

BEFORE THE INDUSTRIAL COMMISSION
OF THE STATE OF NORTH DAKOTA

CASE NO. 25717
ORDER NO. 28128

IN THE MATTER OF A HEARING CALLED ON A MOTION OF THE COMMISSION TO CONSIDER THE APPLICATION OF PETRO HARVESTER OPERATING CO., LLC FOR AN ORDER ESTABLISHING (I) TWO STANDUP 640-ACRE DRILLING UNITS CONSISTING OF THE W/2 OF SECTIONS 3 AND 10; AND THE E/2 OF SECTIONS 3 AND 10, T.163N., R.93W.; (II) FOUR STANDUP 400-ACRE DRILLING UNITS CONSISTING OF THE W/2 OF SECTIONS 27 AND 34; THE E/2 OF SECTIONS 27 AND 34; THE W/2 OF SECTIONS 26 AND 35; AND THE E/2 OF SECTIONS 26 AND 35, T.164N., R.93W., BURKE COUNTY, ND; (III) AND AUTHORIZING A HORIZONTAL WELL TO BE DRILLED IN THE MADISON FORMATION ON EACH SUCH SPACING UNIT WITH 200 FOOT SETBACKS FOR THE TOE AND HEEL OF EACH HORIZONTAL WELL; OR (IV) GRANTING SUCH OTHER RELIEF AS MAY BE APPROPRIATE.

ORDER OF THE COMMISSION

THE COMMISSION FINDS:

- (1) This cause came on for hearing at 9:00 a.m. on the 26th day of April, 2017.
- (2) The witnesses for Petro Harvester Operating Company, LLC (Petro Harvester) provided telephonic testimony in this matter pursuant to North Dakota Administrative Code (NDAC) Section 43-02-03-88.2. Telephonic Communication Affidavits were received on May 8, 2017; therefore, such testimony may be considered evidence.
- (3) Petro Harvester made application to the Commission for an order establishing two standup 640-acre drilling units consisting of the E/2 of Sections 3 and 10; and the W/2 of Sections 3 and 10, Township 163 North, Range 93 West (Sections 3 and 10); four standup 400-acre drilling units consisting of the E/2 of Sections 26 and 35; the W/2 of Sections 26 and 35; the E/2 of Sections 27 and 34; and the W/2 of Sections 27 and 34, Township 164 North, Range 93 West (Sections 26, 35, 27, and 34), Burke County, North Dakota; and authorizing a horizontal well to be drilled in the Madison Formation on each such spacing unit with 200 foot

setbacks for the toe and heel of each horizontal well; or granting such other relief as may be appropriate.

(4) Petro Harvester withdrew the standup 640-acre drilling units described as the E/2 of Sections 3 and 10; and the W/2 of Sections 3 and 10 from the application.

(5) Sections 26, 34, and 35 are adjacent to the Short Creek Field and Section 27 is one section removed from the Short Creek Field. There are no wells currently permitted to or producing from said sections.

(6) Order No. 28240 entered in Case No. 25824, the most recent spacing order for the Short Creek-Madison Pool, established proper spacing for the development of Zone I at one well per 160 acres, and Zone II at one horizontal well per 800 acres.

(7) Petro Harvester presented evidence the Short Creek-Madison Pool underlies Sections 26, 27, 34, and 35; therefore, the boundary of the Short Creek Field should be extended to include such land.

(8) Section 26; and Section 27 are short sections adjacent to the North Dakota-Canada border containing approximately 149.2 acres and 149.76 acres, respectively.

(9) Petro Harvester's idealized development plan for each standup 400-acre spacing unit described as the E/2 of Sections 26 and 35; the W/2 of Sections 26 and 35; the E/2 of Sections 27 and 34; and the W/2 of Sections 27 and 34 is to drill two horizontal wells parallel to the long axis targeting the lower Midale subinterval of the Mission Canyon Formation. Utilization of horizontal drilling technology as proposed would result in the wells being completed at a location or locations not in compliance with current applicable spacing orders for the Short Creek-Madison Pool. The horizontal well design proposed may be preliminary and could be changed for various reasons which is permissible as long as the horizontal well design still justifies the spacing unit.

(10) Petro Harvester plans to drill the two horizontal wells in the E/2 of Sections 26 and 35 depicted in paragraph (9) above from the Hess Bakken Investments II, LLC (Hess) #0211H-1 AV-Schwartz-163-93 well (File No. 19347) pad in the NE/4 NE/4 of Section 2, Township 163 North, Range 93 West, Burke County, North Dakota (Section 2), which they are acquiring from Hess. Petro Harvester plans to drill the two horizontal wells in the W/2 of Sections 26 and 35 depicted in paragraph (9) above from a common drilling pad in the NW/4 of Section 2. Petro Harvester plans to drill the four horizontal wells in Sections 27 and 34 depicted in paragraph (9) above from a common drilling pad in the SE/4 SW/4 of Section 34.

