STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

July 16, 1991

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

ARCO Oil & Gas Company
c/o Campbell & Black, P.A.
P.O. Box 2208
Santa Fe, New Mexico 87504-2208

Attention: William F. Carr

Amended
RE: *Injection Pressure Increase*
Empire-Abo Unit "J" Well No. 10
Eddy County, New Mexico

Dear Sir:

Reference is made to your request dated June 7, 1991, to increase the surface injection pressure on the Empire-Abo Unit "J" Well No. 10. This request is based on bottom hole pressure calculations submitted with your request. The calculations have been reviewed by my staff and we feel an increase in injection pressure on the well is justified at this time.

You are therefore authorized to increase the surface injection pressure on the following well.

WELL AND LOCATION	MAXIMUM INJECTION SURFACE PRESSURE
Empire-Abo Unit "J" Well No. 10 Unit F, Section 3, T-18 South, R-27 East, NMPM Eddy County, New Mexico	2,000 PSIG

The Division Director may rescind this injection pressure increase if it becomes apparent that the injected gas is not being confined to the injection zone or is endangering any fresh water aquifers.

Sincerely,

William J. LeMay
Director

WJL/DC/jc

cc: Oil Conservation Division - Artesia
File: Case No. 9931
D. Catanach
R. Brown

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RE: Injection Pressure Increase
Empire-Abo Unit "J" Well No. 10
Eddy County, New Mexico

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You are therefore authorized to increase the surface injection pressure on the following well.

WELL AND LOCATION	MAXIMUM INJECTION SURFACE PRESSURE
Empire-Abo Unit "J" Well No. 10 Unit F, Section 3, T-18 South, R-27 East, NMPM Eddy County, New Mexico	2,000 PSIG

The Division Director may rescind this injection pressure increase if it becomes apparent that the injected water is not being confined to the injection zone or is endangering any fresh water aquifers.

Sincerely,

William J. LeMay
Director

WJL/DC/jc

cc: Oil Conservation Division - Artesia
File: Case No. 9931
D. Catanach
R. Brown

NO WAITING PERIOD

COMPANY: Arco Oil & Gas Company C/O Campbell & Black, P.A.

ADDRESS: P.O. Box 2208

CITY, STATE, ZIP: Santa Fe, N.M. 87504-2208

ATTENTION: William F. Carr

Re: Injection Pressure Increase
"J"
Empire Abo Unit Well No. 10

Eddy County, New Mexico

Dear Sir:

Reference is made to your request dated June 7, 1991, to increase the surface injection pressure on the Empire-Abo Unit "J" Well No. 10. This request is based on ~~a step rate test conducted on the well on~~ , 19 . The ~~results of the test~~ have been reviewed by my staff and we feel an increase in injection pressure on the well is justified at this time.

Calculations

You are therefore authorized to increase the surface injection pressure on the following well:

Bottom hole pressure calculations submitted with your request.

Well & Location	Maximum Injection Surface Pressure
Empire-Abo Unit "J" Well No. 10 Unit F, Section 3, T-18 South, R-27 East, NMPM, Eddy County, New Mexico	2000 PSIG

The Division Director may rescind this injection pressure increase if it becomes apparent that the injected water is not being confined to the injection zone or is endangering any fresh water aquifers.

R. Brown

xc: ~~T. GALLEGOS~~
D. CATANACH
FILE- Case No. 9931
OCD- Artesia

CAMPBELL & BLACK, P.A.
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June 7, 1991

HAND-DELIVERED

William J. LeMay, Director
Oil Conservation Division
New Mexico Department of Energy,
Minerals and Natural Resources
State Land Office Building
Santa Fe, New Mexico 87503

Re: **Oil Conservation Division Case No. 9931 (Order No. R-9466): Application of ARCO Oil & Gas Company for a Pressure Maintenance Expansion and an Unorthodox Gas Injection Well, Eddy County, New Mexico**

Gentlemen:

On March 15, 1991 the Division entered the above-referenced Order which, among other things, approved the conversion of the ARCO Empire Unit "J" Well No. 10 from a producing oil well to a gas injection well and set a pressure limitation on this well of 0.2 psi per foot of depth from the surface to the uppermost perforation therein.

ARCO needs an exception to the 0.2 psi per foot limitation pursuant to Paragraph 5 of Order No. R-9466. This paragraph provides that the Division Director may authorize an increase in injection pressure upon a proper showing by the operator that the higher pressure will not result in migration of injection fluid from the Abo formation.

Attached for your consideration is a work sheet which illustrates that, since we will be injecting gas, not water, the surface pressure can be increased and a bottomhole pressure maintained substantially below the pressure that would result from water injection at the 0.2 psi per foot.

EAU J-10

NMOCD ORDER R-9466

Statement of Problem: The order applies the statewide guideline for a maximum surface injection pressure of .2 psi/foot of depth to the EAU J-10. The statewide guideline is for water injection wells. EAU J-10 is a gas injection well. The order limits it to a surface injection pressure of .2(5564')=1113 psi.

Intent of the State Guideline: In the case of a water injection well the state guideline would allow a surface injection pressure of 0.2(5564')=1113 psi. This equates to a bottom hole injection pressure of 1113+(.433)5564'=**3522** psi. Where 0.433 is the gradient of fresh water in psi/ft.

BHIP: From Craft & Hawkins the equation for calculating the static bottom hole pressure due to a column of gas is:

$$P_{ws} = P_{wh} e^{0.01875 \times SG \times D/ZT}$$

Where:
- P_{ws} = Static Bottom Hole Press.
- P_{wh} = Well head pressure
- SG = Specific gravity of gas
- D = Depth to the top perforation
- Z = Average gas deviation factor
- T = Average temperature

BHIP of EAU J-10: For a 2000 psi surface pressure(which is currently not in the order), SG=0.63, Z=.76 & T=542 deg. Rankin, the calculated BHIP is only **2346** psi. This is **1176** psi less than what state guidelines would allow for a water injection well. The limitation currently in the order of 1113 psi at the surface is over **2200** psi less than the 3522 psi allowed for water injection wells.

Request: We request that EAU J-10 be allowed to operate at surface injection pressures of up to **2000** psi. This pressure is well within any and all state guidelines when the bottom hole injection pressures are considered.