VICTOR G. CARRILLO, *CHAIRMAN*
ELIZABETH A. JONES, *COMMISSIONER*
MICHAEL L. WILLIAMS, *COMMISSIONER*

LINDIL C. FOWLER, JR., *GENERAL COUNSEL*
COLIN K. LINEBERRY, *DIRECTOR*
HEARINGS SECTION

RAILROAD COMMISSION OF TEXAS

OFFICE OF GENERAL COUNSEL

OIL AND GAS DOCKET NO. 8A-0261402

THE APPLICATION OF CANAN MOWREY OPERATING, L.L.C. TO INJECT FLUID INTO A RESERVOIR PRODUCTIVE OF OIL OR GAS, BELL LEASE WELL NO. 5, IRON BRIDGE (CROTON LIME) FIELD, DICKENS COUNTY, TEXAS

HEARD BY: Donna K. Chandler, Technical Examiner
Marshall F. Enquist, Hearings Examiner

APPEARANCES:

APPLICANT:	**REPRESENTING:**
Doug Dashiell Pat Canan David Mowrey	Canan Mowrey Operating, L.L.C.

PROTESTANTS:	
Joe C. Neal	Henderson & Erickson, Inc.

PROCEDURAL HISTORY

Application Filed:	December 9, 2008
Request for Hearing:	February 24, 2009
Notice of Hearing:	April 1, 2009
Date of Hearing:	May 7, 2009
Transcript Received:	May 15, 2009
Proposal For Decision Issued:	July 7, 2009

EXAMINERS' REPORT AND PROPOSAL FOR DECISION

STATEMENT OF THE CASE

Canan Mowrey Operating, L.L.C. ("Canan") requests authority pursuant to Statewide Rule 46 to inject fluids into its Bell No. 5 in the Iron Ridge (Croton Lime) Field. The application is protested by Henderson & Erickson, Inc., an offsetting operator in the field.

DISCUSSION OF THE EVIDENCE

Applicant's Evidence

The subject well was drilled in 2002 and has been a producing well in the Iron Bridge (Croton Lime) Field. It is drilled to a total depth of 4,930 feet. The well has 217 feet of 13 ⅜" surface casing cemented to surface. The Texas Commission on Environmental Quality recommends that usable-quality ground water be protected to a depth of 200 feet. The well also has 1,405 feet of 8⅝" casing, with top of cement at 357 feet, and 4,927 feet of 5½" casing, with top of cement at 3,600 feet as verified by a cement bond log. (See attached wellbore diagram for proposed wellbore configuration.)

The proposed injection interval is the Croton Lime between 4,700 and 4,716 feet. Injection will be through 2⅜" tubing set on a packer at approximately 4,625 feet. The proposed maximum injection volume is 1,000 BWPD and the proposed maximum injection pressure is 2,350 psig. Canan believes that 400-500 BWPD will be the actual injection volume maximum, but has requested 1,000 BWPD to allow for volume increases if necessary.

The only wellbore within a ¼ mile radius of the Bell No. 5 is the Bell No. 3 operated by Canan. The No. 3 well is an active producing well in the Iron Bridge (Croton Lime) Field.

The Croton Lime is a blanket formation which extends across the area. Several separate fields exist as a result of structural trapping. The nearest comparable field is the Spur, South (Croton Lime) Field approximately 2 miles to the south of the Iron Bridge (Croton Lime) Field. Applicant also operates wells in the Spur, South (Croton Lime) Field and that field has been successfully waterflooded.

Henderson & Erickson has one well carried in the Iron Bridge (Croton Lime) Field, the Thomason No. 1 approximately 1,600 feet north of the Bell No. 5. Canan's mapping of the field indicates that the Thomason No. 1 is not producing from a common reservoir as the other wells in the Iron Bridge (Croton Lime) Field. Canan's structure map indicates west dip of the reservoir with an oil-water contact at 2,489 feet subsea. Canan maps the Thomason No. 1 in a separate structural feature.

The separation of the Thomason No. 1 from other wells in the Iron Bridge (Croton Lime) Field is supported by pressure data. The first well drilled in the field was the Bell No. 1 in 2002. This well is on the western edge of the field and had a drill stem test pressure of 1,888 psi. No other wells encountered pressures this high and by the time the Carlisle "C" No. 2C was drilled in late 2004 on the eastern side of the field, the reservoir pressure was down to 371 psi. When the Thomason No. 1 was drilled in 2006, the reservoir pressure in the well was 1,054 psi, indicating that the Thomason No. 1 is not in

communication with the other wells in the Iron Bridge (Croton Lime) Field. (See attached pressure map indicating well locations and pressures.)

