Citation OIL & GAS CORP.

August 31, 2012

South Dakota DENR
523 East Capital
Pierre, SD 57501-3181

Attn: Mr. Brian Walsh

Re: West Buffalo B Unit
Clarkson #2-26H injection pressure
Sections 26 T21N-R03E
Harding Co., SD

Dear Mr. Walsh:

Citation Oil and Gas Corporation (COGC) currently has 5 water injection wells at West Buffalo B Unit (WBBU) in Harding Co., SD. injecting into the Red River B. Current maximum pressure limits for all of the water injectors at WBBU range from 1540-1550 psi. The pressures were originally derived from a step rate test performed on the State #14-16 vertical injection well on August 16th, 1989. COGC recently conducted step rate tests on the Clarkson #2-26H (horizontal injector) water injection well. Results of the step rates are considered to be exclusive to the Clarkson #2-26H and not valid for vertical water injectors. Therefore, Citation Oil and Gas requests an authorized maximum injection pressure of **2,010 psi** for the Clarkson #2-26H water injection well.

COGC performed a step rate test on the Clarkson #2-26H (**FIG #1** attached) on July 18th, 2012. The test was performed in 5 minute step intervals ranging from rates of 0.3 bpm to 3 bpm. Typical step rate results with injection pressure plotted versus rate show two straight line trends with the first trend line possessing a steeper decline representing matrix injection. The second trend line is typically shallower and characterizes fracture extension pressures. The intersection point of the two lines is used to estimate fracture extension pressure. The plotted results for the first step rate for the Clarkson #2-26H **(FIG #1)** do not exhibit a typical step rate trend and the straight line trend indicates that this step rate did not achieved a high enough rate to fracture the formation. Therefore, a second step rate test was performed on August 29th, 2012 (**FIG #2** attached) with 5 minute step intervals ranging from 1 bpm to 5.5 bpm. The pressure and rate data from the first step rate and second step rate test were merged and plotted accordingly (**FIG #3** attached). **Table #1** on **FIG #3** contains the averaged rates and averaged surface injection pressures during the step rate. The results from the merged step rate analysis remain the same as there are 2 distinct slopes but the trend is the inverse of a typical step rate plot. The line plotted in **FIG #3** exhibits a slight exponential trend and then deviates to an increasing linear trend. The point of deviation on this trend line corresponds to 2010 psi surface pressure or the requested

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authorized maximum injection pressure. This deviation point corresponding to 2010 psi is not to be confused with the parting pressure of the formation.

The Clarkson #2-26H step rate results reveal that much higher injection rates will be required to exceed the parting pressure of the formation. **FIG #4** plots the surface injection pressure and the bottom hole pressure (BHP) versus rate. **Table #2** on **FIG #4** contains the calculated friction pressures (P_f) at corresponding step rates. P_f was calculated using the imperial form of the Hazen-Williams equation.

$$P_f = [0.002083(L)(100/C)^{1.85}(Q^{1.85}/d^{4.8655})]/2.31$$

P_f = friction pressure (psi)
L = tubing length (ft)
C = friction coefficient (90 for used tubing)
Q = flow rate (gpm)
d = inside tubing diameter (in.)

Note the trend of the BHP pressure curve on **FIG #4** and that increasing the rate lowers the BHP due to increasing friction pressure. The black dashed line represents the bottom hole fracture pressure based on a fracture gradient of 0.617 psi/ft. The fracture gradient was derived from the original State #14-16 step rate and falls in line with estimated fracture gradients throughout the field. The bottom hole fracture pressure for the Clarkson #2-26H = (Fracture gradient x TVD of the lateral) = (0.617 psi/ft x 8422 ft) = 5196 psi. The BHP's fall below this line verifying that current and requested maximum injection pressures will not meet or exceed the estimated fracture pressure of the formation. Furthermore, the top confining zone (Stony Mt. Shale) will typically have a fracture gradient of 1.0 psi/ft or greater. However, the red dashed line represents a bottom hole fracture pressure (7100 psi) of the Stony Mt. Shale assuming a conservative fracture gradient of 0.85 psi/ft. **FIG #4** illustrates that current and requested maximum injection pressures not only fall below the Red River B parting pressure but also below the confining zone parting pressure. Therefore, it is reasonable to conclude that horizontal injectors should be evaluated independently and utilizing vertical injection well step rate data will result in ultra-conservative injection pressures for horizontal injection wells.