(11) The Commission enforces a policy which requires measurement inaccuracies in the directional survey equipment be considered when the angle between the horizontal lateral and the corresponding spacing unit boundary is ten degrees or less. Waiving potential tool error in the directional survey equipment when calculating the bottom hole location of any horizontal lateral in spacing units which allow multiple horizontal wells will allow said spacing units to be more efficiently developed.

(12) Petro Harvester prefers to develop standup 400-acre spacing units to reduce the number of drilling pads and well bore count and allow for more reservoir access with longer laterals from a single pad. The relatively shallow target depth of approximately 6000 feet reduces the ability to deviate well bore trajectories due to a lack of weight on the bit. Petro Harvester believes standup 400-acre spacing units allow adjustment of the inter-lateral distance to minimize drilling and completion risks such as existing vertical wells and enhances their anti-collision strategy to maintain a 100-foot offset, and allow Petro Harvester to maintain a 50 feet to 100 feet offset from a spacing unit setback boundary to avoid trespass.

(13) Construction of common drilling pads will reduce surface impact and the expenditure of funds on surface facilities and enhance the economics of production, thereby preventing economic waste and promoting the greatest ultimate recovery of oil and gas from the Short Creek-Madison Pool. Utilization of such common drilling pads will improve the timing and economics of connecting wells to gas gathering systems thereby reducing gas flaring and will minimize surface disturbance and enhance the aesthetic values resulting from fewer production facilities.

(14) Petro Harvester plans to complete the horizontal wells with cemented liners and multi-stage fracture stimulations.

(15) Petro Harvester testified a 200-foot setback will allow additional fracture stimulation stages per well. Petro Harvester testified it gathered microseismic data during the hydraulic fracture stimulation of its FLX1 #22-15 163-91 B well (File No. 32423) and FLX1 #22-15 163-91 D well (File No. 32424), which recorded noise events at an average maximum distance of 521 feet from the lateral. Petro Harvester believes the propped fracture half-length is 100 to 150 feet and the effective propped fracture half-length is approximately 103 feet based upon modeling and history matching. Petro Harvester testified they will set the production casing 50 feet across the setback requirement and terminate the well 50 feet from the setback requirement, and they do not fracture stimulate out the liner shoe or at the casing shoe, but instead the deepest fracture stimulation perforation is located 150 feet from the total depth of the well and the shallowest fracture stimulation perforation is located 100 feet from the casing shoe. Petro Harvester estimates the induced fracture orientation is north 65 degrees east. Petro Harvester testified the additional fracture stimulation stages will result in the incremental recovery of oil.

(16) There were no objections to this application.

(17) If Petro Harvester's activities are successful, greater ultimate recovery of oil and gas from the pool will be achieved which will prevent waste and the drilling of unnecessary wells in a manner which will not have a detrimental effect on correlative rights.

IT IS THEREFORE ORDERED:

(1) The E/2 of Sections 26 and 35; the W/2 of Sections 26 and 35; the E/2 of Sections 27 and 34; and the W/2 of Sections 27 and 34, Township 164 North, Range 93 West, Burke County, North Dakota, are hereby established as standup 400-acre spacing units for the exclusive purpose of drilling up to two horizontal wells within each said spacing unit within the Short Creek-Madison Pool and Zone II is hereby redefined to include said spacing units. Existing and future vertical and directional wells drilled within the spacing units herein established shall

conform to the applicable spacing requirements providing for the orderly development of Zone I in the Short Creek-Madison Pool.

(2) The Director is hereby authorized to exercise continuing jurisdiction in this matter to determine whether a horizontal well proposed or drilled upon the 400-acre spacing units herein established has justified the creation of such unit, to require amendments or modifications to the permit to drill for such horizontal well, and to deny a permit to drill in the event a well is proposed to be drilled in a manner inconsistent with the evidence that justified such spacing unit.

(3) The Short Creek Field is hereby redefined as the following described tracts of land in Burke County, North Dakota:

TOWNSHIP 164 NORTH, RANGE 93 WEST, 5TH PM
ALL OF SECTIONS 25, 26, 27, 34, 35 AND 36,

TOWNSHIP 163 NORTH, RANGE 93 WEST, 5TH PM
ALL OF SECTIONS 1, 2, 3, 4, 5, 8, 9, 10, 11 AND 12.

