

RECEIVED OGD

2013 SEP 23 P 1:33

September 20, 2013

Mr. Philip Goetze
Oil Conservation Division
New Mexico Department of Energy,
Minerals and Natural Resources
1220 South Saint Francis Drive
Santa Fe, New Mexico 87505

VIA EMAIL AND FIRST CLASS MAIL

Re: Request for Administrative Order to Amend Existing Order R-13443 to Increase the Current Maximum Allowable Operating Pressure of 2,973 psi to 3,200 psi for Maljamar AGI #1 (API 3002540420)

Dear Mr. Goetze:

Frontier Field Services, LLC (Frontier) hereby requests administrative approval to amend NMOCC Order R-13443 regarding the existing Maljamar AGI #1 (API # 3002540420), located 130' FSL, 1813' FEL, Section 21, T17S, R32E in Lea County, New Mexico, to increase the current Maximum Allowable Operating Pressure (MAOP) from 2,973 psi to 3,200 psi based on the results of the original step rate test performed in October 2012 and calculations of the formation parting pressure.

As detailed in Attachment A below, Frontier is confident that the increased injection pressure will not create fractures in the Wolfcamp reservoir nor in the overlying Leonardian cap rock. At 3,200 psi the calculated bottom hole pressure will be approximately 6,996 psi. As seen in the October 2012 step rate test (summary and CD containing the original data included in Attachment B), no indications of fracturing were observed at bottom hole pressures significantly greater than 7,000 psi.

Frontier will modify the required pressure limiting devices to assure that the approved MAOP is not exceeded, and will comply with all other conditions of Order R-13443.

Pursuant to the Division's request, Frontier has provided notice of this request to the operators working within the one-mile radius of the Maljamar AGI #1. A copy of the notice and signed confirmation of certified mail receipts of the notices are included as Attachment C. When we receive the signed confirmations of receipt we will forward those to you.

Thank you for your attention to this matter. If you have any questions regarding this request, please contact me or Alberto Gutierrez of our office at 505-842-8000.

Sincerely,

Geolex, Inc.



James C. Hunter, RG

cc: Brian Briscoe – AKA Energy Group, LLC
Kourtney Hadrick – AKA Energy Group, LLC
John Prentiss – AKA Energy Group, LLC
Alberto Gutiérrez, RG – Geolex, Inc.
Richard Ezeanyim – NM Oil Conservation Division, Santa Fe
E.L Gonzales– NM Oil Conservation Division, Hobbs

Enclosures: MAOP Application and Attachments

ATTACHMENT A:

**INFORMATION IN SUPPORT OF REQUEST FOR
ADMINISTRATIVE ORDER TO AMEND THE MAXIMUM
ALLOWABLE OPERATING PRESSURE (MAOP) SET IN
EXISTING ORDER R-13443, MALJAMAR AGI #1**

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Frontier Field Services, LLC (Frontier) requests administrative approval to amend NMOCC Order R-13443 regarding the existing Maljamar AGI #1 (API # 3002540420), located 130' FSL, 1813' FEL, Section 21, T17S, R32E in Lea County, New Mexico, to increase the current MAOP from 2,973 psi to 3,200 psi based on the results of the original step rate test performed in October 2012 and calculations of the formation parting pressure. Increasing the surface pressure to 3,200 psi will increase the bottom hole pressure to approximately 7,000 psi. No break was observed at or near this pressure during the step rate test, and this pressure is below the conservative calculated parting pressure of 7,300 psi.

During initial commissioning and testing of this well, Frontier has determined that permeability of the reservoir is less than originally anticipated based on surrounding wells and that current reservoir pressures are higher than originally calculated during the well and surface compressor design phase. In addition, the specific gravity of the treated acid gas (TAG) is lower than originally predicted by the models used in the design of compression facilities. For these reasons, Frontier has not been able to inject TAG into the reservoir at the maximum current compression capability of the existing surface facilities. Therefore, Frontier has initiated the design and purchase of pumps and coolers that will allow it to raise the current surface pressures at TAG densities that will permit the injection of the permitted rate of TAG into the well.

