

DEPARTMENT OF ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
denr.sd.gov



c. BU

January 16, 2014

Peter MacIntyre
Continental Resources
20 N. Broadway
Oklahoma City, OK 73102

Dear Mr. MacIntyre:

Re: Case No. 49-2013 – approval of permit to inject

Thank you for your application filed October 18, 2013, requesting a permit to inject into the existing Hansen State 34-1 well in Harding County, South Dakota.

The department published a Notice of Recommendation for Case No. 49-2013, recommending approval of the application. The date for intervention was January 2, 2014, and no parties petitioned the Board of Minerals and Environment for a hearing on the application by the deadline.

In order to inject production water into the Hansen State 34-1 well an EPA approved aquifer exemption was required. EPA has approved the aquifer exemption (see enclosed approval letter). Therefore, in accordance with the Administrative Rules of South Dakota (ARSD) 74:12:07 and 74:12:09, approval of the application is hereby granted. The permit is conditioned on compliance with all applicable requirements of South Dakota Codified Laws 45-9 and ARSD 74:12.

Thank you for your interest in protecting the water resources of the state.

Sincerely,

Steven M. Pirner
Secretary

Enclosures

c: Lawrence Bender, Fredrikson & Byron, P.A., Bismarck, ND



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8

1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
<http://www.epa.gov/region08>

JAN 15 2014

Ref: 8P-W-UIC

Mr. Steven M. Pirner, Secretary
South Dakota Department of Environment and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3182

RE: Aquifer Exemption Approval:
Inyan Kara Group near the Continental
Resources, Inc. Hansen State 34-1 Saltwater
Disposal Injection well, Harding County, South
Dakota, and Underground Injection Control
Program Revision Approval

Dear Mr. Pirner:

As requested, the U.S. Environmental Protection Agency Region 8 Water Program office has reviewed the notices of, and supporting information for, the proposed South Dakota Department of Environment and Natural Resources (DENR) designation of the Inyan Kara Group near the Continental Resources, Inc. (Continental) Hansen State 34-1 Saltwater Disposal (SWD) injection well, Harding County, South Dakota, as an exempted aquifer.

This request is connected with the Continental proposal for the Hansen State 34-1 SWD well to be used for disposal into the Inyan Kara Group of saltwater produced from nearby oil production wells in the Buffalo Field. The DENR UIC permit number for this well is 49-2013. The American Petroleum Institute (API) number for this well is 40-063-20385.

APPROVAL OF PROPOSED AQUIFER EXEMPTION: Based on review of the supporting information provided by DENR, and pursuant to the Code of Federal Regulations at 40 CFR 144.7(b)(3) and the EPA's Groundwater Protection Branch Guidance #34, the EPA hereby approves a non-substantial program revision to include exemption of the Inyan Kara Group within 1,800 feet (ft.) of the Hansen State 34-1 SWD injection well, located at SWSE Section 1, T22N-R3E, between the approximate depths of 4,650 ft. to 4,854 ft., Harding County, South Dakota.

This approval is based in part on the information provided by DENR showing that the Inyan Kara Group in the vicinity of the proposed Hansen State 34-1 SWD injection well is not presently used as a source of drinking water. Also, the Inyan Kara Group, due to the well's depth and location, is not reasonably expected to supply a public water system due primarily to the higher costs of well construction and water treatment (economically impracticable), given the availability of higher quality shallow aquifers in the area. The specific exemption criteria that apply are listed at 40 CFR parts 146.4(a) and 146.4(b)(2). This

approval applies to the location and the injection activities described herein. Additional approvals may be required for additional injection activities.

OVERVIEW: The Hansen State 34-1 SWD well is a former oil well that is proposed to be converted to a UIC Class II SWD injection well. The well would be used to dispose of produced waters from the South Buffalo Red River Unit (SBRRU) of the Buffalo Field. Oil production in the area is primarily from the Red River Formation. The injection zone would be the Inyan Kara Group which is comprised of the Fall River Formation and the Lakota Formation (a.k.a., Dakota Formation). Both of these formations are predominantly sandstones.

The surface casing of this well was set at 1,573 ft. and cemented to surface and the top of cement outside the longstring casing is at a calculated depth of approximately 3,853 ft. in this well. However, there is currently no cement bond log (CBL) for the well. A CBL is planned to be required by DENR to verify the top of cement depth prior to any authorization to inject. Continental proposes to inject through perforations into the Inyan Kara Group between the depths of approximately 4,730 ft. to 4,850 ft. Water quality of the Inyan Kara Group was estimated from analysis of three (3) nearby wells (wells within approximately four (4) miles) to be approximately 7,000 mg/l total dissolved solids (TDS); therefore, the Inyan Kara Group may be considered to be an underground source of drinking water (USDW) in this area. The fluid to be injected will be primarily Red River Formation production water which may exceed 10,000 mg/l TDS.