(4) The Short Creek-Madison Pool is hereby redefined as the following described tracts of land in Burke County, North Dakota:

ZONE I (160V-CSE QQ)

TOWNSHIP 164 NORTH, RANGE 93 WEST, 5TH PM
ALL OF SECTIONS 25, 26, 27, 34, 35 AND 36,

TOWNSHIP 163 NORTH, RANGE 93 WEST, 5TH PM
ALL OF SECTIONS 1, 2, 3, 4, 5, 8, 9, 10, 11 AND 12.

ZONE II (2/400H-STANDUP)

TOWNSHIP 164 NORTH, RANGE 93 WEST, 5TH PM
ALL OF SECTIONS 26, 27, 34 AND 35.

ZONE III (800H-STANDUP)

TOWNSHIP 164 NORTH, RANGE 93 WEST, 5TH PM
ALL OF SECTIONS 25 AND 36.

(5) The Short Creek-Madison Pool is hereby defined as that accumulation of oil and gas found in the interval from below the base of the Last Charles Salt to above the top of the Lodgepole Formation within the limits of the field as set forth above.

(6) The proper spacing for the development of Zone I in the Short Creek-Madison Pool is hereby set at one vertical well per 160-acre spacing unit.

(7) All wells in Zone I in the Short Creek-Madison Pool shall be located in the approximate center of the northwest quarter of each quarter section unless granted an exception by the Commission after due notice and hearing.

(8) Spacing units in Zone I in the Short Creek-Madison Pool shall consist of a governmental quarter section or governmental lots corresponding thereto.

(9) Zone I in the Short Creek-Madison Pool shall not be extended except by further order of the Commission after due notice and hearing.

(10) Provisions established herein for Zone II in the Short Creek-Madison Pool are for the exclusive purpose of drilling horizontal wells. Existing and future vertical and directional wells drilled within the area defined as Zone II in paragraph (4) above shall conform to the applicable spacing requirements for the orderly development of Zone I in the Short Creek-Madison Pool.

(11) The proper spacing for the development of Zone II in the Short Creek-Madison Pool is hereby set at up to two horizontal wells per standup 400-acre spacing unit.

(12) All portions of the well bore not isolated by cement of any horizontal well in Zone II in the Short Creek-Madison Pool shall be no closer than 500 feet to the east or west boundary and 200 feet to the north or south boundary of the spacing unit. Measurement inaccuracies in the directional survey equipment when calculating the bottom hole location in a horizontal well need not be considered.

(13) The E/2 of Sections 26 and 35; the W/2 of Sections 26 and 35; the E/2 of Sections 27 and 34; and the W/2 of Sections 27 and 34, Township 164 North, Range 93 West, Burke County, North Dakota, are hereby designated standup 400-acre spacing units in Zone II in the Short Creek-Madison Pool.

(14) Spacing units hereafter created in Zone II in the Short Creek-Madison Pool shall be standup spacing units designated by the Commission.

(15) Zone II in the Short Creek-Madison Pool shall not be extended except by further order of the Commission after due notice and hearing.

(16) Provisions established herein for Zone III in the Short Creek-Madison Pool are for the exclusive purpose of drilling horizontal wells. Existing and future vertical and directional wells drilled within the area defined as Zone III in paragraph (4) above shall conform to the applicable spacing requirements for the orderly development of Zone I in the Short Creek-Madison Pool.

(17) The proper spacing for the development of Zone III in the Short Creek-Madison Pool is hereby set at one horizontal well per standup 800-acre spacing unit.

(18) All portions of the well bore not isolated by cement of any horizontal well in Zone III in the Short Creek-Madison Pool shall be no closer than 500 feet to the east or west boundary and 200 feet to the north or south boundary of the spacing unit. Measurement inaccuracies in the directional survey equipment need not be considered except when deemed necessary by the Director.

(19) Sections 25 and 36, Township 164 North, Range 93 West, Burke County, North Dakota, are hereby designated a standup 800-acre spacing unit in Zone III in the Short Creek-Madison Pool.

(20) Spacing units hereafter created in Zone III in the Short Creek-Madison Pool shall be standup spacing units designated by the Commission.

(21) Zone III in the Short Creek-Madison Pool shall not be extended except by further order of the Commission after due notice and hearing.

(22) The operator of any horizontally drilled well in the Short Creek-Madison Pool shall cause to be made a directional survey of the well bore. The directional survey contractor shall file a certified survey with the Commission within 30 days after completion of the well in accordance with NDAC Section 43-02-03-25. The survey shall be of sufficient quality to enable the Commission to determine the entire completion location of the well and its terminus.

(23) The Director is hereby authorized to exercise continuing jurisdiction to determine whether any well proposed or drilled upon any spacing unit herein established has justified the creation of such unit, to require amendments or modifications to the permit to drill for such well, and to deny a permit to drill in the event a well is proposed to be drilled in a manner inconsistent with the evidence that justified the spacing requirements in the Short Creek-Madison Pool.

