RAILROAD COMMISSION OF TEXAS

HEARINGS DIVISION

OIL AND GAS DOCKET NO. 8A-0287578

THE APPLICATION OF KINDER MORGAN PRODUCTION CO., LLC, FOR A NEW FIELD DESIGNATION AND TO ADOPT FIELD RULES FOR THE PROPOSED TALL COTTON (SAN ANDRES) FIELD, GAINES COUNTY, TEXAS

HEARD BY: Paul Dubois - Technical Examiner
Marshall Enquist - Hearings Examiner

HEARING DATE: March 27, 2014

APPEARANCES:	**REPRESENTING:**
APPLICANT:	
Brian Sullivan, P.E.	Kinder Morgan Production Co. LLC
Steven Pontious	

EXAMINERS' REPORT AND RECOMMENDATION

STATEMENT OF THE CASE

This is the application of Kinder Morgan Production Co., Inc. (Kinder Morgan) for a new field designation and to adopt field rules for the Tall Cotton (San Andres) Field (ID No. 88230 500) in Gaines County, Texas. Kinder Morgan is developing a pilot study for hydrocarbon recovery to inject carbon dioxide (CO_2) into a residual oil zone (ROZ) in the San Andres Formation. Kinder Morgan expects the pilot study to demonstrate the efficacy of this production technique to economically recover hydrocarbons from an otherwise unproductive ROZ. Kinder Morgan requests adoption of the following field rules:

Rule 1: A correlative interval of 5,250 to 5,800 feet;

Rule 2: 330 feet lease line spacing and zero (0) feet spacing between wells; and

Rule 3: Capacity exempt allowable pursuant to 16 TAC § 3.48.

Kinder Morgan is not requesting special well density provisions at this time. The proposed

field rules will facilitate the implementation of the pilot study; Kinder Morgan requests that the rules be adopted as permanent. The examiners recommend that the proposed field rules be adopted as requested by Kinder Morgan.

DISCUSSION OF THE EVIDENCE

Kinder Morgan is undertaking a "greenfields" CO_2 enhanced oil project in the San Andres Formation in Gaines County, Texas, about 14.4 miles northwest of Seminole. The term "greenfields" represents that this particular area has not experienced any primary hydrocarbon production from the San Andres Formation; it is new, or 'Green' to oil production. However, the formation contains a residual oil saturation that Kinder Morgan will attempt to economically produce by employing CO_2 flooding technology commonly reserved for secondary or tertiary recovery projects. The Applicant believes this is a first-of-its-kind project where secondary or tertiary recovery technology is implemented in an area with no historical primary production. Therefore, as no existing regulatory field exists, an early step is to establish field rules to facilitate field development for the particular situations in which Statewide Rules are not sufficient. First, the area ROZ and the pilot project will be described to justify the specific field rule requests.

Type 3 Residual Oil Zone (ROZ)

ROZs can occur or be created by a number of mechanisms. Typically a producing zone is surround to some degree by a ROZ. As a producing zone is depleted, a ROZ remains. Depletion may occur by production or by natural processes. The San Andres Formation in the area of the proposed project is considered to be a Type 3 ROZ. Residual oil exists in a Type 3 ROZ not as a result of capillary action, but instead from an originally formed oil trap that was subsequently subjected to changed hydrodynamic conditions within the underlying aquifer. In the case of the San Andres Formation, and a number of other instances in the Permian Basin, the changed hydrodynamic conditions resulted from uplift in the west, exposing the San Andres to an infiltration of meteoric water and some change to the aquifer discharge point allowing for internal flow from west to east. Via a mechanism termed "Mother Nature's Waterflood", the formation water moved down-dip and encountered oil zones, sweeping the hydrocarbons from pre-existing accumulations (and, presumably, creating others elsewhere.) In some cases structurally-high "attic" traps remained stranded with recoverable oil; in other cases, conventionally recoverable quantities were entirely swept from an area. The pilot project will explore the potential for production from one of these latter zones–a zone in which the there is residual oil saturation, but not enough to be economically produced through traditional means.

