one year period beginning April 1, 1979, for both of the above areas.

CASE 6445: In the matter of the hearing called by the Oil Conservation Division on its own motion to permit Consolidated Minerals Development Corporation, American Surety Company, and all other interested parties to appear and show cause why the Sarah "S" Well No. 1 located in Unit J of Section 26, Township 31 North, Range 23 East, Colfax County, New Mexico, should not be plugged and abandoned in accordance with a Division-approved plugging program.

CASE 6446: Application of Flag-Redfern Oil Company for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the San Andres formation through the perforated interval from 4,969 feet to 4,984 feet in its Santa Fe Well No. 2 located in Unit D of Section 35, Township 10 South, Range 36 East, Dickinson-San Andres Pool, Lea County, New Mexico.

CASE 6447: Application of Atlantic Richfield Company for approval of infill drilling and an unorthodox well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the drilling of its J. R. Phillips "B" Well No. 6 to be located at an unorthodox location 990 feet from the North line and 1650 feet from the West line of Section 31, Township 19 South, Range 37 East, Eumont Gas Pool, Lea County, New Mexico, is necessary to effectively and efficiently drain that portion of the previously approved 160-acre non-standard proration unit which cannot be so drained by the existing unit well.

CASE 6448: Application of Sam H. Snoddy for amendment of Order No. R-5521, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Order No. R-5521 to change the 160-acre non-standard proration unit to a 320-acre non-standard proration unit comprising the SW/4 of Section 25 and the NW/4 of Section 36, both in Township 20 South, Range 32 East, South Salt Lake Field, Lea County, New Mexico.

CASE 6449: Application of The Superior Oil Company for downhole commingling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Strawn and Morrow production in the wellbore of its Ryan Com. Well No. 1 located in Unit D of Section 5, Township 23 South, Range 27 East, South Carlsbad Field, Eddy County, New Mexico.

CASE 6450: Application of Sun Oil Company for a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for its East Millman Pool Unit Area comprising 920 acres, more or less, of Federal and state lands in Township 19 South, Range 28 East, Eddy County, New Mexico.

CASE 6451: Application of Burleson & Huff for approval of infill drilling and an unorthodox well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the drilling of its Coll A Well No. 2 to be located at an unorthodox location 1980 feet from the North line and 330 feet from the East line of Section 29, Township 25 South, Range 37 East, Jalmat Gas Pool, Lea County, New Mexico, is necessary to effectively and efficiently drain that portion of the previously approved 160-acre non-standard proration unit which cannot be so drained by the existing unit well.

CASE 6452: Application of Burleson & Huff for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the recompletion of its Harrison Well No. 2 located in Unit N or, in the alternative, the drilling of its Harrison Well No. 4 to be located in Unit L, both in Section 25, Township 24 South, Range 36 East, Jalmat Gas Pool, Lea County, New Mexico, is necessary to effectively and efficiently drain that portion of the previously approved 160-acre non-standard proration unit which cannot be so drained by the existing unit well.

CASE 6453: Application of Moranco for downhole commingling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Blinebry and Drinkard production in the wellbore of its EM Elliott Well No. 1 located in Unit E of Section 35, Township 21 South, Range 37 East, Lea County, New Mexico.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
State Land Office Building
Santa Fe, New Mexico
14 February 1979

EXAMINER HEARING

IN THE MATTER OF:

Application of Flag-Redfern Oil Company for salt water disposal, Lea County, New Mexico. CASE 6446

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: Lynn Teschendorf, Esq.
Legal Counsel for the Division
State Land Office Bldg.
Santa Fe, New Mexico 87503

For the Applicant: Jason Kellahin, Esq.
KELLAHIN & KELLAHIN
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Santa Fe, New Mexico 87501

I N D E X

STEVE ROSSLER

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Applicant Exhibit Two, Log 22

MR. NUTTER: Call next Case 6446.

MS. TESCHENDORF: Case 6446. Application of Flag-Redfern Oil Company for salt water disposal, Lea County, New Mexico.

MR. KELLAHIN: If the Examiner please, Jason Kellahin, appearing on behalf of the applicant. We have one witness to be sworn.

(Witness sworn.)

STEVE ROSSLER

being called as a witness and having been duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Would you state your name, please?

A. My name is Steve Rossler. I'm employed by Flag-Redfern Oil Company in Midland, Texas, as a petroleum engineer.

Q. Have you ever testified before the Oil Conservation Division or one of its examiners, Mr. Rossler?

A. Yes, sir, I have.

Q. And your qualifications are a matter of record?

A. Yes, sir.

MR. KELLAHIN: Are the witness' qualifications acceptable, Mr. Nutter?

MR. NUTTER: Yes, they are.

Q (Mr. Kellahin continuing.) Mr. Rorsler, are you familiar with the application of Flag-Redfern in Case Number 6446?

A Yes, sir, I am.

Q What does the applicant propose in this case?

A We propose to apply for a permit for salt water disposal in our Dickinson-San Andres Field, Lea County, New Mexico.

Q And would you give the location of the subject well?

A Okay. The subject well is located in Unit D, 660 feet from the north line, 660 feet from the west line, Section 35, Township 10 South, Range 36 East, Lea County, New Mexico.

Q Now, you are referring at the moment to what has been marked as Flag-Redfern's Exhibit Number One, is that correct?

A That is correct. It's on page two.

Q What other information is shown on that?

A Okay. Other information shown on page two, which is the application to dispose, or New Mexico Form C-108, also shows all the casing strings in the well, cement

calculated tops of cement and circulated cops of cement, my proposed injection zone, top of the formation, current perforations, squeezed off perforations, my anticipated injection volume of salt water, minimum/maximum, my approximate pressure. There is a discrepancy in this 1308 figure, which I will wish to talk about as we progress. And then, of course, the offset operators and the surface owner notification.

Q. So the offset operators have all been notified in this case, is that correct?

A. Yes, sir, that's correct. The offset operators have been notified and on page nine through eleven I've got three waivers from Reed and Stevens, Stevens, Incorporated, from Lawrence C. Harris, and also from MGF Oil Corporation.

Q. And those are the offset operators, are they not?

A. Yes, sir, that is correct.

Q. Now, referring to page three of your Exhibit Number One, would you identify that exhibit?

A. Okay, page three of the exhibit is just a sheet of pertinent information regarding the application. Of course my [illegible] the San Andres. I wish to dispose of produced San Andres water through the current perforations which are listed, 4969 to 84. I again repeat,

my maximum and minimum barrels of disposable fluid per day, and I also list the wells that will be tied into this system, which will consist of five wells. Two wells will be operated by Flag-Redfern Oil Company; the remaining three by Reed and Stevens.

Q Now what's the status of those wells at the present time?

A At the present time Flag-Redfern Oil Company wells, both are producing, No. 1 and 3. On the Reed and Stevens, Incorporated, they have the one well, the Santa Fe No. 4, which is currently producing and has an allowable. Their other two wells, consisting of the Fawn Cherry No. 1 and the Santa Fe No. 5, these wells are listed as having a temporary completion with suspended operation.

Now, it is my understanding from talking with Reed and Stevens that these wells will be completed. Right now they are evaluating their completions due to the high water production they have from both wells. It's my firm understanding there that they're waiting to see if they have an economical way to get rid of their disposal water before they complete these two wells.

Q What's currently being done with the produced water?

A The produced water is currently being hauled by commercial sources there to approved brine stations

there at a cost of $.95 a barrel.

Q. Now referring to what has been marked as Exhibit Number -- as page number four of Exhibit One, would you identify that?

A. Page number four is a report of water analysis from the proposed disposal well, the Santa Fe No. 2, and let me emphasize that this water analysis was taken one day after the initial stimulation job on the well, so therefore it shows slight remnants of the acid job performed on the well.

I have page five, which is a current water analysis of the San Andres water from all three wells. This was taken from a stock tank, from the water -- water storage tank, excuse me.

Q. This is the produced water from the subject wells, is this --

A. Yes, sir, that is correct.

Q. Now, page six, what does that show?

A. Page six is an area plat showing the proposed disposal well, and all wells within one-half mile radius, and also a two-mile radius.

There are five wells within one-half mile radius, including the disposal well.

Q. Then referring to pages -- page seven, would you identify that for me?

A. Page seven is a proposed well profile of the disposal well. It shows all casing strings, cement. It also shows the proposed disposal string, which is 2-3/8ths internally plastic-coated tubing with a Baker Lokset packer, a packer designed to hold pressure from either direction. It shows the depth on the packer setting and also the currently open perforations there.

We do not propose to open up any more zones in this well for disposal.

Q. Now will you inject -- you say it's internally coated tubing set in a packer. Will the annulus be filled with an inert fluid?

A. The annulus will be filled with an inert fluid. There will also be a pressure gauge on the annulus, 2-3/8ths by 4-1/2 annulus there, so that packer leakage or tubing holes, holes in tubing, can be noticed quickly.

Q. In your opinion will this well as it is presently completed fully protect any producing zones or fresh water zones?

A. Yes, sir, I believe it will fully protect those.

Q. Now referring to page eight of the Exhibit One, would you identify that, please?

A. Page eight is a location plat of the proposed well. Notice that it says operator, Hanson Oil Corporation.

They applied for the permit but the well was drilled by Flag-Redfern Oil Company once Flag-Redfern Oil Company took over operations of this Santa Fe lease.

Q. You've already testified as to pages nine, ten, and eleven, as being waivers from the offset operators.

A. That is correct.

Q. Referring to page twelve of the Exhibit, would you discuss the information shown on that?

A. Page twelve is the tabular summary of all wells within one-half mile radius of the proposed salt water disposal well. It gives their locations, their total depths, their producing formation and interval. Incidentally, all wells are producing or have completion in the San Andres formation only.

I also show surface casing and cement, production casing and cement, and multi-stage cement jobs.

That consists of page twelve and it continues to page thirteen.

Also I've included the Reed and Stevens Santa Fe Well No. 4, which is over one-half mile from the proposed disposal well but it's -- I consider it to be an integral part of the disposal-affected area.

Q. Now in your opinion will the casing and cementing program on the offsetting wells protect the producing zones and fresh water zones and prohibit any migration

of fluids into those zones?

A. Of the --

Q. Could you have a breakthrough as a result of injection, is what I'm saying?

A. As a result of the injection we should not have a breakthrough in the San Andres zone there. All fluids should be contained to the San Andres zone.

Q. Is there any possibility of migration upward from the wellbores of these offsetting wells as they are completed?

A. As they are completed now, no, but let me mention there, which I'm sure the Examiner can see by reading on the two wells by Reed and Stevens there, they have DV tools set in their casing strings but they did not have cement from those DV tools to the surface there, and until they are sure they're going to make a completion there, they're going to leave the DV -- not DV's, it's a multi-stage cement tool uncemented there.

MR. NUTTER: Well, that's on the two wells, the No. 1 and 5, they do -- they have two-staged a couple of the other wells, though, haven't they?

A. Yes, sir. Their completion, they have second-staged it and they have protected all zones from the Rustler anhydrite to the surface, so fresh water will be protected there.

Q. Now, in the event these --

MR. NUTTER: And you've two-staged your Santa Fe No. 3, apparently, too.

A. Yes, sir. At the time, apparently when the regulations were changed there to include protection from the Rustler anhydrite to the surface is when we applied and drilled for this Well No. 3, and that's -- that's the reason for that well being circulated to the surface.

MR. NUTTER: I just noticed that the subject well, as well as the Flag-Redfern No. 1, do not have any cement across the salt.

A. That is correct.

MR. NUTTER: Okay, go ahead.

Q. (Mr. Kellahin continuing.) Now, turning to page fourteen on the Exhibit, would you discuss the information on that, please?

A. Page fourteen is a fracture gradient table which was prepared from the results of initial stimulation of all six wells in the immediate area.

Now, I'm listing the wells, the top perforations in the San Andres, date of stimulation, surface pressure required to break formation. Now this is the pressure with acid on the formation face that the zone finally accepts the fluid. The job was done and the next column, instant shut-in pressure was the minute the pumps were shut

down there; this gives an instant shut-in pressure, which by using this figure there and being able to calculate the hydrostatic head of the fluid in the tubing, I'm able to come up with a formation fracture pressure, next column.

I've listed this for each of the six wells.

The next column is the formation fracture gradient, which is nothing more than the fracture pressure divided by the depth to the top of the perforation in psi per foot.

Okay, my next column, assuming that I have San Andres disposal water in my tubing instead of the two percent KCL water and/or oil, as was displaced in the acid jobs on the wells, my calculated surface shut-in pressure for each well is listed, starting from the disposal well at 1100 -- I'm sorry, 1,116 to 2214. This is the pressure that I will have on the surface there for a column of produced San Andres salt water in the tubing before I breakdown -- before I fracture the San Andres formation.

The next column is the surface shut-in gradient that this pressure on the surface will yield.

What I've done, I've taken a field average, including the five wells within the one-half mile area. I have left out the sixth well, Santa Fe Well No. 4, because not only -- it's out of the half-mile radius, but also it has a much higher formation fracture pressure than any of

the other wells.

I've taken this field average to -- which calculates out that my formation fracture pressure average for the half-mile area is 4,027 pounds; formation fracture pressure of .813 psi per foot, which means for an average well before the formation is fractured under static shut-in pressure conditions I will have 1550 pound[illegible]he tubing. That would give me a surface shut-in grad[illegible]f .314.

The next item is I go back to the disposal well because the depth is different than the average depth to the top of the San Andres in the field, and I've taken the same formation fracture pressure, 4,027, and I've come up with, under static conditions, before the San Andres formation is fractured, with a full load of San Andres water in my tubing, I have shut-in tubing pressure of 1547 psig, which gives me a gradient of .311 psi per foot, which in my understanding is over what is allowed without a hearing in New Mexico.

Q. Now, page fifteen covers the information you've just discussed, does it not?

A. Yes, it does.

Q. Do you have anything to add to that?

A. No, sir.

Q. Now turning to page sixteen of the Exhibit, would you discuss that information, please?

A. Page sixteen is my friction table. What I'm showing on this table is, on the very lefthand column my injection rate in barrels per minute, I list rates from 1/4 barrel a minute to 1-3/4 barrels per minute.

The next three columns are calculations and variables, which I'll explain on the next page, to arrive at my last column on the extreme right, which is my friction pressure that will be incurred under the various disposal rates listed that they correspond to.

In other words, what I'm saying there, is I'm going to have six pounds pressure there at the surface when I'm disposing of 1/4 barrel a minute, and I'll have an extra 223 pounds at the surface if my disposal rate is 1-3/4 barrels per minute.

This friction pressure has nothing to do with bottom hole formation pressure there. It's energy loss there and therefore I've calculated out to show that with an increase in surface injection pressure, by this friction pressure I don't modify the formation pressure at all.

Q Now, page seventeen-A, would you discuss that information? Is that just an explanation of how you arrived at the figures on page sixteen?

A Yes, sir. Page seventeen-A, I'm showing how I calculated my friction losses, using the Fanning

friction equation, which is listed, and also I calculated Reynolds numbers for each disposal rate there. I list my reference, and these two calculations are the third and the fourth columns listed on page sixteen.

Seventeen-B is the friction curve there that I used applying my Fanning friction factors in my reference.

Q. And that is the source of your tabulation on page sixteen?

A. Yes, sir, that is correct.

Q. Now turn to page eighteen, would you identify that, please?

A. Page eighteen is my calculated surface injection pressure. This is really one of my -- this is really the whole gist of the application. This is what I'm asking for.

I've listed my injection rates in barrels per minute. It ranges from 1/4 to 1-3/4 barrels per minute.

The next column is my calculated friction pressure, which we just previously talked about.

The next column is my calculated instant shut-in surface pressure, which comes from my fracture gradient table on page fourteen.

The last column is my calculated surface injection pressure in psig. This table shows the various disposal rates, what my wellhead -- what my disposal well-

head pressure should be before the San Andres formation is fractured.

Q. This is your surface pressure, is that correct?

A. This is my surface pressure. That is correct.

Q. Now, what surface pressure do you anticipate using in this particular well, or do you want to reserve that until later?

A. I will make just a few comments on it. This well has produced 60,000 barrels total fluid. Of that, 58,000 is water. Now, when disposal operations are started there, I don't anticipate even having to dispose at 1000 pounds, due to the void in the formation, but as I start filling the void left from the production of the well there, my pressures will start to climb there, and the reason I'm asking for these pressures here, these are -- these are the maximum pressures that I think should ever be imposed upon the well before -- maximum pressures; otherwise, I fracture the San Andres formation there.

To ask for a lower pressure at this time and have to come back six months later and ask for another increase in pressure would require another hearing, so I'm asking for the complete pressure now.

Q. Now, you're talking about disposing of 50 to

100 barrels of water per day. Why do you need that excessive -- higher rate of pressure; not excessive?

A. I need the higher rate of disposal in barrels per minute due to the fact that this field is not under electrification, so my disposal pump will be run by natural gas engine and I propose to dispose of my fluid during the three hours that my pumper for the lease is there, so that he can see any problems with the system, or leaks, or anything else there. The system will not be automated, so therefore I propose to dispose of my fluid in a short period of time.

I will have a kill switch attached to this gas engine there that will be operated off of high pressure there, which will limit my wellhead pressure and also, of course, low tank level, low tank level fluids.

Q. Then in the operation of this lease you'll accumulate the produced water in tanks and then dispose of it on a daily basis for a short period of time. Is this what you're saying?

A. Yes, sir, that is correct.

Q. It will just be an intermittent injection and not the regular straight injection?

A. No, sir, it will not be a steady injection as in waterflood.

Q. And in your opinion, as I understand your

testimony, the surface pressures which you're proposing to use will not fracture the formation?

A. They will not fracture the formation.

Q. Now turning to page nineteen of your Exhibit, will you discuss that information, please?

A. Page nineteen is the structure map contoured on the top of the PI zone, San Andres PI zone, for the Dickinson Field.

The PI zone is a marker that's approximately 170 feet above the San Andres porosity.

Q. Page twenty of the exhibit?

A. Page twenty is a north-south cross section for the Dickinson-San Andres Field. Opening up the cross section, you'll see by the index map where the line of section goes. The disposal well is the second from the left, and on this cross section I am showing top of the San Andres PI zone, which I described on the structure map, and also the top of the San Andres porosity, which the wells are completed in, the top of their completions.

Q. Now Exhibit Number 21, would you identify that exhibit?

A. Exhibit 21 is a west-east cross section for this same field, showing the same data. The disposal well is the first log, first well on the left.

I'm sorry, it's the center.

Q. Okay. Now referring to Exhibit Number 22, would you identify that exhibit, please?

A. Exhibit 22 is a production history of Flag-Redfern Oil Company's Santa Fe lease from the time the first well was drilled up until January of '79. It shows barrels of oil, Mcf of gas, barrels of water.

Q. And Exhibit 23, page twenty-three?

A. Exhibit page 23 is production histo[illegible] for the proposed disposal well, the Santa Fe Well No. 2. It shows the same data, oil production, gas production, and water production.

Q. And page twenty-four?

A. Page twenty-four is a graph of the production history of the Santa Fe lease. It's just -- it's a graph of page twenty-two.

Q. And then page twenty-five?

A. Twenty-five is a graph of the production of the proposed disposal well, showing the same information described on page twenty-three.

Q. Now, referring to page twenty-six of the Exhibit, and subsequent pages, what are they designed to show?

A. Page twenty-six through page thirty-one, which is the last of my exhibit, show the treating reports there for the initial stimulation of the wells in a 1/2-mile circle

Let me note that I had the actual report on Flag-Redfern's wells, wells which is on 26, 27, 28. The Reed and Stevens wells, the only report I have is on their daily drilling report.

These treating reports is where I came up with my instant shut-in -- where I took my instant shut-in pressures there to calculate my fracture, formation fracture table.

Q And they are your supporting data for your fracture information and pressure information?

A Yes, sir, that is correct.

Q Now, in your opinion, Mr. Rossler, will the approval of this application result in the production of oil that would not otherwise be recovered?

A There is a good possibility that this salt water disposal project, while it's being applied for as a disposal well, is actually a pilot waterflood, because it is disposing of water into the same zone that the surrounding wells produce from, so I do expect, if nothing is fractured, to see a reasonable response from my disposal operation.

Q But if you have to continue trucking water at $.90 a barrel, would that cause premature abandonment of this lease?

A Yes, sir, that is definitely correct there. That is what's keeping Reed and Stevens right now from pro-

ducing their wells.

Q. Now, if -- is it a practical solution to set up some kind of injection system that operated full time at lower pressures?

A. At this time it would not be practical to set up such a system there due to the fact there that we need to bring electricity on the lease there and we're -- we're only applying for one well now and unless future conditions change, we'll just have one disposal well in the field. I think at this time it would be unwise there to try to actually waterflood this formation with a strict adherence to constant injection rates.

Q. Now, turning to what has been marked as Exhibit Number Two, would you identify that exhibit?

A. Exhibit Number Two is a log of the proposed disposal well, the Santa Fe No. 2. I have the perforations marked on the small scale, 1-inch scale, and the perforations marked on the detailed 5-inch scale.

These are perforations that are currently open in the well and these are perforations we propose to dispose through.

Q. Were Exhibits One and Two prepared by you or under your supervision?

A. Yes, sir, they were.

MR. KELLAHIN: At this time I'll offer Ex-

hibits One and Two.

MR. NUTTER: Applicant's Exhibits One and Two will be admitted in evidence.

Q Do you have anything to add, Mr. Rossler?

A Just on -- with the enclosed packet on your left the first page is just describing the docket. The second page is the whole -- a short summary of the entire application there. It's reiterating there that I'm asking for a surface injection pressure of .311 psi per foot.

And it's also showing my range of disposal rates and pressure.

Q But your present request is for pressure gradient of .311.

A Yes, sir, that is correct, surface injection pressure gradient.

MR. KELLAHIN: That's all we have, Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Rossler, with respect to page fourteen of your Exhibit Number One, I don't understand the botton line here. We know that the actual formation fracture pressure in this Santa Fe No. 2 is 3596. Now how do you arrive at the 4027 down at the bottom?

A Okay, how I arrived here, I've taken each of

the wells in the area there and based on the formula on the next page there, and from their instant shut-in pressures from the initial stimulation, which is when I'm going to get the best data that I'm going to get on that well I determined that, yes.

Q. Okay, you've got instantaneous shut-ins on all of the wells.

A. Yes, sir.

Q. And you have calculated the formation fracture pressure on all the wells.

A. Yes, sir.

Q. But you average it and come out with 4027.

A. Yes, sir. That's for the --

Q. Now --

A. That's for the -- that's my average with all five wells taken together there.

Q. I understand that. Okay, then you come over to your next column, which is the .813. Now I'm reading the second line from the bottom.

A. Oh, okay, yes, sir.

Q. Excluding the Santa Fe Well No. 4, your average is .813 for the gradient, is that correct?

A. Right. Yes, sir, that's correct.

Q. Now what is this next line down here, this .810, how is that derived?

A. Okay, how that's derived, the last line, my disposal well, the depth to the top of the San Andres perforations is lower than the average depth to the top of the perforations for the other five wells; therefore, when you divide the formation fracture pressure 4027 by 4969, you get .810.

Q. In other words, you're taking the -- you're taking the average formation fracture pressure and then decreasing that average because your injection well is less than average.

A. Well, I'm decreasing it there just due to the fact of the 17 foot difference --

Q. Uh-huh.

A. -- in the top of the disposal zone in the proposed well, San Andres.

Q. Now, isn't it a fact, however, that of these six wells that we've got in the pool, the formation fracture pressure in the subject well is the smallest of all? It's the lowest of all?

A. That is correct.

Q. And isn't that where the injection is going to take place?

A. That is correct, yes, sir.

Q. Shouldn't we be looking at the formation in the vicinity of the injection well rather than looking at

the formation in the vicinity of a well that's a mile away?

A. Yes, sir. Initially that area around the well is the only well that will be affected, but as the disposal progresses there, in years there, assuming no fracture around the wellbore of this Santa Fe No. 2, this disposal front is going to start influencing on the other wells of the field there.

Q. How can we be sure that there will be no fracturing if we're going to exceed the fracture pressure at the wellbore?

A. Okay, at the wellbore, as I believe I commented on earlier, it won't -- we're not looking at even 1500 pounds there initially when we start off disposing there at less pressure.

Q. Mr. Rossler, have you taken the figures that you've obtained here for the top line, being the fracture pressure and the gradient and the calculated shut-in pressure and the shut-in gradient for the Santa Fe No. 2 and gone through all of these formulas that you've got on pages sixteen through -- fifteen through eighteen, I guess it is, and come up with a calculated surface pressure for the injection well only?

A. Yes, sir, I'm sorry I didn't come back to it, that's on page two, which is the Form C-108, which is 1308 psi.

Q So that's where that 1303 came from.

A Yes, sir, that's -- that's the discrepancy right there.

Q And that calculates the --

A That will include the friction.

Q Does that include the friction?

A It includes friction, yes, sir.

Q So instead of having 1771, I think it was, we'd have 1308 for the injection well itself.

A For the injection well itself, yes, sir.

Q And you're anticipating a necessity for going up to the 1771 because you'll be disposing of 101 barrels of water in approximately three hours rather than on a 24-hour basis?

A Mr. Examiner, 1-3/4 barrels a minute will be the maximum rate that will ever be disposed down that well.

Q How much water could you get in at 1771 at 1-3/4 barrels per minute in three hours?

A You'll get all the water in there before an hour's gone, a 100 barrels.

Q Within ah hour?

A Yes, sir. Why I've looked at these varying disposal rates ranging from a quarter to one and three-quarter there, we don't have as of yet purchased a disposal pump there and I'm trying to leave myself enough leeway.

I'm estimating there that we're going to be disposing between one and one and a quarter barrels a minute, is what I'm estimating there.

MR. NUTTER: Are there any further questions of Mr. Rossler? He may be excused.

Do you have anything further, Mr. Kellahin?

MR. KELLAHIN: That's all we have, Mr. Nutter. Thank you.

MR. NUTTER: Does anyone have anything they wish to offer in Case Number 6446?

We'll take the case under advisement.

(Hearing concluded.)

SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
Santa Fe, New Mexico 87501

REPORTER'S CERTIFICATE

I, SALLY W. BOYD, a Court Reporter, DO HEREBY CERTIFY that the attached and foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability, skill, and knowledge, from my notes taken at the time of the hearing.

Sally W. Boyd C.S.R.
Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6446 heard by me on 7/14, 1978.

, Examiner
Oil Conservation Division

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
State Land Office Building
Santa Fe, New Mexico
14 February 1979

EXAMINER HEARING

IN THE MATTER OF:

Application of Flag-Redfern Oil Company for salt water disposal, Lea County, New Mexico.

CASE 6446

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: Lynn Teschendorf, Esq.
Legal Counsel for the Division
State Land Office Bldg.
Santa Fe, New Mexico 87503

For the Applicant: Jason Kellahin, Esq.
KELLAHIN & KELLAHIN
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Santa Fe, New Mexico 87501

I N D E X

STEVE ROSSLER

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Applicant Exhibit Two, Log 22

MR. NUTTER: Call next Case 6446.

MS. TESCHENDORF: Case 6446. Application of Flag-Redfern Oil Company for salt water disposal, Lea County, New Mexico.

MR. KELLAHIN: If the Examiner please, Jason Kellahin, appearing on behalf of the applicant. We have one witness to be sworn.

(Witness sworn.)

STEVE ROSSLER

being called as a witness and having been duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A My name is Steve Rossler. I'm employed by Flag-Redfern Oil Company in Midland, Texas, as a petroleum engineer.

Q Have you ever testified before the Oil Conservation Division or one of its examiners, Mr. Rossler?

A Yes, sir, I have.

Q And your qualifications are a matter of record?

A Yes, sir.

MR. KELLAHIN: Are the witness' qualifications acceptable, Mr. Nutter?

MR. NUTTER: Yes, they are.

Q (Mr. Kellahin continuing.) Mr. Rossler, are you familiar with the application of Flag-Redfern in Case Number 6446?

A Yes, sir, I am.

Q What does the applicant propose in this case?