There are no known drinking water supply wells withdrawing from the Inyan Kara Group in the vicinity of the Hansen State 34-1 injection well within one-half (½) mile. The Fox Hills Formation is a USDW at a depth of approximately 800 ft. and is the primary source of drinking water in the area. The Hell Creek Formation is also a USDW and lies above the Fox Hills Formation. However, the Hell Creek Formation is not used in the area as a source of drinking water. The Fox Hills Formation currently provides an adequate supply of drinking water to residents in the general area. Also, the Fox Hills Formation is expected to provide an adequate supply of drinking water to residents in the general area in the future based on the relatively sparse population even with the current population growth rate of 4.9% (between 2010 and 2011). The estimated cost to drill and complete a water well in the Fox Hills Formation is reported to be approximately \$10,000 for this aquifer exemption application (also estimated to be around \$30,000 in other nearby areas in the county). The estimated cost to drill and complete a water well in the Inyan Kara Group is reported to be approximately \$255,000. Also, the water quality of the Fox Hills Formation is better than the water quality of the Inyan Kara Group (the Fox Hills Formation has reported TDS values of around 1,200 mg/L). As such, there would be less water treatment costs associated with the Fox Hills Formation. Therefore, given the availability of the shallower, higher quality Fox Hills Formation and due to economic considerations associated with well construction, well operation and water treatment, it is unlikely that water wells would be constructed in the Inyan Kara Group in the area.

The upper confining layer includes the Graneros Group shales (hundreds of feet thick) which isolate the injection zone from the shallower aquifers. The lower confining layer includes the Morrison Formation shale (over 100 ft. thick) and other geologic strata which provide isolation beneath the injection zone. Below the injection zone and lower confining layer are two known USDWs: the Minnelusa Formation and the Madison Formation. The DENR has limited the total volume of injectate to approximately 36,500,000 barrels to help ensure that the injectate remains in the exempted portion of the Inyan Kara Group. Also, the DENR has set the maximum allowable injection pressure (at least initially) as 1,500 psi. That injection pressure limitation will help ensure that the upper confining zone is not fractured by injection pressures.


On May 7, 2013, the EPA issued a similar aquifer exemption approval for the Continental 32-33A SWD well. That SWD well and the associated aquifer exemption is also located in Harding County, South Dakota.

The DENR recently held a public comment period on the proposed UIC permit and aquifer exemption for the Hansen State 34-1 SWD well. The public comment period closed on January 2, 2014. No public comments were received by DENR during the public comment period.

Should you have questions or concerns, please contact Tom Aalto of my staff at (303) 312-6949.

Sincerely,



 Debra H. Thomas
Acting Assistant Regional Administrator
Office of Partnerships and Regulatory Assistance

cc: Bill Markley, DENR
Tom Brandner, DENR
Sheldon Hamann, DENR
Brain Walsh, DENR
Mike Lees, DENR
Robert EU Smith, OGWDW

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

IN THE MATTER OF THE APPLICATION OF CONTINENTAL RESOURCES, INC., OKLAHOMA CITY, OKLAHOMA, FOR APPROVAL OF A PERMIT TO INJECT PRODUCTION WATER INTO THE EXISTING HANSEN STATE 34-1 WELL LOCATED IN THE SW¼ SE¼ SECTION 1, TOWNSHIP 22 NORTH, RANGE 3 EAST, IN THE TABLE MOUNTAIN FIELD, HARDING COUNTY, ABOUT 23 MILES NORTHWEST OF BUFFALO, SOUTH DAKOTA.	NOTICE OF RECOMMENDATION FOR A PERMIT TO INJECT OIL AND GAS CASE NO. 49-2013
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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."

The Hansen State 34-1 well was completed with 1,573 feet of 8 5/8-inch steel surface casing, cemented to protect underground sources of drinking water, and 9,190 feet of 5 1/2-inch steel production casing, cemented to protect underground sources of drinking water. The well will be converted for injection including the addition of a cast iron bridge plug at 8,925 feet below land surface, a cement plug on top of the cast iron bridge plug, a cement plug at 6,550 feet below land surface, and a cast iron bridge plug at 4,875 feet below land surface. The injection zone will be in the Inyan Kara Formation. All injection water will be produced water from the State Central Tank Battery #4 and the Quinn 44-36H production well. There are no other wells located within the one-half mile area of review.

Water from the Inyan Kara Formation, near the proposed injection well, has a total dissolved solid content of less than 10,000 milligrams per liter; therefore, an aquifer exemption is required to conduct injection operations at this well. The Secretary recommends granting a 1,800-foot radius aquifer exemption in the Inyan Kara Formation around the proposed injection well. The Secretary has made this recommendation because the Inyan Kara Formation, near the proposed injection well, does not currently serve as a source of drinking water, is not expected to supply a public water system, and will not serve as a source of drinking water in the future because its location and depth make recovery of water for drinking water purposes economically impractical.

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 life of the permit may not exceed 25 years;
- 3) Prior to the commencement of injection, the Secretary's recommended Aquifer Exemption for this operation must be approved by the United States Environmental Protection Agency;
- 4) Prior to the commencement of injection, a water compatibility analysis of the water to be injected and water from the injection formation at the Hansen State 34-1 well must be completed and submitted to the department for review. If the analysis indicates the waters are

incompatible, action must be taken to prevent potential damage to the injection well or the injection formation;

- 5) The maximum injection rate may not exceed 4,000 barrels of water per day during injection operations;
- 6) The maximum surface injection pressure may not exceed 1,500 pounds per square inch during injection operations;
- 7) A mechanical integrity test must be successfully conducted prior to commencement of injection. 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;
- 8) 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;
- 9) 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 January 2, 2014, 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 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.

December 2, 2013



Steven M. Pirner
Secretary

Published once at the total approximate cost of _____.