A exploratory well drilled into a ROZ will often encounter numerous indications that the formation should be productive. Mud logs, open hole logs, and core samples may likely indicate the presence of hydrocarbons and sufficient porosity. Upon stimulation,

however, the well does not produce because the oil saturation is not sufficient to flow. The oil that is present is not mobile without the presence of a miscible agent, such as CO_2, that is able to induce flow.

The naturally swept areas of the San Andres Formation, and perhaps others in the Permian Basin, appear to occur in 'fairways', zones of preferential groundwater flow between the recharge zones in New Mexico and the basin deposits in the Permian Basin. Kinder Morgan estimates one section of land in a Type 3 ROZ with a 200 foot pay zone may contain 10 MMBO recoverable oil using CO_2 flood techniques. This estimate is based on an original oil in place (OOIP) estimate of 78 MMBO that was historically and naturally waterflooded to reduce the ROZ OOIP to about 32 MMBO. A one section zone with 400 feet of net pay would be expected to yield 19 MMBO by CO_2 flooding recovery. Thus the CO_2 recovery efficiency is expected to be about 30 percent of the ROZ OOIP.

Pilot Demonstration Project

By employing CO_2 flood techniques, Kinder Morgan believes that the residual oil in a Type 3 ROZ that is not associated with any primary production can be produced economically. If successful, this approach may open up significant areas of heretofore unexploited ROZ reserves. This pilot demonstration project is designed to evaluate the productive and economic feasibility of developing such a "greenfield" ROZ. To identify a potential pilot study area, Kinder Morgan examined cores and mudlogs from several hundred wells to estimate ROZ thickness and identify sweet spots. Examining modern neutron density logs, Kinder Morgan determined the ROZ net pore volume of those sweet spots. Based on this analysis, Kinder Morgan identified an initial target area and began to acquire sufficient acreage for the pilot demonstration project.

The "discovery" well for the proposed Tall Cotton (San Andres) field is Kinder Morgan's Bergen Lease, Well No. 1 (API No. 42-165-37662). The Bergen No. 1 well was drilled in October and November 2012. Kinder Morgan collected 9 continuous San Andres Formation core samples over a gross interval of 540 feet. This testing indicated the well to have 450 feet of net pay with an average porosity of greater than 12 percent. All zones tested water at very good rates, and zone 1 (upper) produced at a 1 percent oil cut. Core sample oil saturations were measured in the laboratory to average about 25 percent. Adjusting this laboratory oil saturation estimate of core samples to gross in situ interval conditions indicate oil saturations of about 50 percent. The adjusted values generally agree with estimates based on downhole wireline tools. Based on this information, a field correlative interval was proposed from a depth of 5,250 feet to 5,800 feet.

The project proposal includes the installation of 16 producing wells and nine CO_2 injection wells. These nine patterns are 20 acres in size and centered on a CO_2 injection well. Each injection well is surrounded by four producing wells, in a five-spot pattern.

In addition, there will be five water curtain/containment wells along the eastern edge of the project area. These wells will inject water to maintain reservoir pressure and prevent the off-site movement of injected CO_2. Kinder Morgan intends to spend more than $90 million to implement this first phase of the project, with first injection occurring in the fourth quarter of 2014.

Kinder Morgan expects the pilot demonstration project will provide a credible performance model sometime between one to two years after injection begins. The project will recover 4.7 MMBO (26,00 BO/acre) over a 15 year life, and peak at 2,000 BOPD after two years. This performance is based on the wells producing at capacity allowables, which is necessary to achieve ultimate recovery. The pilot demonstration project will encourage definition and development of many more Type 3 ROZ sweet spots along the Central Basin Platform of the Permian Basin.

Permanent Field Rules

To facilitate implementation of the pilot demonstration project, Kinder Morgan requests the Commission designate a new field, the Tall Cotton (San Andres) Field, and to adopt special rules for the field. There has been no significant primary production in the San Andres Formation within two miles of the proposed pilot study area, which is Section 427, Block G, CCSD & GRNG RR Co. Survey, Abstract A-128, Gaines County, Texas. The Seminole, West Field, which produces from the San Andres Formation, is about two miles east of the pilot study area. Kinder Morgan owns the surface and 100% of the mineral leases under Section 427. Further, there are no offsetting producing wells on any of the eight sections surrounding Section 427. A new field designation for the Tall Cotton (San Andres) Field is appropriate.