Frontier is currently in the process of designing and installing high-pressure booster pumps, effectively adding a sixth stage to the existing five-stage compressors. These pumps will be capable on increasing the maximum surface pressure to above 3,200 psi. In order to preserve the anticipated safety margin between anticipated operational pressures and the MAOP, Geolex and Frontier have evaluated the step rate test data obtained during the witnessed step rate test in October to support a request to administratively increase the MAOP for this well. The analysis of the step rate data clearly support an increase in the MAOP which will improve the ability to use the well long-term and which will not harm the reservoir or affect any adjacent wells.

Frontier's original application for the AGI well with an MAOP of 2,973 psi was unopposed and therefore, we believe that it is appropriate for NMOCD to approve this MAOP administratively if your review of the calculated parting pressure and the step rate test data indicates that this request is appropriate.

Frontier requests an amended Order to increase the MAOP to 3,200 psi. This pressure is below the maximum capacity of the proposed additional surface equipment which will be fitted with devices to shutdown the equipment at or below the approved MAOP to insure that this pressure will not be exceeded. Pursuant to the information detailed below, Frontier is confident that this new MAOP is below the parting pressure of the Wolfcamp injection units, and will pose no hazard of migration of the injected TAG outside of the approved injection zone.

Parting Pressure Calculations

Following completion of the Maljamar AGI #1, an OCD-witnessed step rate test was conducted in October 2012. Prior to testing, a calculation was made of the anticipated parting pressure (P_p), using the formula:

$$P_p = P_{RES} + (v/(1-v)) \times (P_{OB} - P_{RES})$$

where P_{RES} is the reservoir pressure (psi), P_{OB} is the overburden pressure (psi), and v is the Poisson's ratio (dimensionless) for the reservoir rock.

Reservoir pressure (P_{RES}) can be conservatively calculated as being equal to the hydrostatic pressure in the formation: using the central depth of the perforated interval of 9,855' (9,579' to 10,130') times the fresh-water pressure gradient of 0.433 psi per foot, the calculated reservoir pressure is 4,267 psi.

Similarly, the overburden pressure (P_{OB}) can be calculated from the lithostatic pressure, again using the central depth of 9,855 feet and a sedimentary-rock pressure gradient of 1.0 psi per foot, yielding an overburden pressure of 9,855 psi.

Poisson's ratio for unfractured limestone is approximately 0.33. Using these values and the overburden and reservoir pressures shown above, we can calculate the parting pressure (P_p) to be approximately 7,300 psi in the reservoir (bottom hole pressure).

Step Rate Test

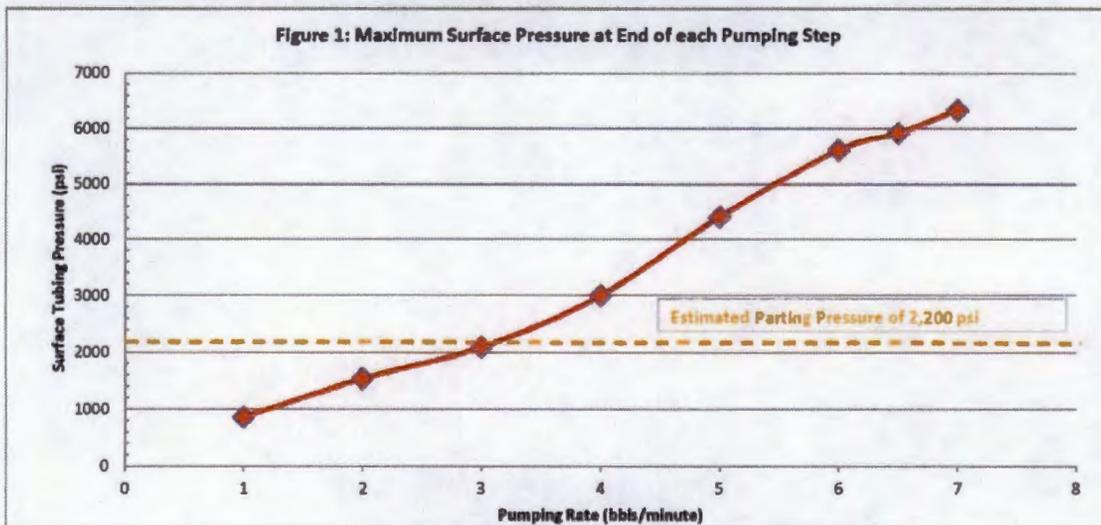
The step rate test was conducted using brine with a weight of 10 pounds per gallon. This fluid has a specific gravity of 1.1958, and results in a static pressure gradient of 0.5187 psi/foot (as opposed to fresh water with a specific gravity of 1.00 and a static pressure gradient of 0.433 psi/foot). Based on the brine density and the central depth of the perforations in the well (9,855 feet) the pressure at the reservoir with a full fluid column and no pressure at the service would be:

