

**STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
SUPERVISOR OF WELLS**

THE VERIFIED PETITION OF JORDAN DEVELOPMENT)
COMPANY, L.L.C., FOR AN ORDER FROM THE)
SUPERVISOR OF WELLS APPROVING A PLAN OF)
UNITIZATION FOR SECONDARY RECOVERY OF OIL,)
GAS, AND RELATED HYDROCARBONS, AND) ORDER NO. 01-2016
ABROGATING EXISTING SPACING AND PRORATION)
ORDERS AND RULES FOR THE SPRINGDALE 14/15)
UNIT, SPRINGDALE TOWNSHIP, MANISTEE COUNTY,)
MICHIGAN.)

OPINION AND ORDER

This case involves the Petition of Jordan Development Company, L.L.C. (Petitioner) for: (i) approval of a plan for unitized operation of the Springdale 14/15 Unit (proposed Unit Area), pursuant to Part 617, Unitization, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); (ii) approval of a secondary recovery operation pursuant to Section 61506(i), Part 615, Supervisor of Wells, of the NREPA and R 324.612; and (iii) approval to operate the proposed Unit Area as an exception to the applicable spacing provisions of Part 615 of the NREPA, and its administrative rules. The Petitioner also requests that the 120-acre drilling unit established by Order No. (A) 2-1-06 be abrogated as the 120 acres are included in the proposed Springdale 14/15 Unit Area. The proposed Unit Area consists of the following acreage:

Section 10: W 1/2 of SE 1/4, SE 1/4 of SE 1/4
Section 14: W 1/2
Section 15: E 1/2, E 1/2 of SW 1/4
Township 24 North, Range 14 West
Springdale Township, Manistee County, Michigan

JURISDICTION

The development of oil and gas in this state is regulated under Part 615, Supervisor of Wells; and Part 617, Unitization; of the NREPA, MCL 324.61501, et seq. and MCL 324.61701, et seq. The purpose of Part 615 is to ensure the orderly development and production of the oil and gas resources of this state, with a view to the

ultimate recovery of the maximum production of these natural resources. MCL 324.61502. For the purpose of maximizing recovery, the Supervisor of Wells (Supervisor) regulates secondary recovery methods for oil and gas, including the introduction of substances into producing formations for purposes of enhancing production. MCL 324.61506(i). A person proposing secondary recovery by injection of a fluid into a producing formation must file a petition for a public evidentiary hearing. 1996 AACCS, R 324.612. Part 617 directs the Supervisor to issue an order providing for unitization pursuant to a hearing if certain criteria are met. MCL 324.61704(4). Evidentiary hearings in these matters are governed by the applicable provisions of the Administrative Procedures Act, 1969 PA 306, as amended, MCL 24.201, et seq. See 1996 AACCS, R 324.1203. The evidentiary hearing in this matter was held on August 24, 2016.

FINDINGS OF FACT

The Petitioner specifically requests that the Supervisor issue an Order allowing the Petitioner to inject fresh water into the Guelph Dolomite/Ruff Formation, the productive zone, for purposes of secondary recovery operations; and to exempt the proposed Unit Area from the applicable spacing and proration rules and orders.

The Administrative Law Judge determined the Notice of Hearing was properly served and published. No answers to the Petition were filed, therefore, the Petitioner is the only party in this matter. The Supervisor designated the hearing to be an uncontested evidentiary hearing pursuant to R 324.1205(1)(c) and directed substantive evidence be presented in the form of written verified statements. In support of its case, the Petitioner offered the verified statements of Mr. Benjamin Brower, Vice President; and Mr. William Quinlan, Engineer.

I. Unitization

Mr. Brower testified all mineral interests in the proposed Unit Area are subject to valid oil and gas leases and that more than 89 percent of owners entitled to royalty within the proposed Unit Area have ratified the Petitioner's Plan of Unitization (Exhibit B to the Petition). In addition, 91 percent of working interest owners have ratified the Plan

of Unitization (Exhibit A to Mr. Brower's verified statement). Mr. Brower stated the Petitioner has made several attempts by telephone, email, and/or by mail to contact the uncommitted owners. The Petitioner is the operator and working interest owner of oil and gas leases covering the proposed Unit Area.

I find that the Petitioner is qualified to be named Unit Operator and has obtained sufficient approval to support entry of a final order approving the Plan of Unitization and approving unit operations pursuant to Part 617 of the NREPA. I further find that the terms of the Petitioner's Plan of Unitization are fair, reasonable and equitable.

II. Unit Area

The Verified Petition in this matter states that the Petitioner plans to conduct unitized operations within a Unitized Formation described as the stratigraphic equivalent of that portion of the Brown and Gray Niagaran formations (in current nomenclature known as the Guelph Dolomite and Gray Niagara Member of the Lockport Dolomite) encountered in the interval from 4,997 measured depth (MD) to 5,024 MD in the State Springdale & Lucking 1-21 Well (Permit No. 46775) located in the NE/4 of NE/4 of NE/4 of Section 21, T24N, R14W, Springdale Township, Manistee County, Michigan.

Mr. Quinlan testified Jordan Development Company, LLC (Jordan) began developing the Springdale Field area in 2002 by drilling the Consumers & Lehman 11-16 well, which resulted in a productive well within an 11-foot thick section of non-reefal Brown Niagaran. This interval was similar to a productive zone encountered within the proximal Consumers Power 1-16A well, which was drilled in 2001 by Tiger Development. It was determined from these two wells that the non-reefal Brown Niagaran was productive within the area. Jordan then developed the Springdale Field by drilling horizontal wellbores of up to 4,300 feet in length in order to maximize the exposure within the approximate 12-foot thick Brown Niagaran interval.

To date, the Springdale Field has produced approximately 893 thousand barrels of oil (MBO) and 4.67 billion cubic feet (BCF) of gas from seventeen productive wells. A pilot waterflood within Sections 21 and 22 has also been incorporated within the field. The Springdale Field development is displayed in Exhibit B to the Plan of Unitization.

The area of the proposed Springdale 14-15 Waterflood is displayed in red cross hatching on Exhibit A-1 to the Petition.

I find the Unitized Formation as proposed by the Petitioner is reasonable and appropriate and should be approved. I find the boundaries of the proposed Unit Area are appropriate.

III. Secondary Recovery

Mr. Quinlan testified the Springdale Field has cumulatively produced approximately 893 MBO barrels of oil and 4.67 BCF of gas. There are six horizontal wells within the proposed Unit Area:

State Springdale & Stedronsky 14-15

State Springdale & Stedronsky 10-15

State Springdale & Trezil 9-15

State Springdale 13-14

State Springdale & Miller 3-14

State Springdale & Henry 15-15

Mr. Quinlan testified that all wells are presently at or near economic limit. The wells in the proposed Unit Area have produced a combined 416,539 barrels of oil (Exhibit J to Mr. Quinlan's verified statement).

Mr. Quinlan testified a waterflood operation is a reasonable means of extending the life of the field. The wells are well configured to accommodate that development going forward while minimizing the need for additional drilling, pipeline work and surface disruption. He stated continuing to produce the wells under primary production operations would result in no additional oil in the proposed Unit Area (Exhibit J). If Petitioner's proposed secondary recovery operations are successful, Mr. Quinlan estimates waterflooding has the potential to improve the overall recovery of the flooded area from 16 percent to 32 percent, which would represent the potential of an additional 284 MBO of recoverable oil from the initial three wells planned as a pilot of the Springdale 14-15 Unit.

The Petitioner initially proposes to convert one existing well, the State Springdale 13-14, to a water injection well and inject fresh water at a maximum rate of

approximately 1,200 to 1,500 barrels per day, with decreasing injection rates to likely occur within the first year of operations dependent upon the rate at which the injection well will accept fluid. The fresh water will come from a fresh water source at the Jordan Development Springdale 16 CPF (Exhibit P). A hydrogeologic study was performed on the source well prior to its utilization within the Springdale 21-22 waterflood (Exhibit Q to Mr. Quinlan's supplemental verified statement). At this time, Petitioner has no plans to drill additional wells.

After approximately six months of injection, production is projected to commence from the two offset wells, the State Springdale & Trezil 9-15 and the State Springdale & Miller 3-14. The combined production is projected to begin at approximately 40 barrels of oil per day (BOPD) and increase to 80 BOPD over a six-month period, then hold that for one year, and then decline fifteen percent (15 percent) linearly until economic limit is reached.