The step rate test performed for the Clarkson #2-26H validates the suspicion that in order to exceed parting pressures in this horizontal injector rates beyond the capability of the surface equipment would be required. The information supplied should provide ample support to accept the requested maximum injection pressure of 2010 psi. Currently, the Clarkson #2-26H is averaging 694 bwipd at 1515 psi. It is anticipated that COGC will inject +/- 900 bwipd with the approved increase in maximum allowable pressure limits.

If, after reviewing the above information and attachments, you have any questions or concerns, please call.

Sincerely,

Jeremy Wagner
Operations Engineer
Citation Oil and Gas Corporation

Cc: Bob Christofferson
Region Manager
Citation Oil and Gas Corporation

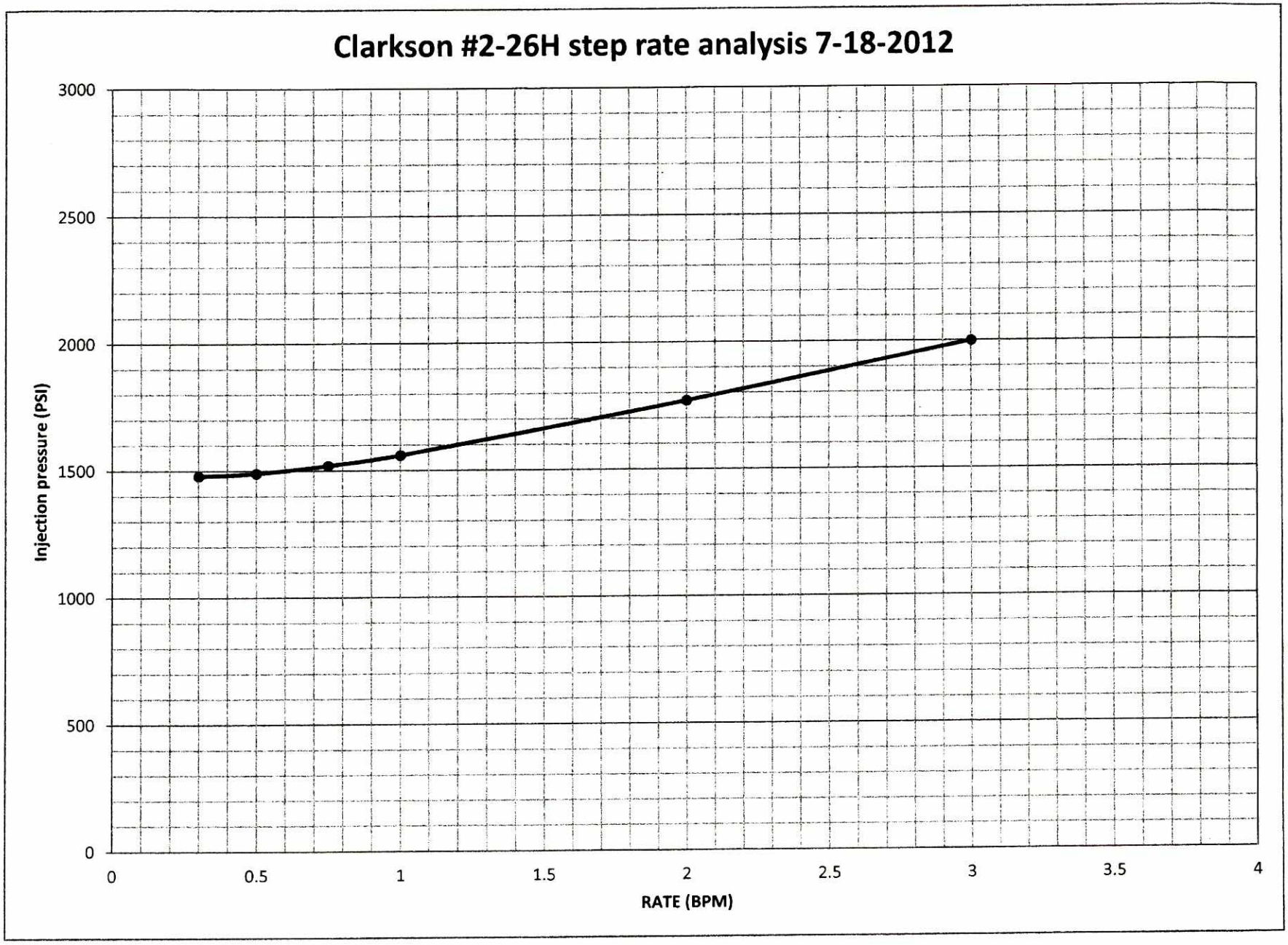

Clarkson #2-26H step rate analysis 7-18-2012
Injection pressure (PSI)
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
3
3.5
4
RATE (BPM)