A We propose to apply for a permit for salt water disposal in our Dickinson-San Andres Field, Lea County, New Mexico.

Q And would you give the location of the subject well?

A Okay. The subject well is located in Unit D, 660 feet from the north line, 660 feet from the west line, Section 35, Township 10 South, Range 36 East, Lea County, New Mexico.

Q Now, you are referring at the moment to what has been marked as Flag-Redfern's Exhibit Number One, is that correct?

A That is correct. It's on page two.

Q What other information is shown on that?

A Okay. Other information shown on page two, which is the application to dispose, or New Mexico Form C-108, also shows all the casing strings in the well, cement,

calculated tops of cement and circulated tops of cement, my proposed injection zone, top of the formation, current perforations, squeezed off perforations, my anticipated injection volume of salt water, minimum/maximum, my approximate pressure. There is a discrepancy in this 1308 figure, which I will wish to talk about as we progress. And then, of course, the offset operators and the surface owner notification.

Q So the offset operators have all been notified in this case, is that correct?

A Yes, sir, that's correct. The offset operators have been notified and on page nine through eleven I've got three waivers from Reed and Stevens, Stevens, Incorporated, from Lawrence C. Harris, and also from MGF Oil Corporation.

Q And those are the offset operators, are they not?

A Yes, sir, that is correct.

Q Now, referring to page three of your Exhibit Number One, would you identify that exhibit?

A Okay, page three of the exhibit is just a sheet of pertinent information regarding the application. Of course my disposal zone is in the San Andres. I wish to dispose of produced San Andres water through the current perforations which are listed, 4969 to 84. I again repeat,

my maximum and minimum barrels of disposable fluid per day, and I also list the wells that will be tied into this system, which will consist of five wells. Two wells will be operated by Flag-Redfern Oil Company; the remaining three by Reed and Stevens.

Q Now what's the status of those wells at the present time?

A At the present time Flag-Redfern Oil Company wells, both are producing, No. 1 and 3. On the Reed and Stevens, Incorporated, they have the one well, the Santa Fe No. 4, which is currently producing and has an allowable. Their other two wells, consisting of the Fawn Cherry No. 1 and the Santa Fe No. 5, these wells are listed as having a temporary completion with suspended operation.

Now, it is my understanding from talking with Reed and Stevens that these wells will be completed. Right now they are evaluating their completions due to the high water production they have from both wells. It's my firm understanding there that they're waiting to see if they have an economical way to get rid of their disposal water before they complete these two wells.

Q What's currently being done with the produced water?

A The produced water is currently being hauled by commercial sources there to approved brine stations

there at a cost of $.95 a barrel.

Q. Now referring to what has been marked as Exhibit Number -- as page number four of Exhibit One, would you identify that?

A. Page number four is a report of water analysis from the proposed disposal well, the Santa Fe No. 2, and let me emphasize that this water analysis was taken one day after the initial stimulation job on the well, so therefore it shows slight remnants of the acid job performed on the well.

I have page five, which is a current water analysis of the San Andres water from all three wells. This was taken from a stock tank, from the water -- water storage tank, excuse me.

Q. This is the produced water from the subject wells, is this --

A. Yes, sir, that is correct.

Q. Now, page six, what does that show?

A. Page six is an area plat showing the proposed disposal well, and all wells within one-half mile radius, and also a two-mile radius.

There are five wells within one-half mile radius, including the disposal well.

Q. Then referring to pages -- page seven, would you identify that for me?

A. Page seven is a proposed well profile of the disposal well. It shows all casing strings, cement. It also shows the proposed disposal string, which is 2-3/8ths internally plastic-coated tubing with a Baker Lokset packer, a packer designed to hold pressure from either direction. It shows the depth on the packer setting and also the currently open perforations there.

We do not propose to open up any more zones in this well for disposal.

Q. Now will you inject -- you say it's internally coated tubing set in a packer. Will the annulus be filled with an inert fluid?

A. The annulus will be filled with an inert fluid. There will also be a pressure gauge on the annulus, 2-3/8ths by 4-1/2 annulus there, so that packer leakage or tubing holes, holes in tubing, can be noticed quickly.

Q. In your opinion will this well as it is presently completed fully protect any producing zones or fresh water zones?

A. Yes, sir, I believe it will fully protect those.

Q. Now referring to page eight of the Exhibit One, would you identify that, please?

A. Page eight is a location plat of the proposed well. Notice that it says operator, Hanson Oil Corporation.

They applied for the permit but the well was drilled by Flag-Redfern Oil Company once Flag-Redfern Oil Company took over operations of this Santa Fe lease.

Q You've already testified as to pages nine, ten, and eleven, as being waivers from the offset operators.

A That is correct.

Q Referring to page twelve of the Exhibit, would you discuss the information shown on that?

A Page twelve is the tabular summary of all wells within one-half mile radius of the proposed salt water disposal well. It gives their locations, their total depth, their producing formation and interval. Incidentally, all wells are producing or have completion in the San Andres formation only.

I also show surface casing and cement, production casing and cement, and multi-stage cement jobs.

That consists of page twelve and it continues to page thirteen.

Also I've included the Reed and Stevens Santa Fe Well No. 4, which is over one-half mile from the proposed disposal well but it's -- I consider it to be an integral part of the disposal-affected area.

Q Now in your opinion will the casing and cementing program on the offsetting wells protect the producing zones and fresh water zones and prohibit any migration

of fluids into those zones?

A. Of the --

Q. Could you have a breakthrough as a result of injection, is what I'm saying?

A. As a result of the injection we should not have a breakthrough in the San Andres zone there. All fluids should be contained to the San Andres zone.

Q. Is there any possibility of migration upward from the wellbores of these offsetting wells as they are completed?

A. As they are completed now, no, but let me mention there, which I'm sure the Examiner can see by reading on the two wells by Reed and Stevens there, they have DV tools set in their casing strings but they did not have cement from those DV tools to the surface there, and until they are sure they're going to make a completion there, they're going to leave the DV -- not DV's, it's a multi-stage cement tool uncemented there.

MR. NUTTER: Well, that's on the two wells, the No. 1 and 5, they do -- they have two-staged a couple of the other wells, though, haven't they?

A. Yes, sir. Their completion, they have second-staged it and they have protected all zones from the Rustler anhydrite to the surface, so fresh water will be protected there.

Q Now, in the event these --

MR. NUTTER: And you've two-staged your Santa Fe No. 3, apparently, too.

A Yes, sir. At the time, apparently when the regulations were changed there to include protection from the Rustler anhydrite to the surface is when we applied and drilled for this Well No. 3, and that's -- that's the reason for that well being circulated to the surface.

MR. NUTTER: I just noticed that the subject well, as well as the Flag-Redfern No. 1, do not have any cement across the salt.

A That is correct.

MR. NUTTER: Okay, go ahead.

Q (Mr. Kellahin continuing.) Now, turning to page fourteen on the Exhibit, would you discuss the information on that, please?

A Page fourteen is a fracture gradient table which was prepared from the results of initial stimulation of all six wells in the immediate area.

Now, I'm listing the wells, the top perforations in the San Andres, date of stimulation, surface pressure required to break formation. Now this is the pressure with acid on the formation face that the zone finally accepts the fluid. The job was done and the next column, instant shut-in pressure was the minute the pumps were shut

down there; this gives an instant shut-in pressure, which by using this figure there and being able to calculate the hydrostatic head of the fluid in the tubing, I'm able to come up with a formation fracture pressure, next column.

I've listed this for each of the six wells.

The next column is the formation fracture gradient, which is nothing more than the fracture pressure divided by the depth to the top of the perforation in psi per foot.

Okay, my next column, assuming that I have San Andres disposal water in my tubing instead of the two percent KCL water and/or oil, as was displaced in the acid jobs on the wells, my calculated surface shut-in pressure for each well is listed, starting from the disposal well at 1100 -- I'm sorry, 1,116 to 2214. This is the pressure that I will have on the surface there for a column of produced San Andres salt water in the tubing before I breakdown -- before I fracture the San Andres formation.

The next column is the surface shut-in gradient that this pressure on the surface will yield.

What I've done, I've taken a field average, including the five wells within the one-half mile area. I have left out the sixth well, Santa Fe Well No. 4, because not only -- it's out of the half-mile radius, but also it has a much higher formation fracture pressure than any of

the other wells.

I've taken this field average to -- which calculates out that my formation fracture pressure average for the half-mile area is 4,027 pounds; formation fracture pressure of .813 psi per foot, which means for an average well before the formation is fractured under static shut-in pressure conditions I will have 1550 pounds on the tubing. That would give me a surface shut-in gradient of .314.

The next item is I go back to the disposal well because the depth is different than the average depth to the top of the San Andres in the field, and I've taken the same formation fracture pressure, 4,027, and I've come up with, under static conditions, before the San Andres formation is fractured, with a full load of San Andres water in my tubing, I have shut-in tubing pressure of 1547 psig, which gives me a gradient of .311 psi per foot, which in my understanding is over what is allowed without a hearing in New Mexico.

Q. Now, page fifteen covers the information you've just discussed, does it not?

A. Yes, it does.

Q. Do you have anything to add to that?

A. No, sir.

Q. Now turning to page sixteen of the Exhibit, would you discuss that information, please?

A. Page sixteen is my friction table. What I'm showing on this table is, on the very lefthand column my injection rate in barrels per minute, I list rates from 1/4 barrel a minute to 1-3/4 barrels per minute.

The next three columns are calculations and variables, which I'll explain on the next page, to arrive at my last column on the extreme right, which is my friction pressure that will be incurred under the various disposal rates listed that they correspond to.

In other words, what I'm saying there, is I'm going to have six pounds pressure there at the surface when I'm disposing of 1/4 barrel a minute, and I'll have an extra 223 pounds at the surface if my disposal rate is 1-3/4 barrels per minute.

This friction pressure has nothing to do with bottom hole formation pressure there. It's energy loss there and therefore I've calculated out to show that with an increase in surface injection pressure, by this friction pressure I don't modify the formation pressure at all.

Q. Now, page seventeen-A, would you discuss that information? Is that just an explanation of how you arrived at the figures on page sixteen?

A. Yes, sir. Page seventeen-A, I'm showing how I calculated my friction losses, using the Fanning

friction equation, which is listed, and also I calculated Reynolds numbers for each disposal rate there. I list my reference, and these two calculations are the third and the fourth columns listed on page sixteen.

Seventeen-B is the friction curve there that I used applying my Fanning friction factors in my reference.

Q And that is the source of your tabulation on page sixteen?

A Yes, sir, that is correct.

Q Now turn to page eighteen, would you identify that, please?

A Page eighteen is my calculated surface injection pressure. This is really one of my -- this is really the whole gist of the application. This is what I'm asking for.

I've listed my injection rates in barrels per minute. It ranges from 1/4 to 1-3/4 barrels per minute.

The next column is my calculated friction pressure, which we just previously talked about.

The next column is my calculated instant shut-in surface pressure, which comes from my fracture gradient table on page fourteen.

The last column is my calculated surface injection pressure in psig. This table shows the various disposal rates, what my wellhead -- what my disposal well-

head pressure should be before the San Andres formation is fractured.

Q. This is your surface pressure, is that correct?

A. This is my surface pressure. That is correct.

Q. Now, what surface pressure do you anticipate using in this particular well, or do you want to reserve that until later?

A. I will make just a few comments on it. This well has produced 60,000 barrels total fluid. Of that, 58,000 is water. Now, when disposal operations are started there, I don't anticipate even having to dispose at 1000 pounds, due to the void in the formation, but as I start filling the void left from the production of the well there, my pressures will start to climb there, and the reason I'm asking for these pressures here, these are -- these are the maximum pressures that I think should ever be imposed upon the well before -- maximum pressures; otherwise, I fracture the San Andres formation there.

To ask for a lower pressure at this time and have to come back six months later and ask for another increase in pressure would require another hearing, so I'm asking for the complete pressure now.

Q. Now, you're talking about disposing of 50 to

100 barrels of water per day. Why do you need that excessive -- higher rate of pressure; not excessive?

A. I need the higher rate of disposal in barrels per minute due to the fact that this field is not under electrification, so my disposal pump will be run by natural gas engine and I propose to dispose of my fluid during the three hours that my pumper for the lease is there, so that he can see any problems with the system, or leaks, or anything else there. The system will not be automated, so therefore I propose to dispose of my fluid in a short period of time.

I will have a kill switch attached to this gas engine there that will be operated off of high pressure there, which will limit my wellhead pressure and also, of course, low tank level, low tank level fluids.

Q. Then in the operation of this lease you'll accumulate the produced water in tanks and then dispose of it on a daily basis for a short period of time. Is this what you're saying?

A. Yes, sir, that is correct.

Q. It will just be an intermittent injection and not the regular straight injection?

A. No, sir, it will not be a steady injection as in waterflood.

Q. And in your opinion, as I understand your

testimony, the surface pressures which you're proposing to use will not fracture the formation?

A. They will not fracture the formation.

Q. Now turning to page nineteen of your Exhibit, will you discuss that information, please?

A. Page nineteen is the structure map contoured on the top of the PI zone, San Andres PI zone, for the Dickinson Field.

The PI zone is a marker that's approximately 170 feet above the San Andres porosity.

Q. Page twenty of the exhibit?

A. Page twenty is a north-south cross section for the Dickinson-San Andres Field. Opening up the cross section, you'll see by the index map where the line of section goes. The disposal well is the second from the left, and on this cross section I am showing top of the San Andres PI zone, which I described on the structure map, and also the top of the San Andres porosity, which the wells are completed in, the top of their completions.

Q. Now Exhibit Number 21, would you identify that exhibit?

A. Exhibit 21 is a west-east cross section for this same field, showing the same data. The disposal well is the first log, first well on the left.

I'm sorry, it's the center.

Q Okay. Now referring to Exhibit Number 22, would you identify that exhibit, please?

A Exhibit 22 is a production history of Flag-Redfern Oil Company's Santa Fe lease from the time the first well was drilled up until January of '79. It shows barrels of oil, Mcf of gas, barrels of water.

Q And Exhibit 23, page twenty-three?

A Exhibit page 23 is production history for the proposed disposal well, the Santa Fe Well No. 2. It shows the same data, oil production, gas production, and water production.

Q And page twenty-four?

A Page twenty-four is a graph of the production history of the Santa Fe lease. It's just -- it's a graph of page twenty-two.

Q And then page twenty-five?

A Twenty-five is a graph of the production of the proposed disposal well, showing the same information described on page twenty-three.

Q Now, referring to page twenty-six of the Exhibit, and subsequent pages, what are they designed to show?

A Page twenty-six through page thirty-one, which is the last of my exhibit, show the treating reports there for the initial stimulation of the wells in a 1/2-mile circle

Let me note that I had the actual report on Flag-Redfern's wells, wells which is on 26, 27, 28. The Reed and Stevens wells, the only report I have is on their daily drilling report.

These treating reports is where I came up with my instant shut-in -- where I took my instant shut-in pressures there to calculate my fracture, formation fracture table.

Q. And they are your supporting data for your fracture information and pressure information?

A. Yes, sir, that is correct.

Q. Now, in your opinion, Mr. Rossler, will the approval of this application result in the production of oil that would not otherwise be recovered?

A. There is a good possibility that this salt water disposal project, while it's being applied for as a disposal well, is actually a pilot waterflood, because it is disposing of water into the same zone that the surrounding wells produce from, so I do expect, if nothing is fractured, to see a reasonable response from my disposal operation.

Q. But if you have to continue trucking water at $.90 a barrel, would that cause premature abandonment of this lease?

A. Yes, sir, that is definitely correct there. That is what's keeping Reed and Stevens right now from pro-

ducing their wells.

Q. Now, if -- is it a practical solution to set up some kind of injection system that operated full time at lower pressures?

A. At this time it would not be practical to set up such a system there due to the fact there that we need to bring electricity on the lease there and we're -- we're only applying for one well now and unless future conditions change, we'll just have one disposal well in the field. I think at this time it would be unwise there to try to actually waterflood this formation with a strict adherence to constant injection rates.

Q. Now, turning to what has been marked as Exhibit Number Two, would you identify that exhibit?

A. Exhibit Number Two is a log of the proposed disposal well, the Santa Fe No. 2. I have the perforations marked on the small scale, 1-inch scale, and the perforations marked on the detailed 5-inch scale.

These are perforations that are currently open in the well and these are perforations we propose to dispose through.

Q. Were Exhibits One and Two prepared by you or under your supervision?

A. Yes, sir, they were.

MR. KELLAHIN: At this time I'll offer Ex-

hibits One and Two.

MR. NUTTER: Applicant's Exhibits One and Two will be admitted in evidence.

Q Do you have anything to add, Mr. Rossler?

A Just on -- with the enclosed packet on your left the first page is just describing the docket. The second page is the whole -- a short summary of the entire application there. It's reiterating there that I'm asking for a surface injection pressure of .311 psi per foot.

And it's also showing my range of disposal rates and pressure.

Q But your present request is for pressure gradient of .311.

A Yes, sir, that is correct, surface injection pressure gradient.

MR. KELLAHIN: That's all we have, Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Rossler, with respect to page fourteen of your Exhibit Number One, I don't understand the bottom line here. We know that the actual formation fracture pressure in this Santa Fe No. 2 is 3596. Now how do you arrive at the 4027 down at the bottom?

A Okay, how I arrived here, I've taken each of

A. Okay, how that's derived, the last line, my disposal well, the depth to the top of the San Andres perforations is lower than the average depth to the top of the perforations for the other five wells; therefore, when you divide the formation fracture pressure 4027 by 4969, you get .810.

Q. In other words, you're taking the -- you're taking the average formation fracture pressure and then decreasing that average because your injection well is less than average.

A. Well, I'm decreasing it there just due to the fact of the 17 foot difference --

Q. Uh-huh.

A. -- in the top of the disposal zone in the proposed well, San Andres.

Q. Now, isn't it a fact, however, that of these six wells that we've got in the pool, the formation fracture pressure in the subject well is the smallest of all? It's the lowest of all?

A. That is correct.

Q. And isn't that where the injection is going to take place?

A. That is correct, yes, sir.

Q. Shouldn't we be looking at the formation in the vicinity of the injection well rather than looking at

the formation in the vicinity of a well that's a mile away?

A. Yes, sir. Initially that area around the well is the only well that will be affected, but as the disposal progresses there, in years there, assuming no fracture around the wellbore of this Santa Fe No. 2, this disposal front is going to start influencing on the other wells of the field there.

Q. How can we be sure that there will be no fracturing if we're going to exceed the fracture pressure at the wellbore?

A. Okay, at the wellbore, as I believe I commented on earlier, it won't -- we're not looking at even 1500 pounds there initially when we start off disposing there at less pressure.

Q. Mr. Rossler, have you taken the figures that you've obtained here for the top line, being the fracture pressure and the gradient and the calculated shut-in pressure and the shut-in gradient for the Santa Fe No. 2 and gone through all of these formulas that you've got on pages sixteen through -- fifteen through eighteen, I guess it is, and come up with a calculated surface pressure for the injection well only?

A. Yes, sir, I'm sorry I didn't come back to it, that's on page two, which is the Form C-108, which is 1308 psi.

Q So that's where that 1303 came from.

A Yes, sir, that's -- that's the discrepancy right there.

Q And that calculates the --

A That will include the friction.

Q Does that include the friction?

A It includes friction, yes, sir.

Q So instead of having 1771, I think it was, we'd have 1308 for the injection well itself.

A For the injection well itself, yes, sir.

Q And you're anticipating a necessity for going up to the 1771 because you'll be disposing of 101 barrels of water in approximately three nours rather than on a 24-hour basis?

A Mr Examiner, 1-3/4 barrels a minute will be the maximum rate that will ever be disposed down that well.

Q How much water could you get in at 1771 at 1-3/4 barrels per minute in three hours?

A You'll get all the water in there before an hour's gone, a 100 barrels.

Q Within an hour?

A Yes, sir. Why I've looked at these varying disposal rates ranging from a quarter to one and three-quarter there, we don't have as of yet purchased a disposal pump there and I'm trying to leave myself enough leeway.

I'm estimating there that we're going to be disposing between one and one and a quarter barrels a minute, is what I'm estimating there.

MR. NUTTER: Are there any further questions of Mr. Rossler? He may be excused.

Do you have anything further, Mr. Kellahin?

MR. KELLAHIN: That's all we have, Mr. Nutter. Thank you.

MR. NUTTER: Does anyone have anything they wish to offer in Case Number 6446?

We'll take the case under advisement.

(Hearing concluded.)

REPORTER'S CERTIFICATE

I, SALLY W. BOYD, a Court Reporter, DO HEREBY CERTIFY that the attached and foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability, skill, and knowledge, from my notes taken at the time of the hearing.

Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6446 heard by me on 7/14 1979.

Oil Conservation Division, Examiner

DOCKET NO. 6-79
EXAMINER HEARING
FEBRUARY 14, 1979
CASE 6446

Application of Flag-Redfern Oil Company for salt water disposal, Lea County, New Mexico. Applicant, in the above - styled cause, seeks authority to dispose of produced salt water into the San Andres formation through the perforated interval from 4,969 feet to 4,984 in its Santa Fe Well No. 2 located in Unit D of Section 35, Township 10 South, Range 36 East, Dickinson - San Andres Pool, Lea County, New Mexico.

Examiner: Daniel S. Nutter
Alternate Examiner: Richard L. Stamets

Flag-Redfern Ex 1
Cs 6446

CASE 6446

Flag-Redfern Oil Company requests approval to dispose of produced San Andres salt water back into the San Andres formation through its Santa Fe Well No. 2. Permission is also requested to dispose at a surface injection pressure gradient of 0.311 PSI per foot of depth to the top of the injection zone, based upon the surrounding average San Andres fracture gradient for the Dickenson (San Andres) Field which is calculated to be 0.810 PSI per foot of depth. This would allow for a maximum surface injection pressure ranging from 1554 PSIG @ 1/4 BPM to 1771 PSIG @ 1-3/4 BPM.

It should be noted that this application, while being requested for salt water disposal purposes, also has the characteristics of being a pilot waterflood injection well as the disposal zone and the field's producing zone are the same. Therefore, favorable response to this disposal operation should result in an increase in oil production in offsetting wells.

In addition, at a later date Flag-Redfern Oil Company may wish to increase its daily water disposal volume by the addition of more San Andres wells to this disposal system.

Flag-Redfern Oil Company Representative - Steve Rossler
New Mexico Attorney at Law - Tom Kellahin

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Flag-Redfern Oil Company
1200 WALL TOWERS WEST • MIDLAND, TEXAS 79701 • PHONE (915) 683-5184

Mailing address:
P. O. Box 23
Midland, Texas 79702

January 26, 1979

File:

New Mexico Oil Conservation Commission
P. O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87501

Attention: Mr. D. S. Nutter
Chief Engineer

Re: Confirmation of Hearing
Application for Salt Water
Disposal Permit
Sante Fe Well #2
Fee Lease
Dickinson (San Andres) Field
Lea County, New Mexico

Dear Mr. Nutter:

This letter will serve to confirm Flag-Redfern Oil Company's request for a hearing for a salt water disposal permit for the above captioned well. Attached is Form C-108 with all necessary attachments.

It is our understanding that the hearing will be on February 14, 1979. Please advise us of the time and location where this hearing is to occur.

Thank you for your cooperation in this matter.

Sincerely,

Steve Rossler
Petroleum Engineer

SWR/dlp

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR		ADDRESS	
Flag-Redfern Oil Company		P. O. Box 23 Midland, Texas 79702	
LEASE NAME	WELL NO.	FIELD	COUNTY
Sante Fe	2	Dickinson (San Andres)	Lea

LOCATION

UNIT LETTER D ; WELL IS LOCATED 660 FEET FROM THE North LINE AND 660 FEET FROM THE West LINE, SECTION 35 TOWNSHIP 10-S RANGE 36-E NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8"	415	250	Surface	Cement Circulated
INTERMEDIATE	None				
LONG STRING	4-1/2"	5085'	250	4060'	Calculated using Log Caliper
TUBING	2-3/8"	4934'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Lok-set set @ 4900'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
San Andres	4213' D.F.	Not drilled thru

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Through Tubing	Perforations	4969' - 4984'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
No	For Oil Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

4968 - 4998 squeezed w/150 sx of Class "C"

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Triassic @ 1200'	None within a 2 mi. radius	11,263'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
50	100	Closed	Pressure	1308

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE -	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Harding Burris, Box 97 Elida, New Mexico 88116

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

Read & Stevens, Inc. - Box 2126, 314 Security Nat'l Bk. Roswell, New Mexico 88201

Lawrence C. Harris - Box 1714 - Roswell, New Mexico 88201

Holly Energy Inc. - 2001 Bryan Tower, Suite 2680 - Dallas, TX 75201

MGF Oil Corp. - 700 Vaughn Bldg., Midland, TX 79701

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING?	SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
	Yes	Yes	Yes
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B)	PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL
	Yes	Yes	Yes

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

Steve Reasber — Petroleum Engineer — 1-26-79

(Signature) (Title) (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

2

1

SANTE FE WELL #2

Pertinent Information

1.) Disposal Zone: San Andres

2.) Depth of Disposal Zone: 4969' - 4984'

3.) Type of Disposal Fluid: Produced San Andres Water

4.) Anticipated Disposal Volumes:
Minimum = 50 Bbls water per day
Maximum = 100 Bbls water per day

5.) Source of Disposal Fluid:

a. Flag-Redfern Oil Company :
Sante Fe
1F 35 10S 36E - 14 BWPD
3E 35 10S 36E - 21 BWPD
Total Lease = 35 BWPD

b. Read and Stevens Inc.
Fawn Cherie
1M 26 10S 36E - 25 BWPD Est.*
Sante Fe
4K 35 10S 36E - 16 BWPD
5C 35 10S 36E - 25 BWPD Est.*
Total Read & Stevens 66 BWPD

* These 2 wells have been assigned a temporary completion and currently have suspended operations. When they are completed the produced San Andres water that they produce will be disposed in the proposed Sante Fe #2 Salt Water Disposal Well.

1

UNIVERSAL TREATING COMPANY Inc.

Box 1146
LEVELLAND, TEXAS

REPORT OF WATER ANALYSIS

JJR
Ja
WHC
RHF
HNF
BHG
ARG
ODS
WLP
RWC
MAY 18 1976

Company Flag-Redfern Oil Company Analysis CWA Date May 15, 1976

Sample marked Santa Fe #2

	Milligrams Per Liter	IONIC FORM	Milligrams Per Liter
Chloride (NaCl)	194,000	Calcium (Ca++)	
Total Hardness (CaCO3)	73,000	Magnesium (Mg++)	
Calcium Hardness (CaCO3)	41,000	Sodium (NA++)	
Total Alkalinity (CaCO3)	300	Carbonate (Co_3^-)	
Acidity to Phenolphthalein (CaCO3)	300	Bicarbonate (HCo_3)	
Sulfate (Na2SO4)	1,985	Sulfate (SO_4)	
Total Iron (Fe)	9.2	Iron (Fe)	
P. H. 6.5 Specific Gravity	1.165	Chloride (CL-)	

Remarks Indicates formation water.