Mr. Quinlan's secondary recovery production forecast and estimated economics (Exhibit N to his verified statement) indicate the project will be profitable. Mr. Quinlan estimated that water injection in the proposed Unit Area would result in incremental oil recovery nearly matching the projected primary reserves for the unit. Initial secondary recovery operations would have an estimated capital cost of \$453,000 and cost of operations of approximately \$5,150 per month per producing well, \$5,150 per month per injection well, and a disposal cost of \$4 per barrel of water.

Based on the Petitioner's analysis, there is evidence of significant amounts of oil remaining in the reservoir. I find the testimony indicates the proposed Unit Area contains accumulations of hydrocarbons that will not be recovered by primary production of the wells in the field, but may be recovered by secondary recovery operations conducted as a part of a unitized operation. I find the estimated additional cost of unitized operations will not exceed the value of the additional hydrocarbons recovered, and the unitization requested is reasonably necessary to substantially increase recovery of oil from the proposed Unit Area and avoid waste.

Mr. Quinlan testified that the Petitioner proposes to allocate production in the proposed Unit Area based on the historic primary recovery of each well in the proposed

unit, as shown in Exhibit A to the Plan of Unitization. I find such allocation of production is fair, reasonable, and equitable as required by Section 615705 of Part 617.

Mr. Brower's Verified Statement notes that one of the wells within the proposed Springdale 14-15 Unit, the St. Springdale & Miller 3-14 (PN 57589), was drilled on a 120-acre unit created by Order (A) 2-1-06. Jordan requests that the 120-acre unit be abrogated. I find that abrogation of Order (A) 2-1-06 and the 120-acre unit for the St. Springdale & Miller 3-14 is necessary to implement the Plan of Unitization.

The Petitioner requests abrogation of spacing requirements within the proposed Unit Area to assist in implementing its Plan of Unitization and proceeding with unitized operations, including secondary recovery.

I find the type of operations contemplated by the Petitioner are feasible, will prevent underground waste by recovering oil not otherwise recoverable, and will protect correlative rights. I find abrogation of the existing spacing and proration rules and orders is necessary to implement the Plan of Unitization and proceed with unitized operations, except that no well shall be completed in the Unitized Formation at a location closer than 330 feet from the outside boundary of the proposed Unit Area.

IV. Hydrogeologic Investigation

Mr. Quinlan testified that water supplied to the proposed unit flood will be sourced from the existing water well currently supplying water to the Jordan operated Springdale 21-22 Waterflood. The supply well is located at the Jordan Springdale 16 CPF. Exhibit P displays a plan view of the existing source water well and the existing four-inch (4-inch) steel pipeline which will be converted to an injection water line. The converted water line will transport fresh water to the State Springdale 13-14 injection well within the proposed Springdale 14-15 pilot waterflood.

Mr. Quinlan also testified that a hydrogeologic study was performed on the source well prior to its utilization within the Springdale 21-22 waterflood. Based on this study, the current source well is capable of delivering a sustained rate of 3,000 BPD, or 90 GPM of fresh water, with no adverse effect to existing drinking water wells or surface waters in the area.

To date, the Springdale 21-22 waterflood has utilized approximately 265,000 barrels of water, at a maximum injection rate of approximately 1,200 BPD. The current injection rate into the 21-22 waterflood averages approximately 50 BPD.

Jordan proposes to utilize the existing source well at a rate not to exceed 3,000 BPD of total withdrawal. As such, no adverse impact will be caused to the source aquifer, as evidenced by the hydrogeologic study previously performed and entered into the record in Cause No. 03-2011. I find the Petitioner's proposed waterflood operations will not adversely affect surface water or water supplies in the area.

CONCLUSIONS OF LAW

Based on the findings of fact, I conclude, as a matter of law:

1. The applicable spacing, well location, and proration requirements for the proposed Unit Area (80 acre spacing) were established by Special Order No. 1-73, as amended and Order No. (A) 2-1-06. Exceptions to these Orders may be granted by the Supervisor.

2. The Supervisor shall issue an order providing for the unit operation of a unit area if he or she finds all of the following:

(a) That the unitization requested is reasonably necessary to substantially increase the ultimate recovery of oil and gas from the unit area;

(b) That the type of operations contemplated by the plan are feasible, will prevent waste, and will protect correlative rights.

(c) That the estimated additional cost of conducting such operations will not exceed the value of the additional oil and gas so recovered. MCL 324.61704(4).

3. The Supervisor's Order may be declared effective if the Plan of Unitization has been approved in writing by one of the three ways specified in MCL 324.61706.