$$9,855 \text{ feet} \times 0.5187 \text{ psi/foot} = 5,112 \text{ psi.}$$

Therefore the formation pressure encountered in the step rate test would be the sum of 5,112 psi plus the surface pressure created by the pumping equipment at the surface.

During step rate tests, the parting pressure is typically observed as a "break" in the pressure-pumping rate curve, with the curve clearly flattening as fracturing (parting) begins. Based on the calculated parting pressure of 7,300 psi and the brine static pressure of 5,112 psi, it was anticipated that a break would occur near the additional surface pressure of 2,200 psi (using specific gravity of brine).

As seen in Figure 1 below, no clear break was found around the calculated surface parting pressure of 2,200 psi. In fact, the slope slightly increased near this point. There is no clear "flattening" break until a surface pressure of approximately 5,600 psi was reached.



Although this behavior clearly does not show that the parting pressure is in excess of 10,000 psi, it does clearly demonstrate that no fracturing of the injection zone occurred at or near the reservoir pressure of 7,300 psi.

Discussion and Conclusions

If TAG was compressed to the proposed new MAOP of 3,300 psi at a temperature of 95°F, the average density in the well would be approximately 889 kg/m³, or a specific gravity of 0.889. This results in a pressure gradient of 0.3849 psi/foot, and a pressure at the central depth of the perforations with no pressure at the surface full fluid column of:

$$9,855 \text{ feet} \times 0.3849 \text{ psi/foot} = 3,794 \text{ psi.}$$

Combined with the new proposed MAOP of 3,200 psi, the calculated bottom hole pressure will be:

$$3,794 \text{ psi} + 3,200 \text{ psi} = 6,994 \text{ psi}$$

Figure 2 combines the observed surface pressures with the calculated column pressures for brine (5,112 psi) and average density TAG (3,794 psi). As was seen in Figure 1, there is no clear break in the pressure curves at or near the calculated bottom hole parting pressure of 7,300 psi.