FIG #1

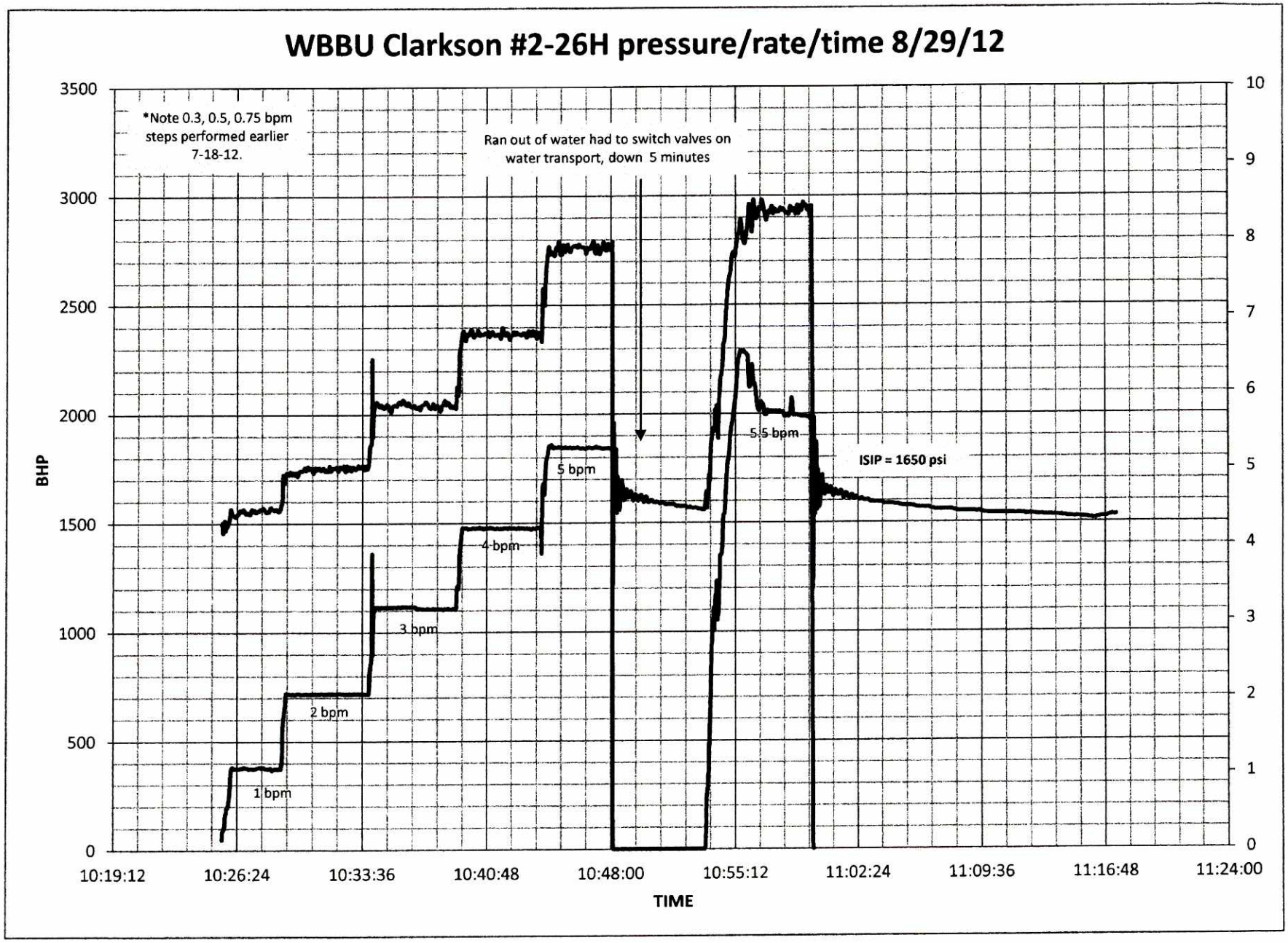

WBBU Clarkson #2-26H pressure/rate/time 8/29/12
*Note 0.3, 0.5, 0.75 bpm steps performed earlier 7-18-12.
Ran out of water had to switch valves on water transport, down 5 minutes
1 bpm
2 bpm
3 bpm
4 bpm
5 bpm
5.5 bpm
ISIP = 1650 psi
BHP
TIME
0
500
1000
1500
2000
2500
3000
3500
0
1
2
3
4
5
6
7
8
9
10
10:19:12
10:26:24
10:33:36
10:40:48
10:48:00
10:55:12
11:02:24
11:09:36
11:16:48
11:24:00