Rufus L. Morgan
Analyst

TRETOLITE DIVISION
369 Marshall Avenue / Saint Louis, Missouri 63119
(314) WO 1-3500/TWX 910-760-1660/Telex 44-2417

JHH
GSB
ENG FEB 1 1979
GEO
LOL
ACCT

WATER ANALYSIS REPORT

COMPANY Flag-Redfern Oil Company ADDRESS Tatum, N.M. DATE: 1-31-79

SOURCE Santa Fe # 2 DATE SAMPLED 1-29-79 ANALYSIS NO. 13682

Analysis		Mg/l = PPM		*Meq/l	
1. pH	6.52				
2. H_2S (Qualitative)	Pos.				
3. Specific Gravity	1.150				
4. Dissolved Solids		205,366			
5. Suspended Solids					
6. Phenolphthalein Alkalinity ($CaCO_3$)					
7. Methyl Orange Alkalinity ($CaCO_3$)		620			
8. Bicarbonate (HCO_3)	HCO_3	756	÷61	12.4	HCO_3
9. Chlorides (Cl)	Cl	122,897	÷35.5	3,462	Cl
10. Sulfates (SO_4)	SO_4	2,225	÷48	46	SO_4
11. Calcium (Ca)	Ca	4,000	÷20	200	Ca
12. Magnesium (Mg)	Mg	972	÷12.2	80	Mg
13. Total Hardness ($CaCO_3$)		14,000			
14. Total Iron (Fe)		7.0			
15. Barium (Qualitative)					
16. Strontium					

*Milli equivalents per liter

PROBABLE MINERAL COMPOSITION

200	Ca ←	→ HCO_3	12.4
80	Mg →	→ SO_4	46
3,240	Na ←	→ Cl	3,462

Saturation Values Distilled Water 20°C

$Ca CO_3$ 13 Mg/L

$Ca SO_4 \cdot 2H_2O$ 2,090 Mg/L

$Mg CO_3$ 103 Mg/L

Compound	Equiv. Wt.	X Meq/L	= Mg/L
$Ca(HCO_3)_2$	81.04	12.4	1,004
$Ca SO_4$	68.07	46	3,133
$Ca Cl_2$	55.50	142	7,881
$Mg(HCO_3)_2$	73.17		
$Mg SO_4$	60.19		
$Mg Cl_2$	47.62	80	3,808
$Na HCO_3$	84.00		
$Na_2 SO_4$	71.03		
Na Cl	58.46	3,240	189,540

REMARKS (2) Rossler

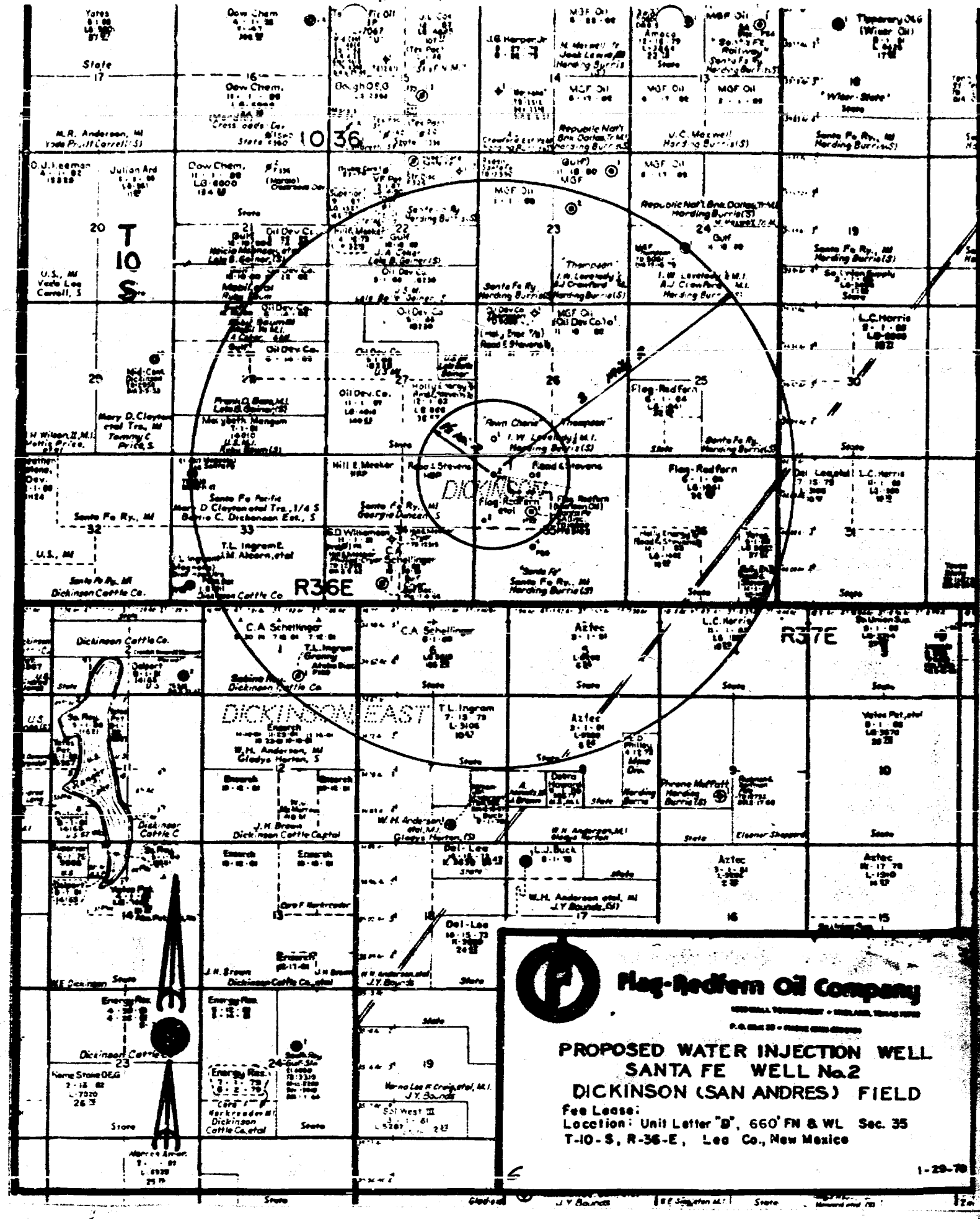
Adkins-Roberts-Gray-File

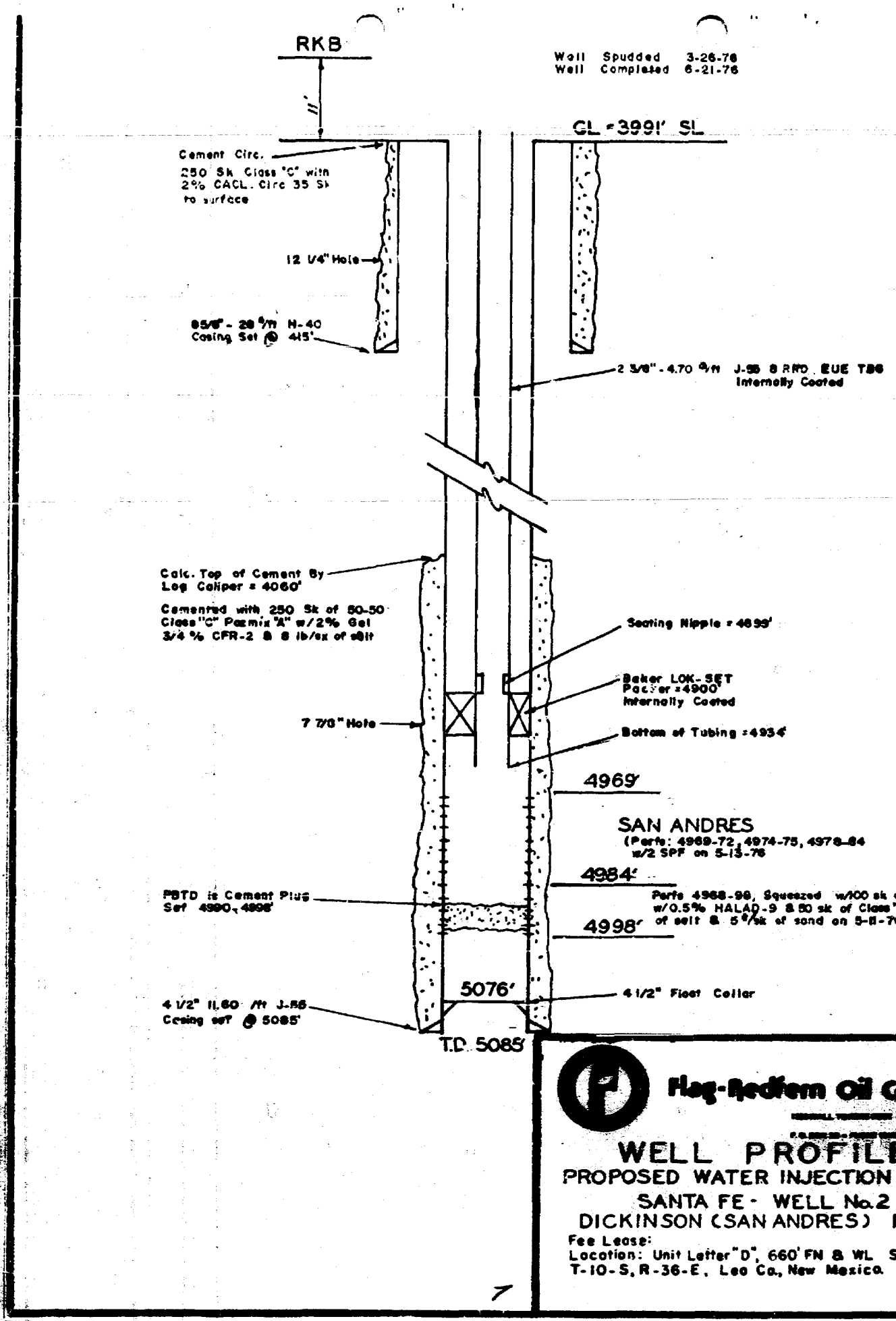
Respectfully submitted
TRETOLITE COMPANY

Ray Shaffner

5

1


T 10 S
R 36 E
R 37 E
DICKINSON
DICKINSON EAST
Flag-Redfern Oil Company
PROPOSED WATER INJECTION WELL
SANTA FE WELL No. 2
DICKINSON (SAN ANDRES) FIELD
Fee Lease:
Location: Unit Letter "B", 660' FN & WL Sec. 35
T-10-S, R-36-E, Lee Co., New Mexico
1-29-79



Flag-Redfern Oil Company

WELL PROFILE

PROPOSED WATER INJECTION WELL

SANTA FE - WELL No. 2

DICKINSON (SAN ANDRES) FIELD

Fee Lease:
Location: Unit Letter "D", 660' FN & WL Sec. 35
T-10-S, R-36-E, Lea Co., New Mexico

1-29-79

NEW MEXICO OIL CONSERVATION COMMISSION

WELL LOCATION AND ACREAGE DEDICATION PLAT

Form C-102
Supersedes C-128
Effective 1-1-65

All distances must be from the outer boundaries of the Section.

Operator	Lease	Well No.
Hanson Oil Corporation	Santa Fe	2

Unit Letter	Section	Township	Range	County
D	35	10 South	36 East	Lea

Actual Footage Location of Well:
660 feet from the North line and 660 feet from the West line

Ground Level Elev.	Producing Formation	Pool	Dedicated Acreage:
3990.7			Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

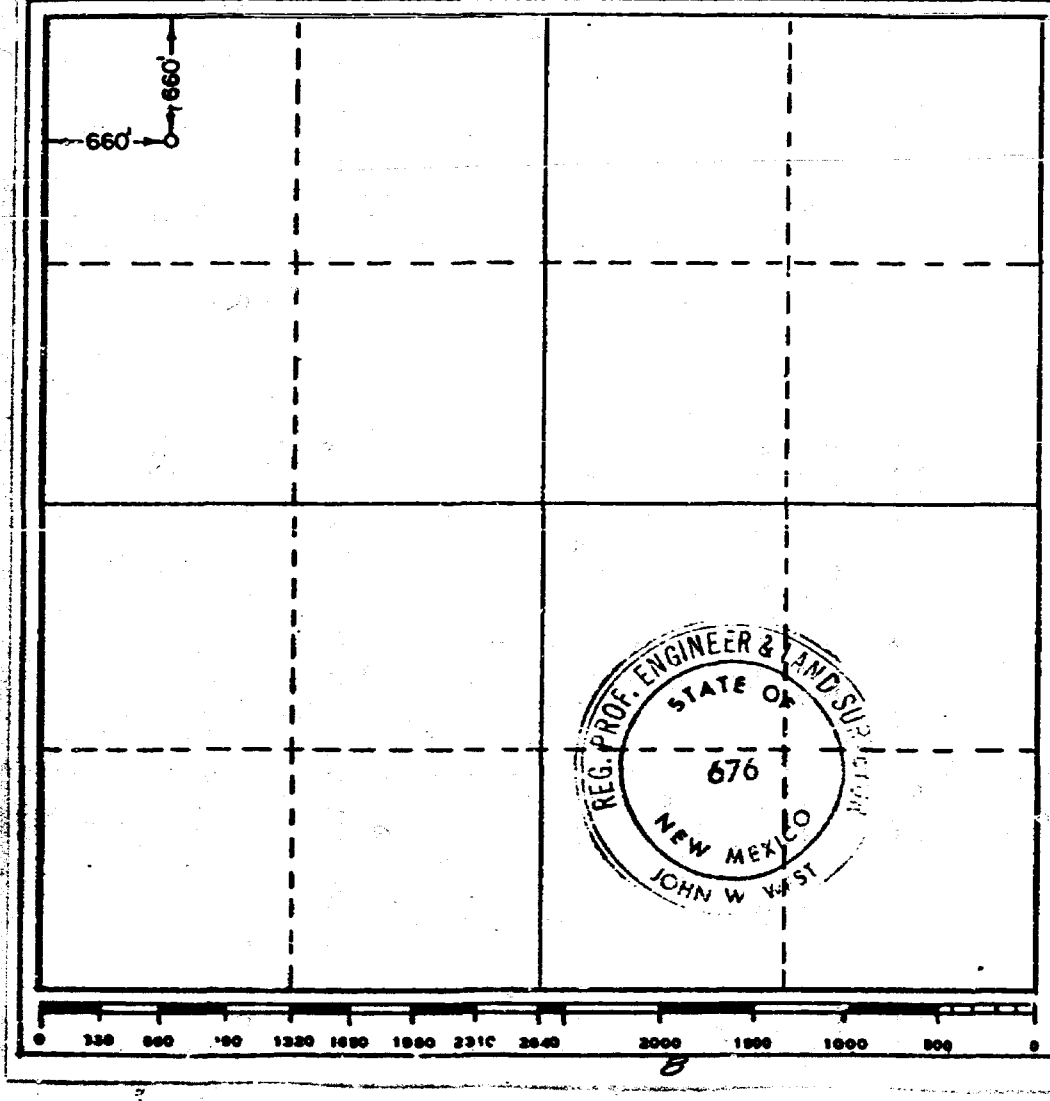
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling. etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief.

Name

Position

Company

Date

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

Date Surveyed
February 22, 1976

Registered Professional Engineer and/or Land Surveyor

John W. West

Certificate No. 676

W A I V E R

I have no objections to Flag-Redfern Oil Company's proposed salt water application for their Sante Fe Well #2 in the Dickenson (San Andres) Field, Lea County, New Mexico

John L. Anderson Jr.
Signature

2/5/79
Date

Read & Stevens, Inc.
Company

9

WAIVER

I have no objections to Flag-Redfern Oil Company's proposed salt water application for their Sante Fe Well #2 in the Dickenson (San Andres) Field, Lea County, New Mexico.

Signature

2-5-79
Date

Company

W A I V E R

I have no objections to Flag-Redfern Oil Company's proposed salt water application for their Sante Fe Well #2 in the Dickenson (San Andres) Field, Lea County, New Mexico.

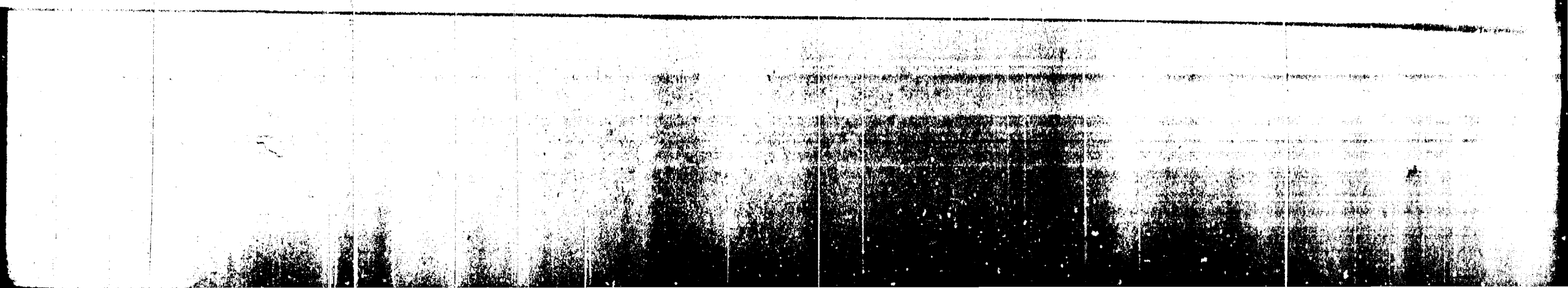
Hugh L Boyt
Signature

7-7-79
Date

MGF Oil Corp
Company

TABULAR SUMMARY OF ALL WELLS WITHIN ONE-HALF MILE OF
FLAG-REDFERN OIL COMPANY'S SANTE FE WELL #2
PROPOSED SALT WATER DISPOSAL WELL

Operator & Well Name	Location	Total Depth	Producing Formation and Interval	Surface Casing	Production Casing
Flag-Redfern Oil Co. Sante Fe Well #2 Proposed Disposal Well	660' FN & WL Unit Letter D Sec. 35, T-10-S, R-36-E	5085' RKB EL.= 4002'	San Andres 4669 - 4984' (Sub-sea = -967 to -982') Perfs 4963' - 4998' were previously squeezed off with 150 sx of Class "C"	8-5/8" set @ 415' Cemented w/250 sx Class "C" w/2% CaCl. Circ 35 sx to surface.	4½" set @ 5085'. Cemented w/250 sx of 50-50 Class "C" - Pozmix "A" w/2% Gel, 3/4% CFR-2 & 8 lb/sx of Salt. Top of cement @ 4060', calculated from Log Caliper.
Flag-Redfern Oil Co. Sante Fe Well #1 (Previously operated by Hanson Oil Corp.) Field Discovery Well	1980' FN & WL Unit Letter F Sec. 35, T-10-S, R-36-E Southeast Offset to Proposed Disposal Well	10,800' PBTD = 4952' RKB EL.= 3999'	San Andres 4933 - 4945' (Sub-sea = -934 to -946') EZSV Cement Retainer set @ 4962'. Perfs 4996 - 5020' squeezed w/150 sx of Class "C" - 3-9-77. Perfs 4935 - 4957' squeezed w/100 sx of Class "C" - 3-13-77.	12-3/4" set @ 370'. Cemented w/410 sx of Class "H" w/2% CaCl. Circ 50 sx to surface. 8-5/8" set @ 4300'. Cemented w/300 sx of Halli Lt. Wt. w/8#/sx of Salt followed by 200 sx of Class "C" w/2% CaCl. Top of cement = 1970', calculated using 70% fillup.	Cement Plugs in uncased 7-7/8" hole: 1) 35 sx from 9400'-9295' (105') 2) 35 sx from 9140'-9035' (105') 3) 35 sx from 7754'-7649' (105') 4) 35 sx from 5683'-5584' (99') 5½" casing set @ 5103'. Cemented w/325 sx of Class "C" w/0.4% CFR-2. Top of cement @ 3196', calculated from Log Caliper.
Flag-Redfern Oil Co. Sante Fe Well #3	330' FWL & 2310' FNL Unit Letter E Sec. 35, T-10-S, R-26-E South Offset to Proposed Disposal Well	4985' RKB EL.= 4002'	San Andres 4953 - 4982' (Sub-sea = -951 to -980')	8-5/8" set @ 360'. Cemented w/250 sx of Class "H" w/2% CaCl. Circulated 50 sx to surface.	4½" set @ 4985'. Cemented with 250 sx of Class "H" w/2% Gel, 0.75% CFR-2 and 8#/sx of Salt. Top of cement @ 4155, calculated from Log Caliper. 4½" Multi stage Tool @ 2260'. Cemented w/550 sx of Halli Lt. Wt. w/ 0.4% CFR-2 & 8#/sx of Salt. Circulated 75 sx to surface.



TABULAR SUMMARY OF ALL WELLS WITHIN ONE-HALF MILE OF
FLAG-REDFERN OIL COMPANY'S SANTE FE WELL #2
PROPOSED SALT WATER DISPOSAL WELL

Operator & Well Name	Location	Total Depth	Producing Formation and Interval	Surface Casing	Production Casing
Read & Stevens Inc. Fawn Cherie Well #1	660' FS & WL Unit Letter M Sec. 26, T-10-S, R-36-E North Offset to Proposed Disposal Well	5013' RKB EL.= 4004'	San Andres 4955'-5013' O.H. (Sub-sea = -951 to -1009)	8-5/8" set @ 360' Cemented w/225 sx of Class "C" w/2% CaCl. Circ 89 sx to surface	5½" set @ 4955'. Cemented w/100 sxs of Class "H" w/0.75% CFR-2. Calculated Top of Cement using 70% Fillup efficiency = 4497'. Multi-stage cement tool set @ 2025'.
Read & Stevens Inc. Sante Fe Well #5	660' FNL & 1980' FWL Unit Letter C Sec. 35, T-10-S, R-36-E East Offset to Proposed Disposal Well	4991' RKB EL.= 3991'	San Andres 4950'-4991' O.H. (Sub-sea = -959 to -1000')	8-5/8" set @ 373' Cemented w/225 sx of Class "C" w/2% CaCl. Circ 34 sx to surface.	5½" set @ 4950'. Cemented w/100 sx of Class "H" w/0.75% CFR-2. Calculated Top of Cement using 70% Fillup efficiency = 4492'. Multi-stage cement tool set @ 2196'.
Read & Stevens Inc. Sante Fe Well #4	1980' FS & WL Unit Letter K Sec. 35, T-10-S, R-36-E Over ½ mi. South-east from Proposed Disposal Well	5000' RKB EL.= 3999'	San Andres 4960'-5000' O.H. (Sub-sea = -961' to -1001')	8-5/8" set @ 348' Cemented w/225 sx of Class "C" w/2% CaCl. Circ 25 sx to surface.	5½" set @ 4960'. Cemented w/100 sx of Class "C" cement w/0.75% CFR-2. Calculated Top of Cement using 70% Fillup efficiency = 4447'. Multi-stage cement tool set @ 2200'. Cemented w/450 sx of Halliburton Light Weight w/8#/sx of Salt and 0.75% CFR-2. Circulated 79 sx cement to surface.

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FRACTURE GRADIENTS - SAN ANDRES FORMATION
DICKINSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

Well Name	Top Perforation	(1) Date of Acid Stimulation	Surface Pressure Required to Break Formation PSIG	Instant Shut-In Press. PSIG	(2) Formation Fracture Press. PSIG	Formation Fracture Gradient-PSI/Ft.	(3) San Andres Disposal Water Calc. Surface Shut In Press-PSIG*	(3) San Andres Disposal Water Surface Shut In Gradient-PSI/Ft.
Sante Fe Well #2 Proposed Disposal Well	4969'	5-14-76	1350	1400	3596	0.724	1116	0.225
Sante Fe Well #1	4933'	3-16-77	1700	1600	3780	0.766	1318	0.267
Sante Fe Well #3	4953'	11-5-76	1950	1950	4139	0.836	1667	0.337
Fawn Cherie Well #1	4955'	3-24-78	Unknown	2200	4187	0.845	1714	0.346
Sante Fe Well #5	4950'	5-16-78	2200	2450	4435	0.896	1965	0.397
Sante Fe Well #4	4960'	12-3-77	2300	2700	4689	0.945	2214	0.446
Field Average	4952'	(Excluding Sante Fe Well #4 due to its being over ½ mile from proposed Disposal Well.)			4027	0.813	1556	0.314
Disposal Well	4969'				4027	0.810	1547 PSIG	0.311 PSI/FT.

*NOTE: This Table is based on Static (No Injection) Conditions.
For Friction Pressure, See Friction Table

(Based on Shut In conditions with Tubing Loaded with San Andres Disposal Water)

EXPLANATION OF FRACTURE GRADIENT TABLE

1. All acid jobs were performed based on the Matrix stimulation technique and hydraulic fracturing was purposely avoided to prevent treating out of zone and stimulating the San Andres water zone, which is encountered 15 feet below the lowest oil productive San Andres zone in these wells.

2. Calculation of the San Andres formation fracture pressures were based on the following formula:

$$P_{ISI} = P_{BF} - P_H$$

Where:

P_{ISI} = Instant Shut-In Pressure - psig
P_{BF} = Bottom Hole Fracturing Pressure - psig
P_H = Hydrostatic Pressure - psig

Reference:

Howard and Fast, Hydraulic Fracturing, Monograph Volume 2. "Mechanics of Hydraulic Fracturing", pg. 100. American Petroleum Institute of Mining, Metalurgical and Petroleum Engineers; Dallas, Texas 1970.

3. San Andres Disposal Water
Specific Gravity = 1.150
Fluid Gradient = 0.499 $\frac{psi}{ft.}$

FRICTION TABLE

2-3/8" - 4.70 Lb/Ft Internally Plastic Coated Tubing

INJECTION RATE / VELOCITY Bbl/Min	Ft/Sec. Down Tubing	REYNOLD NUMBER N_R	FANNING FRICTION FACTOR f	FRICTION* PRESSURE ΔP_f
0.25 BPM	1.077	2.15×10^4	0.00625	6.7 PSI
0.50 "	2.154	4.29×10^4	0.00550	23.6 PSI
0.75 "	3.230	6.44×10^4	0.00500	48.3 "
1.00 "	4.307	8.58×10^4	0.00475	81.6 "
1.25 "	5.384	1.07×10^5	0.00450	120.8 "
1.50 "	6.461	1.29×10^5	0.00440	170.0 "
1.75 BPM	7.537	1.50×10^5	0.00425	223.5 PSI

* This friction pressure (friction loss) is the differential pressure that will be realized from surface to the top of the disposal zone (4969') when the San Andres disposal water is injected down the 2-3/8" internally plastic coated tubing at the various rates listed above. In other words, with no increase in bottom hole disposal pressure, the surface injection pressure will be increased due to friction by the pressures listed above for their corresponding injection rates.

EXPLANATION OF CALCULATED FRICTION PRESSURE VALUES

1. All friction pressures were calculated using the Fanning Friction Equation* which is:

$$\Delta p_f = \frac{f L \rho v^2}{25.8\, d}$$

where:

Δp_f = Friction loss for turbulent flow - PSI, see friction table
f = Fanning friction factor - see (2.) below
L = Depth of tubing = 4969 Ft.
ρ = Density of fluid = 9.59 lb/gal
v = Velocity of disposal fluid - Ft/Sec, see friction table
d = Internal diameter of plastic coated tubing = 1.995 in.

2. Fanning friction factor (f) is obtained from the attached curve on "Friction factors for clean steel pipe" *using the curve for smooth tubing which is the same as internally plastic coated tubing. In order to utilize this curve, the Reynolds Number must be calculated for each disposal rate. The Reynolds Number Equation* is as follows:

$$N_R = \frac{928\, d\, v\, \rho}{\mu}$$

where:

N_R = Reynolds number - see friction table
μ = Viscosity of San Andres disposal water = 0.891 centipoises

* REFERENCE:
Craft, Holden and Graves, WELL DESIGN: DRILLING AND PRODUCTION, Chapter One - Fluid Flow in Pipes pp. 18 - 23 Prentice - Hall Inc., Englewood Cliffs, New Jersey 1963.

