EDO Principal Correspondence Control

FROM: DUE: 07/19/05 EDO CONTROL: G20050451
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FINAL REPLY:

John V. Corra
Department of Environmental Quality
State of Wyoming

TO:

Chairman Diaz

FOR SIGNATURE OF : ** GRN ** CRC NO: 05-0328

Strosnider, NMSS

DESC:

Clarification of NRC Ground Water Restoration Criteria In-Situ Uranium Mining

ROUTING:

Reyes
Virgilio
Kane
Silber
Dean
Cyr/Burns
Lohaus, STP

DATE: 06/23/05

ASSIGNED TO: CONTACT:

NMSS Strosnider

SPECIAL INSTRUCTIONS OR REMARKS:

Add EDO and the Commission for concurrence. EDO and the Commission to review prior to dispatch.

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CORRESPONDENCE CONTROL TICKET

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| **AUTHOR:** | John Corra | | |
| **AFFILIATION:** | WY | | |
| **ADDRESSEE:** | Nils Diaz | | |
| **SUBJECT:** | Request for clarification of NRC Ground Water Restoration Criteria In-Situ Uranium Mining | | |
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EDO --G20050451

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

June 13, 2005

Nils J. Diaz, Ph.D.
Chairman, Nuclear Regulatory Commission
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: Request for Clarification of NRC Ground Water Restoration Criteria In-Situ Uranium Mining

Dear Dr. Diaz:

The Wyoming Department of Environmental Quality (DEQ) and the Nuclear Regulatory Commission (NRC) are currently working on a Memorandum of Understanding (MOU) for regulation of in-situ uranium mining (NRC Regulatory Issue Summary 2004-02, Deferral of Active Regulation of Groundwater Protection at In-Situ Leach Uranium Extraction Facilities). One issue that is apparently of concern in the development of this MOU is whether DEQ's ground water restoration requirements in statute and rule are comparable to the NRC restoration guidance. Therefore, DEQ is requesting clarification of the Nuclear Regulatory Commission's (NRC's) interpretation of the ground water restoration language in NUREG 1569 (Standard Review Plan for In-Situ Leach Uranium Extraction License Applications). The requested clarification is for both what the restoration criteria are and where they are applicable. Table I, see attachment, includes excerpts of the restoration language from the DEQ statutes and rules and from NUREG 1569.

**Restoration Criteria**

DEQ has had statutory ground water restoration requirements in place since 1979 (W.S. § 35-11-103(f)(i)&(iii)), and rules related to those statutes were promulgated in 1980 DEQ Land Quality Division (LQD) Non-Coal Rules, Chapter 11, Section 3(d). Those rules, which were hardly changed until recently, set the primary restoration goal as "baseline", (determined by the pre-mining ground water sampling results) and the secondary restoration requirement as "class of use", (determined by DEQ Water Quality Division). In 2003, NRC completed development of NUREG 1569 which included a similar approach to ground water restoration.

In 2004, during discussions between DEQ and NRC on development of the MOU, DEQ reminded NRC personnel that extensive revisions to the DEQ rules were in progress and those revisions were promulgated in 2005. The revisions included changes to DEQ's restoration requirements (DEQ LQD Non-Coal Rules, Chapter 11, Section 5(a)(ii) based in part on comments from industry that DEQ did not have statutory authority to include a restoration goal of baseline (letter of July 30, 2003 from M. Loomis, Wyoming Mining Association to members of the LQD Advisory Board).

Whether or not DEQ's revised rule language is as stringent as the language in NRC's NUREG 1569 has been described as a potential "roadblock" to the MOU development, again based in part on comments from industry to NRC (letter of November 2, 2004 from K. Sweeney, National Mining Association, to G. Janosko (NRC). However, these comments raise another issue about restoration requirements, i.e., where they are applicable, that also needs to be resolved.

**Where the Restoration Criteria are Applicable**

In general, the overall ground water quality at Wyoming in-situ mines is good, with concentrations of Total Dissolved Solids (TDS) on the order of 1,000 milligrams/liter or less. In fact, with the exception of elevated radium concentrations in the ore zones, it is not readily apparent from general water quality data that a particular well is completed in an ore zone.

Because of the low TDS concentrations, the Environmental Protection Agency (EPA) requires exemption of that portion of an aquifer in which mining will occur. EPA does not require restoration inside the exempted area unless necessary to protect ground water adjacent to the exempted area or the site is on Indian Lands. However, the Wyoming restoration requirements apply to all ground waters affected by mining. When Wyoming was granted primacy by EPA for the Underground Injection Program in 1983, DEQ chose to retain its existing ground water classification system rather than adopt the EPA exemption process. In addition, DEQ is required by rule to protect ground water for "all uses for which it is suitable", and the various statutory and restoration provisions applied whether the ground water was inside or outside any area exempted by the EPA.

**Request for Clarification**

As DEQ and NRC continue work on the MOU for regulation of in-situ uranium mining, it would be helpful to clarify whether DEQ and NRC restoration approaches are comparable. It is our understanding the NRC has recently received additional comments from industry, and we are concerned that discussions are taking place without benefit of clear understanding of technical and regulatory restoration issues in Wyoming. The in-situ uranium mine operators in Wyoming have only applied to DEQ for a determination of restoration success at four commercial well fields, and DEQ has considered restoration complete at two of those (although continued monitored natural attenuation was required at one well field). Restoration has generally taken longer than originally anticipated, however, all the water quality parameters have been returned to concentrations at or below baseline or class of use concentrations both inside and outside the production zone. Depending on well-specific conditions, concentrations of a few parameters have been more difficult to reduce (e.g., radium or arsenic concentrations in a specific well). Industry has continued to explore new technologies to improve the restoration process.

If you have any questions or need additional information, please contact me at 307-777-7192 or email me at jcorra@state.wy.us.

Sincerely,

John V. Corra
Director

Attachment - Table I

cc: Sandy Stavnes, EPA Region 8
Robert Nelson, NRC
Mike Barrash
Rick Chancellor
Roberta Hoy
John Wagner
Kevin Frederick

**Table I - Ground Water Restoration Criteria of the Wyoming Department of Environmental Quality (WDEQ) and the Nuclear Regulatory Commission (NRC)**