FIG #2

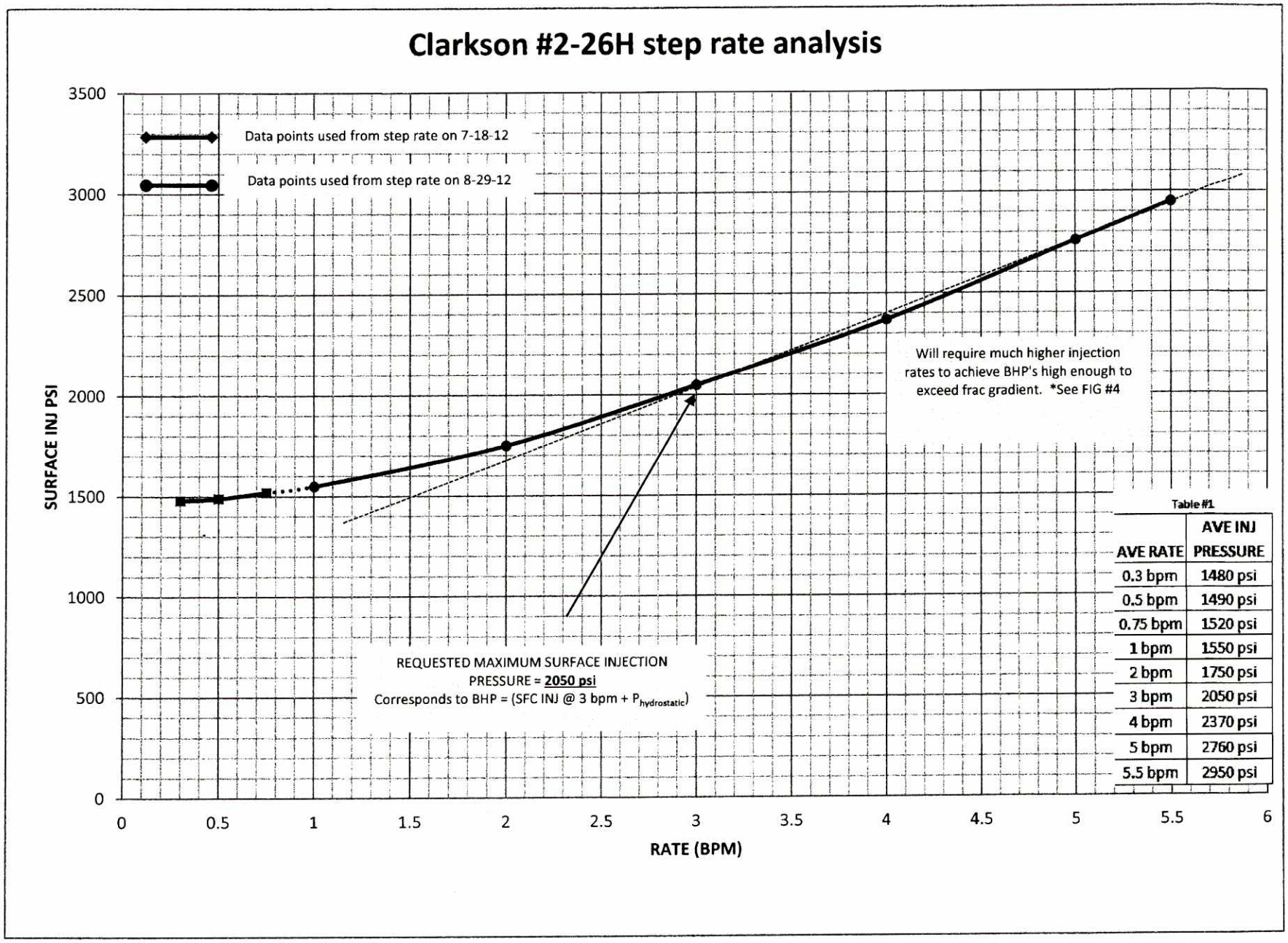


Table #1

AVE RATE	AVE INJ PRESSURE
0.3 bpm	1480 psi
0.5 bpm	1490 psi
0.75 bpm	1520 psi
1 bpm	1550 psi
2 bpm	1750 psi
3 bpm	2050 psi
4 bpm	2370 psi
5 bpm	2760 psi
5.5 bpm	2950 psi