Canan recently determined bottomhole pressures in seven of its eight wells in the field. The pressures range from a high of 321 psi on the western portion of the field down to less than 50 psi on the eastern portion of the field. Canan attributes this pressure differential to slight water encroachment from the western downdip area of the reservoir. Based on the current pressures and well performance, Canan plans to initiate a water injection program, using the Bell No. 5 as the initial injection well. Other producing wells may be converted to injection wells as they water out.

Based on its mapping of the reservoir, original oil in place is 1.43 million BO. The wells in the field have produced 540,000 BO, or approximately 38% of original oil in place. Based on the performance of the waterflood in the Spur, South (Croton Lime) Field, secondary recovery in the Iron Bridge (Croton Lime) Field is expected to be 12% of original oil in place, or an additional 171,000 BO. This additional oil will not be recovered without the proposed injection.

Canan estimated the remaining reserves of about 7,500 BO for the Thomason No. 1 well, assuming that the current exponential decline continues. Canan believes this decline is appropriate because it is very similar to decline seen in other wells in the subject field and wells in the Spur, South (Croton Lime) Field. The Thomason No. 1 will reach its economic limit in a maximum of 3.2 years.

Commission records indicate that Canan & Mowrey has a current P-5 with the Commission and has financial assurance posted in the amount of $250,000.

Notice of the subject application was published in *The Texas Spur,* a newspaper of general circulation in Dickens and Kent Counties, on November 20, 2008. Notice of the subject hearing was published in *The Texas Spur* on April 9, 16, 23 and 30, 2009. A copy of the application was mailed to the Dickens County Clerk's Office on November 17, 2008. Also on November 17, 2008, Applicant mailed copies of the application to Henderson & Erickson, the only operator within ½ mile of the well, and to the surface owner of the tract on which the well is located.

Protestant's Evidence

Henderson & Erickson believe that the proposed injection will result in premature watering-out of their producing well to the north, the Thomason No. 1. This well is approximately 1,600 feet to the north of the Bell No. 5. The Thomason No. 1 was completed in November 2006. Reported perforations are from 4,710-4,712 feet. There are apparently additional perforations between 4,702 and 4,707 feet which are not reflected on Commission records.

The structural map presented by Henderson & Erickson indicates that the Bell No. 5 and the Thomason No. 1 are in a common reservoir, indicated to be an anticlinal structure. A drill stem test was run on the Thomason No. 1 over the interval from 4,680 feet to 4,725 feet. This interval includes a small portion of the Tannehill Lime, which lies just below the Croton Lime. Henderson & Erickson believe that the 1,054 psi initial pressure found in the Thomason No. 1 was higher than other wells in the area at the time because the Tannehill was influencing the pressure in the drill stem test of the Thomason No. 1. The pressure was not an accurate determination of pressure in the Croton Lime. Henderson & Erickson believe that the actual pressure in the Croton Lime was much less, supporting their interpretation that the Thomason No. 1 and Ball No. 5 are in a common reservoir. Henderson & Erickson attempted to run a fluid level test in the Thomason No. 1 prior to the hearing, but was unsuccessful in obtaining a current pressure.

Henderson & Erickson provided calculations indicating that the flood front created by the proposed injection will reach its Thomason No. 1 in about 4½ years, assuming 500 BWPD injection into the Bell No. 5, and radial flow. Assuming the maximum injection rate of 1,000 BWPD, the flood front would reach the Bell No. 5 in slightly less than 2 years.

The Thomason No. 1 has produced approximately 26,000 BO to date and currently produces about 14 BOPD. Remaining reserves for the Thomason No. 1 are estimated to be 25,000 BO, assuming an economic limit of 50 BO per month. This estimation is also based on the assumption that the decline rate for the well will become more hyperbolic.