FRICTION FACTORS FOR CLEAN STEEL PIPE

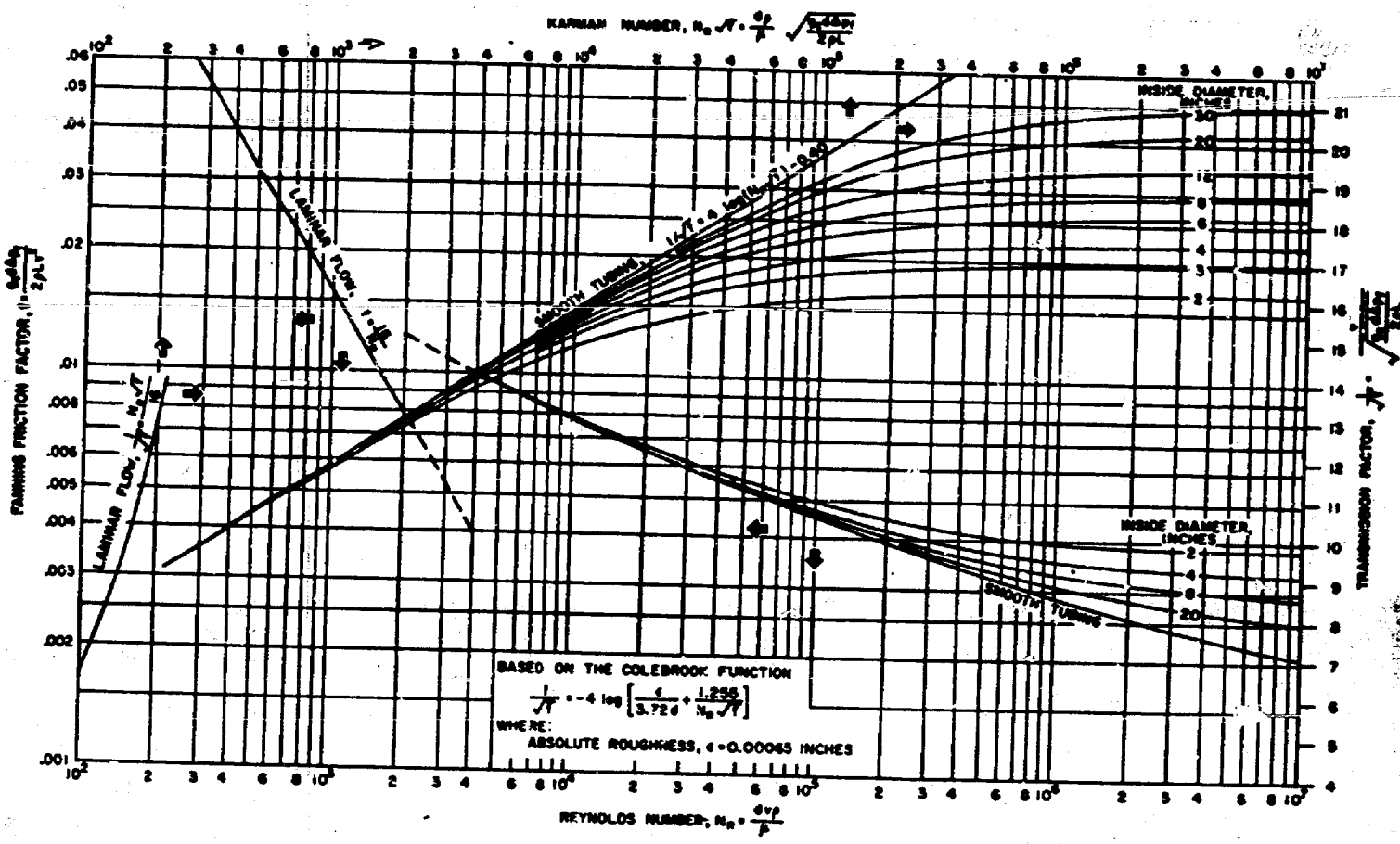


Fig. 1.4 Friction factors for clean steel pipe.

1-26-72

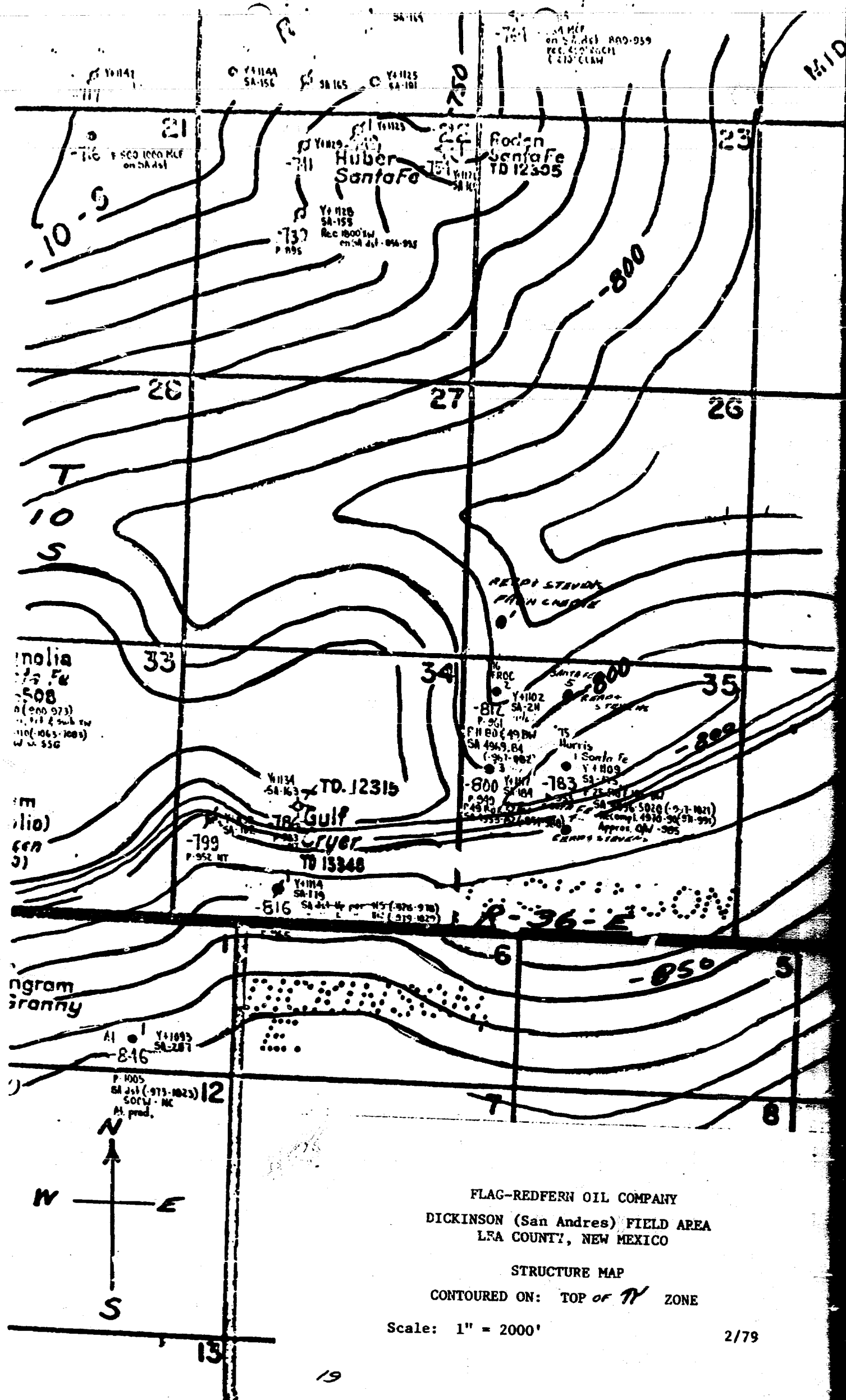
* REFERENCE:

Craft, Holden and Graves, WELL DESIGN: DRILLING AND PRODUCTION, Chapter One - Fluid Flow in Pipes pp. 18 - 23 Prentice - Hall Inc., Englewood Cliffs, New Jersey 1963.

CALCULATED SURFACE INJECTION PRESSURES

PROPOSED DISPOSAL WELL
SANTA FE WELL #2
DICKENSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

INJECTION RATE - BPM	CALCULATED FRICTION PRESSURE PSI	CALCULATED INSTANT SHUT-IN SURFACE PRESSURE - PSIG	CALCULATED SURFACE INJECTION PRESSURE - PSIG
0.25	7	1547	1554
0.50	24	1547	1571
0.75	48	1547	1595
1.00	82	1547	1629
1.25	121	1547	1668
1.50	170	1547	1717
1.75	224	1547	1771



FLAG-REDFERN OIL COMPANY

DICKINSON (San Andres) FIELD AREA
LEA COUNTY, NEW MEXICO

STRUCTURE MAP

CONTOURED ON: TOP of "N" ZONE

Scale: 1" = 2000'

2/79

SANTA FE LEASE
DICKENSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

PRODUCTION HISTORY

TIME	OIL PROD. BBL/MO.	GAS PROD. MCF/MO.	WATER PROD. BBL/MO.	REMARKS
Jan. 1975	243	178 Est.	486	1 well Hanson
Feb.	290	213 "	580	Oil Co. Operator
March	41	30 "	82	
April	160	117 "	320	
May	226	166 "	452	
June	96	70 "	192	
July	128	94 "	256	
Aug.	45	33 "	90	
Sept.	143	105 "	286	
Oct.	41	30 "	82	
Nov.	61	48 "	122	
Dec.	5	4 "	10	
Jan. 1976	77	57 "	154	
Feb.	55	40 "	110	
March	33	24 "	66	
April	233	171 "	466	
May	0	0	0	Shut-in
June	0	0	0	Shut-in
July	376	308 Actual	1519	
Aug.	180	147	1519	
Sept.	96	79	1470	Well #1 now oper-
Oct.	184	151	1519	ated by Flag Red
Nov.	370	200	2940	Fern Oil Co.
Dec.	946	433	3038	3 wells
Jan. 1977	941	431	3038	
Feb.	757	346	2744	
March	685	244	2759	
April	894	369	3090	
May	713	427	3193	
June	780	467	3090	
July	696	417	3193	
Aug.	756	452	3193	
Sept.	560	336	3090	
Oct.	588	353	3193	
Nov.	474	284	3090	
Dec.	588	350	3193	
Jan. 1978	517	310	3193	
Feb.	420	250	2884	
March	346	208	3193	
April	441	265	3090	
May	395	231	3193	
June	370	233	3098	
July	272	171	3193	
Aug.	199	113	3193	
Sept.	266	177	3090	
Oct.	303	182	3193	
Nov.	303	182	3193	
Dec.	182	109	3193	
Jan. 1979	303	182	3193	
TOTALS	16,778 BBL OIL	9887 MCF	93,524 BBL WATER	

SANTA FE WELL #2
DICKINSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

PRODUCTION HISTORY

TIME	OIL PROD. BBL/MO.	GAS PROD. MCF/MO.	WATER PROD. BBL/MO.
July 1976	376	308	1519
Aug. 1976	180	147	1519
Sept 1976	96	79	1470
Oct. 1976	184	151	1519
Nov. 1976	105	86	1470
Dec. 1976	62	51	1519
Jan. 1977	62	51	1519
Feb. 1977	50	41	1372
March 1977	60	8	2108
April 1977	62	1	2040
May 1977	46	1	2108
June 1977	50	1	2040
July 1977	45	1	2108
Aug. 1977	49	1	2108
Sept. 1977	36	1	2040
Oct. 1977	38	1	2108
Nov. 1977	31	1	2040
Dec. 1977	39	1	2108
Jan. 1978	33	1	2108
Feb. 1978	28	1	1904
Mar. 1978	23	1	2108
April 1978	28	1	2040
May 1978	29	1	2108
June 1978	23	1	2040
July 1978	15	1	2108
Aug. 1978	16	1	2108
Sept. 1978	21	1	2040
Oct. 1978	21	1	2108
Nov. 1978	21	1	2108
Dec. 1978	13	1	2108
Jan. 1979	21	1	2108
TOTALS	1863 BBL OIL	960 MCF	59,711 BBL WTR.

Acid Spot 19.45

Type Acid 500 gallons MH-72

Am't Acid

Chemical

Treatment Stage No.

Tbg. Cap. 16.28

Csg. Cap. .17

Open Hole

Universal Treating Co., Inc.

UNIVERSAL ACIDIZING INC.
Box 1146 LEVELLAND, TEXAS Phone 894-6725

The Best Acid Jobs In The Oil Patch

TREATING LOG

Company Flag Redfern Oil Company Date May 14, 1976

Lease Santa Fe State Well 2

Total Depth 4993 Csg. Wt. Set Open Hole

Csg. Perf. 4969 to 4984 Shots per ft. Packer

Tbg. Perf. 4986 To Tbg. Depth Tbg.

Pkr. Set Production Prior Treatment

Type Treatment Treat casing perforation via tubing with 500 gallons 20% MH-72 acid. Flush with treated water.

Time	Tbg. PSI	Csg. PSI	Rate B.P.M.	Total Bbls. In Form.	
12:15	0	0			Start water via tubing.
12:30	200	NG			60 bbl water. Start acid to spot.
12:37	200				All acid. Start flush.
12:45	200	NG			Acid on spot. Pressure formation 1000 PSI.
12:46	1000	1000			
1:00	1000	1000			Pressure formation to 1000 PSI.
1:35	1200	1200	.06	3	Pressure formation to 1200 PSI.
1:50	1200	1200	.1	4.5	Pressure formation to 1200 PSI.
1:55	1350	1350			Pressure formation to 1350 PSI.
2:04	1250	1250	.14	6.5	Formation break 50 PSI While pumping.
2:09	1400	1400			Speed pump slightly.
2:12	1500	1500	.25	9	Slow pump.
2:14	1400	1450			Speed pump.
2:18	1450	1450	.5	12	All flush. Shut down.
2:18	1400	1400			Instant Shut Down Pressure.
2:23	475	475			5 minute shut down.
					Pressure Maximum 1500 Minimum 1000 Average 1175
					Injection RAte Maximum .5 Minimum 06 Average .13
					Total load to recover 84 bbl
					Instant Shut Down Pressure 1400
					Thank you

Treatment Ordered by

Treating Engineer Jim Kent

26

1

Acid Spot _____ Treatment Stage No. 2

Type Acid 20% N.E.

Am't Acid 500

Chemical _____

Universal Treating Co., Inc.

Box 1146 LEVELLAND, TEXAS Phone 894-6125

The Best Acid Jobs In The Oil Patch

Tbg. Cap. 28.

Csg. Cap. 78.

Open Hole _____

TREATING LOG

Company Flag-Redfern Oil Co. Date 3-16-77

Lease Santa Fe Well # 1

Total Depth 4961.5 Csg. 5½ Wt. 15.50 Set Thru Open Hole _____

Csg. Perf. 4944 to 4948 2 Shots per ft. _____ Packer None

Tbg. Perf. 4951 To 4954 Tbg. Depth 4959 Tbg. 2½

Pkr. Set _____ Production Prior Treatment _____

Type Treatment Treat via tubing with 500 gallons 20% N.E. Non-emulsion Acid Spot. Break formation & put 500 gallons in formation & Swab test.

Time	Tbg. PSI	Csg. PSI	Rate B.P.M.	Total Bbls. In Form.	
8:30	200				Start Acid to spot
8:45					500 gallons Acid in - Start 17.7 bbls. Water
9:00	200				Acid on spot
9:20	1500	1500			Start fromation break
10:00	1600	1600			Continue to pressure formation
10:45	1700	1700			Continue to pressure formation
	1700	1700			Formation taking fluid
11:50	1700	1600			14 bbls. Flush in - 500 gallons Acid in formation
					Maximum PSI 1700
					Minimum PSI 1500
					Instant Shut Down Pressure 1600
					After 15 minutes 800
					Total Fluid 120 bbls.
					Thank You

Treatment Ordered by D. Russell

Treating Engineer Joe Richardson

27

STAGE NO. 2

CARDINAL CHEMICAL, INCORPORATED

SERVICE REPORT

DISTRICT 3-Area-1 STATION Hobbs, New Mexico DATE November 5, 1976

COMPANY Flag-Redfren STATE New Mexico COUNTY Lea

LEASE Santa Fe WELL NO 3 POOL Dickson

COMPANY REPRESENTATIVES Mr. Doyal Russell CARDINAL ENGINEERS Holland

WELL DATA

CASING, TUBING & PACKER DATA

CASING O.D. 4 1/2 WT. 9.5 DPT. ____ CEMENT yes

LINER O.D. ____ WT. ____ FR. ____ TO ____

TUBING SIZE 2 3/8 PERF'S OR OPEN END ____

TUBING SIZE ____ PERF'S OR OPEN END ____

HYD. HOLD DOWN ANCHOR: KIND ____ DEPTH ____

UPPER PACKER TYPE: Watson DEPTH ____

LOWER PACKER TYPE: ____ DEPTH ____

CASING PERFORATED W/ 24 SHOTS/FT. FROM 4953 TO 4982

___ SHTS./FT. FR. ____ TO ____ FR. ____ TO ____

___ SHTS./FT. FR. ____ TO ____ FR. ____ TO ____

OPEN HOLE SIZE: ____ FROM ____ TO ____

COMPLETION DATA

DATE DRILLED 10-76 FORMATION San Andres

PAY SECTION FROM 4953 TO 4982

PRESENT TOTAL DEPTH 4985 P.B. FROM ____

INITIAL PROD: OIL ____ GAS ____ WATER ____

PRESENT PROD: OIL ____ GAS ____ WATER ____

ACID AND/OR FRAC ____ DATE ____

ACID AND/OR FRAC ____ DATE ____

ACID AND/OR FRAC ____ DATE ____

ACID AND/OR FRAC ____ DATE ____

TOTAL ACID AND/OR FRAC IN WELL ____

TYPE FLUID IN TBG. ____ IN CSG. ____

VOLUMES

TBG 19.2 BBLS. CSG. ____ BBLS. OPEN HOLE ____ BBLS

ANNULAR VOL. OF PAY ZONE: CSG. 1.5 OPEN HOLE ____

TOTAL TO FILL ____ BBLS. TOTAL TO SPOT ____ BBLS

VOL. USED TO FLUSH 20.7 BBLS. TO OVERFLUSH 1.0 BBLS

OTHER INFORMATION: ____

OIL TANK GAUGES: START ____ FINISH ____

SERVICES USED

1,500	GALS.	20% NM Stabilized	TYPE
2	GALS.	NM-225	TYPE
3	GALS.	RD-11	TYPE
150	LBS.	KCL; 2 gals. LST-5	MATERIAL
10-7/8	LBS.	Balls (RCN)	MATERIAL

PUMPS USED ON TBG. ____

PUMPS USED ON CSG. ____

DETAILS OF SERVICES PERFORMED REMARKS

CARDINAL CONNECTIONS TESTED TO: TBG. 2000 PSI. CSG. ____ PSI.

TIME a.m. or p.m.	PRESSURES Casing	PRESSURES Tubing	BARRELS OF FLUID PUMPED In Formation	BARRELS OF FLUID PUMPED Per Reading	BARRELS OF FLUID PUMPED Per Minute	
8:00						ARRIVED ON LOCATION. Rig up Cardinal Equipment
8:50	500			1.0		PSI casing.
8:55	500	0				Start acid down tubing.
9:01	500	500		20	1.3	Encounter PSI-continue pumping.
9:17	450	900	2	2	1.0	Inject 5 ball sealers.
9:29	450	1100	8	6	.5	Inject 5 ball sealers.
	400	2000	16	8		All acid, start flush, discontinue balls.
	500	2000				After shooting 10 due to slow rate.
	600	2000				
11:35	700	2000	37	21	.2	All flush, shut down.
	700	1950				ISIP 1950#
	700	1550				5 min. 1550#,
	700	1400				10 min. 1400#.
						57 bbls. total load.
	700	1950				
					.26	

ADD FOR SAND DISPLACEMENT ____

INSTANTANEOUS SHUT-IN PRESSURES ____

PRESSURES ____ MINUTES AFTER STOPPING ALL PUMPS.

MAXIMUM PRESSURES AND AVG. INJECTION RATE FOR 138 MINS. PUMPING.

MINIMUM PRESSURES ____

LAST TRUCK DEPARTED. LOCATION WAS LEFT CLEAN - ~~XXXX~~ 28 Thank You

IR-1-F REV.

Read & Stevens, Inc.

3-21-78 TD 5000' dolo., prep to drill to 5003' and run log.

3-22-78 TD 5003' dolo., prep to run tubg. and pkr. and swab test. Ran Welex Radioactivity log. Note correction on casing setting: Set 5½" @ 4945' due to apparent 18' fillup at time of running casing. Have 7 7/8" hole from 4945' to 4963' and 4 3/4" hole from 4963' to 5003'. When reverse unit drilling commenced, bit went to 4963' with no weight. Apparently rotary rig drilling depth was in error.

3-23-78 TD 5003' dolo., prep to acidize. Ran tubg. and pkr. w/ pkr. set @ 4900' and tubg. to 4995'. Swab hole dry and waited 1 hr. Ran swab and hole still dry. Shut down overnight. At 8:00 AM, had 600' fluid in hole. Swabbed hole dry and rec. oily emulsion.

3-24-78 TD 5003' dolo., prep to swab. Acidized open hole 4945'-5003' w/ 2000 gals. 15% NE acid and flushed w/ oil. Acid treatment max. treat. press. 2200#, min. treat. press. 1200#, aver. inj. rate 1½ BPM. Oil flush max. press. 3000#, min. press 1200#, aver. press. 2200#. ISDP 2200#, 5 min. SIP 2000#, 10 min. SIP 1950#, 15 min. SIP 1900#. Total load 68 bbls. Bled off press. and swab 64 bbls. load in 4½ hrs. Had 1400' fluid in hole last swab run.

3-25-78 TD 5003' dolo. prep to swab. At 8:00 AM, FL 2400' FS. Swab 3 hrs. and lower FL to 4600' FS. Shut down 2½ hrs. to change out sond line and FL back up to 3200' FS. Swabbed total 4 bbls. load and 37 bbls. formation fluid, oil and water.

3-26-78 TD 5003' dolo., shut down. At 8:00 AM, FL 3000' FS. Swab 39 bbls. fluid in 9 hrs., est. 40% oil and 60% SW.

3-27-78 TD 5003', dolo., prep to run rods and pump. Shut down for Sunday.

3-28-78 TD 5003' dolo., prep to pull tubg. & pkr. and run rods & pump. Swabbed 30 bbls. fluid in 10 hrs. No est. of oil-water cut.

3-29-78 TD 5003' dolo., prep to spaceout pump. Ran tubg., rods and pump.

3-30-78 TD 5003' dolo., prep to install pumping unit. Taking run as follows: 159 joints 2 3/8", 8 rd., 4.7#, J-55, total of 4991.96', set at 5002' RKB w/ seating nipple at 4967' RKB. Ran rods and 2"x1½" x 16' pump.

3-31-78 TD 5003' dolo., rigging up pump.

4-1-78 TD 5003' dolo., rigging up pump.

4-2-78 TD 5003' dolo., started pumping @ 4:00 PM, 4-1-78.

4-3-78 TD 5003' dolo., testing. Pumped 34 bbls. load oil in 16 hrs.

5-8-78 TD 4950' lm., moving out rotary rig.

5-9-78 TD 4950' lm., WOCU.

5-10-78 TD 4950', lm., WOCU. Set anchors and moved-in test tank.

5-11-78 TD 4950' lm., WOCU. Welded on bell nipple & moved-in tubg. Completion unit broke down one mile from location.

5-12-78 TD 4952' lm., prep to re-run tubg. & circulate hole with oil. Rigged up Pool Co. unit & ran 2 3/8" tubg. w/ 12 drill collars and 4 3/8" Walker bit. Tagged cement and drilled plug, insert float, 27' of cement, guide shoe and 2' of formation. Pulled tubg. to change bit. Shut down overnight.

5-13-78 TD 4984', dolo., prep to drill. Re-ran tubg., collars and Hughes. J-55, 4 3/4" bit. Drilled from 4952' to 4984'.

5-14-78 TD 4991' dolo., shut down. Drilled from 4984' to 4991'. Circulated hole clean. Ran Dresser Atlas Gamma Ray, Compensated Neutron log.

5-15-78 TD 4991' dolo., prep to re-run tubg. and swab test.

5-16-78 TD 4991' dolo., prep to swab. Ran 156 joints 2 3/8" tubg. w/ RTTS pkr. Set tubg. @ 4965' RKB w/ pkr. set @ 4874' RKB. Swabbed tubg. capacity plus est. 2 bbls. formation oil. Broke off bottom part of swab mandrel. Pulled and re-ran tubg. and pkr. @ same depth setting. Recovered broken swab. Spotted acid over open hole. Acidized w/ 2000 gals. 15% N.E. acid. Formation began taking fluid @ 2200# and increased rate to 2.5 BPM @ 2750#. Max. treat. press. 3100# (on flush), min. treat. press. 2200#, aver. treat. press. 2670#, aver. inj. rate 2.17 BPM. ISDP 2450#, 5 min. SIP 2400#, 10 min. SIP 2350#, 15 min. SIP 2250#. Total load 70 bbls. (20 bbls. oil & 40 bbls. acid). Shut-in overnight.

5-17-78 TD 4991' dolo., prep to swab. At 8:00 AM, SITP 0#. Hole full of fluid. Swabbed 22 BLO & 20 BLW in 8½ hrs. Lack 28 BLW. FL 4700' FS lost swab run. Well making some gas with each swab run.

5-18-78 TD 4991' dolo., testing. Swabbed 12 BO & 11 BLW in 8½ hrs. Lack 17 BLW.

Reed & Stevens, Inc.

12-3-77 TD 5000', dolo., prep. to swab. Acidized open hole 4960'-5000' w/ 2000 gals. 15% NE acid. Formation began feeding @ 1/4 BPM @ 2300#, increased rate to 1 BPM & press. increased to 2600#, increased rate to 1 3/4 BPM & press. increased to 3000#. Formation did not break. ISDP 2700#, 5 min. SIP 2300#, 10 min. SIP 2100#, 15 min. SIP 1900#. Total load 68 bbls. Began swabbing @ 3:00 PM. Swab 43 bbls. load in 1 1/2 hrs. Shut down overnight.

12-4-77 TD 5000' dolo., shut down. At 7:30 AM, 12-3-77, FL 1300' FS. Swab 107 bbls. fluid in 9 hrs. being 25 bbls. load & 82 bbls. new oil. Last hour swabbed 9 BO, no water w/FL 3000' FS. Shut down till Monday morning.

12-5-77 TD 5000' dolo., prep to cement upper stage of production casing. At 7:30 AM, FL 2500' FS. Swab 47 BO in 4 hrs. Last hour (10:30 AM to 11:30 AM) swabbed 8 BO, no water w/ small amount of gas.

12-6-77 TD 5000' dolo., WOC. Pulled tubg. & pkr. Ran bridge plug & tool to shift DV tool. Set BP @ 2285' & spotted 2 sx. sand on top of BP. Opened DV tool @ 2195'. Broke circulation & cemented w/ 450 sx. HOWCO lite cement w/ 3/4 of 1% CFR-2 & 8# salt per sx. Circulated 79 sx. cement. Closed DV tool & press. tested csg. to 1500# for 30 min., held OK. Reversed sand off BP, retrieved BP and pulled tubg.

12-7-77 TD 5000' dolo., prep to run rods & pump. Ran 161 joints 2 3/8", 4.7#, upset tubg. (4950.54'), 1 seating nipple (1.10'), 1 perf. jt. (3.00') & 1 jt. tubg for mud anchor (31.62'), total of 4986.26', set @ 4994.26' RKB.

12-8-77 TD 5000' dolo. Ran rods & pump.

12-9-77 TD 5000' dolo. Moved in & set-up tanks.

12-10-77 TD 5000' dolo. Set pumping unit.

12-11-77 TD 5000' dolo. Shut-down.

12-12-77 TD 5000' dolo. Laying flow lines & hooking up tank battery.

12-13-77 TD 5000' dolo. Hooking up tank battery.

12-14-77 TD 5000' dolo. Hooking up tank battery.

12-15-77 TD 5000' dolo. Sand blasted and coated tanks.

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Exhibit 1
Case 6446

Flag-Redfern Oil Company
1200 WALL TOWERS WEST • MIDLAND, TEXAS 79701 • PHONE (915) 683-5184

Mailing address:
P. O. Box 23
Midland, Texas 79702

January 26, 1979

File:

New Mexico Oil Conservation Commission
P. O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87501

Attention: Mr. D. S. Nutter
Chief Engineer

Re: Confirmation of Hearing
Application for Salt Water
Disposal Permit
Sante Fe Well #2
Fee Lease
Dickinson (San Andres) Field
Lea County, New Mexico

Dear Mr. Nutter:

This letter will serve to confirm Flag-Redfern Oil Company's request for a hearing for a salt water disposal permit for the above captioned well. Attached is Form C-108 with all necessary attachments.

It is our understanding that the hearing will be on February 14, 1979. Please advise us of the time and location where this hearing is to occur.

Thank you for your cooperation in this matter.

Sincerely,

Steve Rossler
Petroleum Engineer

SWR/dlp

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR	ADDRESS
Flag-Redfern Oil Company	P. O. Box 23 Midland, Texas 79702

LEASE NAME	WELL NO.	FIELD	COUNTY
Sante Fe	2	Dickinson (San Andres)	Lea

LOCATION

UNIT LETTER D WELL IS LOCATED 660 FEET FROM THE North LINE AND 660 FEET FROM THE West LINE, SECTION 35 TOWNSHIP 10-S RANGE 36-E NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8"	415	250	Surface	Cement Circulated
INTERMEDIATE	None				
LONG STRING	4-1/2"	5085'	250	4060'	Calculated using Log Caliper
TUBING	2-3/8"	4934'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Lok-set set @ 4900'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
San Andres	4213' D.F.	Not drilled thru

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Through Tubing	Perforations	4969' - 4984'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
No	For Oil Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

4968 - 4998 squeezed w/150 sx of Class "C"

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Triassic @ 1200'	None within a 2 mi. radius	11,263'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
50	100	Closed	Pressure	1308

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE —	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Harding Burris, Box 97 Elida, New Mexico 88116

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

Read & Stevens, Inc. - Box 2126, 314 Security Nat'l Bk. Roswell, New Mexico 88201

Lawrence C. Harris - Box 1714 - Roswell, New Mexico 88201

Holly Energy Inc. - 2001 Bryan Tower, Suite 2680 - Dallas, TX 75201

MGF Oil Corp. - 700 Vaughn Bldg., Midland, TX 79701

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING?	SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
	Yes	Yes	Yes
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B)	PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL
	Yes	Yes	Yes

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

(Signature)	(Title)	(Date)
[signature]	Petroleum Engineer	1-26-79

NOTE: *Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well, not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests.* SEE RULE 701.

2

1

SANTE FE WELL #2

Pertinent Information

1.) Disposal Zone: San Andres

2.) Depth of Disposal Zone: 4969' - 4984'

3.) Type of Disposal Fluid: Produced San Andres Water

4.) Anticipated Disposal Volumes:
Minimum = 50 Bbls water per day
Maximum = 100 Bbls water per day

5.) Source of Disposal Fluid:

a. Flag-Redfern Oil Company :
Sante Fe
1F 35 10S 36E - 14 BWPD
3E 35 10S 36E - 21 BWPD
Total Lease = 35 BWPD

b. Read and Stevens Inc.
Fawn Cherie
1M 26 10S 36E - 25 BWPD Est.*
Sante Fe
4K 35 10S 36E - 16 BWPD
5C 35 10S 36E - 25 BWPD Est.*
Total Read & Stevens 66 BWPD

* These 2 wells have been assigned a temporary completion and currently have suspended operations. When they are completed the produced San Andres water that they produce will be disposed in the proposed Sante Fe #2 Salt Water Disposal Well.

UNIVERSAL TREATING COMPANY Inc.

Box 1146
LEVELLAND, TEXAS

REPORT OF WATER ANALYSIS

JJR
JS
WHC
RHF
HNF
BHG
ARG
ODS
WLP
RWC
MAY 18 1976

Company Flag-Redfern Oil Company Analysis CWA Date May 15, 1976

Sample marked Santa Fe #2

	Milligrams Per Liter	IONIC FORM	Milligrams Per Liter
Chloride (NaCl)	194,000	Calcium (Ca++)	
Total Hardness (CaCO3)	73,000	Magnesium (Mg++)	
Calcium Hardness (CaCO3)	41,000	Sodium (NA++)	
Total Alkalinity (CaCO3)	300	Carbonate (Co_3^-)	
Acidity to Phenolphthalein (CaCO3)	300	Bicarbonate (HCo_3)	
Sulfate (Na2SO4)	1,985	Sulfate (SO_4)	
Total Iron (Fe)	9.2	Iron (Fe)	
P. H. 6.5 Specific Gravity	1.165	Chloride (CL-)	

Remarks Indicates formation water.

Rufus L. Morgan
Analyst

TRETOLITE DIVISION
369 Marshall Avenue / Saint Louis, Missouri 63119
(314) WO 1-3500/TWX 910-760-1660/Telex 44-2417

JJK
JHH
GSB
ENG FEB 1 1979
GEO
LSL
ACCT

WATER ANALYSIS REPORT

COMPANY Flag-Redfern Oil Company ADDRESS Tatum, N.M. DATE: 1-31-79

SOURCE Santa Fe # 2 DATE SAMPLED 1-29-79 ANALYSIS NO. 13682

Analysis		Mg/l = PPM		*Meq/l	
1. pH	6.52				
2. H_2S (Qualitative)	Pos.				
3. Specific Gravity	1.150				
4. Dissolved Solids		205,366			
5. Suspended Solids					
6. Phenolphthalein Alkalinity ($CaCO_3$)					
7. Methyl Orange Alkalinity ($CaCO_3$)		620			
8. Bicarbonate (HCO_3)	HCO_3	756	÷61	12.4	HCO_3
9. Chlorides (Cl)	Cl	122,897	÷35.5	3,462	Cl
10. Sulfates (SO_4)	SO_4	2,225	÷48	46	SO_4
11. Calcium (Ca)	Ca	4,000	÷20	200	Ca
12. Magnesium (Mg)	Mg	972	÷12.2	80	Mg
13. Total Hardness ($CaCO_3$)		14,000			
14. Total Iron (Fe)		7.0			
15. Barium (Qualitative)					
16. Strontium					

*Milli equivalents per liter

PROBABLE MINERAL COMPOSITION

200	Ca ← → HCO_3	12.4
80	Mg → SO_4	46
3,240	Na ← → Cl	3,462

Compound	Equiv. Wt.	X Meq/L	= Mg/L
Ca $(HCO_3)_2$	81.04	12.4	1,004
Ca SO_4	68.07	46	3,133
Ca Cl_2	55.50	142	7,881
Mg $(HCO_3)_2$	73.17		
Mg SO_4	60.19		
Mg Cl_2	47.62	80	3,808
Na HCO_3	84.00		
Na_2SO_4	71.03		
Na Cl	58.46	3,240	189,540

Saturation Values Distilled Water 20°C
Ca CO_3 13 Mg/L
Ca $SO_4 \cdot 2H_2O$ 2,090 Mg/L
Mg CO_3 103 Mg/L

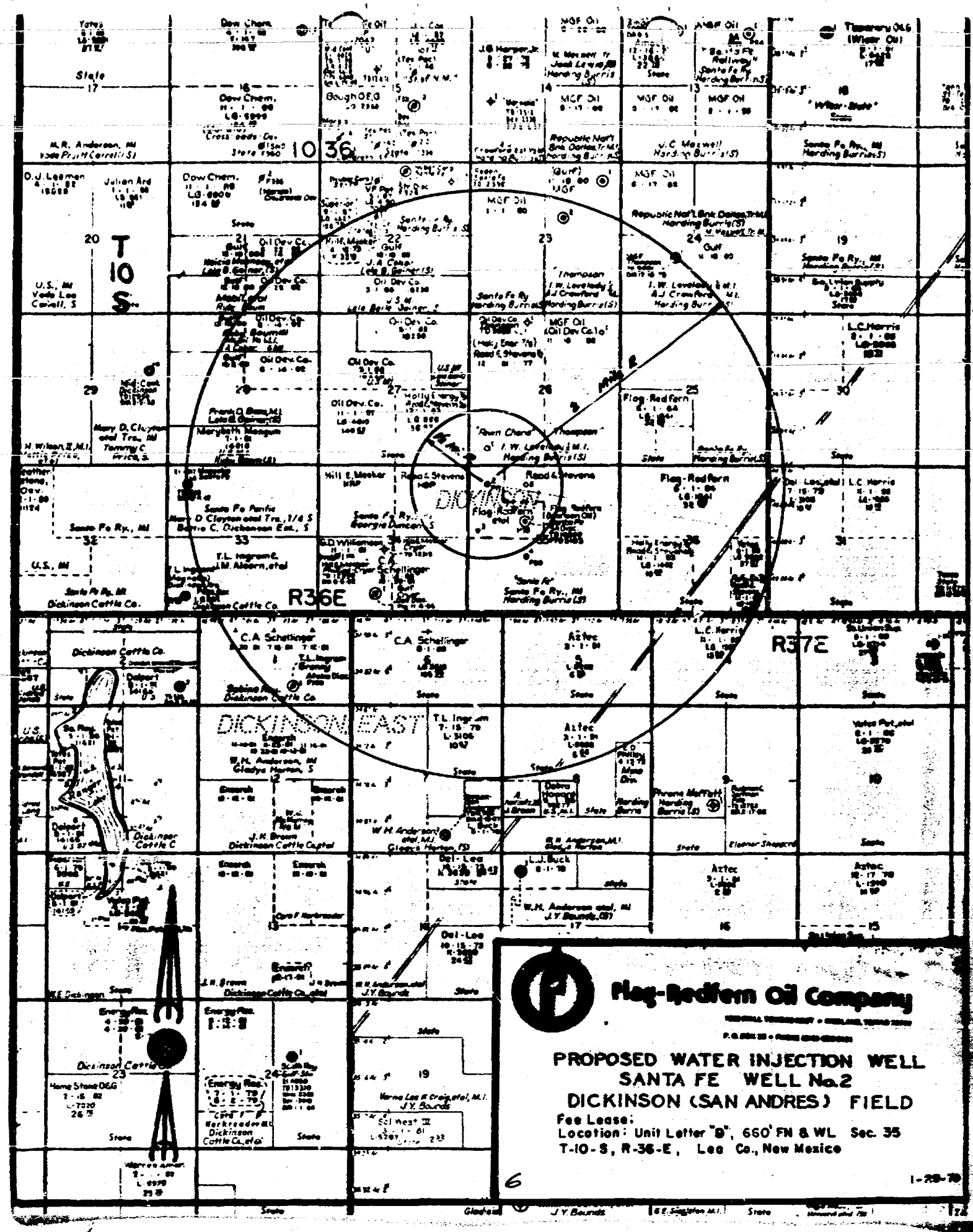
REMARKS (2) Rossler

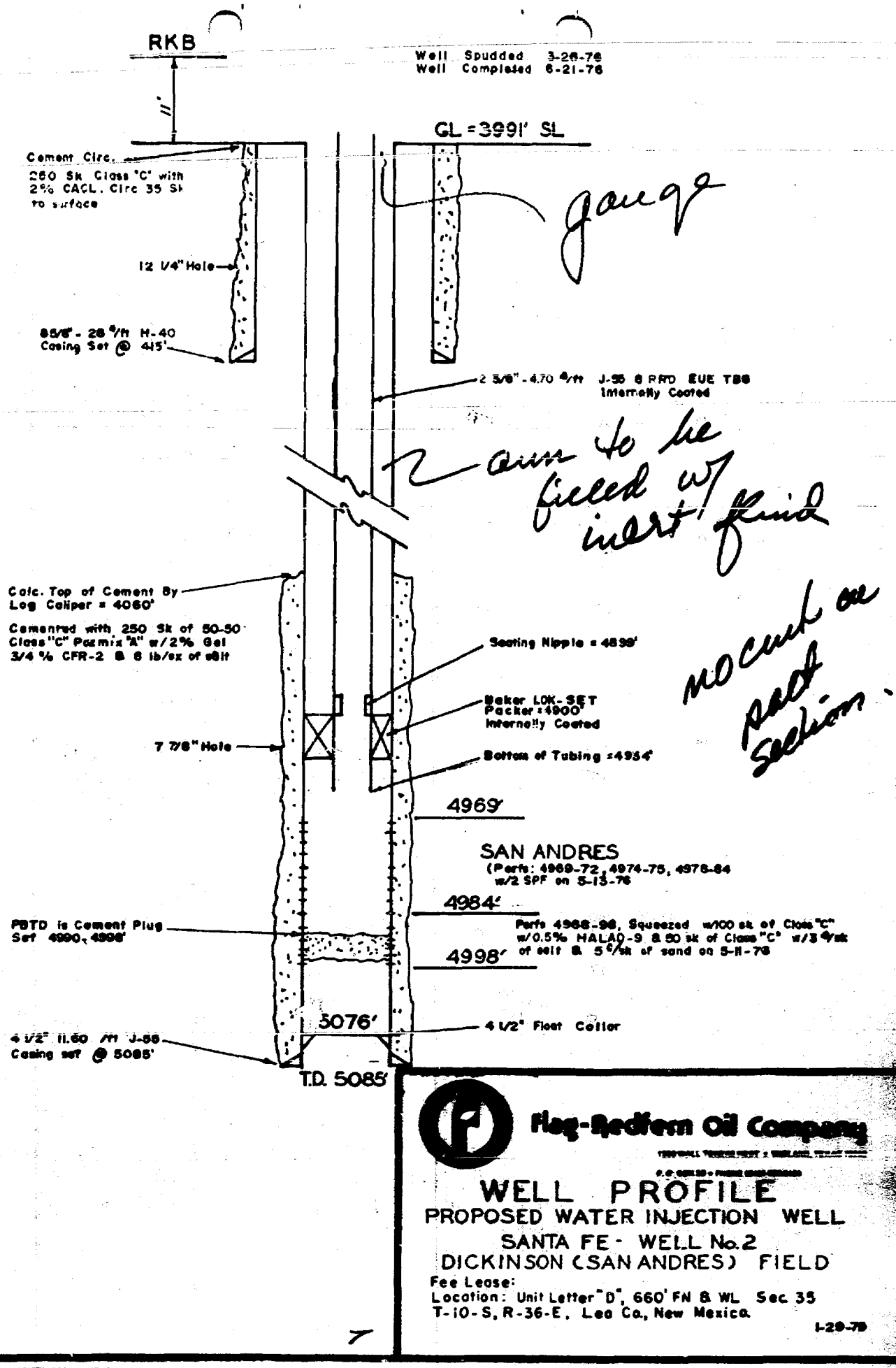
Adkins-Roberts-Gray-File

Respectfully submitted
TRETOLITE COMPANY

Ray Shaffner

5


T 10 S
R 36 E
R 37 E
DICKINSON
DICKINSON EAST
Flag-Redfern Oil Company
PROPOSED WATER INJECTION WELL
SANTA FE WELL No. 2
DICKINSON (SAN ANDRES) FIELD
Fee Lease:
Location: Unit Letter "B", 660' FN & WL Sec. 35
T-10-S, R-36-E, Lea Co., New Mexico
6
1-29-79



Flag-Redfern Oil Company

WELL PROFILE

PROPOSED WATER INJECTION WELL

SANTA FE - WELL No. 2

DICKINSON (SAN ANDRES) FIELD

Fee Lease:

Location: Unit Letter "D", 660' FN & WL Sec 35
T-10-S, R-36-E, Lea Co., New Mexico.

1-29-79

NEW MEXICO OIL CONSERVATION COMMISSION
WELL LOCATION AND ACREAGE DEDICATION PLAT

Form C-102
Supersedes C-128
Effective 1-1-65

All distances must be from the outer boundaries of the Section.

Operator	Lease	Well No.
Hanson Oil Corporation	Santa Fe	2

Unit Letter	Section	Township	Range	County
D	35	10 South	36 East	Lea

Actual Footage Location of Well:
660 feet from the North line and 660 feet from the West line

Ground Level Elev.	Producing Formation	Pool	Dedicated Acreage:
3990.7			Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

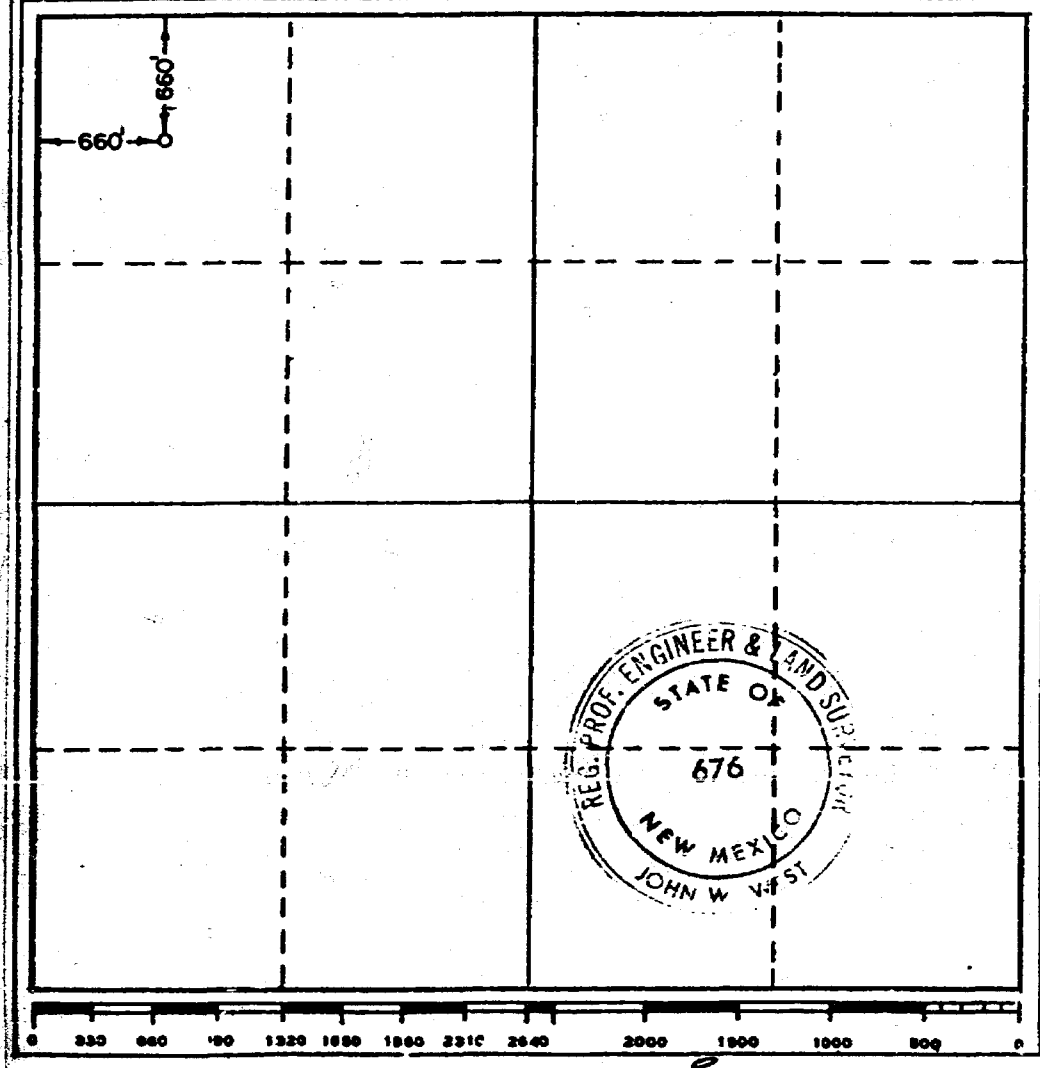
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling. etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief.

Name

Position

Company

Date

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

Date Surveyed
February 22, 1976

Registered Professional Engineer and/or Land Surveyor
John W. West

Certificate No. 676

W A I V E R

I have no objections to Flag-Redfern Oil Company's proposed salt water application for their Sante Fe Well #2 in the Dickenson (San Andres) Field, Lea County, New Mexico.

John L. Anderson Jr.
Signature

2/5/79
Date

Read & Stevens, Inc.
Company

WAIVER

I have no objections to Flag-Redfern Oil Company's proposed salt water application for their Sante Fe Well #2 in the Dickenson (San Andres) Field, Lea County, New Mexico.

Lawrence C. Harris
Signature

2-5-79
Date

Lawrence C. Harris
Company

WAIVER

I have no objections to Flag-Redfern Oil Company's proposed salt water application for their Sante Fe Well #2 in the Dickenson (San Andres) Field, Lea County, New Mexico.

Hugh L Bright
Signature

2-7-79
Date

MGF Oil Corp
Company

TABULAR SUMMARY OF ALL WELLS WITHIN ONE-HALF MILE OF
FLAG-REDFERN OIL COMPANY'S SANTE FE WELL #2
PROPOSED SALT WATER DISPOSAL WELL

Operator & Well Name	Location	Total Depth	Producing Formation and Interval	Surface Casing	Production Casing
Flag-Redfern Oil Co. Sante Fe Well #2 Proposed Disposal Well	660' FN & WL Unit Letter D Sec. 35, T-10-S, R-36-E	5085' RKB EL.= 4002'	San Andres 4669 - 4984' (Sub-sea = -967 to -982') Perfs 4968' - 4998' were previously squeezed off with 150 sx of Class "C"	8-5/8" set @ 415' Cemented w/250 sx Class "C" w/2% CaCl. Circ 35 sx to surface.	4½" set @ 5085'. Cemented w/250 sx of 50-50 Class "C" - Pozmix "A" w/2% Gel, 3/4% CFR-2 & 8 lb/sx of Salt. Top of cement @ 4060', calculated from Log Caliper.
Flag-Redfern Oil Co. Sante Fe Well #1 (Previously operated by Hanson Oil Corp.) Field Discovery Well	1980' FN & WL Unit Letter F Sec. 35, T-10-S, R-36-E Southeast Offset to Proposed Disposal Well	10,800' PBTD = 4952' RKB EL.= 3999'	San Andres 4933 - 4945' (Sub-sea = -934 to -946') EZSV Cement Retainer set @ 4962'. Perfs 4996 - 5020' squeezed w/150 sx of Class "C" - 3-9-77. Perfs 4935 - 4957' squeezed w/100 sx of Class "C" - 3-13-77.	12-3/4" set @ 370'. Cemented w/410 sx of Class "H" w/2% CaCl. Circ 50 sx to surface. 8-5/8" set @ 4300'. Cemented w/300 sx of Halli Lt. Wt. w/8#/sx of Salt followed by 200 sx of Class "C" w/2% CaCl. Top of cement = 1970', calculated using 70% fillup.	Cement Plugs in uncased 7-7/8" hole: 1) 35 sx from 9400'-9295' (105') 2) 35 sx from 9140'-9035' (105') 3) 35 sx from 7754'-7649' (105') 4) 35 sx from 5683'-5584' (99') 5½" casing set @ 5103'. Cemented w/325 sx of Class "C" w/0.4% CFR-2. Top of cement @ 3196', calculated from Log Caliper.
Flag-Redfern Oil Co. Sante Fe Well #3	330' FWL & 2310' FNL Unit Letter E Sec. 35, T-10-S, R-26-E South Offset to Proposed Disposal Well	4985' RKB EL.= 4002'	San Andres 4953 - 4982' (Sub-sea = -951 to -980')	8-5/8" set @ 360'. Cemented w/250 sx of Class "H" w/2% CaCl. Circulated 50 sx to surface.	4½" set @ 4985'. Cemented with 250 sx of Class "H" w/2% Gel, 0.75% CFR-2 and 8#/sx of Salt. Top of cement @ 4155, calculated from Log Caliper. 4½" Multi stage Tool @ 2260'. Cemented w/550 sx of Halli Lt. Wt. w/ 0.4% CFR-2 & 8#/sx of Salt. Circulated 75 sx to surface.

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TABULAR SUMMARY OF ALL WELLS WITHIN ONE-HALF MILE OF
FLAG-REDFERN OIL COMPANY'S SANTE FE WELL #2
PROPOSED SALT WATER DISPOSAL WELL

Operator & Well Name	Location	Total Depth	Producing Formation and Interval	Surface Casing	Production Casing
Read & Stevens Inc. Fawn Cherie Well #1	660' FS & WL Unit Letter M Sec. 26, T-10-S, R-36-E North Offset to Proposed Disposal Well	5013' RKB EL.= 4004'	San Andres 4955'-5013' O.H. (Sub-sea = -951 to -1009)	8-5/8" set @ 360' Cemented w/225 sx of Class "C" w/2% CaCl. Circ 89 sx to surface	5½" set @ 4955'. Cemented w/100 sxs of Class "H" w/0.75% CFR-2. Calculated Top of Cement using 70% Fillup efficiency = 4497'. Multi-stage cement tool set @ 2025'.
Read & Stevens Inc. Sante Fe Well #5	660' FNL & 1980' FWL Unit Letter C Sec. 35, T-10-S, R-36-E East Offset to Proposed Disposal Well	4991' RKB EL.= 3991'	San Andres 4950'-4991' O.H. (Sub-sea = -959 to -1000')	8-5/8" set @ 373' Cemented w/225 sx of Class "C" w/2% CaCl. Circ 34 sx to surface.	5½" set @ 4950'. Cemented w/100 sx of Class " "H" w/0.75% CFR-2. Calculated Top of Cement using 70% Fillup efficiency = 4492'. Multi-stage cement tool set @ 2196'.
Read & Stevens Inc. Sante Fe Well #4	1980' FS & WL Unit Letter K Sec. 35, T-10-S, R-36-E Over ½ mi. South-east from Proposed Disposal Well	5000' RKB EL.= 3999'	San Andres 4960'-5000' O.H. (Sub-sea = -961' to -1001')	8-5/8" set @ 348' Cemented w/225 sx of Class "C" w/2% CaCl. Circ 25 sx to surface.	5½" set @ 4960'. Cemented w/100 sx of Class "C" cement w/0.75% CFR-2. Calculated Top of Cement using 70% Fillup efficiency = 4447'. Multi-stage cement tool set @ 2200'. Cemented w/450 sx of Halliburton Light Weight w/8#/sx of Salt and 0.75% CFR-2. Circulated 79 sx cement to surface.

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FRACTURE GRADIENTS - SAN ANDRES FORMATION
DICKINSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

Well Name	Top Perforation	(1) Date of Acid Stimulation	Surface Pressure Required to Break Formation PSIG	Instant Shut-In Press. PSIG	(2) Formation Fracture Press. PSIG	Formation Fracture Gradient-PSI Ft.	(3) San Andres Disposal Water Calc. Surface Shut In Press-PSIG*	(3) San Andres Disposal Water Surface Shut In Gradient-PSI Ft.
Sante Fe Well #2 Proposed Disposal Well	4969'	5-14-76	1350	1400	3596	0.724	1116	0.225
Sante Fe Well #1	4933'	3-16-77	1700	1600	3780	0.766	1218	0.267
Sante Fe Well #3	4953'	11-5-76	1950	1950	4139	0.836	1667	0.337
Fawn Cherie Well #1	4955'	3-24-78	Unknown	2200	4187	0.845	1714	0.346
Sante Fe Well #5	4950'	5-16-78	2200	2450	4435	0.896	1965	0.397
Sante Fe Well #4	4960'	12-3-77	2300	2700	4689	0.945	2214	0.446
Field Average	4952'	(Excluding Sante Fe Well #4 due to its being over ½ mile from proposed Disposal Well.)			4027	0.813	1556	0.314
Disposal Well	4969'				4027	0.810	1547 PSIG	0.311 PSI FT.

(Based on Shut In conditions with Tubing Loaded with San Andres Disposal Water)

*NOTE: This Table is based on Static (No Injection) Conditions.
For Friction Pressure, See Friction Table

EXPLANATION OF FRACTURE GRADIENT TABLE

1. All acid jobs were performed based on the Matrix stimulation technique and hydraulic fracturing was purposely avoided to prevent treating out of zone and stimulating the San Andres water zone, which is encountered 15 feet below the lowest oil productive San Andres zone in these wells.

2. Calculation of the San Andres formation fracture pressures were based on the following formula:

$$P_{ISI} = P_{BF} - P_H$$

Where:

P_{ISI} = Instant Shut-In Pressure - psig
P_{BF} = Bottom Hole Fracturing Pressure - psig
P_H = Hydrostatic Pressure - psig

Reference:

Howard and Fast, Hydraulic Fracturing, Monograph Volume 2. "Mechanics of Hydraulic Fracturing", pg. 100. American Petroleum Institute of Mining, Metalurgical and Petroleum Engineers; Dallas, Texas 1970.

3. San Andres Disposal Water
Specific Gravity = 1.150
Fluid Gradient = 0.499 $\frac{psi}{ft.}$

FRICTION TABLE

2-3/8" - 4.70 Lb/Ft Internally Plastic Coated Tubing

INJECTION RATE Bbl/Min	VELOCITY Ft/Sec. Down Tubing (v)	REYNOLD NUMBER (N_R)	FANNING FRICTION FACTOR (f)	FRICTION* PRESSURE (Δp_f)
0.25 BPM	1.077	2.15×10^4	0.00625	6.7 PSI
0.50 "	2.154	4.29×10^4	0.00550	23.6 PSI
0.75 "	3.230	6.44×10^4	0.00500	48.3 "
1.00 "	4.307	8.58×10^4	0.00475	81.6 "
1.25 "	5.384	1.07×10^5	0.00450	120.8 "
1.50 "	6.461	1.29×10^5	0.00440	170.0 "
1.75 BPM	7.537	1.50×10^5	0.00425	223.5 PSI

* This friction pressure (friction loss) is the differential pressure that will be realized from surface to the top of the disposal zone (4969') when the San Andres disposal water is injected down the 2-3/8" internally plastic coated tubing at the various rates listed above. In other words, with no increase in bottom hole disposal pressure, the surface injection pressure will be increased due to friction by the pressures listed above for their corresponding injection rates.

EXPLANATION OF CALCULATED FRICTION PRESSURE VALUES

1. All friction pressures were calculated using the Fanning Friction Equation* which is:

$$\Delta p_f = \frac{f L \rho v^2}{25.8\, d}$$

where:

- Δp_f = Friction loss for turbulent flow - PSI, see friction table
- f = Fanning friction factor - see (2.) below
- L = Depth of tubing = 4969 Ft.
- ρ = Density of fluid = 9.59 lb/gal
- v = Velocity of disposal fluid - Ft/Sec, see friction table
- d = Internal diameter of plastic coated tubing = 1.995 in.

2. Fanning friction factor (f) is obtained from the attached curve on "Friction factors for clean steel pipe" *using the curve for smooth tubing which is the same as internally plastic coated tubing. In order to utilize this curve, the Reynolds Number must be calculated for each disposal rate. The Reynolds Number Equation* is as follows:

$$N_R = \frac{928\, d\, v\, \rho}{\mu}$$

where:

- N_R = Reynolds number - see friction table
- μ = Viscosity of San Andres disposal water = 0.891 centipoises

* REFERENCE:

Craft, Holden and Graves, WELL DESIGN: DRILLING AND PRODUCTION, Chapter One - Fluid Flow in Pipes pp. 18 - 23 Prentice - Hall Inc., Englewood Cliffs, New Jersey 1963.

FRICTION FACTORS FOR CLEAN STEEL PIPE

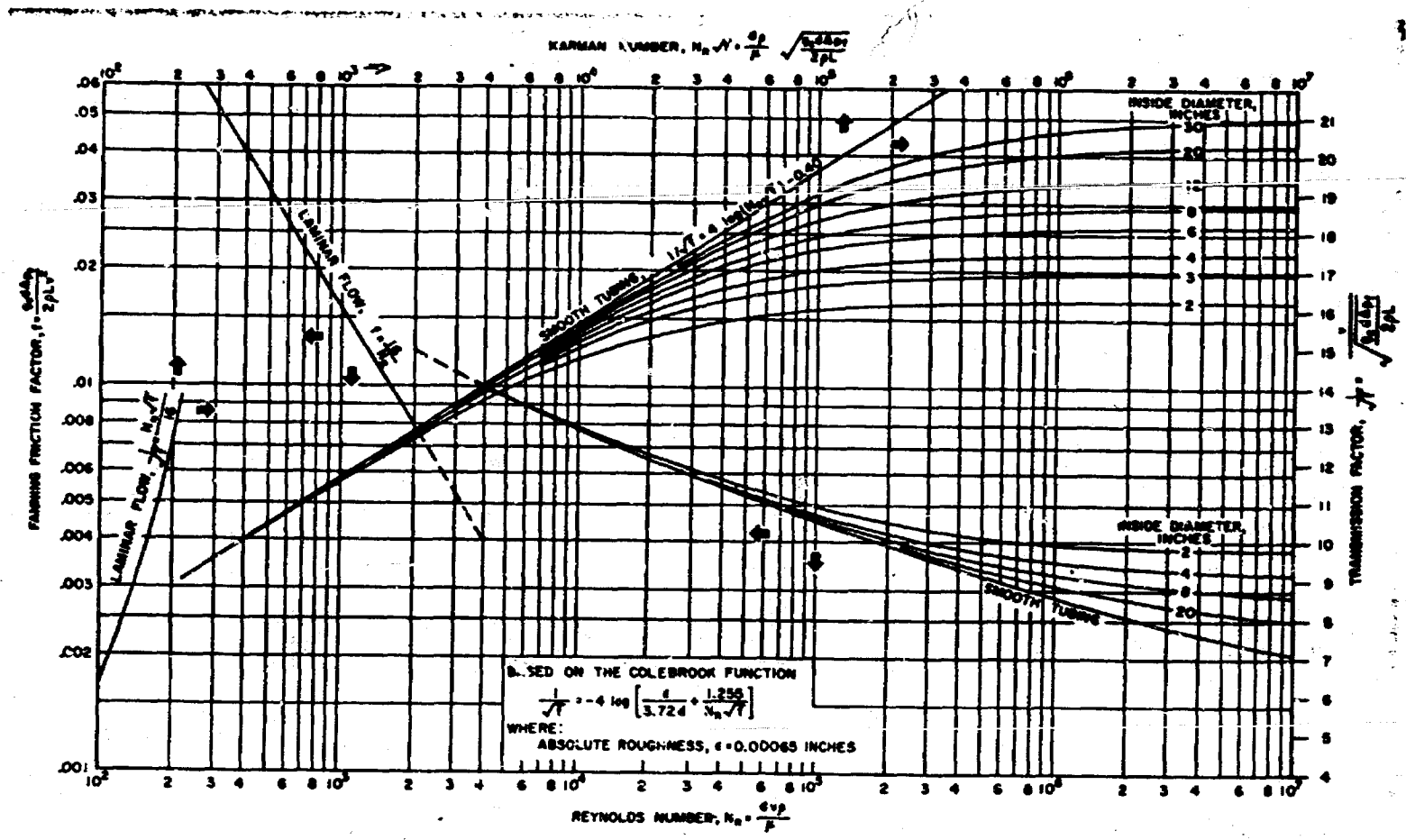


Fig. 1.4 Friction factors for clean steel pipe.

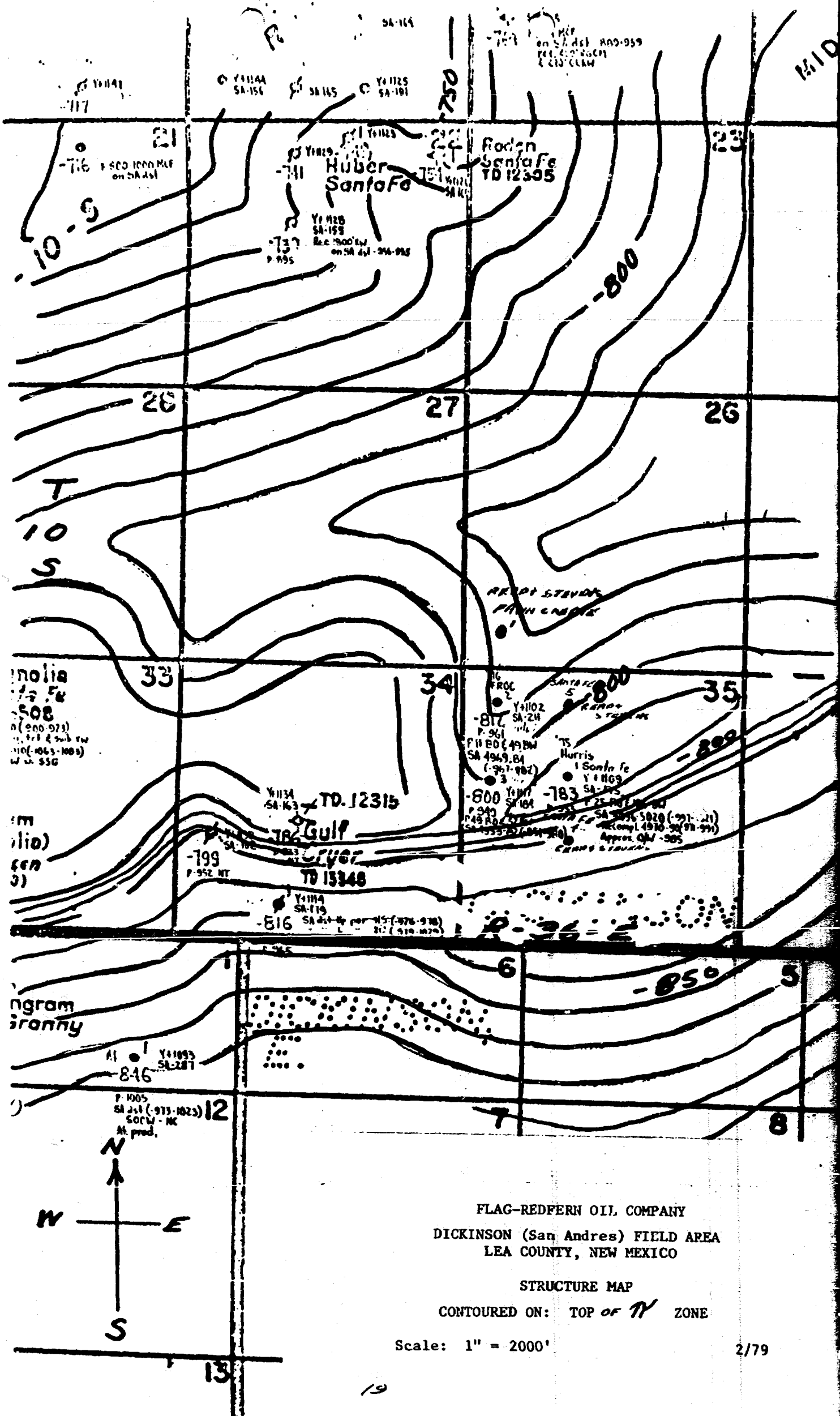
1-26-72

* REFERENCE:

Craft, Holden and Graves, WELL DESIGN: DRILLING AND PRODUCTION, Chapter One - Fluid Flow in Pipes pp. 18 - 23 Prentice - Hall Inc., Englewood Cliffs, New Jersey 1963.

CALCULATED SURFACE INJECTION PRESSURES
PROPOSED DISPOSAL WELL
SANTA FE WELL #2
DICKENSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

INJECTION RATE - BPM	CALCULATED FRICTION PRESSURE PSI	CALCULATED INSTANT SHUT-IN SURFACE PRESSURE - PSIG	CALCULATED SURFACE INJECTION PRESSURE - PSIG
0.25	7	1547	1554
0.50	24	1547	1571
0.75	48	1547	1595
1.00	82	1547	1629
1.25	121	1547	1668
1.50	170	1547	1717
1.75	224	1547	1771



FLAG-REDFERN OIL COMPANY

DICKINSON (San Andres) FIELD AREA
LEA COUNTY, NEW MEXICO

STRUCTURE MAP

CONTOURED ON: TOP OF N ZONE

Scale: 1" = 2000'

2/79

SANTA FE LEASE
DICKENSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

PRODUCTION HISTORY

TIME	OIL PROD. BBL/MO.	GAS PROD. MCF/MO.	WATER PROD. BBL/MO.	REMARKS
Jan. 1975	243	178 Est.	486	1 well Hanson
Feb.	290	213 "	580	Oil Co. Operator
March	41	30 "	82	
April	160	117 "	320	
May	226	166 "	452	
June	96	70 "	192	
July	128	94 "	256	
Aug.	45	33 "	90	
Sept.	143	105 "	286	
Oct.	41	30 "	82	
Nov.	61	48 "	122	
Dec.	5	4 "	10	
Jan. 1976	77	57 "	154	
Feb.	55	40 "	110	
March	33	24 "	66	
April	233	171 "	466	
May	0	0	0	Shut-in
June	0	0	0	Shut-in
July	376	308 Actual	1519	
Aug.	180	147	1519	
Sept.	96	79	1470	Well #1 now oper
Oct.	184	151	1519	ated by Flag Red
Nov.	370	200	2940	Fern Oil Co.
Dec.	946	433	3038	3 wells
Jan. 1977	941	431	3038	
Feb.	757	346	2744	
March	685	244	2759	
April	894	369	3090	
May	713	427	3193	
June	780	467	3090	
July	696	417	3193	
Aug.	756	452	3193	
Sept.	560	336	3090	
Oct.	588	353	3193	
Nov.	474	284	3090	
Dec.	588	350	3193	
Jan. 1978	517	310	3193	
Feb.	420	250	2884	
March	346	208	3193	
April	441	265	3090	
May	390	231	3193	
June	370	233	3098	
July	272	171	3193	
Aug.	199	113	3193	
Sept.	266	177	3090	
Oct.	303	182	3193	
Nov.	303	182	3193	
Dec.	182	109	3193	
Jan. 1979	303	182	3193	
TOTALS	16,778 BBL OIL	9887 MCF	93,524 BBL WATER	

SANTA FE WELL #2
DICKINSON (SAN ANDRES) FIELD
LEA COUNTY, NEW MEXICO

PRODUCTION HISTORY

TIME	OIL PROD. BBL/MO.	GAS PROD. MCF/MO.	WATER PROD. BBL/MO.
July 1976	376	308	1519
Aug. 1976	180	147	1519
Sept 1976	96	79	1470
Oct. 1976	184	151	1519
Nov. 1976	105	86	1470
Dec. 1976	62	51	1519
Jan. 1977	62	51	1519
Feb. 1977	50	41	1372
March 1977	60	8	2108
April 1977	62	1	2040
May 1977	46	1	2108
June 1977	50	1	2040
July 1977	45	1	2108
Aug. 1977	49	1	2108
Sept. 1977	36	1	2040
Oct. 1977	38	1	2108
Nov. 1977	31	1	2040
Dec. 1977	39	1	2108
Jan. 1978	33	1	2108
Feb. 1978	28	1	1904
Mar. 1978	23	1	2108
April 1978	28	1	2040
May 1978	29	1	2108
June 1978	23	1	2040
July 1978	15	1	2108
Aug. 1978	16	1	2108
Sept. 1978	21	1	2040
Oct. 1978	21	1	2108
Nov. 1978	21	1	2108
Dec. 1978	13	1	2108
Jan. 1979	21	1	2108
TOTALS	1863 BBL OIL	960 MCF	59,711 BBL WTR.

Acid Spot 19.45

Type Acid 500 gallons MH-72

Ac't Acid

Chemical

Universal Treating Co., Inc.

UNIVERSAL ACIDIZING INC.
Box 1146 LEVELLAND, TEXAS Phone 894-6725

The Best Acid Jobs In The Oil Patch

Treatment Stage No.

Tbg. Cap. 16.28

Csg. Cap. .17

Open Hole

TREATING LOG

Company Flag Redfern Oil Company Date May 14, 1976

Lease Santa Fe State Well 2

Total Depth 4993 Csg. Wt. Set Open Hole

Csg. Perf. 4969 to 4984 Shots per ft. Packer

Tbg. Perf. 4986 To Tbg. Depth Tbg.

Pkr. Set Production Prior Treatment

Type Treatment Treat casing perforation via tubing with 500 gallons 20% MH-72 acid. Flush with treated water.

Time	Tbg. PSI	Csg. PSI	Rate B.P.M.	Total Bbls. In Form.	
12:15	0	0			Start water via tubing.
12:30	200	NG			60 bbl water. Start acid to spot.
12:37	200				All acid. Start flush.
12:45	200	NG			Acid on spot. Pressure formation 1000 PSI.
12:46	1000	1000			
1:00	1000	1000			Pressure formation to 1000 PSI.
1:35	1200	1200	.06	3	Pressure formation to 1200 PSI.
1:50	1200	1200	.1	4.5	Pressure formation to 1200 PSI.
1:55	1350	1350			Pressure formation to 1350 PSI.
2:04	1250	1250	.14	6.5	Formation break 50 PSI While pumping.
2:09	1400	1400			Speed pump slightly.
2:12	1500	1500	.25	9	Slow pump.
2:14	1400	1450			Speed pump.
2:18	1450	1450	.5	12	All flush. Shut down.
2:18	1400	1400			Instant Shut Down Pressure.
2:23	475	475			5 minute shut down.
					Pressure Maximum 1500 Minimum 1000 Average 1175
					Injection RAte Maximum .5 Minimum 06 Average .13
					Total load to recover 84 bbl
					Instant Shut Down Pressure 1400
					Thank you

Treatment Ordered by

Treating Engineer Jim Kent

26

Acid Spot _____

Type Acid 20% N.E.

Am't Acid 500

Chemical _____

Universal Treating Co., Inc.

Box 1146 LEVELLAND, TEXAS Phone 894-6125

The Best Acid Jobs In The Oil Patch

Treatment Stage No. 2

Tbg. Cap. 28.

Csg. Cap. 78.

Open Hole _____

TREATING LOG

Company Flag-Redfern Oil Co. Date 3-16-77

Lease Santa Fe Well # 1

Total Depth 4961.5 Csg. 5½ Wt. 15.50 Set Thru Open Hole _____

Csg. Perf. 4944 to 4948 2 Shots per ft. _____ Packer None

Tbg. Perf. 4951 To 4954 Tbg. Depth 4959 Tbg. 2⅛

Pkr. Set _____ Production Prior Treatment _____

Type Treatment Treat via tubing with 500 gallons 20% N/E. Non-emulsion Acid Spot. Break formation & put 500 gallons in formation & Swab test.

Time	Tbg. PSI	Csg. PSI	Rate B.P.M.	Total Bbls. in Form.	
8:30	200				Start Acid to spot
8:45					500 gallons Acid in - Start 17.7 bbls. Water
9:00	200				Acid on spot
9:20	1500	1500			Start fromation break
10:00	1600	1600			Continue tc pressure formation
10:45	1700	1700			Continue to pressure formation
	1700	1700			Formation taking fluid
11:50	1700	1600			14 bbls. Flush in - 500 gallons Acid in formation

Maximum PSI 1700

Minimum PSI 1500

Instant Shut Down Pressure 1600

After 15 minutes 800

Total Fluid 120 bbls.

Thank You

Treatment Ordered by D. Russell

Treating Engineer Joe Richardson

27

STAGE NO. 2

CARDINAL CHEMICAL, INCORPORATED

SERVICE REPORT

DISTRICT 3-Area-1 STATION Hobbs, New Mexico DATE November 5, 1976

COMPANY Flag-Redfren STATE New Mexico COUNTY Lea

LEASE Santa Fe WELL NO. 3 POOL Dickson

COMPANY REPRESENTATIVES Mr. Doyal Russell CARDINAL ENGINEERS Holland

WELL DATA

CASING, TUBING & PACKER DATA

CASING O.D. 4 1/2 WT. 9.5 DPT. CEMENT yes

LINER O.D. WT. FR. TO

TUBING SIZE 2 3/8 PERF'S OR OPEN END

TUBING SIZE PERF'S OR OPEN END

HYD. HOLD DOWN ANCHOR: KIND DEPTH

UPPER PACKER TYPE: Watson DEPTH

LOWER PACKER TYPE: DEPTH

CASING PERFORATED W/ 24 SHOTS/FT. FROM 4953 TO 4982

SHTS./FT. FR. TO FR. TO

SHTS./FT. FR. TO FR. TO

OPEN HOLE SIZE: FROM TO

COMPLETION DATA

DATE DRILLED 10-76 FORMATION San Andres

PAY SECTION FROM 4953 TO 4982

PRESENT TOTAL DEPTH 4985 P.B. FROM

INITIAL PROD: OIL GAS WATER

PRESENT PROD: OIL GAS WATER

ACID AND/OR FRAC DATE

ACID AND/OR FRAC DATE

ACID AND/OR FRAC DATE

ACID AND/OR FRAC DATE

TOTAL ACID AND/OR FRAC IN WELL

TYPE FLUID IN TBG. IN CSG.

VOLUMES

TBG 19.2 BBLS. CSG. BBLS. OPEN HOLE BBLS

ANNULAR VOL. OF PAY ZONE: CSG. 1.5 OPEN HOLE

TOTAL TO FILL BBLS. TOTAL TO SPOT BBLS

VOL. USED TO FLUSH 20.7 BBLS. TO OVERFLUSH 1.0 BBLS

OTHER INFORMATION:

OIL TANK GAUGES: START FINISH

SERVICES USED

1,500	GALS. 20% NM Stabilized	TYPE
2	GALS. NM-225	TYPE
3	GALS. RD-11	TYPE
150	LBS. KCL; 2 gals. LST-5	MATERIAL
10-7/8	LBS. Balls (RCN)	MATERIAL

PUMPS USED ON TBG.

PUMPS USED ON CSG.

DETAILS OF SERVICES PERFORMED REMARKS

CARDINAL CONNECTIONS TESTED TO: TBG. 2000 PSI. CSG. PSI.

TIME a.m. or p.m.	PRESSURES Casing	PRESSURES Tubing	BARRELS OF FLUID PUMPED In Formation	BARRELS OF FLUID PUMPED Per Reading	BARRELS OF FLUID PUMPED Per Minute	
8:00						ARRIVED ON LOCATION. Rig up Cardinal Equipment
8:50	500			1.0		PSI casing.
8:55	500	0				Start acid down tubing.
9:01	500	500		20	1.3	Encounter PSI-continue pumping.
9:17	450	900	2	2	1.0	Inject 5 ball sealers.
9:29	450	1100	8	6	.5	Inject 5 ball sealers.
	400	2000	16	8		All acid, start flush, discontinue balls.
	500	2000				After shooting 10 due to slow rate.
	600	2000				
11:35	700	2000	37	21	.2	All flush, shut down.
	700	1950				ISIP 1950#
	700	1550				5 min. 1550#,
	700	1400				10 min. 1400#.
						57 bbls. total load.
	700	1950				ADD FOR SAND DISPLACEMENT
						INSTANTANEOUS SHUT-IN PRESSURES
						PRESSURES MINUTES AFTER STOPPING ALL PUMPS.
					.26	MAXIMUM PRESSURES AND AVG. INJECTION RATE FOR 138 MINS. PUMPING.
						MINIMUM PRESSURES

LAST TRUCK DEPARTED. LOCATION WAS LEFT CLEAN — ~~XXXX~~ 28 Thank You

YB-1F REV.

Read & Stevens, Inc.

3-21-78 TD 5000' dolo., prep to drill to 5003' and run log.

3-22-78 TD 5003' dolo., prep to run tubg. and pkr. and swab test. Ran Welex Radioactivity log. Note correction on casing setting: Set 5½" @ 4945' due to apparent 18' fillup at time of running casing. Have 7 7/8" hole from 4945' to 4963' and 4 3/4" hole from 4963' to 5003'. When reverse unit drilling commenced bit went to 4963' with no weight. Apparently rotary rig drilling depth was in error.

3-23-78 TD 5003' dolo., prep to acidize. Ran tubg. and pkr. w/ pkr. set @ 4900' and tubg. to 4995'. Swab hole dry and waited 1 hr. Ran swab and hole still dry. Shut down overnight. At 8:00 AM, had 600' fluid in hole. Swabbed hole dry and rec. oily emulsion.

3-24-78 TD 5003' dolo., prep to swab. Acidized open hole 4945'-5003' w/ 2000 gals. 15% NE acid and flushed w/ oil. Acid treatment max. treat. press. 2200#, min. treat. press. 1200#, aver. inj. rate 1½ BPM. Oil flush max. press. 3000#, min. press 1200#, aver. press. 2200#. ISDP 2200#, 5 min. SIP 2000#, 10 min. SIP 1950#, 15 min. SIP 1900#. Total load 68 bbls. Bled off press. and swab 64 bbls. load in 4½ hrs. Had 1400' fluid in hole last swab run.

3-25-78 TD 5003' dolo. prep to swab. At 8:00 AM, FL 2400' FS. Swab 3 hrs. and lower FL to 4600' FS. Shut down 2½ hrs. to change out sond line and FL back up to 3200' FS. Swabbed total 4 bbls. load and 37 bbls. formation fluid, oil and water.

3-26-78 TD 5003' dolo., shut down. At 8:00 AM, FL 3000' FS. Swab 39 bbls. fluid in 9 hrs., est. 40% oil and 60% SW.

3-27-78 TD 5003', dolo., prep to run rods and pump. Shut down for Sunday.

3-28-78 TD 5003' dolo., prep to pull tubg. & pkr. and run rods & pump. Swabbed 30 bbls. fluid in 10 hrs. No est. of oil-water cut.

3-29-78 TD 5003' dolo., prep to spaceout pump. Ran tubg., rods and pump.

3-30-78 TD 5003' dolo., prep to install pumping unit. Taking run as follows: 159 joints 2 3/8", 8 rd., 4.7#, J-55, total of 4991.96', set at 5002' RKB w/ seating nipple at 4967' RKB. Ran rods and 2"x1½" x 16' pump.

3-31-78 TD 5003' dolo., rigging up pump.

4-1-78 TD 5003' dolo., rigging up pump.

4-2-78 TD 5003' dolo., started pumping @ 4:00 PM, 4-1-78.

4-3-78 TD 5003' dolo., testing. Pumped 34 bbls. load oil in 16 hrs.

5-8-78 TD 4950' lm., moving out rotary rig.

5-9-78 TD 4950' lm., WOCU.

5-10-78 TD 4950', lm., WOCU. Set anchors and moved-in test tank.

5-11-78 TD 4950' lm., WOCU. Welded on bell nipple & moved-in tubg. Completion unit broke down one mile from location.

5-12-78 TD 4952' lm., prep to re-run tubg. & circulate hole with oil. Rigged up Pool Co. unit & ran 2 3/8" tubg. w/ 12 drill collars and 4 3/8" Walker bit. Tagged cement and drilled plug, insert float, 27' of cement, guide shoe and 2' of formation. Pulled tubg. to change bit. Shut down overnight.

5-13-78 TD 4984', dolo., prep to drill. Re-ran tubg., collars and Hughes. J-55, 4 3/4" bit. Drilled from 4952' to 4984'.

5-14-78 TD 4991' dolo., shut down. Drilled from 4984' to 4991'. Circulated hole clean. Ran Dresser Atlas Gamma Ray, Compensated Neutron log.

5-15-78 TD 4991' dolo., prep to re-run tubg. and swab test.

5-16-78 TD 4991' dolo., prep to swab. Ran 156 joints 2 3/8" tubg. w/ RTTS pkr. Set tubg. @ 4965' RKB w/ pkr. set @ 4874' RKB. Swabbed tubg. capacity plus est. 2 bbls. formation oil. Broke off bottom part of swab mandrel. Pulled and re-ran tubg. and pkr. @ same depth setting. Recovered broken swab. Spotted acid over open hole. Acidized w/ 2000 gals. 15% N.E. acid. Formation began taking fluid @ 2200# and increased rate to 2.5 BPM @ 2750#. Max. treat. press. 3100# (on flush), min. treat. press. 2200#, aver. treat. press. 2670#, aver. inj. rate 2.17 BPM, ISDP 2450#, 5 min. SIP 2400#, 10 min. SIP 2350#, 15 min. SIP 2250#. Total load 70 bbls. (20 bbls. oil & 48 bbls. acid). Shut-in overnight.

5-17-78 TD 4991' dolo., prep to swab. At 8:00 AM, SITP 0#. Hole full of fluid. Swabbed 22 BLO & 20 BLW in 8½ hrs. Lack 28 BLW. FL 4700' FS lost swab run. Well making some gas with each swab run.

5-18-78 TD 4991' dolo., testing. Swabbed 12 BO & 11 BLW in 8½ hrs. Lack 17 BLW.

Read & Stevens, Inc.

12-3-77 TD 5000', dolo., prep. to swab. Acidized open hole 4960'-5000' w/ 2000 gals. 15% NE acid. Formation began feeding @ 1/4 BPM @ 2300#, increased rate to 1 BPM & press. increased to 2600#, increased rate to 1 3/4 BPM & press. increased to 3000#. Formation did not break. ISDP 2700#, 5 min. SIP 2300#, 10 min. SIP 2100#, 15 min. SIP 1900#. Total load 68 bbls. Began swabbing @ 3:00 PM. Swab 43 bbls. load in 1 1/2 hrs. Shut down overnight.

12-4-77 TD 5000' dolo., shut down. At 7:30 AM, 12-3-77, FL 1300' FS. Swab 107 bbls. fluid in 9 hrs. being 25 bbls. load & 82 bbls. new oil. Last hour swabbed 9 BO, no water w/FL 3000' FS. Shut down till Monday morning.

12-5-77 TD 5000' dolo., prep to cement upper stage of production casing. At 7:30 AM, FL 2500' FS. Swab 47 BO in 4 hrs. Last hour (10:30 AM to 11:30 AM) swabbed 8 BO, no water w/ small amount of gas.

12-6-77 TD 5000' dolo., WOC. Pulled tubg. & pkr. Ran bridge plug & tool to shift DV tool. Set BP @ 2285' & spotted 2 sx. sand on top of BP. Opened DV tool @ 2195'. Broke circulation & cemented w/ 450 sx. HOWCO lite cement w/ 3/4 of 1% CFR-2 & 8# salt per sx. Circulated 79 sx. cement. Closed DV tool & press. tested csg. to 1500# for 30 min., held OK. Reversed sand off BP, retrieved BP and pulled tubg.

12-7-77 TD 5000' dolo., prep to run rods & pump. Ran 161 joints 2 3/8", 4.7#, upset tubg. (4950.54'), 1 seating nipple (1.10'), 1 perf. jt. (3.00') & 1 jt. tubg for mud anchor (31.62'), total of 4986.26', set @ 4994.26' RKB.

12-8-77 TD 5000' dolo. Ran rods & pump.

12-9-77 TD 5000' dolo. Moved in & set-up tanks.

12-10-77 TD 5000' dolo. Set pumping unit.

12-11-77 TD 5000' dolo. Shut-down.

12-12-77 TD 5000' dolo. Laying flow lines & hooking up tank battery.

12-13-77 TD 5000' dolo. Hooking up tank battery.

12-14-77 TD 5000' dolo. Hooking up tank battery.

12-15-77 TD 5000' dolo. Sand blasted and coated tanks.

Flag-Redfern Oil Company

1200 WALL TOWERS WEST • MIDLAND, TEXAS 79701 • PHONE (915) 683-5184

Mailing address:
P. O. Box 23
Midland, Texas 79702

January 26, 1979

File:

Case 6446

New Mexico Oil Conservation Commission
P. O. Box 2088
State LAnd Office Building
Santa Fe, New Mexico 87501

Attention: Mr. D. S. Nutter
Chief Engineer

Re: Confirmation of Hearing
Application for Salt Water
Disposal Permit
Sante Fe Well #2
Fee Lease
Dickinson (San Andres) Field
Lea County, New Mexico

Dear Mr. Nutter:

This letter will serve to confirm Flag-Redfern Oil Company's request for a hearing for a salt water disposal permit for the above captioned well. Attached is Form C-108 with all necessary attachments.

It is our understanding that the hearing will be on February 14, 1979. Please advise us of the time and location where this hearing is to occur.

Thank you for your cooperation in this matter.

Sincerely,

Steve Rossler
Petroleum Engineer

SWR/dlp

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR	ADDRESS
Flag-Redfern Oil Company	P. O. Box 23 Midland, Texas 79702

LEASE NAME	WELL NO.	FIELD	COUNTY
Sante Fe	2	Dickinson (San Andres)	Lea

LOCATION

UNIT LETTER D WELL IS LOCATED 660 FEET FROM THE North LINE AND 660 FEET FROM THE West LINE, SECTION 35 TOWNSHIP 10-S RANGE 36-E NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8"	415	250	Surface	Cement Circulated
INTERMEDIATE	None				
LONG STRING	4-1/2"	5085'	250	4060'	Calculated using Log Caliper
TUBING	2-3/8"	4934'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Lok-set set @ 4900'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
San Andres	4213' D.F.	Not drilled thru

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Through Tubing	Perforations	4969' - 4984'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
No	For Oil Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

4968 - 4998 squeezed w/150 sx of Class "C"

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Triassic @ 1200'	None within a 2 mi. radius	11,263'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
50	100	Closed	Pressure	1308

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE —	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Harding Burris, Box 97 Elida, New Mexico 88116

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

Read & Stevens, Inc. - Box 2126, 314 Security Nat'l Bk. Roswell, New Mexico 88201

Lawrence C. Harris - Box 1714 - Roswell, New Mexico 88201

Holly Energy Inc. - 2001 Bryan Tower, Suite 2680 - Dallas, TX 75201

MGF Oil Corp. - 700 Vaughn Bldg., Midland, TX 79701

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING?	SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
	Yes	Yes	Yes
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B)	PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL
	Yes	Yes	Yes

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

(Signature)	Petroleum Engineer (Title)	1-26-79 (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

SANTE FE WELL #2

Pertinent Information

1.) Disposal Zone: San Andres

2.) Depth of Disposal Zone: 4969' - 4984'

3.) Type of Disposal Fluid: Produced San Andres Water

4.) Anticipated Disposal Volumes:
Minimum = 50 Bbls water per day
Maximum = 100 Bbls water per day

5.) Source of Disposal Fluid:

a. Flag-Redfern Oil Company :
Sante Fe
1F 35 10S 36E - 14 BWPD
3E 35 10S 36E - 21 BWPD
Total Lease = 35 BWPD

b. Read and Stevens Inc.
Fawn Cherie
1K 26 10S 36E - 25 BWPD Est.*
Sante Fe
4K 35 10S 36E - 16 BWPD
5C 35 10S 36E - 25 BWPD Est.*
Total Read & Stevens 66 BWPD

* These 2 wells have been assigned a temporary completion and currently have suspended operations. When they are completed the produced San Andres water that they produce will be disposed in the proposed Sante Fe #2 Salt Water Disposal Well.

UNIVERSAL TREATING COMPANY Inc.

Box 1146
LEVELLAND, TEXAS

REPORT OF WATER ANALYSIS

JJR
JS
WHC
RHF
HNF
BHC
ARG
ODS
WLP
RWC
MAY 18 1976

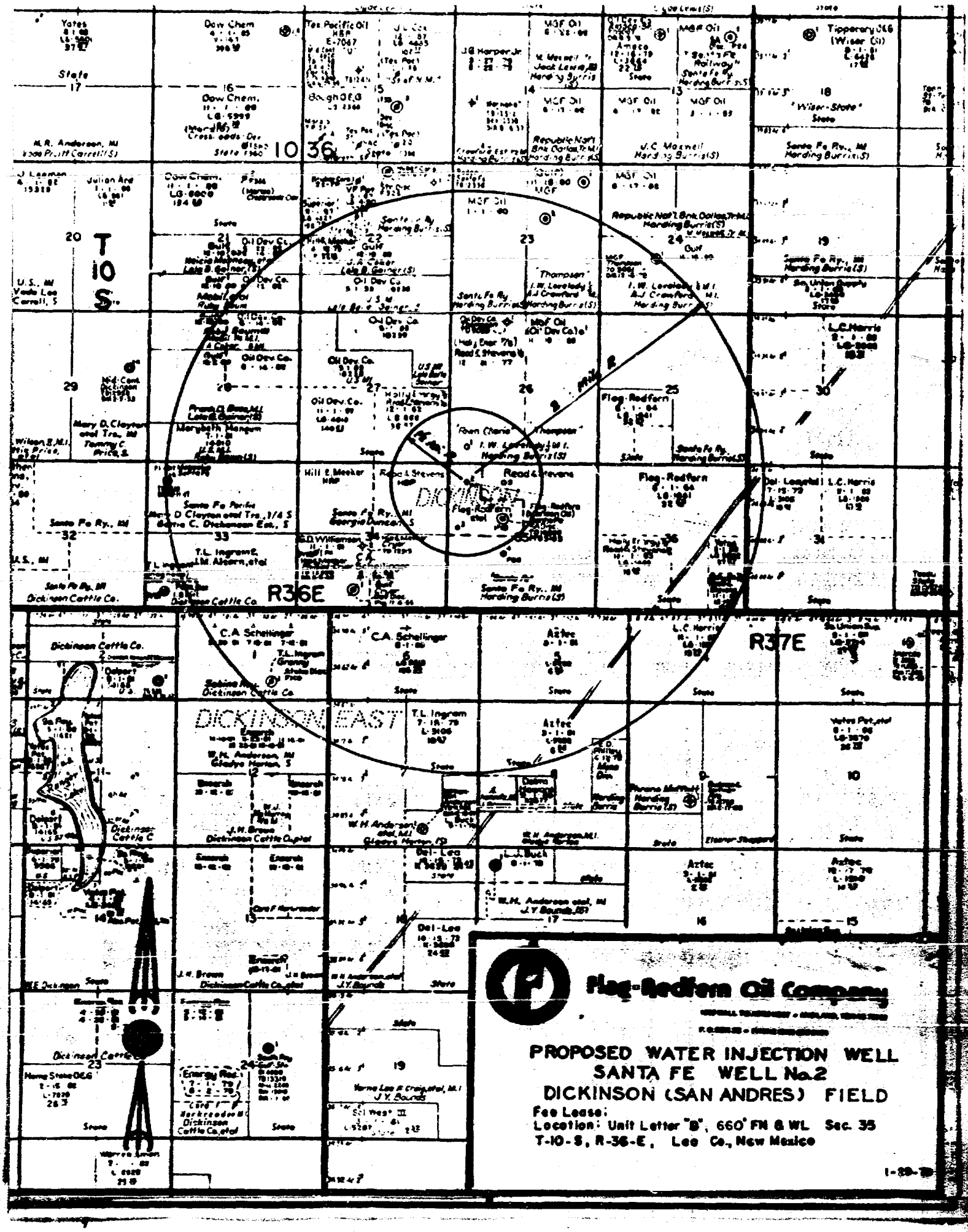
Company Flag-Redfern Oil Company Analysis CWA Date May 15, 1976

Sample marked Santa Fe #2

	Milligrams Per Liter	IONIC FORM	Milligrams Per Liter
Chloride (NaCl)	194,000	Calcium (Ca++)	
Total Hardness (CaCO3)	73,000	Magnesium (Mg++)	
Calcium Hardness (CaCO3)	41,000	Sodium (NA++)	
Total Alkalinity (CaCO3)	300	Carbonate ($Co\bar{3}$-)	
Acidity to Phenolphthalein (CaCO3)	300	Bicarbonate (HCo_3)	
Sulfate (Na2SO4)	1,985	Sulfate (SO_4)	
Total Iron (Fe)	9.2	Iron (Fe)	
P. H. 6.5 Specific Gravity	1.165	Chloride (CL-)	

Remarks Indicates formation water.

Rufus L. Morgan
Analyst


T 10 S
R 36 E
R 37 E
DICKINSON
DICKINSON EAST
Flag-Redfern Oil Company
PROPOSED WATER INJECTION WELL
SANTA FE WELL No. 2
DICKINSON (SAN ANDRES) FIELD
Fee Lease:
Location: Unit Letter "B", 660' FN & WL Sec. 35
T-10-S, R-36-E, Lee Co., New Mexico

NEW MEXICO OIL CONSERVATION COMMISSION

WELL LOCATION AND ACREAGE DEDICATION PLAT

Form C-102
Supersedes C-128
Effective 1-1-65

All distances must be from the outer boundaries of the Section.

Operator	Lease	Well No.
Hanson Oil Corporation	Santa Fe	2

Unit Letter	Section	Township	Range	County
D	35	10 South	36 East	Lea

Actual Footage Location of Well:
660 feet from the North line and 660 feet from the West line

Ground Level Elev.	Producing Formation	Pool	Dedicated Acreage:
3990.7			Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

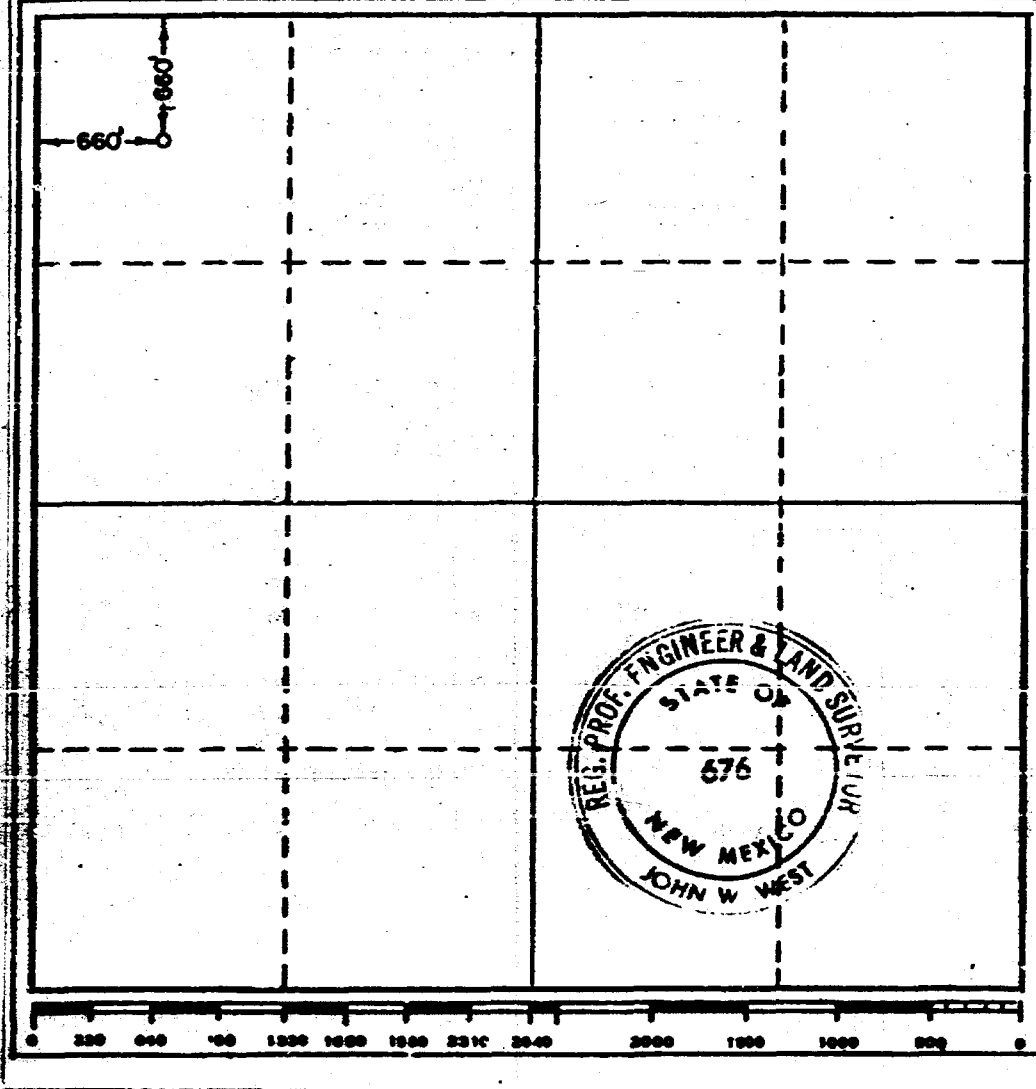
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling, etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief.

Name

Position

Company

Date

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

Date Surveyed
February 22, 1976

Registered Professional Engineer and/or Land Surveyor
John W. West

Certificate No. 676

JAN 30 1979

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

Santa Fe

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR	ADDRESS
Flag-Redfern Oil Company	P. O. Box 23 Midland, Texas 79702

LEASE NAME	WELL NO.	FIELD	COUNTY
Sante Fe	2	Dickinson (San Andres)	Lea

LOCATION

UNIT LETTER D ; WELL IS LOCATED 660 FEET FROM THE North LINE AND 660 FEET FROM THE West LINE, SECTION 35 TOWNSHIP 10-S RANGE 36-E NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8"	415	250	Surface	Cement Circulated
INTERMEDIATE	None				
LONG STRING	4-1/2"	5085'	250	4060'	Calculated using Log Caliper
TUBING	2-3/8"	4934'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Lok-set set @ 4900'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
San Andres	4213' D.F.	Not drilled thru

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Through Tubing	Perforations	4969' - 4984'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
No	For Oil Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

4968 - 4998 squeezed w/150 sx of Class "C"

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Triassic @ 1200'	None within a 2 mi. radius	11,263'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
50	100	Closed	Pressure	1308

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE — WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OF LESSEE, IF STATE OR FEDERAL LAND)

Harding Burris, Box 97 Elida, New Mexico 88116

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

Read & Stevens, Inc. - Box 2126, 314 Security Nat'l Bk. Roswell, New Mexico 88201

Lawrence C. Harris - Box 1714 - Roswell, New Mexico 88201

Holly Energy Inc. - 2001 Bryan Tower, Suite 2680 - Dallas, TX 75201

MGF Oil Corp. - 700 Vaughn Bldg., Midland, TX 79701

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING? SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
Yes	Yes	Yes

ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701)? PLAT OF AREA	ELECTRICAL LOG	[illegible]
Yes	Yes	Yes

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

(Signature) Petroleum Engineer (Title) 1-26-79 (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

SANTE FE WELL #2

Pertinent Information

1.) Disposal Zone: San Andres

2.) Depth of Disposal Zone: 4969' - 4984'

3.) Type of Disposal Fluid: Produced San Andres Water

4.) Anticipated Disposal Volumes:
Minimum = 50 Bbls water per day
Maximum = 100 Bbls water per day

5.) Source of Disposal Fluid:

a. Flag-Redfern Oil Company :
Sante Fe
1F 35 10S 36E - 14 BWPD
3E 35 10S 36E - 21 BWPD
Total Lease = 35 BWPD

b. Read and Stevens Inc.
Fawn Cherie
1M 26 10S 36E - 25 BWPD Est.*
Sante Fe
4K 35 10S 36E - 16 BWPD
5C 35 10S 36E - 25 BWPD Est.*
Total Read & Stevens 66 BWPD

* These 2 wells have been assigned a temporary completion and currently have suspended operations. When they are completed the produced San Andres water that they produce will be disposed in the proposed Sante Fe #2 Salt Water Disposal Well.

UNIVERSAL TREATING COMPANY Inc.

Box 1146
LEVELLAND, TEXAS

REPORT OF WATER ANALYSIS

JJR
J3
WHC
RHF
HNF
BHG
ARG
ODS
WLP
RWC
MAY 18 1976

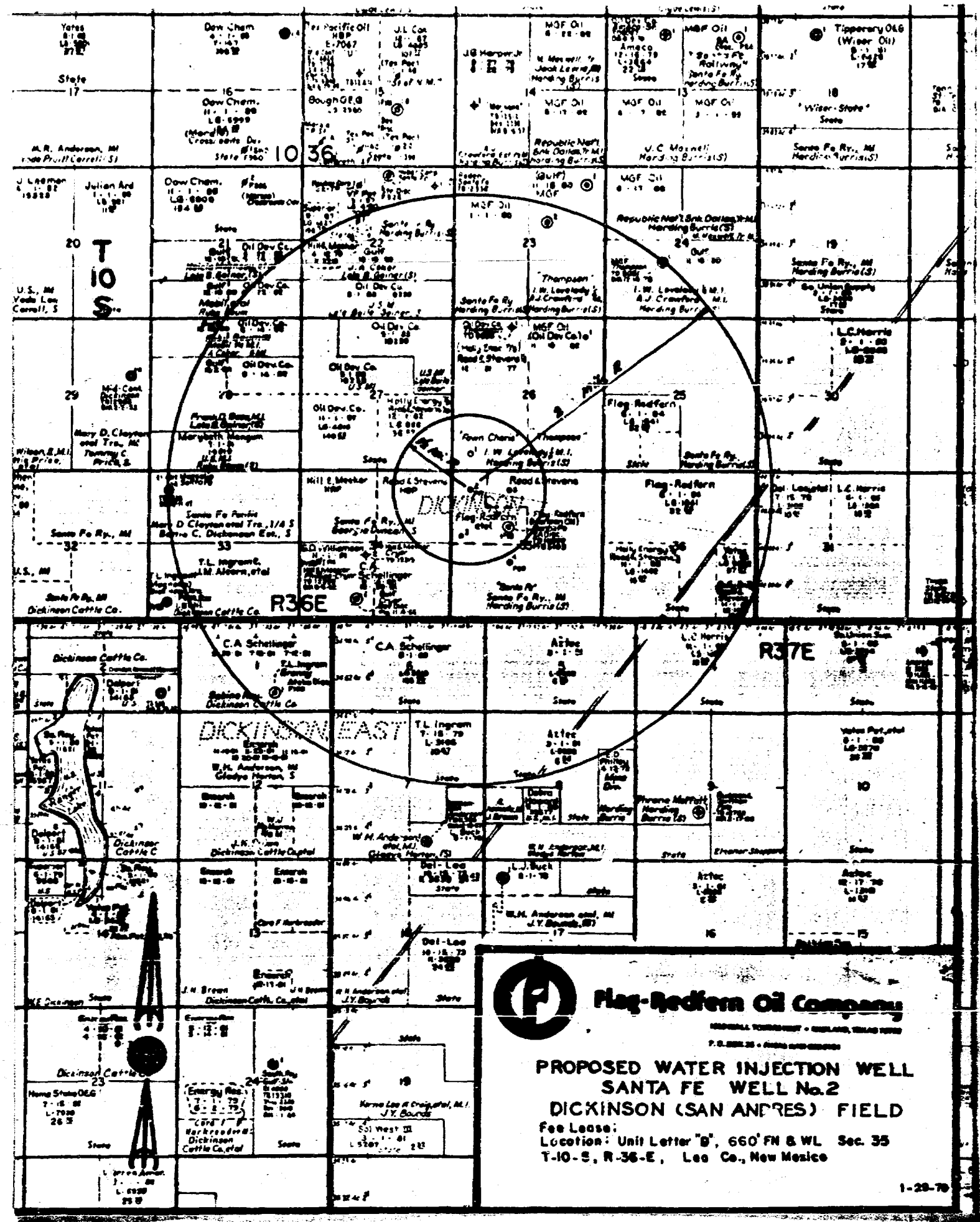
Company Flag-Redfern Oil Company Analysis CWA Date May 15, 1976

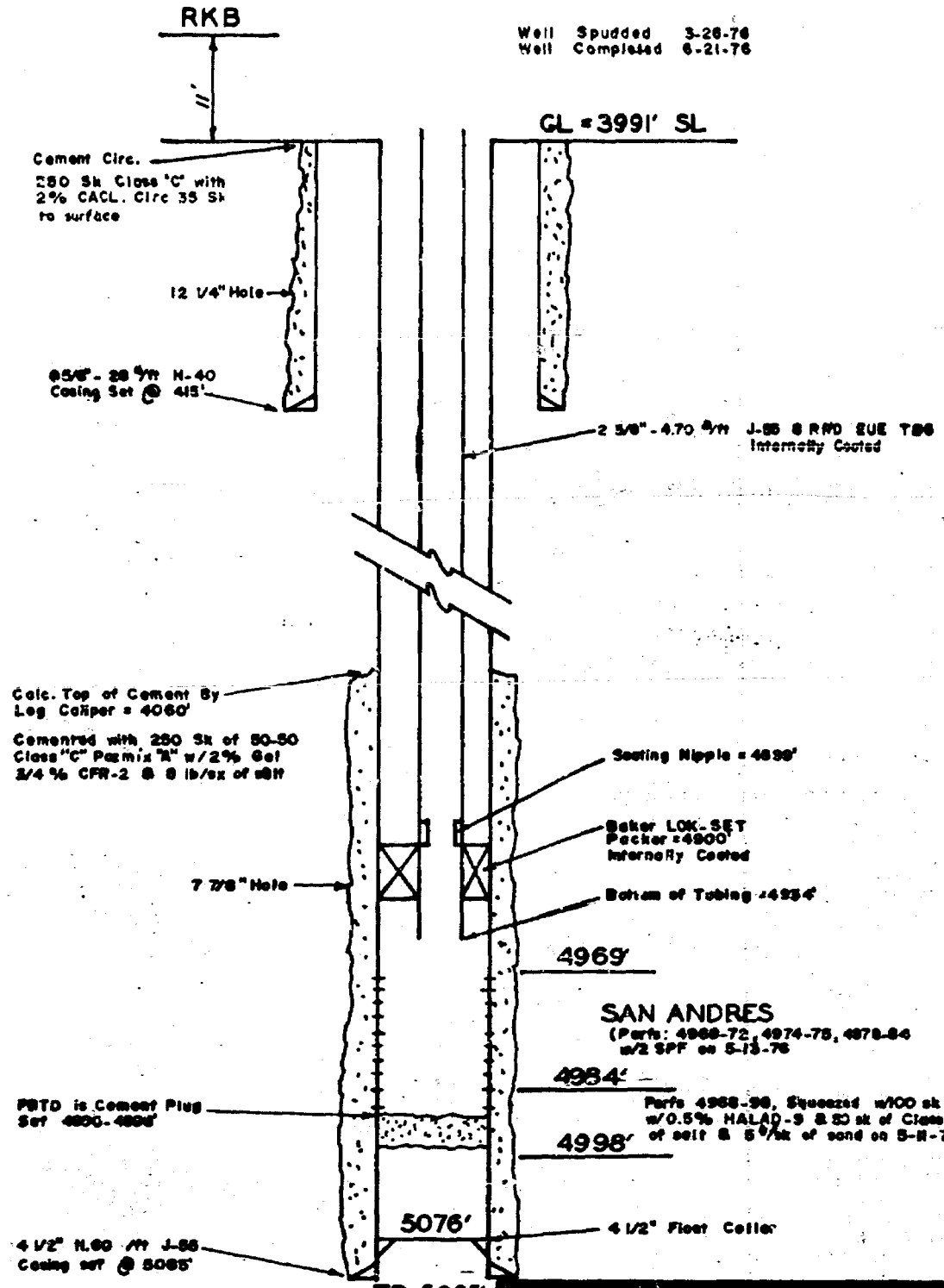
Sample marked Santa Fe #2

	Milligrams Per Liter	IONIC FORM	Milligrams Per Liter
Chloride (NaCl)	194,000	Calcium (Ca++)	
Total Hardness (CaCO3)	73,000	Magnesium (Mg++)	
Calcium Hardness (CaCO3)	41,000	Sodium (NA++)	
Total Alkalinity (CaCO3)	300	Carbonate ($Co\bar{3}-$)	
Acidity to Phenolphthalein (CaCO3)	300	Bicarbonate (HCo_3)	
Sulfate (Na2SO4)	1,985	Sulfate (SO_4)	
Total Iron (Fe)	9.2	Iron (Fe)	
P. H. 6.5 Specific Gravity	1.165	Chloride (CL-)	

Remarks Indicates formation water.

Rufus L. Morgan
Analyst


T 10 S
R 36 E
R 37 E
DICKINSON
DICKINSON EAST
Flag-Redfern Oil Company
PROPOSED WATER INJECTION WELL
SANTA FE WELL No. 2
DICKINSON (SAN ANDRES) FIELD
Fee Lease:
Location: Unit Letter "B", 660' FN & WL Sec. 35
T-10-S, R-36-E, Lea Co., New Mexico
1-28-70



Flag-Redfern Oil Company

P.O. BOX 2529 • MIDLAND, TEXAS 79702

WELL PROFILE

PROPOSED WATER INJECTION WELL

SANTA FE - WELL No. 2

DICKINSON (SAN ANDRES) FIELD

Fee Lease:

Location: Unit Letter "D", 660' FN & WL Sec. 35

T-10-S, R-36-E, Lea Co., New Mexico

1-29-79

NEW MEXICO OIL CONSERVATION COMMISSION

WELL LOCATION AND ACREAGE DEDICATION PLAT

JAN 29 1979

Form C-102
Supersedes C-128
Effective 1-1-65

All distances must be from the outer boundaries of the Section.

Operator	Lease	Well No.
Hanson Oil Corporation	Santa Fe	2

Unit Letter	Section	Township	Range	County
D	35	10 South	36 East	Lea

Actual Footage Location of Well:
660 feet from the North line and 660 feet from the West line

Ground Level Elev.	Producing Formation	Pool	Dedicated Acreage:
3990.7			Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

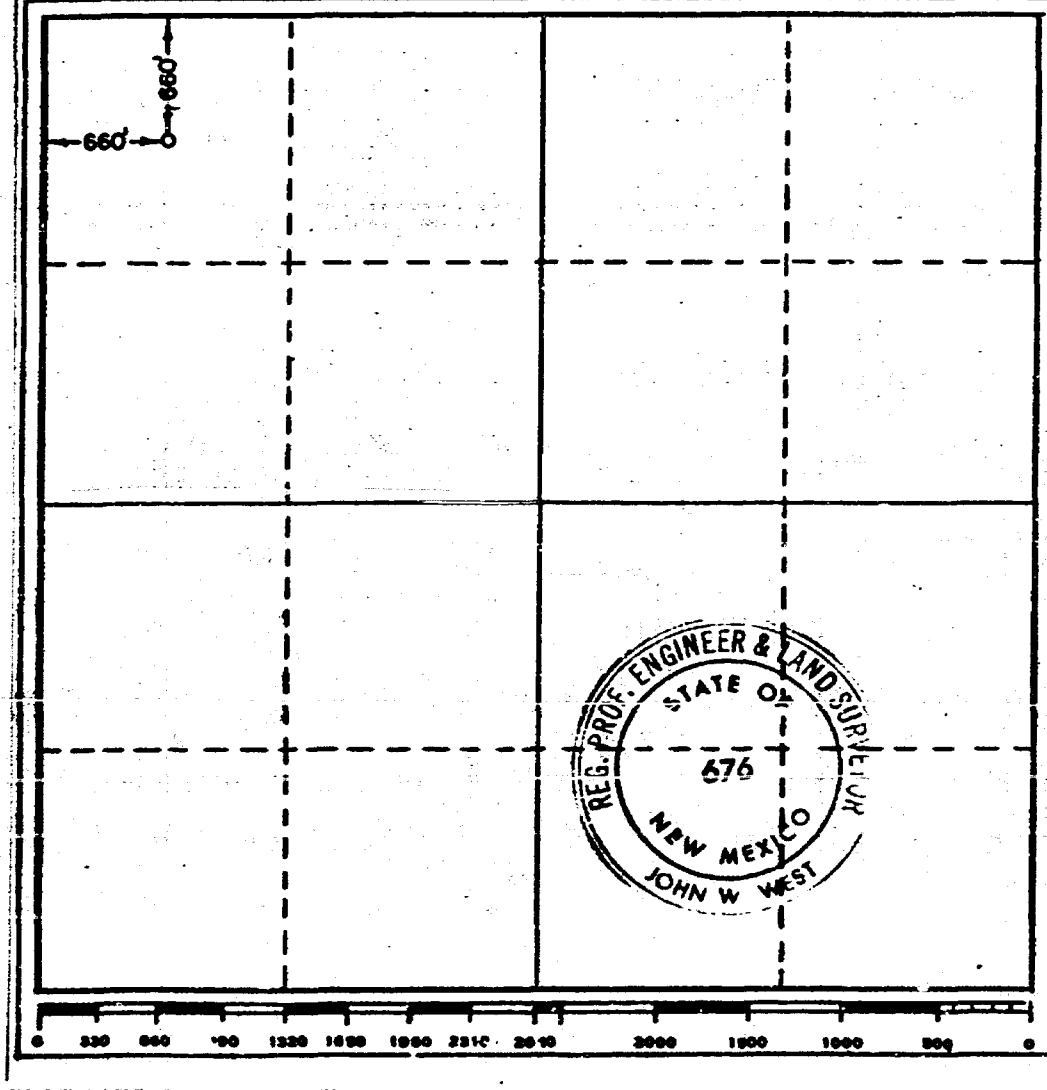
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling. etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief.

Name

Position

Company

Date

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

Date Surveyed
February 22, 1976

Registered Professional Engineer and/or Land Surveyor
John W. West

Certificate No. 676

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR: Flag-Redfern Oil Company		ADDRESS: P. O. Box 23 Midland, Texas 79702	
LEASE NAME: Sante Fe	WELL NO.: 2	FIELD: Dickinson (San Andres)	COUNTY: Lea

LOCATION: UNIT LETTER D ; WELL IS LOCATED 660 FEET FROM THE North LINE AND 660 FEET FROM THE West LINE, SECTION 35 TOWNSHIP 10-S RANGE 36-E NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8"	415	250	Surface	Cement Circulated
INTERMEDIATE	None				
LONG STRING	4-1/2"	5085'	250	4060'	Calculated using Log Caliper
TUBING	2-3/8"	4934'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Lok-set set @ 4900'		

NAME OF PROPOSED INJECTION FORMATION: San Andres	TOP OF FORMATION: 4213' D.F.	BOTTOM OF FORMATION: Not drilled thru
IS INJECTION THROUGH TUBING, CASING, OR ANNULUS? Through Tubing	PERFORATIONS OR OPEN HOLE? Perforations	PROPOSED INTERVAL(S) OF INJECTION: 4969' - 4984'

IS THIS A NEW WELL DRILLED FOR DISPOSAL? No	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED? For Oil Production	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE? Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH: 4968 - 4998 squeezed w/150 sx of Class "C"

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA: Triassic @ 1200'	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA: None within a 2 mi. radius	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA: 11,263'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
50	100	Closed	Pressure	1308

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE –	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND): Harding Burris, Box 97 Elida, New Mexico 88116

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL:

Read & Stevens, Inc. - Box 2126, 314 Security Nat'l Bk. Roswell, New Mexico 88201

Lawrence C. Harris - Box 1714 - Roswell, New Mexico 88201

Holly Energy Inc. - 2001 Bryan Tower, Suite 2680 - Dallas, TX 75201

MGF Oil Corp. - 700 Vaughn Bldg., Midland, TX 79701

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING?	SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
	Yes	Yes	Yes
ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B)	PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL
	Yes	Yes	Yes

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

(Signature)	(Title)	(Date)
	Petroleum Engineer	1-26-79

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

SANTE FE WELL #2

Pertinent Information

1.) Disposal Zone: San Andres

2.) Depth of Disposal Zone: 4969' - 4984'

3.) Type of Disposal Fluid: Produced San Andres Water

4.) Anticipated Disposal Volumes:
Minimum = 50 Bbls water per day
Maximum = 100 Bbls water per day

5.) Source of Disposal Fluid:

a. Flag-Redfern Oil Company :
Sante Fe
1F 35 10S 36E - 14 BWPD
3E 35 10S 36E - 21 BWPD
Total Lease = 35 BWPD

b. Read and Stevens Inc.
Fawn Cherie
1M 26 10S 36E - 25 BWPD Est.*
Sante Fe
4K 35 10S 36E - 16 BWPD
5C 35 10S 36E - 25 BWPD Est.*
Total Read & Stevens 66 BWPD

* These 2 wells have been assigned a temporary completion and currently have suspended operations. When they are completed the produced San Andres water that they produce will be disposed in the proposed Sante Fe #2 Salt Water Disposal Well.

UNIVERSAL TREATING COMPANY Inc.

Box 1146
LEVELLAND, TEXAS

REPORT OF WATER ANALYSIS

JJR
JB
WHC
RHF
HNF
BHG
ARG
ODS
WLP
RWC
MAY 18 1976

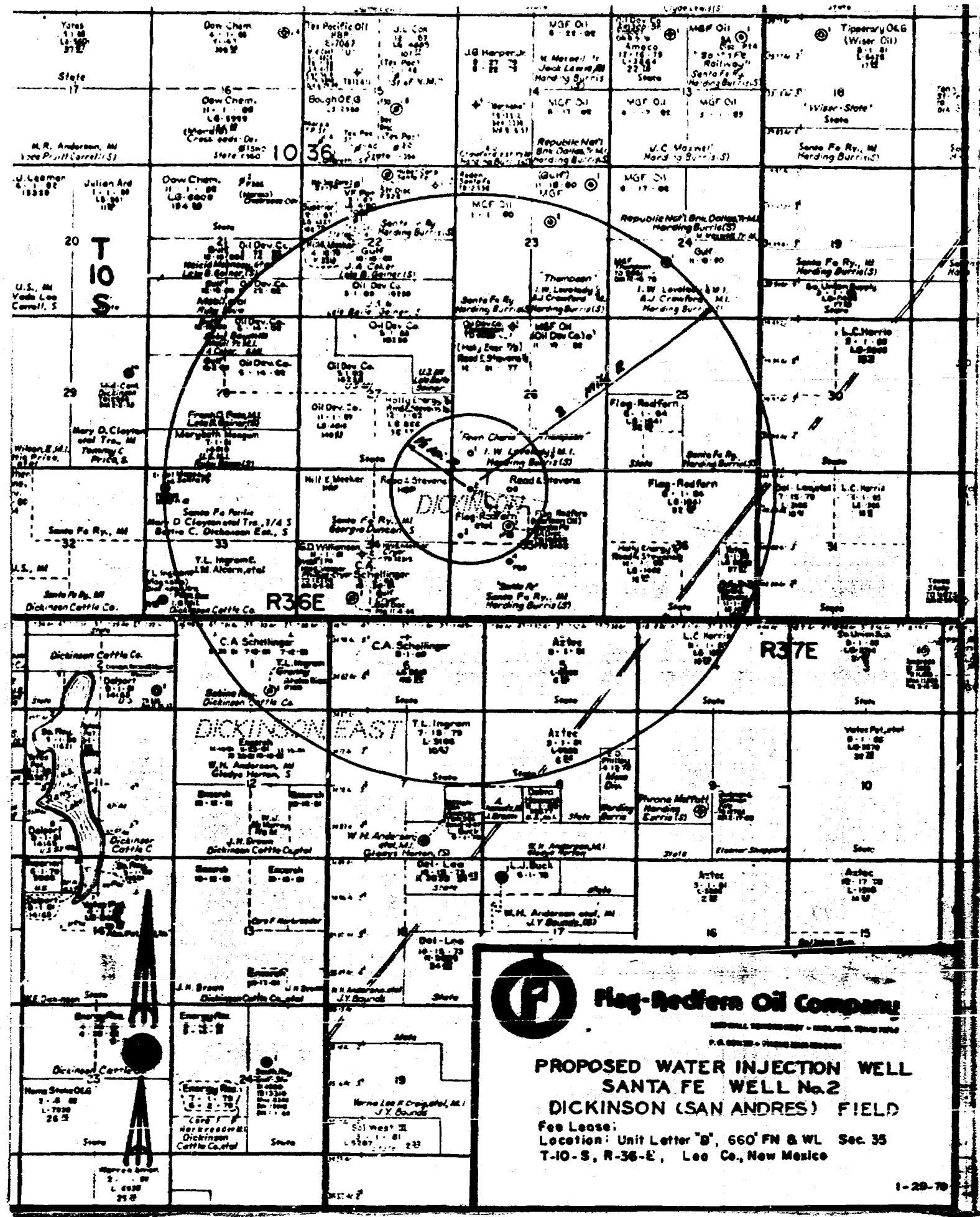
Company Flag-Redfern Oil Company Analysis CWA Date May 15, 1976

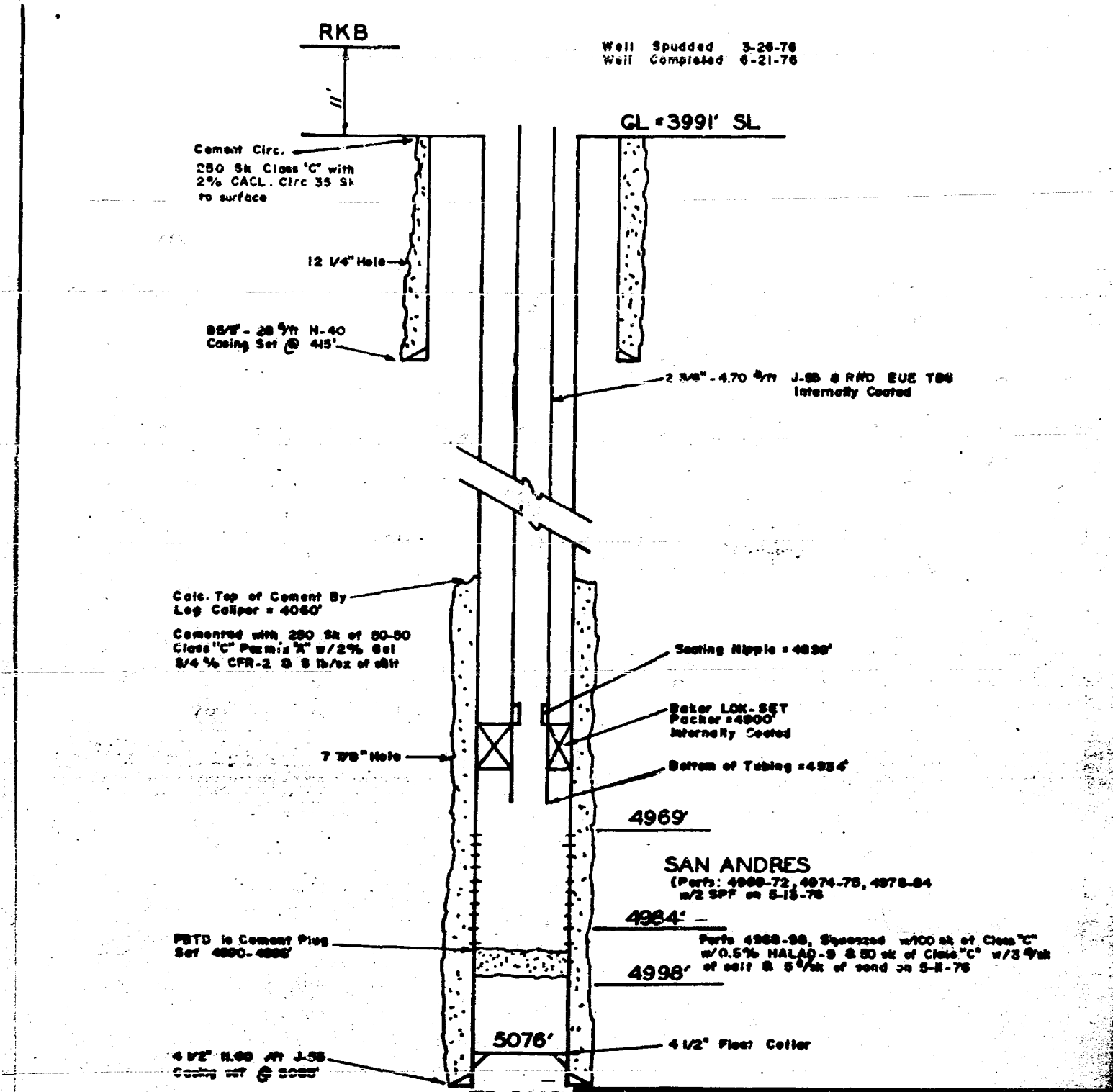
Sample marked Santa Fe #2

	Milligrams Per Liter	IONIC FORM	Milligrams Per Liter
Chloride (NaCl)	194,000	Calcium (Ca++)	
Total Hardness (CaCO3)	73,000	Magnesium (Mg++)	
Calcium Hardness (CaCO3)	41,000	Sodium (NA++)	
Total Alkalinity (CaCO3)	300	Carbonate ($Co\bar{3}-$)	
Acidity to Phenolphthalein (CaCO3)	300	Bicarbonate (HCo_3)	
Sulfate (Na2SO4)	1,985	Sulfate (SO_4)	
Total Iron (Fe)	9.2	Iron (Fe)	
P. H. 6.5 Specific Gravity	1.165	Chloride (CL-)	

Remarks Indicates formation water.

Rufus L. Morgan
Analyst


T 10 S
R 36 E
R 37 E
DICKINSON
DICKINSON EAST
Flag-Redfern Oil Company
PROPOSED WATER INJECTION WELL
SANTA FE WELL No. 2
DICKINSON (SAN ANDRES) FIELD
Fee Lease:
Location: Unit Letter "B", 660' FN & WL Sec. 35
T-10-S, R-36-E, Lea Co., New Mexico
1-29-79



Plag-Redfern Oil Company

WELL PROFILE

PROPOSED WATER INJECTION WELL

SANTA FE - WELL No. 2

DICKINSON (SAN ANDRES) FIELD

Fee Lease:
Location: Unit Letter "D", 660' FN & WL Sec. 35
T-10-S, R-36-E, Lea Co., New Mexico

1-20-78

NEW MEXICO OIL CONSERVATION COMMISSION

WELL LOCATION AND ACREAGE DEDICATION PLAT

Form C-102
Supersedes C-128
Effective 1-1-65

All distances must be from the outer boundaries of the Section.

Operator	Lease	Well No.
Hanson Oil Corporation	Santa Fe	2

Unit Letter	Section	Township	Range	County
D	35	10 South	36 East	Lea

Actual Footage Location of Well:
660 feet from the North line and 660 feet from the West line

Ground Level Elev.	Producing Formation	Pool	Dedicated Acreage:
3990.7			Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

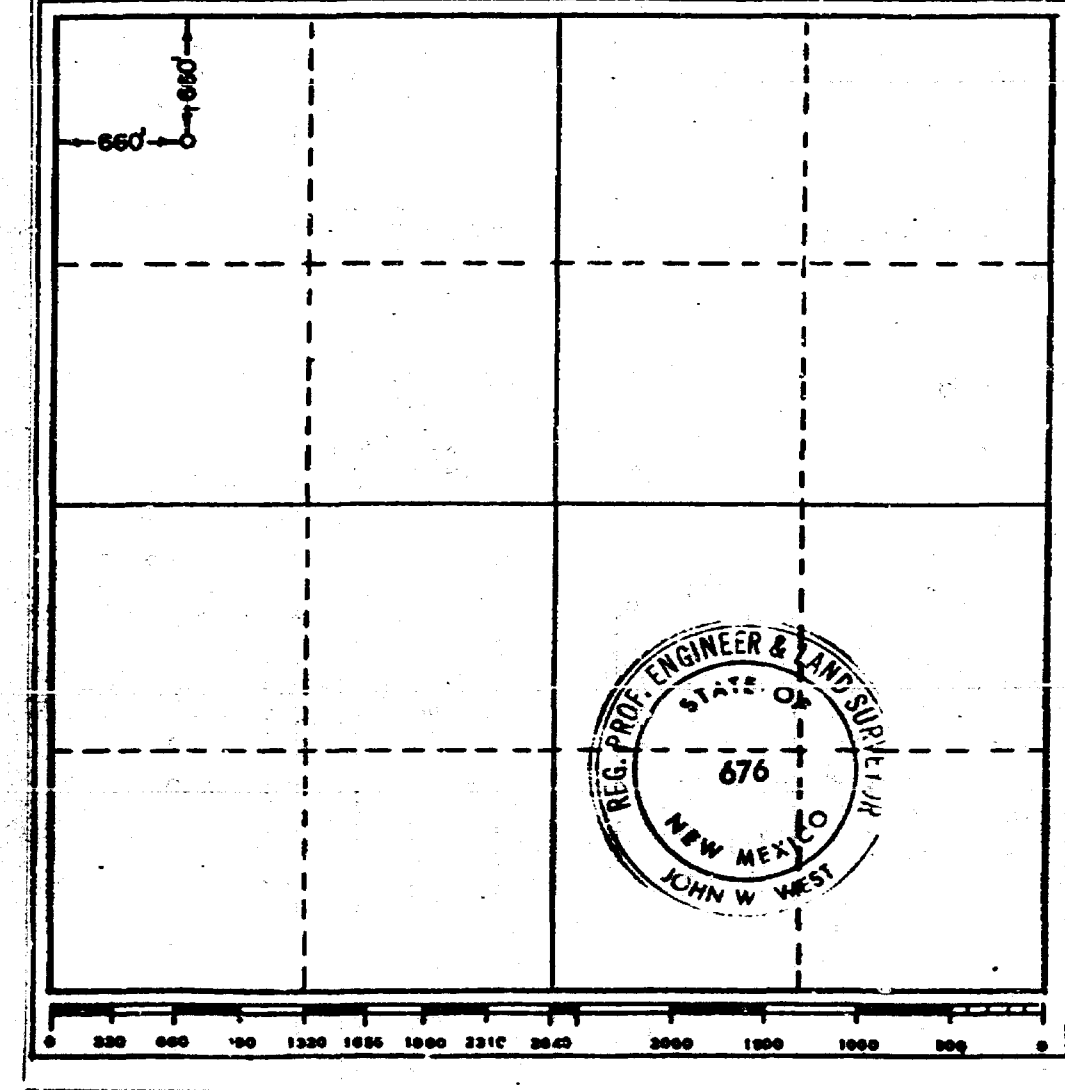
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling. etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief.

Name

Position

Company

Date

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

Date Surveyed
February 22, 1976

Registered Professional Engineer and/or Land Surveyor
John W. West

Certificate No. 676

Flag-Redfern Oil Company
1200 WALL TOWERS WEST · MIDLAND, TEXAS 79701 · PHONE (915) 683-5184

Mailing address:
P. O. Box 23
Midland, Texas 79702

January 26, 1979

File:

Case 6446

New Mexico Oil Conservation Commission
P. O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87501

Attention: Mr. D. S. Nutter
Chief Engineer

Re: Confirmation of Hearing
Application for Salt Water
Disposal Permit
Sante Fe Well #2
Fee Lease
Dickinson (San Andres) Field
Lea County, New Mexico

Dear Mr. Nutter:

This letter will serve to confirm Flag-Redfern Oil Company's request for a hearing for a salt water disposal permit for the above captioned well. Attached is Form C-108 with all necessary attachments.

It is our understanding that the hearing will be on February 14, 1979. Please advise us of the time and location where this hearing is to occur.

Thank you for your cooperation in this matter.

Sincerely,

Steve Rossler
Petroleum Engineer

SWR/dlp

Form C-108
Revised 1-65

JAN 30 1979

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

Santa Fe

OPERATOR		ADDRESS	
Flag-Redfern Oil Company		P. O. Box 23 Midland, Texas 79702	
LEASE NAME	**WELL NO.**	**FIELD**	**COUNTY**
Sante Fe	2	Dickinson (San Andres)	Lea

LOCATION

UNIT LETTER D ; WELL IS LOCATED 660 FEET FROM THE North LINE AND 660 FEET FROM THE West LINE, SECTION 35 TOWNSHIP 10-S RANGE 36-E NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	8-5/8"	415	250	Surface	Cement Circulated
INTERMEDIATE	None				
LONG STRING	4-1/2"	5085'	250	4060'	Calculated using Log Caliper
TUBING	2-3/8"	4934'	NAME, MODEL AND DEPTH OF TUBING PACKER: Baker Lok-set set @ 4900'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
San Andres	4213' D.F.	Not drilled thru

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Through Tubing	Perforations	4969' - 4984'

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
No	For Oil Production	Yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

4968 - 4998 squeezed w/150 sx of Class "C"

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
Triassic @ 1200'	None within a 2 mi. radius	11,263'

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
50	100	Closed	Pressure	1308

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE — WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
Yes	Yes	Yes

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Harding Burris, Box 97 Elida, New Mexico 88116

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

Read & Stevens, Inc. - Box 2126, 314 Security Nat'l Bk. Roswell, New Mexico 88201

Lawrence C. Harris - Box 1714 - Roswell, New Mexico 88201

Holly Energy Inc. - 2001 Bryan Tower, Suite 2680 - Dallas, TX 75201

MGF Oil Corp. - 700 Vaughn Bldg., Midland, TX 79701

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING? SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
Yes	Yes	Yes

ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B) PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL
Yes	Yes	Yes

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

Mike Rasbin — Petroleum Engineer — 1-26-79

(Signature) (Title) (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

SANTE FE WELL #2

Pertinent Information

1.) Disposal Zone: San Andres

2.) Depth of Disposal Zone: 4969' - 4984'

3.) Type of Disposal Fluid: Produced San Andres Water

4.) Anticipated Disposal Volumes:
Minimum = 50 Bbls water per day
Maximum = 100 Bbls water per day

5.) Source of Disposal Fluid:

a. Flag-Redfern Oil Company :
Sante Fe
1F 35 10S 36E - 14 BWPD
3E 35 10S 36E - 21 BWPD
Total Lease = 35 BWPD

b. Read and Stevens Inc.
Fawn Cherie
1M 26 10S 36E - 25 BWPD Est.*
Sante Fe
4K 35 10S 36E - 16 BWPD
5C 35 10S 36E - 25 BWPD Est.*
Total Read & Stevens 66 BWPD

* These 2 wells have been assigned a temporary completion and currently have suspended operations. When they are completed the produced San Andres water that they produce will be disposed in the proposed Sante Fe #2 Salt Water Disposal Well.

ROUGH

dr/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6446

Order No. R- 5932

APPLICATION OF FLAG-REDFERN OIL
COMPANY FOR SALT WATER DISPOSAL,
LEA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on February 14, 19 79, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this _____ day of February, 19 79, the Division Director, having considered the testimony, the record, and the recomendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Flag-Redfern Oil Company, is the owner and operator of the Santa Fe Well No. 2, located in Unit D of Section 35, Township 10 South, Range 36 East, NMPM, Dickinson-San Andres Pool, Lea County, New Mexico.

(3) That the applicant proposes to utilize said well to dispose of produced salt water into the San Andres formation, with injection into the perforated interval from approximately 4,969 feet to 4,984 feet.

(4) That the injection should be accomplished through 2 3/8 -inch plastic lined tubing installed in a packer set at approximately 4900 feet; that the casing-tubing annulus should be filled with an inert fluid; and that a pressure gauge or approved leak detection device should be attached to the annulus in order

to determine leakage in the casing, tubing, or packer.

(5) That the injection well or system should be equipped with a ~~pop-off valve~~ pressure limiting switch or other acceptable device ~~substitute~~ which will limit the wellhead pressure on the injection well to no more than 1308 psi.

(6) That the operator should notify the supervisor of the Hobbs district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(7) That the operator should 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.

(8) That approval of the subject application will prevent the drilling of unnecessary wells and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Flag-Redfern Oil Company, is hereby authorized to utilize its Santa Fe Well No. 2, located in Unit D of Section 35, Township 10 South, Range 36 East, NMPM, Dickinson-San Andres Pool, Lea County, New Mexico, to dispose of produced salt water into the San Andres formation, injection to be accomplished through 2 3/8-inch tubing installed in a packer set at approximately 4900 feet, with injection into the perforated interval from approximately 4,969 feet to 4,984 feet;

PROVIDED HOWEVER, that the tubing shall be plastic-lined; that the casing-tubing annulus shall be filled with an inert fluid; and that a pressure gauge shall be attached to the annulus

or the annulus shall be equipped with an approved leak detection device in order to determine leakage in the casing, tubing, or packer.

(2) That the injection well or system shall be equipped with a ~~pop-off valve~~ pressure limiting switch or other acceptable ~~substitute~~ devices which will limit the wellhead pressure on the injection well to no more than 1208 psi.

(3) That the operator shall notify the supervisor of the Hobbs district office of the Division of the date and time of the installation of disposal equipment so that the same may be inspected.

(4) That the operator shall immediately notify the supervisor of the Division's Hobbs district office of the failure of the tubing, casing, or packer, in said well or the leakage of water from or around said well and shall take such steps as may be timely and necessary to correct such failure or leakage.

(5) That the applicant shall submit monthly reports of its disposal operations in accordance with Rules 704 and 1120 of the Division Rules and Regulations.

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

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

Memo

From
D. S. NUTTER
CHIEF ENGINEER

Salt water disp

To

Flag-Redfern Oil Co
Santa Fe Well No 2
D-35-10S-36E Lea
perf 4969 - 4984
San Andres
Dickinson San Andres.
(XS pressure
surf press 1308)

Steve Rossler
Flag-Redfern
(915) 683-5184