FIG #3

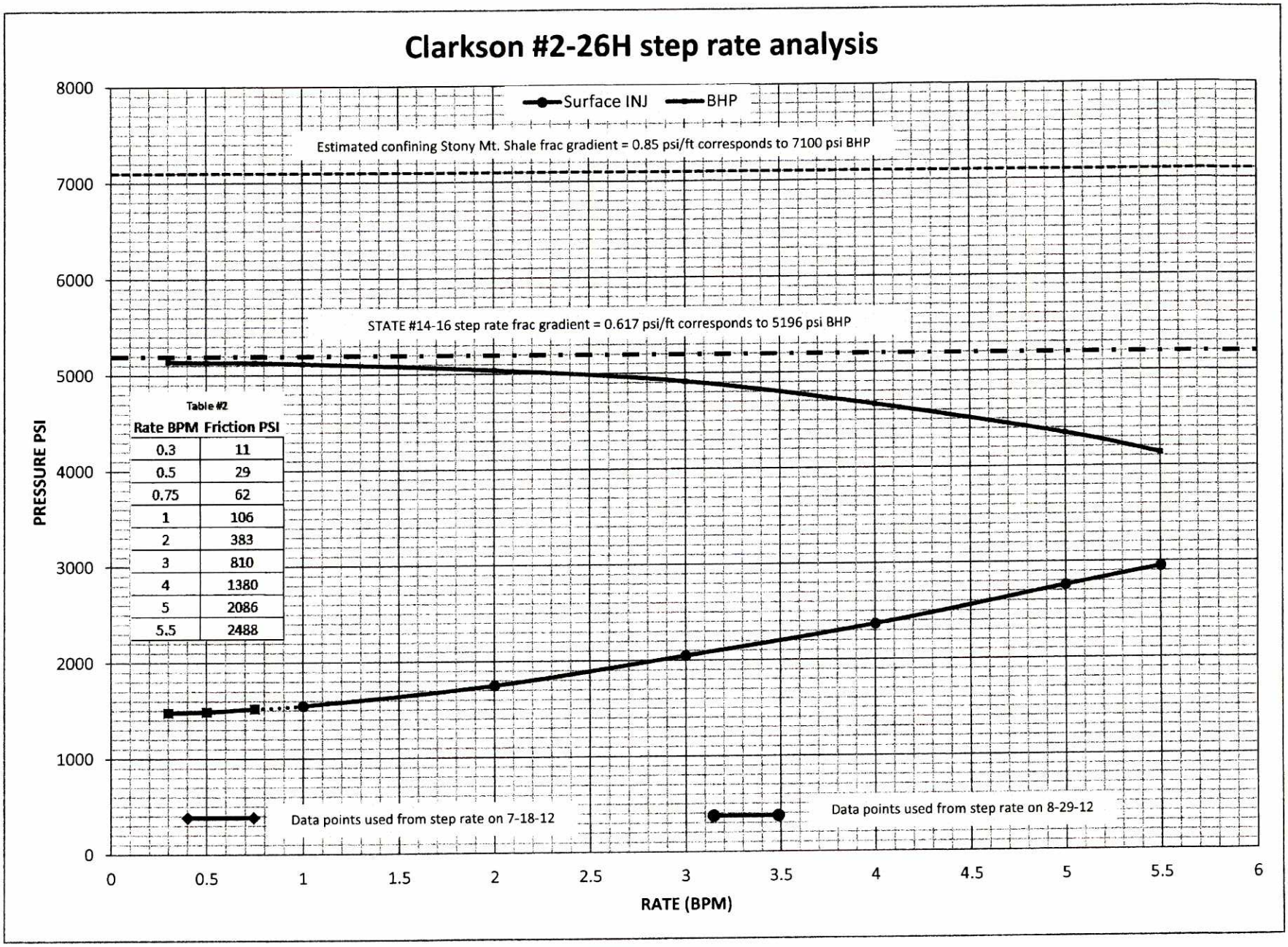