EXAMINERS' OPINION

The examiners recommend that the application be approved. The subject well is completed in a manner which will confine injected fluids to the proposed injection interval between 4,700 and 4,716 feet. The well has surface casing set at 217 feet and cemented to surface. The Texas Commission on Environmental Quality recommends that usable-quality ground water be protected to a depth of 200 feet. There are no wells within a ¼ mile of the proposed well which will provide a conduit for migration of fluids from the injection zone.

The examiners agree with Canan that the Thomason No. 1 and Bell No. 5 wells are not in communication and that injection into the Bell No. 5 will not affect the Thomason No. 1. Protestant's structure map cannot be relied upon because it does not include data from several wells and therefore incorrectly depicts downdip to the east on an anticlinal structure. Canan's mapping is more accurate because it includes more wellbore data. When Canan's wells to the east are considered, structure to the east is actually updip, in direct conflict with protestant's mapping. The pressure data also supports separation in that the Thomason No. 1 was the most recent well drilled in the area and had an initial pressure several hundred pounds higher than any other well in the field at the time.

Injection into the Bell No. 5 is necessary to initiate a waterflood in the field, which will result in the recovery of approximately 170,000 barrels of secondary oil. This estimate is reasonable based on the performance of the nearest comparable field.

FINDINGS OF FACT

1. Notice of this application was provided by Canan Mowrey Operating, LLC to all persons entitled to notice pursuant to Statewide Rule 46. Notice of the subject application was published in *The Texas Spur,* a newspaper of general circulation in Dickens and Kent Counties, on November 20, 2008. Notice of the subject hearing was published in *The Texas Spur* on April 9, 16, 23 and 30, 2009.

2. The Bell No. 5 is cased and cemented in a manner to protect usable quality water.

   a. The Texas Commission on Environmental Quality recommends that usable-quality water be protected to 200 feet in the area of the proposed well.

   b. The well has 217 feet of 13 ⅜" surface casing set and cemented to surface.

3. Fluids injected into the Bell No. 5 will be confined to the injection interval.

   a. The well has 4,927 feet of 7⅞" casing, with top of cement at 3,600 feet as verified by a cement bong log.

   b. Injection will be through tubing set on a packer no higher than 100 feet above the top of the injection interval.

   c. There are no wellbores within ¼ mile of the proposed injection well which would provide a conduit for migration of injected fluids from the injection interval.

   d. The proposed injection interval is the Croton Lime between 4,700 and 4,716 feet.

4. Injection into the Bell No. 5 is in the public interest as the proposed waterflood will result in the recovery of approximately 170,000 barrels of secondary oil.

5. The use or installation of the proposed well will not endanger or injure any oil, gas, or other mineral formation.

6. With proper safeguards, as provided by terms and conditions in the attached final order which are incorporated herein by reference, both ground and surface fresh water will be adequately protected from pollution.

7. Canan Mowrey Operating, LLC Inc. is an active operator with financial assurance in the amount of $250,000.

CONCLUSIONS OF LAW

1. Proper notice was issued in accordance with the applicable statutory and regulatory requirements.

2. All things have occurred to give the Railroad Commission jurisdiction to consider this matter.

3. The use or installation of the proposed injection well is in the public interest as it will result in the recovery of additional oil which would not otherwise be recovered.

4. The use or installation of the proposed injection well will not endanger or injure any oil, gas, or other mineral formation and will not cause the pollution of ground or surface water.

5. Canan Mowrey Operating, LLC has made a satisfactory showing of financial responsibility to the extent required by Section 27.073 of the Texas Water Code.

6. Canan Mowrey Operating, LLC has met its burden of proof and satisfied the requirements of Chapter 27 of the Texas Water Code and the Railroad Commission's Statewide Rule 46.

EXAMINERS' RECOMMENDATION

Based on the above findings and conclusions, the examiners recommend that the application be approved as set out in the attached Final Order.

