STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

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

CASE NO, 13750
ORDER NO. R-12658

APPLICATION OF BP AMERICA PRODUCTION COMPANY FOR APPROVAL OF A WATERFLOOD PROJECT, EDDY COUNTY, NEW MEXICO

ORDER OF THE DIVISION

BY THE DIVISION:

This case came on for hearing at 8:15 a.m. on August 3, 2006, at Santa Fe, New Mexico, before Examiner William V. Jones.

NOW, on this 7th day of November 2006, the Division Director, having considered the testimony, the record and the recommendations of the Examiner, and being fully advised in the premises,

FINDS THAT:

(1) Due public notice has been given, and the Division has jurisdiction of this case and of the subject matter.

(2) The applicant, BP America Production Company ("BP"), seeks authority to institute a lease waterflood project by the injection of water into the Artesia Queen-Grayburg-San Andres Pool (3230).

(3) This project should be designated the Washington "33" State Lease Waterflood Project and encompasses a single oil and gas lease operated by BP, comprised of the following 600 acres, more or less, of State of New Mexico lands:

Township 17 South. Range 28 East. NMPM.
Eddy County. New Mexico

Section 33: S/2, NE/4, S/2 NW/4, NE/4 NW/4

(4) The initial injection well in this project is the Washington "33" State Well No. 12 (API No. 30-015-30348) located 2432 feet from the North line and 2270 feet from

the East line (Unit G) of Section 33, Township 17 South, Range 28 East, NMPM, Eddy County, New Mexico. This well was approved for injection into the Queen, Grayburg, and San Andres formations on June 22, 2005, by administrative order SWD-988.

(5) The applicant is seeking by this order approval of six (6) additional injection wells, as identified on Exhibit A to this order, all located in Section 33, Township 17 South, Range 28 East, NMPM, Eddy County, New Mexico. Each of these six wells will inject water into the Queen, Grayburg, and San Andres formations in this lease. Applicant anticipates adding additional injection wells in the future, and asks that these be permitted by administrative application filed pursuant to the rules of the Division.

(6) The applicant presented the following at the hearing through testimony and exhibits.

(a) The intended injection interval includes the package of five (5) sands called the Penrose A, Penrose B, Loco Hills, Premier, and Lovington all contained in the Queen-Grayburg-San Andres formations at depths from 1,400 feet to 2,000 feet as well as the lower San Andres formation dolomite which ranges from 2,300 feet to 2,800 feet. These six producing intervals are each isolated by relatively impermeable dolomite and are each correlatable across the project area. Injection is intended simultaneously into all six productive intervals.

(b) Each of the proposed six (6) new injection wells will be converted from producing wells, which currently average about 4 barrels of oil per day. Arco drilled the majority of the Queen, Grayburg, San Andres wells in this area in 1998; so the wells are not very old. BP proposes to utilize twenty-two producing wells within the project area and possibly drill and utilize additional producing wells.

(c) Waters injected into this reservoir will consist of produced water from this lease, the Empire Abo Unit, and the NW Artesia Unit. BP does not plan to use fresh water as injection water.

(d) The base of the fresh water sands in this area is approximately 350 feet. The two fresh water samples analyzed indicate total dissolved solids in fresh waters now range from 2700 to 4000 parts per million. The fresh water sands are not hydrologically communicated with the injection interval through any naturally occurring fault or conduit. All wells have been properly cased and cemented to prevent contamination of fresh water from an increase in reservoir pressure due to water injection.

(e) This project is to be located on a single State of New Mexico lease, wholly owned and operated by BP. The royalty burden to BP is uniform throughout the lease.

(f) Cumulative oil production from the Queen, Grayburg, and San Andres is approximately 1 million barrels of 34-degree API oil and 2 billion cubic feet of gas. Currently BP's lease produces 120 barrels of oil per day. Remaining primary is estimated at 150,000 barrels of oil. Ultimate primary recovery would be approximately 7 percent of original oil in place. This 600-acre lease is estimated to yield an additional 1 to 1.5 million barrels of oil equivalent under waterflooding operations.

(g) Of the planned seven injection wells, the minimum depth intended for injection is 1,411 feet in the Queen formation and the maximum depth intended for injection interval is 3,015 feet in the San Andres formation. The average minimum depth is 1,453 feet.

(h) The design of the waterflood is intended to prevent movement of injection water off-lease. The proposed injection wells are spaced on the interior of the lease at roughly equal intervals and are situated in order to best provide water injection support. The pattern can be roughly called an inverted 5-spot. Each of these injection wells has production wells in the same formation surrounding it which will be maintained in a pumped off condition.

(i) The initial reservoir pressure is estimated at 1,200 psi. The current reservoir pressure is approximately 600 psi. Due to the large cumulative primary production and only seven injection wells with 22 producing wells, it is expected that this reservoir will reach fill-up in approximately 2 years from commencement of injection. After fillup, total lease injection is expected to stabilize at 500 barrels of water injection per day.

(j) This lease is surrounded by older, more mature injection projects in this same interval. This lease is a good candidate for the implementation of a waterflood project and the project should begin as soon as possible before reservoir pressure further dissipates.

(7) Mr. Jackie Brewer operates the Daugherty State Well No. 1 (API No. 30-015-02589) located in Unit D of Section 4, Township 4 South, Range 33 East, NMPM, which produces from the San Andres formation. Mr. Brewer did not enter an appearance in this case but was present at the hearing and expressed concern that his well may be watered out or adversely affected by BP's injection operations. BP presented testimony to the effect that the injection pattern has been set up to minimize movement of water off-lease; Mr. Brewer's well is separated from the nearest injection well by other producing wells; and BP does not anticipate water injection to travel to Mr, Brewer's well.

(8) While the Artesia Queen-Grayburg-San Andres Pool is the most prolific producing Pool in this area, Division records and BP testimony show other producing formations within a ½-mile radius of these proposed six new injection wells.

(a) Above the intended injection interval is the Seven Rivers formation with a geologic top at approximately 675 feet. Marbob operates wells producing from the East Empire Yates-Seven Rivers Pool (22260) in Unit M of Section 27 and Units O and P of Section 28.

(b) Below the injection interval, BP is the only operator of wells producing from the Artesia Glorieta-Yeso Pool (96830); the best well is located in Unit O of Section 33. There are also wells producing from the Empire Abo Pool (22040) and a few wells in the Wolfcamp, Upper Penn and Morrow formations. The geologic top of the Yeso is at 3,630 feet and the Abo is at 5,700 feet.

(9) Approval of the proposed lease waterflood project will result in the recovery of additional hydrocarbons from the Queen, Grayburg, and San Andres formations within the project area that may otherwise not be recovered, thereby preventing waste, and will not violate correlative rights.

(10) The proposed waterflood project should be approved.

(11) As required in Rule 702, the proposed six (6) additional injection wells are all cased and cemented adequately and should prevent the movement of injected fluids near the injection wells out of the intended waterflood intervals.

(12) Division Rule 703 requires an injection project to confine injected fluid to the injection interval. There are existing wells within the ½-mile areas of review, which require additional cementing or remedial work to ensure injected fluids are contained in the intended injection interval and do not invade and cause waste of oil and gas in other formations.

(13) The Queen, Grayburg, and San Andres reservoir has been pressure depleted due to years of past production, and the proposed injection will take an estimated two years to reach reservoir fill-up. Even after fillup, there will be more producing wells in this reservoir than injection wells and each injection well will be surrounded by producers. For those reasons, the operator should be allowed up to six months after commencement of injection operations to complete all required remedial cementing work on wells within the areas of review.