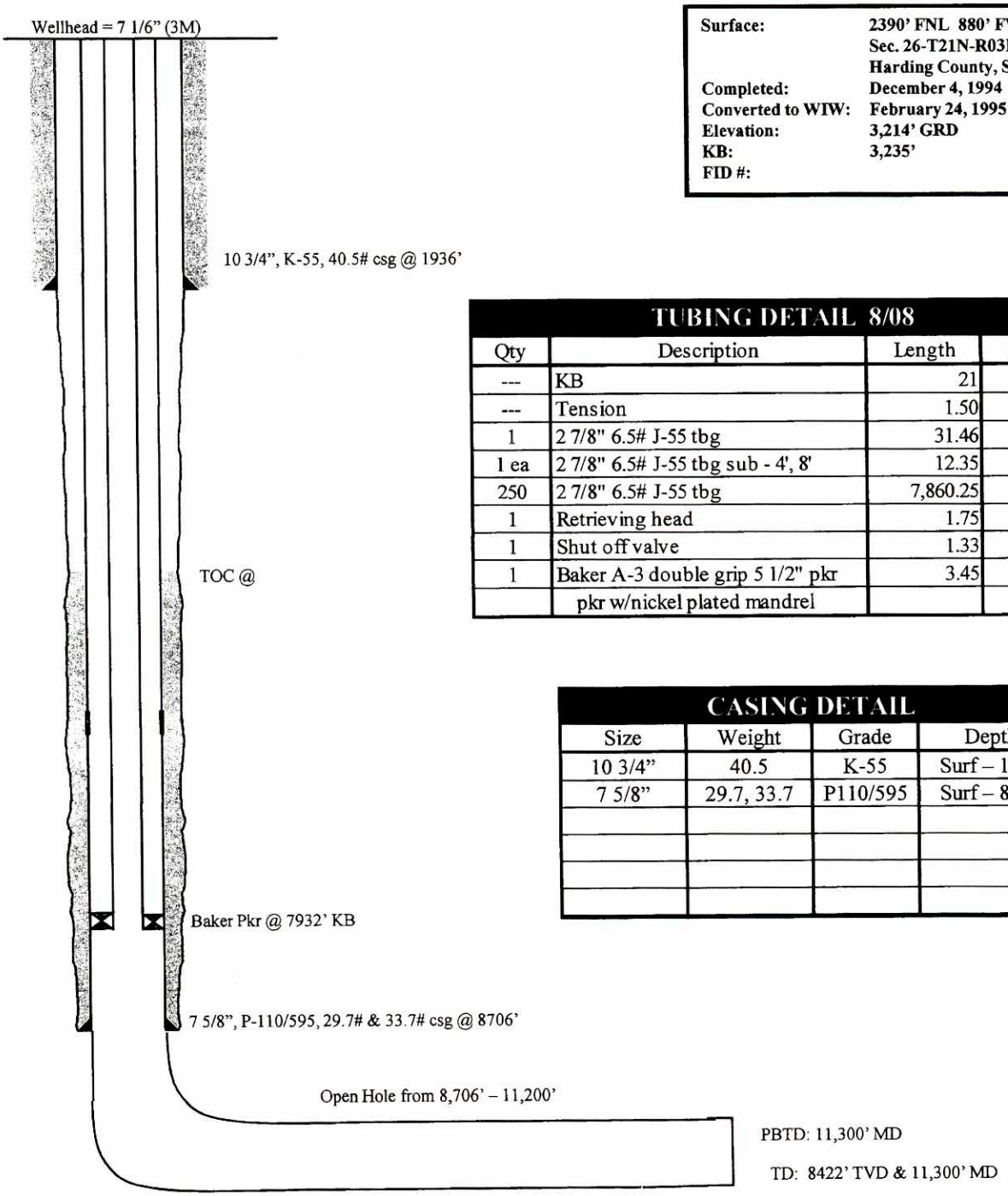