The proposed correlative interval corresponds to the floodable and potentially productive ROZ interval in the San Andres Formation, and is defined by the depth interval from 5,250 feet to 5,800 feet on the Bergen No. 1 discovery well. Kinder Morgan is also requesting well spacing provisions of 330 feet to the lease line and zero (0) feet between well spacing. Kinder Morgan asserts that these spacing requirements will provide it the flexibility it needs in the current and potential future development needs of this project. Specifically, Kinder Morgan has already applied for every regular drilling permit for this project under Statewide Rules at 40 acres. Statewide Rules set a minimum between well spacing distance of 1,200 feet, thus a number of wells will require Rule 37 exceptions for permitting. Eliminating the between well spacing requirements removes the need for an exception, and will allow Kinder Morgan to obtain regular locations for all wells in the pilot project. As Kinder Morgan is the only operator in the field and on Section 427, the correlative rights of other operators are not affected.

The current allowable for producing wells in this field under Statewide Rules would be 102 BOPD per well. Kinder Morgan estimates production at about 144 BOPD per well.

Statewide Rule 48 provides for capacity oil allowables for secondary or tertiary recovery projects. That is, wells in the field are allowed to produce at their own maximum capacity to prevent the occurrence of overproduced status for the lease or unit; wells in such fields are exempt from having to produce within a specified allowable production rate or gas limit restriction. Kinder Morgan request a capacity allowable for all wells in the proposed Tall Cotton (San Andres) Field, as such an allowable is necessary to achieve ultimate recovery.

The applicant is not requesting a field rule density provision at this time. The pilot project includes 16 producing wells on the 640-acre section, corresponding to a 40-acre density consistent with Statewide Rules. Kinder Morgan may revisit the field well density in the future as the pilot project progresses, but at this time the statewide density of 40 acres is sufficient.

FINDINGS OF FACT

1. Notice of this application and hearing was provided to all persons entitled to notice at least ten (10) days prior to the date of the hearing.

2. The subject pilot demonstration project area is Section 427, Block G, CCSD & GRNG RR Co. Survey, Abstract A-128, Gaines County, Texas.

3. Kinder Morgan owns the surface and 100% of the mineral leases under Section 427.

4. There has been no significant primary production in the San Andres Formation on or within two miles of the proposed pilot study area.

    a. There are no offsetting producing wells on any of the eight sections surrounding Section 427.

    b. The Seminole, West Field, which produces from the San Andres Formation, is about two miles east of the pilot study area.

5. A Type 3 residual oil zone (ROZ) exists in Section 427.

    a. The area was naturally waterflooded, leaving behind a residual oil saturation of up to 50 percent based on core sample and wireline tests.

    b. There is 450 feet of net pay with an average porosity of 12 percent in the San Andres Formation underlying Section 427.

6. Patterned injection of CO_2 will mobilize some of the residual oil in the zone.

7. A new field designation for the Tall Cotton (San Andres) Field is appropriate.

8. The proposed correlative interval corresponds to the floodable and potentially productive ROZ interval in the San Andres Formation, and is defined by the depth interval from 5,250 feet to 5,800 feet on the Bergen No. 1 discovery well.

9. Statewide Rules for well spacing and oil well allowable production rates will impede the development of the proposed Tall Cotton (San Andres) Field.

10. Spacing provisions allowing for 330 feet lease line and zero (0) feet between wells will enable field development on 20-acre injection/production well patterns and allow flexibility in future well siting.

11. Capacity allowables for all wells in the proposed Tall Cotton (San Andres) Field are necessary to achieve ultimate recovery.

CONCLUSIONS OF LAW

1. Proper notice of this hearing was issued.

2. All things have been accomplished or have occurred to give the Commission jurisdiction in this matter.

3. Approval of the requested new field designation and adoption of Field Rules for the Tall Cotton (San Andres) Field will prevent waste, protect correlative rights and promote the orderly development of the field.

RECOMMENDATION

Based on the above findings of fact and conclusions of law, the examiners recommend that the Commission approve the new field designation and adopt Field Rules for the proposed Tall Cotton (San Andres) Field, as requested by Kinder Morgan.

Respectfully submitted,

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