| Wyoming Statute (1979) | WDEQ/LQD NonCoal Rules (1980) | WDEQ/LQD Rules (2005) | NRC NUREG 1569 (2003) |
|---|---|---|---|
| **W.S. § 35-11-103(f)(iii)** "'Groundwater restoration' means the condition achieved when the quality of all groundwater affected by the injection of recovery fluids is returned to a quality of use equal to or better than, and consistent with the uses for which the water was suitable prior to the operation by employing the best practicable technology;"<br>where "best practicable technology" is defined as:<br>**W.S. § 35-11-103(f)(i)** ... "[A] technology based process justifiable in terms of existing performance and achievability in relation to health and safety which minimizes, to the extent safe and practicable, disturbances and adverse impacts of the operation on human or animal life, fish, wildlife, plant life and related environmental values;"<br>and where LQD relies on the WDEQ Water Quality Division to determine "quality of use" per the ground water classification criteria in Chapter 8 of the WQD rules. | **Chapter 11, Section 3(d)** A reclamation plan containing all information required by W.S. 35-11-406(b)(ii), (iv), (xv), (xix), and consistent with the applicable in situ technology:<br>**(i)** The information necessary to demonstrate that the operation will return all affected groundwater, including affected groundwater within the production zone, receiving strata, and any other areas, to a condition such that its quality of use is equal to or better than, and consistent with, the uses for which the water was suitable prior to the operation by employing the best practicable technology. Such a demonstration shall be made by showing that through the employment of the best practicable technology, as defined in W.S. 35-11-103(f)(i):<br>**(A)** The condition and quality of all affected groundwater will be returned to background or better, or;<br>**(B)** The requirements of Section 3.(d)(i)(A) cannot be achieved. In this event the condition and quality of all affected groundwater will at a minimum be returned to a quality of use equal to and consistent with uses for which the water was suitable prior to the commencement of the operation.<br>**(ii)** In accordance with paragraph (i) of this subsection, the condition of groundwater restoration and the proposed procedures to achieve such restoration. | **Chapter 11, Section 5(a)(ii)** The information necessary to demonstrate that the operation will achieve the standard of returning all affected groundwater to the pre-mining class of use or better using Best Practicable Technology, in accordance with the following provisions:<br>**(A)** In deciding whether a demonstration has been made by the operator that Best Practicable Technology has been applied, the Administrator shall, at a minimum, take the following factors into consideration:<br>**(I)** The pre-mining background water quality;<br>**(II)** The character and degree of injury or interference with the health and well being of the people, animals, wildlife, aquatic like and plant life affected:<br>**(III)** The social and economic value of the source of pollution;<br>**(IV)** The social and economic value of the impacted aquifer;<br>**(V)** The priority of location in the area involved;<br>**(VI)** The technical practicability and economic reasonableness of reducing or eliminating the source of pollution;<br>**(VII)** The effect upon the environment; and<br>**(VIII)** The potential impacts to other waters of the state;<br>**(B)** The evaluation of restoration of the groundwater within the production zone shall be based on the average quality over the production zone. For groundwater affected outside the production zone, the restoration shall be evaluated separately for each well;<br>**(C)** The evaluation is conducted on a parameter by parameter basis; and<br>**(D)** Regardless of the restored groundwater quality in the production zone, the adjacent aquifers and other waters within the same aquifers must be fully protected to their class of use and, outside the aquifer exemption boundary, to applicable Maximum Contaminant Levels from the U.S. Environmental Protection Agency Rules (40 CFR 141 as amended July 1, 2001). If the restored groundwater in the production zone poses a threat to groundwater outside the production zone, then flow and/or fate and transport models shall be used to assist in determining what action, including monitoring sufficient to verify the model, needs to be taken A monitoring program sufficient to verify the model may be required.<br>**(E)** If the operator demonstrates the application of Best Practicable Technology to the satisfaction of the Administrator, but is unable to achieve the pre-mining class of use, then the operator can:<br>**(I)** Request that the Director recommend the Environmental Quality Council modify the water quality criteria used for ground water restoration, in accordance with W.S. 35-11-429(iii) (2003);<br>**(II)** Provided the operator can demonstrate the requirements of Section 5(a)(ii)(D) will be met. | **6.1.3(4)** Restoration standards are established in the application for each of the monitored constituents. The applicant has the option of determining numerical restoration limits for each monitored constituent on a well-by-well basis, or as a statistical average applied over the entire well field. Restoration standards must be established for the production zone and for any overlying or underlying aquifers that have the potential to be affected by in situ leach solutions.<br>**(a)** Primary Restoration Standards-The primary goal of a restoration program is to return the water quality within the exploited production zone and any affected aquifers to pre-operational (baseline) water quality conditions. Recognizing that in situ leach operations fundamentally alter ground-water geochemistry, restoration activities are not likely to return ground-water quality to exact water quality that existed at every location prior to in situ leach operations. Still, as a primary restoration goal, licensees are required to attempt to return the concentrations of the monitored water quality indicator constituents to within the baseline range of statistical variability for each constituent. This standard requires licensees to identify the type of statistical analysis and criteria that will be used to determine whether concentrations of water quality parameters in the affected aquifers fall within an acceptable range of baseline variability. Statistical approaches for determining whether contamination persists in affected aquifers are found in American Society for Testing and Materials Standard D 6312 (American Society for Testing and Materials, 2001).<br>**(b)** Secondary Restoration Standards-In situ leach operations may cause permanent changes in water quality within the exploited production zone, because the in situ leach extraction process relies on changing the chemistry in the production zone to remove the uranium. The applicant may therefore propose returning the water quality to its pre-operational class of use (e.g., drinking water, livestock, agricultural, or limited use) as a secondary restoration standard. Applications should state the principal goal of the restoration program and that secondary standards will not be applied so long as restoration continues to result in significant improvement in ground-water quality. The applicant must first attempt to return ground-water quality to primary restoration standards before falling back on secondary restoration standards. License conditions should be set up such that a license amendment is necessary before the applicant can revert to secondary goals. The applicant must commit to use reasonable efforts to reach primary restoration standards. It is acceptable to establish secondary restoration standards on a constituent-byconstituent basis, with the numerical limits established to ensure state or EPA primary or secondary drinking water standards will not be exceeded in any potential source of drinking water. For radionuclides not included in the drinking water standards, it is acceptable to determine, on a constituent-by-constituent basis, secondary standards from the concentrations for unrestricted release to the public in water, from Table 2 of 10 CFR Part 20, Appendix B.<br>**(c)** If a constituent cannot technically or economically be restored to its secondary standard within the exploited production zone, an applicant must demonstrate that leaving the constituent at the higher concentration would not be a threat to public health and safety or the environment or produce an unacceptable degradation to the water use of adjacent ground-water resources. This situation might arise with respect to general water quality parameters such as the total dissolved solids, sulfate, chloride, iron, and others which do not typically present a health risk. However, not all the major constituents have a primary or secondary drinking water standard (e.g., bicarbonate, carbonate, calcium, magnesium, and potassium). Consequently, ground-water restoration may achieve the secondary standard for total dissolved solids, but may not achieve a secondary standard for individual major ions that contribute to total dissolved solids. If such a situation occurred, the applicant must show that leaving the individual constituent at a concentration higher than secondary standard would not be a threat to public health and safety nor the environment or produce an unacceptable degradation to the water use of adjacent ground-water resources. Such proposed alternatives must be evaluated on a case-by-case basis as a license amendment request only after restoration to the primary or secondary standard is shown not to be technically or economically achievable. This approach is consistent with the as low as is reasonably achievable philosophy that is used broadly within NRC. |