Clarkson #2-26H step rate analysis
Surface INJ
BHP
Estimated confining Stony Mt. Shale frac gradient = 0.85 psi/ft corresponds to 7100 psi BHP
STATE #14-16 step rate frac gradient = 0.617 psi/ft corresponds to 5196 psi BHP
Table #2
Rate BPM Friction PSI
0.3 11
0.5 29
0.75 62
1 106
2 383
3 810
4 1380
5 2086
5.5 2488
Data points used from step rate on 7-18-12
Data points used from step rate on 8-29-12
PRESSURE PSI
RATE (BPM)
8000
7000
6000
5000
4000
3000
2000
1000
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6

FIG #4

CITATION OIL AND GAS CORPORATION
WELLBORE DIAGRAM AND INFORMATION

Well Name: WBBU #2-26H WIW **Field:** WBBU
Date: August 2, 2008 ls **Location:** SW/NW Sec. 26-T21N-R03E
County: Harding **State:** South Dakota



Surface:	**2390' FNL 880' FWL Sec. 26-T21N-R03E Harding County, SD**
Completed:	**December 4, 1994**
Converted to WIW:	**February 24, 1995**
Elevation:	**3,214' GRD**
KB:	**3,235'**
FID #:	

TUBING DETAIL 8/08

Qty	Description	Length	Depth
---	KB	21	21.00
---	Tension	1.50	22.50
1	2 7/8" 6.5# J-55 tbg	31.46	53.96
1 ea	2 7/8" 6.5# J-55 tbg sub - 4', 8'	12.35	66.31
250	2 7/8" 6.5# J-55 tbg	7,860.25	7,926.56
1	Retrieving head	1.75	7,928.31
1	Shut off valve	1.33	7,929.64
1	Baker A-3 double grip 5 1/2" pkr	3.45	7,931.76
	pkr w/nickel plated mandrel		

CASING DETAIL

Size	Weight	Grade	Depth
10 3/4"	40.5	K-55	Surf – 1936
7 5/8"	29.7, 33.7	P110/595	Surf – 8706

STATE OF SOUTH DAKOTA
SECRETARY OF THE
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION OF CITATION OIL & GAS CORP., HOUSTON, TEXAS, TO INCREASE THE MAXIMUM INJECTION PRESSURE AT THE EXISTING CLARKSON 2-26H INJECTION WELL LOCATED IN THE SW ¼ NW ¼ SECTION 26, TOWNSHIP 21 NORTH, RANGE 3 EAST, IN THE WEST BUFFALO "B" RED RIVER UNIT, HARDING COUNTY, ABOUT 15 MILES NORTHWEST OF BUFFALO, SOUTH DAKOTA.	NOTICE OF RECOMMENDATION FOR MAJOR MODIFICATION TO A PERMIT TO INJECT OIL AND GAS CASE NO. 17-2012

Notice is hereby given to the public and to all interested persons that pursuant to South Dakota Codified Laws (SDCL) Chapter 1-26 and Chapter 45-9 and further pursuant to the Administrative Rules of South Dakota (ARSD) 74:12:07 and 74:12:09, the following matter has come to the attention of the Secretary of the Department of Environment and Natural Resources, hereinafter "Secretary."

Citation Oil & Gas Corp. has submitted an application to the Secretary requesting an increase in the injection pressure at the Clarkson 2-26H well from 1,550 pounds per square inch to 2,010 pounds per square inch. No other permit condition changes were requested. The requested pressure increase will not cause new fractures or propagate existing fractures in the confining zone and will not affect any underground sources of drinking water.