4. The Supervisor may regulate the secondary recovery methods of oil and gas, including pulling or creating a vacuum and the introduction of gas, air, water, and other substances into the producing formations. MCL 324.61506(i).

5. A person desiring to inject water, gas, or other fluids into a producing formation or use other technology for the purpose of increasing the ultimate recovery of hydrocarbons from a reservoir shall file a petition for hearing. 1996 AACS, R 324.612(1).

6. The operator of a secondary recovery project shall keep accurate records of all oil, gas, and brine produced, volumes of fluids injected, and injection pressures. The operator shall file reports of the data and other data as may be required with the Supervisor at regular intervals, as specified. 1996 AACS, R 324.612(2).

7. The Supervisor has jurisdiction over the subject matter and the persons interested therein.

8. Due notice of the time, place, and purpose of the hearing was given as required by law, and all interested persons were afforded an opportunity to be heard. 1996 AACS, R 324.1204.

DETERMINATION AND ORDER

Based on the Findings of Fact and Conclusions of Law, the Supervisor determines the proposed unitization will prevent waste, and protect correlative rights.

NOW, THEREFORE, IT IS ORDERED:

1. The Petition of Jordan Development Company, L.L.C. is granted, and the proposed Unit Area is created in accordance with, and subject to, this Order and the

provisions of the Plan of Unitization, which are hereby incorporated by reference. The proposed Unit Area shall hereafter be known as the Springdale 14/15 Unit.

2. Jordan Development Company, L.L.C. is appointed Unit Operator.

3. The Springdale 14/15 Unit is described as:

Section 10: W 1/2 of SE 1/4, SE 1/4 of SE 1/4

Section 14: W 1/2

Section 15: E 1/2, E 1/2 of SW 1/4

Township 24 North, Range 14 West

Springdale Township, Manistee County, Michigan.

4. For purposes of this Order, the Unitized Formation is described as the stratigraphic equivalent of that portion of the Brown and Gray Niagaran formations (in current nomenclature known as the Guelph Dolomite and Gray Niagara Member of the Lockport Dolomite) encountered in the interval from 4,997 MD to 5,024 MD in the State Springdale & Lucking 1-21 Well (Permit No. 46775) located in the NE/4 of NE/4 of NE/4 of Section 21, T24N, R14W, Springdale Township, Manistee County, Michigan.

5. Jordan Development Company, L.L.C. shall notify the Supervisor between 30 and 60 days prior to the commencement of injection operations, and between 30 and 60 days prior to the anticipated date of abandonment of injection operations. The Petitioner shall comply with all applicable administrative rules of Part 615 of the NREPA and shall obtain such approvals as are necessary from the Supervisor.

6. Each tract within the Springdale 14/15 Unit shall participate in the unit production and other benefits and burdens of unit operations in accordance with the Plan of Unitization.

7. Order No. (A) 2-1-06 is hereby abrogated. Operation of the Springdale 14/15 Unit shall be conducted exclusive of and as an exception to all applicable spacing orders and rules, except no well may be completed in the Unitized

Formation at a location closer than 330 feet from the outside boundaries of the Springdale 14/15 Unit Area. Jordan Development Company, L.L.C. is authorized to produce wells on the Springdale 14/15 Unit at rates that result in the maximum efficient recovery of hydrocarbons. All other parts of the administrative rules of Part 615 of the NREPA shall be adhered to.

8. Jordan Development Company, L.L.C. is authorized to inject fresh water into the Unitized Formation, as defined in this Order. Jordan Development Company, L.L.C. may only inject other substances, including produced water, upon receipt of written approval from the Supervisor. The rate of withdrawal from the fresh water well shall not exceed 90 gallons per minute without first receiving written approval from the Supervisor.

9. The Plan of Unitization, which constitutes the plan for unit operations, is hereby approved; and unit operations thereunder may be commenced as of the effective date determined by the Unit Operator consistent with Article 24 of the Plan of Unitization. Cessation of the unit operations shall be in accordance with the Plan of Unitization and only with the written approval of the Supervisor.

10. The Supervisor retains continuing jurisdiction over the Springdale 14/15 Unit in order that the Supervisor may exercise such administrative control as is consistent with the powers and duties of the Supervisor, as established by Part 615 and Part 617 of the NREPA.

11. This Order shall be effective immediately.

Dated: Oct. 25, 2016


HAROLD R. FITCH
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