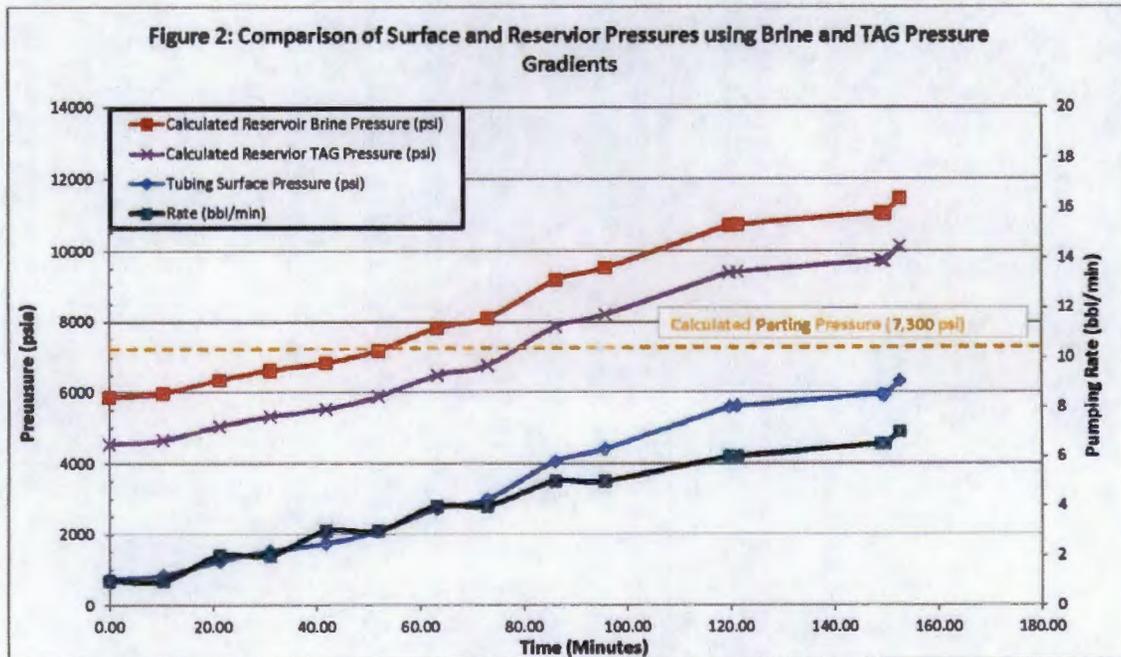
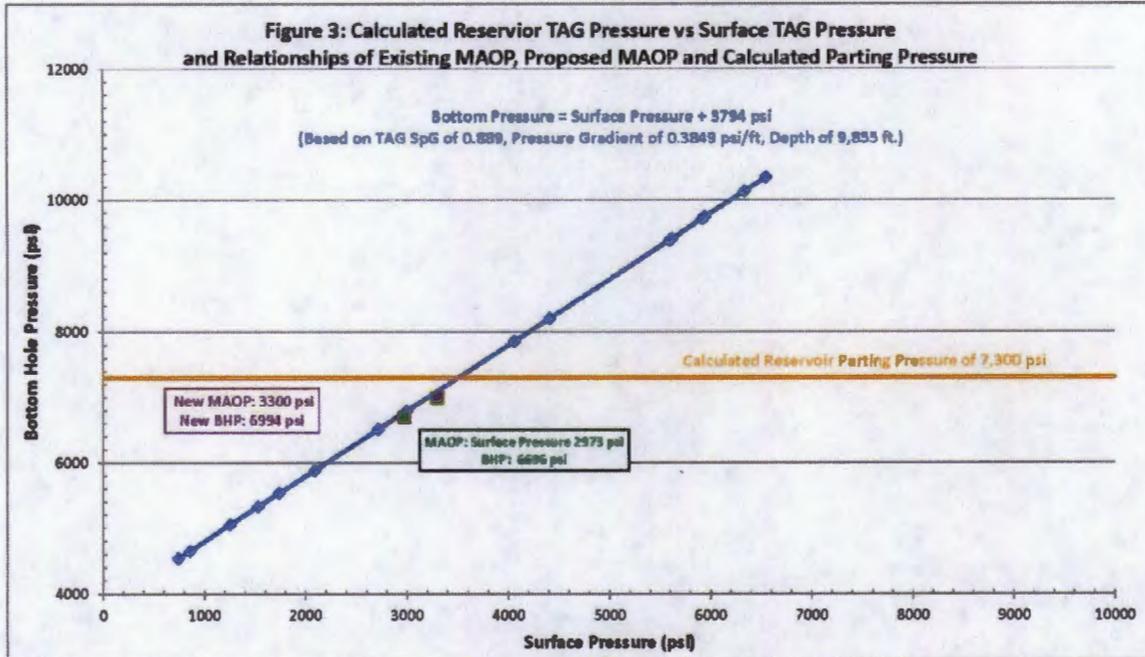


Figure 3 below shows the relationship between the existing MAOP (2,973 psi), the proposed new MAOP (3,200 psi), the calculated reservoir injection pressures, and the extremely conservative calculated parting pressure (7,300 psi).

The proposed new MAOP would result in a bottom hole injection pressure of 6,994 psi. As discussed above, we believe that fracturing may not occur until bottom hole pressures significantly greater than 7,300 psi are reached.



Based on the calculations of parting pressure and the results of the step rate test, we are confident that the increased MAOP of 3,200 psi will not induce any fracturing in the reservoir nor compromise the overlying cap rock. Automatic pressure limiting equipment will be used to maintain injection pressures at or below the MAOP.

ATTACHMENT B:

DATA FROM OCTOBER 2012 STEP RATE TEST

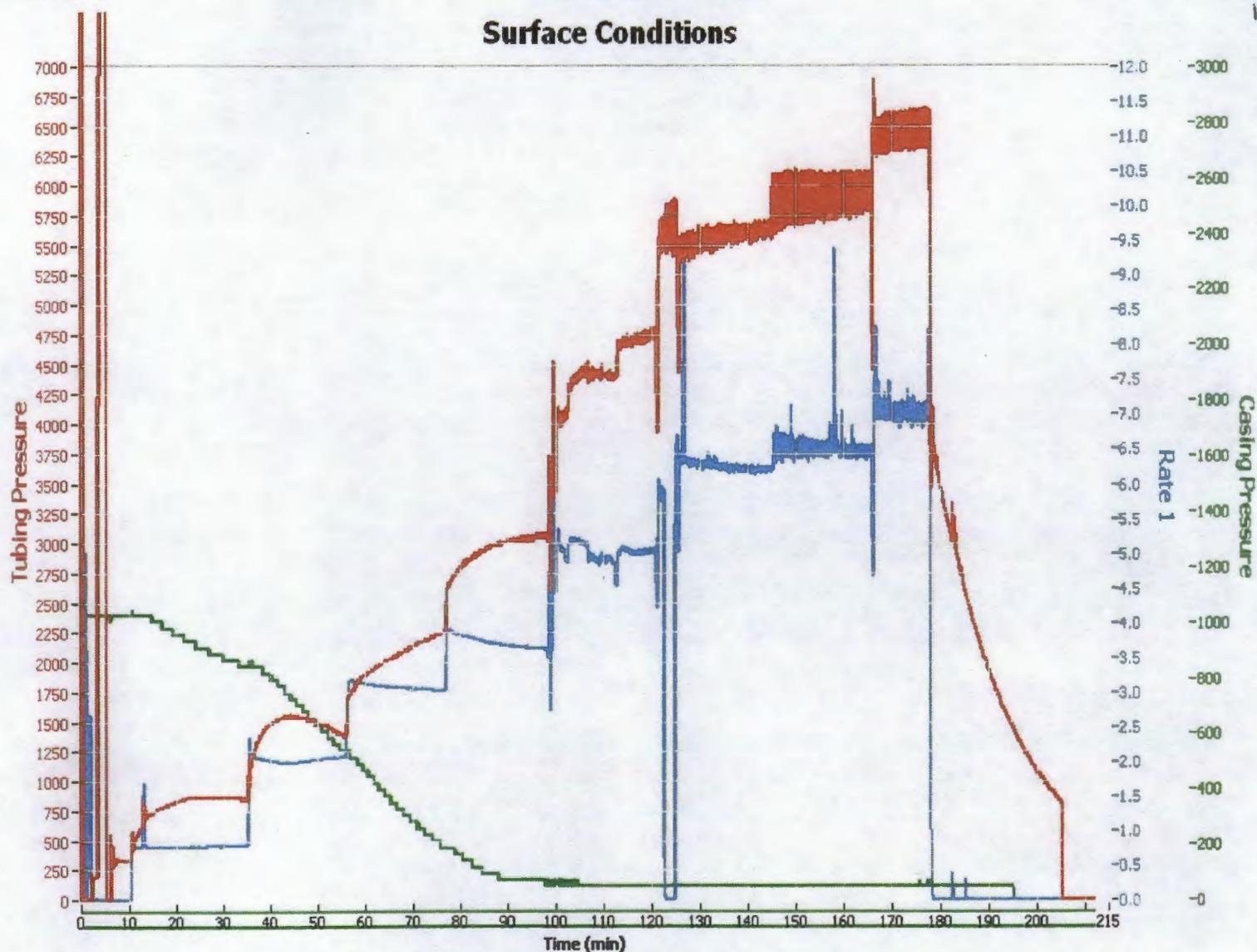
Figure 3

MALJAMAR AGI #1

~~10-8-2012~~
10-9-2012

Surface Conditions

PB ENERGY



ATTACHMENT C:

**COPIES OF NOTICES TO OPERATORS AND
CERTIFIED MAIL RECEIPTS FOR NOTICES**

**(COPIES OF RETURN RECEIPT CARDS WILL BE PROVIDED
TO NMOCD UPON RECEIPT)**

September 20, 2013

Conoco Phillips Company
3401 E. 30th Street
Farmington, NM 87402

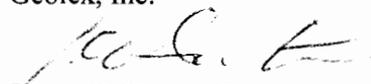
VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED

RE: REQUEST FOR ADMINISTRATIVE APPROVAL TO INCREASE THE MAXIMUM ALLOWABLE OPERATING PRESSURE (MAOP) FOR FRONTIER FIELD SERVICES, LLC MALJAMAR AGI #1 FROM 2,973 TO 3,200 POUNDS PER SQUARE INCH

This letter is to advise you that Frontier Field Services, LLC ("Frontier") filed the enclosed application on September 20, 2012, with the New Mexico Oil Conservation Division ("NMOCD" or "the Division") seeking approval to increase the existing MAOP of 2,973 psi to 3,200 psi. Maljamar AGI #1 is located 130 feet from the South line and 1813 feet from the East line of Section 21, Township 17 South, Range 32 East, in Lea County. Parting pressure calculations and the results of a step rate test show that this requested pressure increase will not induce fracturing in the reservoir or in adjacent formations.

If you have any questions concerning this application, you may contact Mr. Alberto Gutierrez at (505) 842-8000 at Geolex, Inc.; 500 Marquette Avenue NW, Suite 1350; Albuquerque, New Mexico 87102.

Sincerely,
Geolex, Inc.



James C. Hunter, RG

Consultant to Frontier Field Services LLC

Enclosure

G:\10-014\MAOP_Revision\Conoco Phillips ltr.doc

September 20, 2013

Endurance Resources, LLC
15455 Dallas Parkway #600
Addison, TX 75234

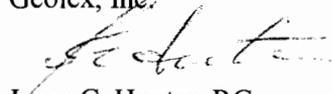
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Sincerely,
Geolex, Inc.



James C. Hunter, RG
Consultant to Frontier Field Services LLC

Enclosure

G:\10-014\MAOP_Revision\Endurance Resources ltr.doc

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	<p>A. Signature <input checked="" type="checkbox"/> Agent <input type="checkbox"/> Addressee</p> <p>B. Received by (Printed Name) JEFF BISHOP</p> <p>C. Date of Delivery 09/23/03</p>
<p>1. Article Addressed to:</p> <p>ENDURANCE RESOURCES 15455 DALLAS PKWY #600 ADDISON TX 75234</p>	<p>D. Is delivery address different from item 1? If YES, enter delivery address below: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>3. Service Type <input checked="" type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.</p> <p>4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes</p>
<p>2. Article Number (Transfer from service label)</p>	<p>7010 0290 0001 9420 7084</p>

PS Form 3811, February 2004 Domestic Return Receipt 2595-02-M-1540

SENDER: COMPLETE THIS SECTION	COMPLETE THIS SECTION ON DELIVERY
<ul style="list-style-type: none"> Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired. Print your name and address on the reverse so that we can return the card to you. Attach this card to the back of the mailpiece, or on the front if space permits. 	<p>A. Signature <input checked="" type="checkbox"/> Agent <input type="checkbox"/> Addressee</p> <p>B. Received by (Printed Name) GUY CROSS</p> <p>C. Date of Delivery 7/23/03</p>
<p>1. Article Addressed to:</p> <p>CONOCO PHILLIPS Co. 3401 E. 30th ST. FARMINGTON NM 87402</p>	<p>D. Is delivery address different from item 1? If YES, enter delivery address below: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>3. Service Type <input checked="" type="checkbox"/> Certified Mail <input type="checkbox"/> Express Mail <input type="checkbox"/> Registered <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> Insured Mail <input type="checkbox"/> C.O.D.</p> <p>4. Restricted Delivery? (Extra Fee) <input type="checkbox"/> Yes</p>
<p>2. Article Number (Transfer from service label)</p>	<p>7012 1640 0001 8695 7580</p>

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540