(24) The Commission shall have continuing jurisdiction in this matter and specifically reserves the authority, upon its own motion or the motion of any interested party, to: (1) review the spacing requirements for the Short Creek-Madison Pool; (2) determine whether the separate zones of spacing established herein are warranted; and, (3) make such further amendments or modifications to the spacing requirements for the Short Creek-Madison Pool as the Commission deems appropriate.

(25) No well shall be hereafter drilled or produced in the Short Creek-Madison Pool, as defined herein, except in conformity with the regulations above without special order of the Commission after due notice and hearing.

(26) The following rules concerning the casing, tubing and equipping of wells shall apply to the subsequent drilling and operation of wells in the Short Creek-Madison Pool:

- (a) The surface casing shall consist of new or reconditioned pipe that has been previously tested to 1000 pounds per square inch. The casing shall be set and cemented at a point not less than 50 feet below the base of the Fox Hills Formation. Sufficient cement shall be used to fill the annular space outside the pipe to the surface of the ground, or the bottom of the cellar, and sufficient scratchers and centralizers shall be used to assure a good cement job. Cement shall be allowed to stand a minimum of 12 hours before drilling the plug or initiating tests. The quality of cement shall conform to the standards provided under NDAC Section 43-02-03-21. After cementing, the casing shall be tested by application of pump pressure of at least 1000 pounds per square inch. If, at the end of 30 minutes this pressure has dropped 100 pounds per square inch or more,

the casing shall be repaired. Thereafter, the casing shall again be tested in the same manner. Further work shall not proceed until a satisfactory test has been obtained;

- (b) The producing or oil string shall consist of new or reconditioned pipe that has been previously tested to 2000 pounds per square inch. Casing shall be set and cemented at a point not higher than the top of the producing formation, or at a point approved by the Director. Sufficient cement shall be used and applied in such manner to protect and isolate all formations containing oil and/or gas, protect the pipe through salt sections encountered, and to isolate the Dakota-Lakota Series. The cement shall be allowed to stand a minimum of 15 hours before drilling the plug or initiating tests. The quality of cement shall conform to the standards provided under NDAC Section 43-02-03-21. After cementing, the casing shall be tested by application of pump pressure of at least 1500 pounds per square inch. If, at the end of 30 minutes this pressure has dropped 150 pounds per square inch or more, the casing shall be repaired. Thereafter, the casing shall again be tested in the same manner. Further work shall not proceed until a satisfactory test has been obtained;
- (c) All well-head fittings and connections shall have a working pressure in excess of that to which they are expected to be subjected; and,
- (d) All wells shall be equipped with tubing; a tubing packer must also be utilized in flowing wells unless a waiver is obtained from the Director after demonstrating the casing will not be subjected to excessive pressure or corrosion; all tubing shall be of sufficient internal diameter to allow the passage of a bottom hole pressure gauge for the purpose of obtaining bottom hole pressure measurements.

(27) The gas-oil ratio of all wells not connected to a gas gathering system shall be measured annually during the month of May. The reservoir pressure shall be measured in any well completed in the Short Creek-Madison Pool if deemed necessary by the Director. Drill stem test pressures are acceptable for determining reservoir pressure. Pressure measurements shall be made at or adjusted to a subsea datum of 4000 feet. All gas-oil ratio and reservoir pressure determinations shall be made by methods approved by the Director and reported to the Director within 15 days following the end of the month in which they are determined. The Director is authorized to waive these requirements if the necessity therefor can be demonstrated to his satisfaction. All additional gas-oil ratio and reservoir pressure determinations conducted on any well but not specifically required herein, shall be reported to the Director within 15 days following the end of the month in which they are determined.

(28) No saltwater, drilling mud, crude oil, or waste oil shall be stored in pits in this field, except in an emergency, and approved by the Director.

(29) All wells in the Short Creek-Madison Pool shall be allowed to produce at a maximum efficient rate.

(30) If the flaring of gas produced with crude oil from the Short Creek-Madison Pool is determined by the North Dakota Department of Health as causing a violation of the North

Dakota Air Pollution Control Rules (NDAC Article 33-15), production from the pool may be restricted.

(31) This order shall cover all of the Short Creek-Madison Pool, common source of supply of crude oil and natural gas, as herein defined, and continues in full force and effect until further order of the Commission or until the last well in the pool has been plugged and abandoned.

Dated this 14th day of August, 2017.

INDUSTRIAL COMMISSION
STATE OF NORTH DAKOTA

By the Director, on behalf of the Commission

/s/ Lynn D. Helms, Director