The Secretary recommends approval of the application with the following conditions:

1) Injection operations authorized under the permit to inject must be conducted in accordance with SDCL Chapter 45-9, ARSD 74:12 and any applicable orders or rules promulgated by the board;

2) The maximum injection rate must not exceed 1,000 barrels of water per day;

3) The maximum pressure must not exceed 2,010 pounds per square inch during injection operations;

4) A mechanical integrity test must be successfully conducted prior to increasing the tubing injection pressure to 2,010 pounds per square inch. The well casing must pass the mechanical integrity test at 1,000 pounds per square inch surface pressure. The operator is required to notify the Secretary a minimum of 72 hours prior to running a mechanical integrity test;

5) Once mechanical integrity is established, the well must be retested at least once every five years to ensure that mechanical integrity is maintained, unless the department indicates differently;

6) If an unsuccessful pressure test occurs, the operator must cease operations immediately if it is determined the injection will threaten any underground source of drinking water. If the failure is not threatening ground water, the operator must cease operations within 48 hours after receipt of the department secretary's notice, and take corrective action on the well as soon as feasible. Corrective action options include repairing the well so that a successful test result can be obtained, plugging and abandoning the well, or any other action approved by the department.

Authority for the Secretary to approve this application is contained in ARSD 74:12:07 and 74:12:09. Unless a person files a petition requesting a hearing on the above application pursuant to the provisions of ARSD 74:09:01 on or before November 27, 2012, the Secretary's recommendation will be considered final and the Secretary will approve the application in accordance with that recommendation. For additional information about the application, please contact Brian J. Walsh, Environmental Scientist III, Ground Water Quality Program, Department of Environment and Natural Resources, 523 East Capitol Avenue, Pierre, SD 57501; 605.773.3296 or email brian.walsh@state.sd.us.

October 29, 2012

Steven M. Pirner
Secretary

Published once at the total approximate cost of _____.