(14) The following area of review remedial cementing work should be required:

(a) The following wells should be plugged and abandoned with a procedure approved by the Artesia district office and sufficient to isolate the equivalent injection interval:

(A) The Empire Abo Unit Well No. 32 (API No. 30-015-01696)

Unit P, Section 33, Township 17 South, Range 28 East

(B) The Empire Abo Unit Well No. 34B (API No. 30-015-01713)
Unit N, Section 34, Township 17 South, Range 28 East

(b) The following plugged wells were not plugged in a manner necessary to prevent movement of injection fluid out of the intended injection interval. These wells should be re-entered and plugged and abandoned with a procedure approved by the Artesia district office and sufficient to isolate the equivalent injection interval:

(A) The State Lease Well No. 1 (API No. 30-015-05889)
Unit D, Section 3, Township 18 South, Range 28 East

(B) The State BL Well No. 1 (API No. 30-015-02588)
Unit B, Section 4, Township 18 South, Range 28 East

(c) The following wells are not adequately cemented to isolate injection fluids and to protect other reservoirs from possible waste. Specific requirements should be as follows:

(A) The Empire Abo Unit Well No. 29 (API No. 30-015-01688) located in Unit L, Section 33, Township 17 South, Range 28 East, should be either (i) temporarily plugged with a cast iron bridge plug with cement placed above the Abo perforations or (ii) permanently plugged and abandoned with a procedure approved by the Artesia district office or (iii) returned to production after first squeezing cement from the top of cement to the surface.

(B) The Empire Abo Unit Well No. 30 (API No. 30-015-02553) located in Unit C, Section 4, Township 18 South, Range 28 East, should be squeezed with cement from the measured top of cement to the surface.

(C) The Hanover State Well No. 2 (API No. 30-015-20355) operated by Marbob Energy Corporation and located in Unit P, Section 28, Township 17 South, Range 28 East, should be squeezed with cement from the current top of cement (estimated at 3962 feet) to above the Seven Rivers formation top, approximately 650 feet.

(D) The Geronimo 34 State Com Well No. 1Y (API No. 30-015-31293) operated by Dominion Oklahoma Texas Expl. & Prod Inc. and located in Unit E, Section 34, Township 17 South, Range 28 East, should have the bradenhead checked for pressure or flow within one month of this

order and at yearly intervals by the operator of the Washington 33 State Lease Waterflood Project. If flow is detected from the 9-5/8 inch by 5-1/2 inch annulus, then the operator of the Washington 33 State Lease Waterflood Project should be required to shut-in all injection wells located within ½ mile until the bradenhead flow is repaired [by squeezing cement from the top of cement (estimated at 3742 feet) to the surface or at least into the 9-5/8 inch casing at 2666 feet].

(d) The following four (4) plugged and abandoned wells have incomplete data. BP should consult with the Artesia District Office of the Division and the operators of these wells to devise and execute a plan where any needed remedial work will be conducted on these wellbores in order to assure that these wells are plugged and abandoned in a manner to effectively isolate the Artesia Queen-Grayburg-San Andres Pool from other formations.

Operator Well Name	API Number	Well Location
Kennedy Oil Company		990' FSL & 1570' FWL
Delhi State #1	30-015-01601	Sec. 28, T-17-S, R-28-E
Welch E.P.		250' FSL & 250' FWL
State #1	30-015-01593	Sec. 27, T-17-S, R-28-E
Workman et al.		1070' FNL & 250' FEL
Thompson #1	30-015-02599	Sec. 5, T-18-S, R-28-E
Bixby et al.		1070' FNL & 1570' FWL
Fry State #1	30-015-02558	Sec. 4, T-18-S, R-28-E

(15) The applicant's request to provide in the order for the administrative approval of additional injection wells in this project should be approved.

IT IS THEREFORE ORDERED THAT:

(1) BP America Production Company ("BP") is hereby authorized to institute a lease waterflood project within its Washington "33" State Lease for injection of water into the Artesia Queen-Grayburg-San Andres Pool (3230). This project is hereby designated the Washington "33" State Lease Waterflood Project and encompasses a single oil and gas lease operated by BP comprised of the following 600 acres, more or less, of State of New Mexico lands:

Township 17 South. Range 28 East. NMPM.
Eddy County, New Mexico

Section 33: S/2, NE/4, S/2 NW/4, NE/4 NW/4

(2) BP is further authorized to convert the six wells shown on Exhibit A into water injection wells. These six wells along with the previously approved Washington State "33" State Well No. 12 injection well shall be utilized for water injection into the

Queen, Grayburg, and San Andres formations for purposes of water enhanced oil (secondary) recovery through perforation depths as specified on Exhibit A.

(3) The Division Director shall have the authority to administratively authorize additional injection wells in this project after proper notice is provided and application is made with form C-108.

(4) The operator shall take all steps necessary to ensure that the injected water enters only the injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(5) The following work shall be completed within six months of the commencement of injection operations into any one of the six new injection wells. If the required work is not completed on any specified well by that time, then any injection well within ½ mile of that well shall be shut-in until the required work is completed to the satisfaction of the Division. The operator shall notify the District supervisor of the Artesia district office prior to commencing any of this required work so that work may be witnessed.

(a) The following wells shall be plugged and abandoned with a procedure approved by the Artesia district office and sufficient to isolate the equivalent injection interval:

(A) The Empire Abo Unit Well No. 32 (API No. 30-015-01696)
Unit P, Section 33, Township 17 South, Range 28 East

(B) The Empire Abo Unit Well No. 34B (API No. 30-015-01713)
Unit N, Section 34, Township 17 South, Range 28 East

(b) The following plugged wells shall be re-entered and plugged and abandoned with a procedure approved by the Artesia district office and sufficient to isolate the equivalent injection interval:

(A) The State Lease Well No. 1 (API No. 30-015-05889)
Unit D, Section 3, Township 18 South, Range 28 East

(B) The State BL Well No. 1 (API No. 30-015-02588)
Unit B, Section 4, Township 18 South, Range 28 East

(c) The following wells shall be repaired as specified below:

(A) The Empire Abo Unit Well No. 29 (API No. 30-015-01688) located in Unit L, Section 33, Township 17 South, Range 28 East,

shall be either (i) temporarily plugged with a cast iron bridge plug with cement placed above the Abo perforations or (ii) permanently plugged and abandoned with a procedure approved by the Artesia district office or (iii) returned to production after first squeezing cement from the top of cement to the surface.

(B) The Empire Abo Unit Well No. 30 (API No. 30-015-02553) located in Unit C, Section 4, Township 18 South, Range 28 East, shall be squeezed with cement from the measured top of cement to the surface.

(C) The Hanover State Well No. 2 (API No. 30-015-20355) operated by Marbob Energy Corporation and located in Unit P, Section 28, Township 17 South, Range 28 East, shall be squeezed with cement from the current top of cement (estimated at 3962 feet) to above the Seven Rivers formation top, approximately 650 feet.

(D) The Geronimo 34 State Com Well No. 1Y (API No. 30-015-31293) operated by Dominion Oklahoma Texas Expl. & Prod. Inc. and located in Unit E, Section 34, Township 17 South, Range 28 East, shall have the bradenhead checked for pressure or flow within one month of this order and at yearly intervals by the operator of the Washington 33 State Lease Waterflood Project. If flow is detected from the 9-5/8 inch by 5-1/2 inch annulus, then the operator of the Washington 33 State Lease Waterflood Project shall shut-in all injection wells located within ¼ mile until the bradenhead flow is repaired [by squeezing cement from the top of cement (estimated at 3742 feet) to the surface or at least into the 9-5/8 inch casing at 2666 feet].

(d) BP shall consult with the Artesia District Office of the Division to devise and execute a plan where any needed remedial work is completed on the following wells.

Operator Well Name	API Number	Well Location
Kennedy Oil Company Delhi State #1	30-015-01601	990' FSL & 1570' FWL Sec. 28, T-17-S, R-28-E
Welch E.P. State #1	30-015-01593	250' FSL & 250' FWL Sec. 27, T-17-S, R-28-E
Workman et al. Thompson #1	30-015-02599	1070' FNL & 250' FEL Sec. 5, T-18-S, R-28-E
Bixby et al. Fry State #1	30-015-02558	1070' FNL & 1570' FWL Sec. 4, T-18-S, R-28-E

The operator shall provide written verification to the engineering bureau in the Santa Fe office of the Division of completion of each of the foregoing requirements.

(6) The injection of water into each of the wells shown on Exhibit "A" shall be accomplished through 2-3/8 inch internally plastic-lined tubing installed in a packer set within 100 feet of the uppermost injection perforations. The casing-tubing annulus shall be filled with an inert fluid and a gauge or approved leak-detection device shall be attached to the annulus in order to detect leakage in the casing, tubing or packer.

(7) Prior to commencing injection operations into the new injection wells shown on Exhibit "A", the casing in each well shall be pressure tested throughout the interval from the surface down to the packer setting depth to assure the integrity of such casing.

(8) The injection wells or pressurization system shall be initially equipped with a pressure control device or acceptable substitute that will limit the surface injection pressure to no more than 290 psi.

(9) The Division Director shall have the authority to administratively authorize an increase in injection pressure upon a showing by the operator that such higher pressure will not result in fracturing of the injection formation or confining strata or affect correlative rights.

(10) For each injection well, the operator shall give advance notice to the supervisor of the Division's Artesia district office of the date and time (i) injection equipment will be installed, and (ii) the mechanical integrity pressure tests will be conducted, so these operations may be witnessed.

(11) The operator shall provide written notice of the date of commencement of injection into each well to the Artesia district office of the Division.

(12) The operator shall immediately notify the supervisor of the Division's Artesia district office of the failure of the tubing, casing or packer in any of the injection wells, or the leakage of water, oil or gas from or around any producing or abandoned well within ½ mile of any injection well within the project area, and shall take all steps as may be timely and necessary to correct such failure or leakage.

(13) The Washington "33" State Lease Waterflood Project shall be governed by Division Rules No. 701 through 708. The operator shall submit monthly reports of the disposal operations on Division Form C-115, in accordance with Rule Nos. 706 and 1120 of the Division Rules and Regulations.

(14) In accordance with Rule No 705.C, the injection authority granted herein for each of the six new injection wells shown on Exhibit "A" shall terminate one year after the effective date of this order if the operator has not commenced injection operations into that well, and will terminate *ipsofacto,* one year after injection operations

into that well have ceased; provided, however, the Division, upon written request by the operator, may grant an extension for good cause.

(15) Jurisdiction is retained by the Division for the entry of such further orders as may be necessary for the prevention of waste and/or protection of correlative rights or upon failure of the operator to conduct operations (1) to protect fresh water or (2) in a manner consistent with the requirements in this order, whereupon the Division may, after notice and hearing, terminate the injection authority granted herein.

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

MARK E, FESMIRE, P.E.
Director

SEAL

EXHIBIT A
CASE NO. 13750
ORDER NO. R-12658
BP America Production Company
Washington "33" **State Lease Waterflood Project**

Artesia; Queen, Grayburg, San Andres Pool (3230)
Township 17 South, Range 28 East, NMPM, Eddy County, New **Mexico**
Section 33: S/2, NE/4, S/2 NW/4, NE/4 NW/4

New injection wells approved by this order:

Well Name and Number	(API: 30-015-)	Footage Location	Unit	Injection Interval
Washington "33" State Well No. 2	(30187)	990' FNL& 930' FEL	A	1,452 to 2,848
Washington "33" State Well No. 4	(30188)	990' FNL& 2270' FEL	B	1,414 to 2,862
Washington "33" State Well No. 10	(30192)	2267'FNL& 1650' FWL	F	1,411 to 2,876
Washington "33" State Well No. 16	(22415)	1500'FSL & 700' FEL	I	1,518 to 3,015
Washington "33" State Well No. 18	(21745)	1550'FSL& 2511' FEL	J	1,462 to 2,985
Washington "33" State Well No. 23	(30333)	975' FSL & 1060' FWL	M	1,466 to 2,757

Existing injection well approved by SWD-988 in this same injection interval

Washington "33" State Well No. 12	(30348)	2432'FNL & 2270' FEL	G	1,449 to 2,928