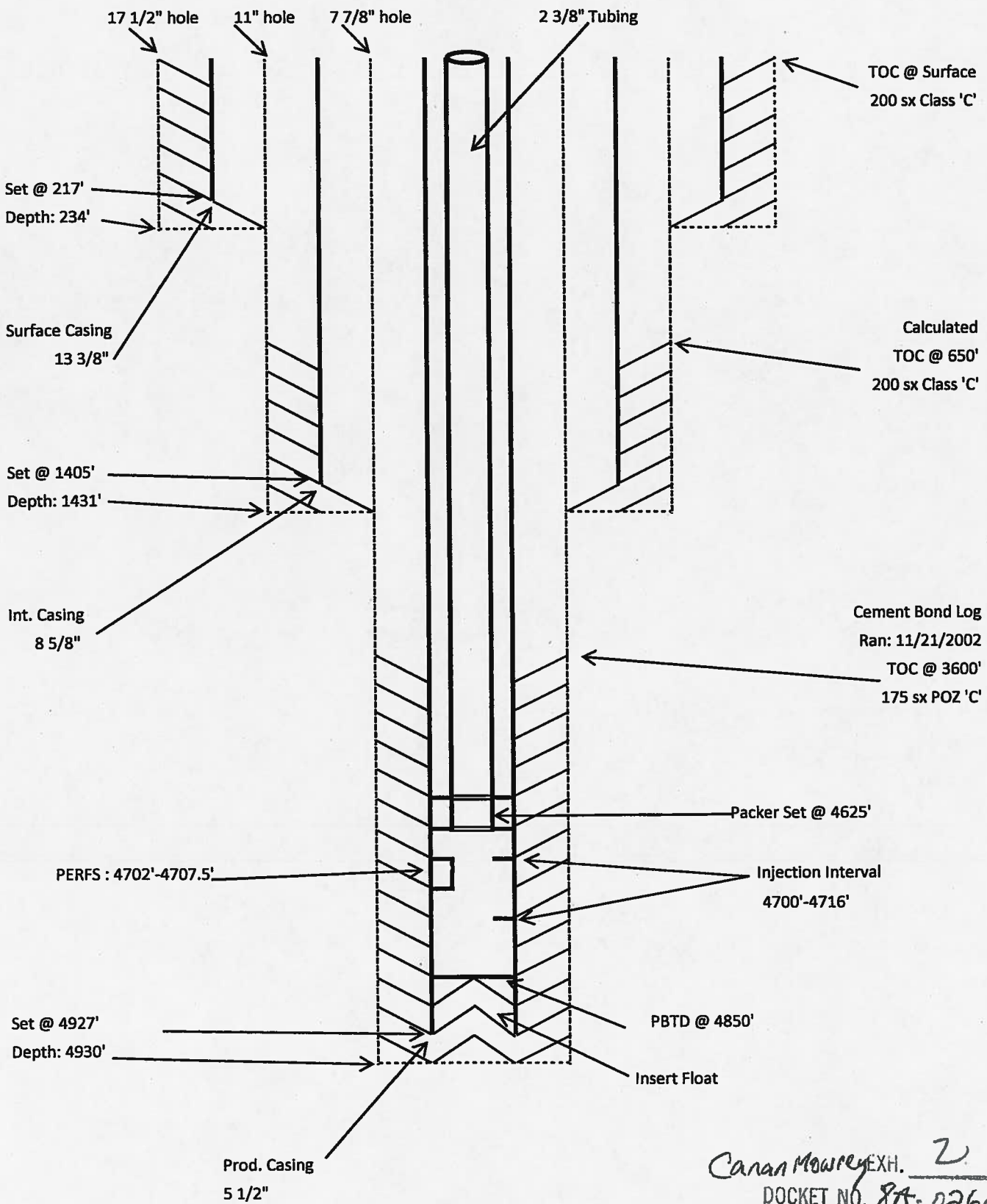
Respectfully submitted,

Donna Chandler
Donna K. Chandler
Technical Examiner

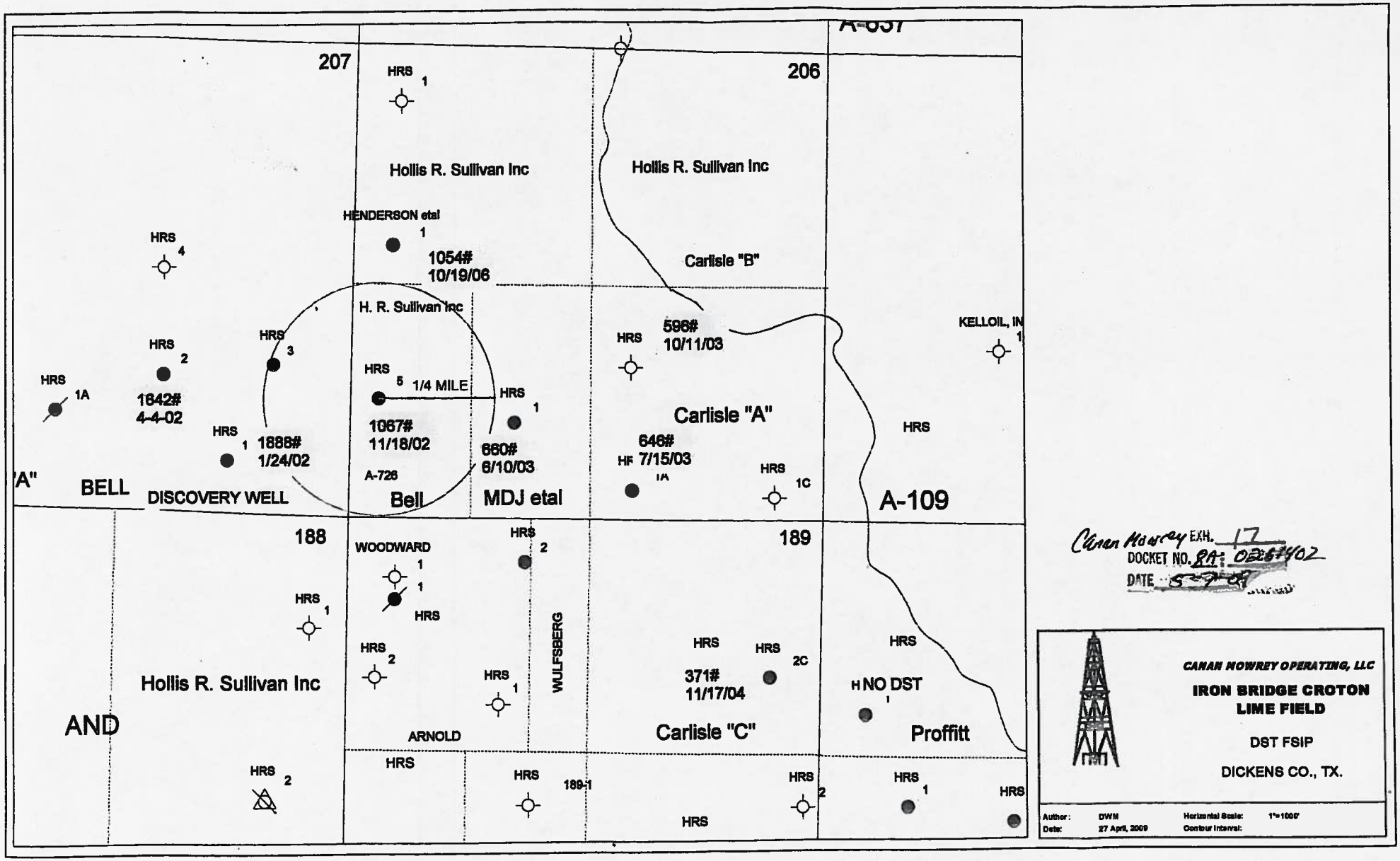
Marshall Enquist (DKC)
Marshall F. Enquist
Hearings Examiner

Bell # 5
Dickens Co.

A.P.I. # 42-125-30819
Permit # 524496



Canan Mowrey EXH. 2
DOCKET NO. 8A-0261402
DATE 5-7-09



207
206
188
189
Hollis R. Sullivan Inc
Hollis R. Sullivan Inc
HENDERSON etal
1054#
10/19/06
Carlisle "B"
H. R. Sullivan Inc
596#
10/11/03
KELLOIL, IN
1642#
4-4-02
1888#
1/24/02
1067#
11/18/02
1/4 MILE
660#
6/10/03
Carlisle "A"
646#
7/15/03
A-726
BELL
DISCOVERY WELL
Bell
MDJ etal
A-109
WOODWARD
WULFSBERG
371#
11/17/04
NO DST
Hollis R. Sullivan Inc
AND
ARNOLD
Carlisle "C"
Proffitt
189-1
Canan Mowrey EXH. 17
DOCKET NO. 8A: 02-67402
DATE 5-7-09
CANAN MOWREY OPERATING, LLC
IRON BRIDGE CROTON
LIME FIELD
DST FSIP
DICKENS CO., TX.
Author: DWM
Date: 27 April, 2009
Horizontal Scale: 1"=1000'
Contour Interval: